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**ACCOUNTING INFORMATION AS A FACTOR FOR
OPTIMIZING THE MANAGEMENT OF
ENTERPRISES IN THE ENERGY SECTOR**

ABSTRACT

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the Professional field 3.8. Economics, Doctoral programme “Accounting,
control, and analysis of economic activity (Accounting)”

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I. GENERAL CHARACTERISTIC OF THE DISSERTATION

1. Relevance

It is expressed in several aspects:

1. Financial transparency and accountability. Currently, energy enterprises¹ are facing the challenge of providing accurate and timely accounting information, especially bearing in mind the increasing role of the energy sector in the economy and the necessity to attract investments.
2. Efficient management of resources. Accounting information is a key tool for the efficient management of resources in energy enterprises. It provides the necessary basis for cost analysis, budget forecasting and cost optimization, which is of crucial importance in such a dynamic and competitive industry.
3. Compliance with regulations. The energy sector is subject to strict regulations and requirements. Accounting information plays a significant role in securing compliance with various regulatory standards and regulations. It should be presented in a manner that meets the requirements of the regulatory organs and the public.
4. Integration with modern technologies. The current trend towards the digital transformation of operations and the implementation of new technologies makes accounting information an even more valuable asset. It should be easily accessible, integrated and adapted to the requirements of contemporary business.
5. Sustainable management and reporting of emissions. In light of the growing awareness of climate change and sustainable development, accounting information is of great importance for the management and reporting of emissions by energy enterprises. The information about

¹ For the purposes of this research, the terms enterprises of the sector “Energy”, energy enterprises, and enterprises of the energy sector are used as synonyms.

emissions is becoming increasingly important for both regulators and investors.

6. Corporate responsibility and investments. Investors are focusing their attention on those enterprises that demonstrate high standards of corporate social responsibility (CSR). Accounting information provides an opportunity to report on innovative and sustainable practices, which attracts the attention of investors and the public.

Accounting information is important for the optimization of the management of the enterprises in the energy sector. On the one hand, it provides the necessary financial tools, on the other hand – it supports strategic decision-making, compliance with regulations and demonstrating responsibility to the society. In this dissertation, we analyze these aspects in detail, in an effort to contribute to the understanding and improvement of the accounting practice in the energy sector.

2. Degree of development of the problem

The topic of accounting information as a factor for optimizing the management of enterprises in the energy sector is of high scientific and practical importance, and internationally it is the subject of increased attention in the context of digitalization, sustainable development and increasing regulatory requirements. A number of studies emphasize the role of accounting information in making strategic management decisions, increasing efficiency, securing transparency and compliance with sustainable reporting standards (e.g., CSRD and ESRS). Nevertheless, it can be stated that in the Bulgarian scientific context the problem has been researched only to a certain extent – the available publications focus mainly on the general principles of accounting and less often on the specific aspects of the energy sector and its management needs. The possibilities of accounting information generated through integrated systems (e.g., ERP) to support management optimization, sustainable budgeting and the analysis of non-financial indicators remain incompletely examined. This

dissertation aims to overcome these deficits through a comprehensive approach to accounting information as a strategic management resource in enterprises in the Energy sector.

3. Research thesis

The thesis of this research is that by combining technological innovations and strategic decisions, the quality of accounting information in the enterprises in the energy sector is a determining factor for successfully addressing the challenges facing the industry. This approach not only optimizes financial and accounting processes but also provides innovative opportunities for sustainable management in the conditions of rapidly developing energy markets.

4. Object and subject

The object of the research are the enterprises from the Energy sector under code 35.1 of CEA (Classification of economic activities)², whereas the subject – the capacity of accounting information as an important factor for optimizing their management.

The choice of the sector, i.e., the choice of enterprises in the energy sector for the purposes of the dissertation research, is determined by a number of considerations and strategic aspects that reveal its importance and relevance for the accounting and management of enterprises.

The first decisive argument for the choice of the energy sector is rooted in the strategic role that this sector plays in modern economy. The second aspect that makes the energy sector important for this research is related to the global challenges and trends in the field of energy. The third argument is concerned with the complexity of the management and accounting in the energy sector. In addition, the choice of research regarding the energy sector is based on the need for innovation and optimization in accordance with the modern trends in technology and sustainable development (SD).

² Sector “D” – “Production and distribution of electricity and heat, gaseous fuels and cooling energy”, code 35. 1 – Production, transmission and distribution of electricity.

5. Main goal and objectives

The goal of this dissertation is to analyze and assess the role of accounting information as a strategic factor for optimizing the management of enterprises in the Energy sector (under code 35.1), by identifying the specific features of the sector, the opportunities for improving the quality of accounting information through internal and independent audit, as well as by examining the implementation of ERP systems as a tool for digitalized, integrated and sustainable reporting.

The main objectives of the dissertation are:

- To clarify the nature and specific aspects of the activity in the energy sector as an object of accounting, including the technological, regulatory, economic, and social aspects that influence the information needs of the management.
- To examine the importance of the accounting information system (AIS) for financial management, accountability to stakeholders and strategic planning of the enterprises in the sector.
- To analyze the theoretical framework and practical contribution of internal and independent financial audit to increasing the reliability and usefulness of accounting information for management purposes.
- To conduct empirical research through interviews with representatives of energy enterprises and auditors, in order to identify good practices, problems and opportunities for improving the control environment and information flows.
- To examine the role and effect of the implementation of ERP (Enterprise Resource Planning) systems on the quality, integration, and usability of accounting information in energy enterprises.
- To outline the prospects for the implementation of modern analytical tools, automation, and predictive technologies in the accounting practice, with a

view to achieving sustainable and transparent management, consistent with ESG requirements.

- To formulate practical guidelines and recommendations for increasing the efficiency of the AIS and its role in the management of enterprises in the sector.

6. Methodology of the research

The methodology used in this dissertation is based on a combination of theoretical and empirical approaches, which allow for a thorough understanding of the role of accounting information in the management of enterprises in the Energy sector (under code 35.1). In writing the dissertation, both classical scientific methods and modern research techniques have been applied, which contribute to achieving the goal of the research and completing the objectives set.

At the theoretical level, the inductive and deductive approaches have been used. For the purposes of the analysis, the methods of analysis and synthesis have also been used – first, studying individual elements of the object (such as accounting functions, audit activities, information systems, etc.), and then by unifying them into an overall conceptual vision for integrated and efficient management.

Comparative analysis also plays an important role in the research – we have used it to make a comparison between different practices and systems within enterprises in the energy sector, revealing good examples, weaknesses and opportunities for improvement.

A crucial role in the dissertation is also played by the empirical research, which is based on conducting expert interviews with experts engaged in internal and external audit in energy enterprises in the Republic of Bulgaria. The data from the interviews are subjected to critical analysis, which contributes to the formulation of validated proposals for optimization.

By using this methodological framework, the dissertation achieves the necessary balance between theoretical validity and practical applicability,

offering an innovative and strategic view on the role of accounting information for the efficient management of enterprises in the energy sector (under code 35.1).

7. Restrictive conditions

Within the framework of this research, we have introduced several restrictive conditions that determine both the scope and the analytical depth of the dissertation. First of all, the main focus of the research is on accounting information and its importance for the management of energy enterprises (under code 35.1), which is why no technical, economic or engineering analysis of the production processes is carried out, and technological innovations outside the scope of accounting and ERP systems are not examined in depth. In addition, the empirical basis of the research focuses primarily on processes that have occurred in the last three years, which is determined both by the dynamics in the regulatory framework and by the accelerated transformations in the industry related to digitalization and risk management. This time restriction allows for greater relevance of the conclusions, but at the same time leads to a weaker coverage of the development of accounting and management practice in the sector. The conclusions drawn from the empirical research relate only to the examined enterprises, and we do not claim to make generalizations for the entire set of enterprises in the energy sector. The regulatory framework used and cited throughout the research is relevant as of 31 May 2025.

II. STRUCTURE AND CONTENTS OF THE DISSERTATION

The dissertation consists of introduction, three chapters, conclusion, bibliography, and appendixes. The total volume of the dissertation is 248 pages. Regarding the contents, the dissertation is structured as follows:

INTRODUCTION

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1.1.3. Economic and social aspects

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3.2. Challenges and opportunities in implementing ERP systems in the accounting practice in the energy sector

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3.2.2. Possibilities for real time automation and control of information flows

3.3. Perspectives and future development of ERP in the accounting of the enterprises in the energy sector

3.3.1. Possibilities for intelligent automation and prognostic analysis in accounting by ERP

3.3.2. The contribution of ERP for sustainable financial management and ESG accounting

3.3.3. The implementation of analytical tools

CONCLUSION

BIBLIOGRAPHY

APPENDIXES

1. Operational processes in the energy sector
2. Audit commitments for boosting confidence under the Internal Audit in the Public Sector Act
3. Interview with internal and external auditors in the energy sector (under code 35.1)/List of questions for a combined interview
4. The accounting module of the ERP systems in energy enterprises – functional and analytical profile
5. Examples of structural and logical incompatibility in migrating accounting data from inherited systems to ERP platforms
6. ESG indicators and automated reporting via ERP modules in energy enterprises

III. A BRIEF SUMMARY OF THE DISSERTATION

INTRODUCTION

The introduction presents the relevance of the research. The research thesis of the dissertation is formulated. The object, subject, goal, and research objectives are defined. The methodology used in the research is described.

CHAPTER ONE. THE PROPERTY AND ACTIVITY OF ENTERPRISES FROM THE ENERGY SECTOR AS AN OBJECT OF ACCOUNTING

1.1. Specific aspects of energy as an economic activity

1.1.1. Technological and technical characteristics

Energy, as a dynamic and at the same time complex business, requires a thorough characterization of the technological and technical aspects that form the basis of its functionality. This section provides an overview of the technological dimensions of energy, focusing on the production, transmission, and distribution

of energy: Energy production; Energy transmission; Energy distribution; Energy systems and storage; Infrastructure and control.

1.1.2. Regulatory and legislative framework

In the dynamic conditions in which the energy industry operates, the legislative and regulatory environment stands out as a significant factor shaping the structure and dynamics of the activities of energy enterprises. The analysis of the legislation that shapes the energy sector reveals the influence of rules and regulations on economic activity and creates a context for the operations of enterprises, as follows: General regulatory environment; Licensing and permits; Pricing policy; Energy efficiency and renewable energy; Consumer protection; Global and regional requirements.

Undoubtedly, regulations in the energy sector both shape the rules for operating enterprises and have a significant impact on the reporting and accounting practices. Therefore, it is important to assess this interaction, highlighting some specific aspects: Compliance with existing legislation and regulations; Tariff regulations and future revenues; Volume of regulated assets and liabilities; Risk and financial notifications; Application of international accounting standards.

1.1.3. Economic and social aspects

This part of the dissertation is aimed at examining the impact of energy in economic and social aspects, emphasizing its importance for the progress and sustainability of the society.

1.1.4. Operational issues

Energy enterprises operate through a complex network of operational processes that include extraction, generation, transmission, distribution, and supply of energy. Understanding these processes is essential for the efficient management and securing the continuous and sustainable provision of energy services.

In the energy sector, the relationship between operational processes and financial structure is essential, as the successful management of operations directly affects the financial performance of the enterprise.

1.1.5. Risks and challenges

The energy industry in contemporary conditions faces various risks and fluctuations that can significantly affect the activities and financial results of the business entities in this sector. In the outlined context, the successful implementation of modern management concepts depends on the existence of an adequate AIS, which supports decision-making processes by providing structured, reliable, and timely information. This information, generated by traditional financial reporting and for the purposes of non-financial reporting, is very important in all phases of strategic and operational management. Information integration within the enterprise creates conditions for more efficient interaction between individual units and for building sustainable business models. The presence of a consistent and reliable base of accounting data is essential for maintaining transparency and accountability in the context of modern corporate governance.

1.2. Significance of accounting information for the efficient management of the enterprises in the energy sector

1.2.1. Financial management

AIS is of crucial importance for every stage of the planning and budgeting process in the energy sector. It provides the necessary tools and analytical capabilities that are essential for maintaining the financial stability and sustainability of the enterprise. In addition, AIS supports the efficient management of financial and non-financial data in all departments (units) of the enterprise, facilitating transparency and control over resources. This integrative approach to the accounting system, on the one hand, improves the quality of financial statements, and on the other hand, supports strategic decision-making, creating a basis for sustainable development and long-term competitiveness.

1.2.2. Measuring the results and the productivity

The use of KPIs (Key Performance Indicators) is essential for assessing the efficiency of energy activities and measuring the results achieved. They provide objective and accurate metrics that allow the management to make informed decisions and thus improve the overall performance of the enterprise.

1.2.3. The role of accounting information in preparing financial reports for external stakeholders

In the energy sector, the process of preparing financial statements for stakeholders provides a reliable and “objective” view of the financial position and performance of the enterprise. The first key aspect that shapes this importance is in the area of transparency of financial information. Financial statements present not only the financial performance of the enterprise, but also a comprehensive overview of its property and financial position. The second aspect is related to the fulfillment of legal obligations. The preparation of tax and regulatory reports is a means of fulfilling the legal requirements and is an essential element in the structure of the legal system.

1.2.4. Business analysis and strategic planning

AIS provides financial transparency and analytical tools that support energy enterprises in the business analysis and formulation of strategies for successful competition in the dynamic energy industry. The development of strategic management, financial and technological innovations, contemporary management methods and new organizational structures, as well as the increased dynamics of the external environment and competition, determine the growing use of tools to support strategic decisions.

1.2.5. Management of resources

The integrated analysis, based on accounting information, allows for the assessment of overall resource utilization. This approach allows energy enterprises to maintain a balance between human, material, and technological

resources, optimizing production processes and achieving sustainability in the energy sector.

AIS provides analytical tools for managing and optimizing resources in the energy sector. Such an approach is essential for the development, efficiency, and sustainability, respectively, for achieving the strategic goals of the enterprise.

1.3. Sustainable development and non-financial accounting as part of the accounting information system

Upgrading the AIS in the energy sector enterprises with non-financial aspects is a crucial stage in the process of adapting to the requirements of resource management. Traditionally, accounting has focused on the financial measures of business activity. However, in recent years, as a result of European regulations, as well as the growing expectations from stakeholders, enterprises have increasingly integrated non-financial information into their reporting and control systems.

1.3.1. Normative requirements for non-financial accounting in the energy sector

The expanded scope of CSRD requires a review of the reporting processes, especially with regard to internal controls, audit, and oversight of non-financial information. For energy enterprises, this is most evident in the need to develop internal systems for collecting, verifying, and validating ESG indicators that are comparable in quality to financial data. For example, the enterprise's carbon footprint, the share of revenues from renewable energy sources or even the percentage of employees participating in resource management training must be subject to a control environment compatible with the corresponding audit requirements.

From an accounting theory perspective, this leads to the emergence of a new reporting architecture in which non-financial data does not exist in isolation but is integrated into a single AIS. It is here that the most significant transformation occurs – accountability is no longer viewed in the traditional

opposition between “financial” and “non-financial” information, but in the concept of integrated corporate reporting, in which sustainability data is treated as a necessary part of the management and investment relevance of the information.

1.3.2. The relationship between financial and sustainability accounting

In the context of the expansion of regulatory requirements for non-financial reporting, especially after the coming into effect of the CSRD, an accelerated process of integration between the financial and non-financial (sustainability) components of the AIS is observed. For energy enterprises, this is not just a regulatory issue, but a structural transformation in the way they create, validate and report information necessary for the strategic management and communication with stakeholders. The AIS, which shall combine both dimensions of accountability, has the capacity to become a strategic tool for sustainability management. However, this requires not only a technological transformation, but also a conceptual evolution of the role of the accounting function – from recording and controlling to predictive and strategically oriented.

1.3.3. The role of the information system in securing reliable non-financial information

Integration is not simply a technical issue, but a fundamental element of the overall corporate strategy for sustainability and transparency. It requires a consistent policy, adequate resources, and organizational readiness for change, but the return on efforts is expressed in greater efficiency, trust, and sustainable development of the enterprise.

1.3.4. Capacity of the enterprises of the energy sector for integrated reporting

Integrated reporting in the energy sector is a challenge that requires a comprehensive approach, including both organizational reforms and modernization of the technological base. Success depends on the ability of enterprises to acknowledge the role of integrated information as an essential

resource for strategic and resource management. Investments in new systems and training are an integral part of this transformation, whereas efficient coordination between departments and adequate internal controls guarantee the quality and reliability of the data provided.

CHAPTER TWO. THE ROLE OF INTERNAL AND INDEPENDENT FINANCIAL AUDIT FOR ENHANCING THE QUALITY OF ACCOUNTING INFORMATION IN THE ENTERPRISES IN THE ENERGY SECTOR

2.1. Essence, goals, and functions of internal audit

2.1.1. Characteristics of internal audit in the enterprises in the energy sector

The enterprises in the energy sector face a number of challenges, such as high capital investments, strict regulations, and major social and environmental responsibilities. Internal audit helps these enterprises to better manage their resources, provide accurate and timely information, also doing it in the context of the Taxonomy Regulation, improve transparency and build trust among the stakeholders and the society. Moreover, in the context of global trends such as the transition to green energy and digitalization, internal audit plays a significant role in adapting these enterprises to new requirements and in identifying opportunities for innovation and sustainable development.

This aspect is becoming increasingly important, especially given the growing role of the energy sector in the economy and the need to attract investment in a dynamic and competitive industry. The energy sector is subject to strict regulations, sustainable management, and emissions reporting. With increasing awareness of climate change, information on the share of energy enterprises' turnover, capital expenditure and operating costs related to economic activities, aligned with the taxonomy, related to the first two environmental objectives, is becoming increasingly important for regulators, investors, and the

society. At the same time, the requirements and integration with modern technologies, cloud solutions and analytical tools are of no less importance.

2.1.2. Goals of internal audit in securing accounting transparency and compliance

The internal audit of energy enterprises shall exist as a well-organized and strategically planned activity that complies with the established rules and standards and at the same time assesses the efficiency of the internal audit activity (disciplined approach).

2.1.3. Functions of internal audit in supporting accounting control and information authenticity

When performing an internal audit in the enterprises in the energy sector, it is important to take into account the importance of technology. First of all, in terms of process automation – using audit software and data management. Next, in relation to performing big data analysis, or using techniques for analyzing large volumes of data to identify trends and deviations. And last but not least, for cybersecurity, which includes assessing measures to protect information systems and data.

Strategic planning in energy enterprises can be studied as a process that involves six main and logically related stages: 1) understanding the energy enterprise and determining the strategic objectives of internal audit; 2) identifying the Audit Universe; 3) assessing the risk of all audit units from the Audit Universe of the internal audit of the enterprise in the energy sector; 4) selecting an Audit Strategy (audit approach); 5) determining the need for personnel; 6) preparation of a Strategic Plan, communication, discussion, coordination, approval.

2.2. Independent financial audit and its relevance for accounting

2.2.1. Essence of independent financial audit

Non-financial audit is not to be perceived as a routine activity, but as a highly expert and strategic process that integrates financial, legal, ethical and

management components. This makes it a guarantor not only of reporting credibility, but also of corporate integrity and sustainability in the long term.

2.2.2. Goals of audit for securing reliability, transparency, and compliance of reports

In today's economic reality, the objectives of independent financial audit go beyond the traditional understanding of "verifying accounts". They are closely related to building a system of economic trust that operates on the basis of objective, timely and accurate information. Audit not only verifies facts, but also validates categories such as ethics, accountability, and sustainable management. Therefore, its significance extends beyond technical expertise and positions it as a tool for strategic development and social responsibility of enterprises.

2.2.3. Main functions of independent financial audit in securing credible and complete accounting information

The functions of non-financial audit are multifaceted and interact dynamically in the process of building trust in accountability. They range from in-depth analytical and procedural activities to the preparation of professional conclusions of strategic importance for the image and economic stability of enterprises. An independent audit is an integral part of the corporate governance and market accountability system, especially in the context of increasing regulatory and public requirements.

2.3. Methodology of the empirical research on the internal and external audit of the enterprises in the sector

2.3.1. Aim and objectives of the interview

In the context of this empirical research, the interview is implemented as the main qualitative method for collecting primary data aimed at a deeper understanding of the role, impact and interaction of internal and external audit in

enterprises from the sector “Production and distribution of electricity, heat, gaseous fuels and cooling energy” (CEA³-2008: code 35.1).

The main objective of the interview is to explore the perception of auditors, both internal and external, on the extent to which audit activities contribute to the transparency, accountability, and management efficiency in the energy sector. A particular emphasis is placed on the interaction between the two types of audit, the identification of synergies and barriers in communication and information flows, as well as on the observed deficits, challenges, and good practices in the real audit environment.

2.3.2. Selection of respondents

To ensure the relevance, professional depth and analytical value of the empirical research, the selection of respondents is aimed at two key categories of experts whose activities are directly related to improving the quality of financial control, accountability, and transparency in enterprises from sector 35.1: internal auditors and external auditors.

2.3.3. Main emphases and questions of the interview

The interview is structured to provide both depth and comparability of the opinions of internal and external auditors working in or with enterprises in sector 35.1. The main focus is on the role of audit in securing the reliability of reporting, the efficiency of internal control and increasing the trust in publicly accessible accounting information.

2.4. Analysis and presentation of the results received

On the basis of the empirical data collected through semi-structured interviews with representatives of internal and external audit in energy enterprises, this section presents a thematic analysis of the results. The interpretation is organized according to the predefined thematic focuses that

³ Classification of Economic Activities

reflect the key aspects of the role, functions, and challenges of audit in the sector 35.1.

2.4.1. Thematic emphasis 1 – Significance and role of audit in energy enterprises

The empirical data clearly shows that while the audit activity is now recognized as a significant factor in management accountability in energy enterprises, there are differences in the degree of its actual integration and practical use. A solid basis for the establishment of audit in support of management is found, but this requires organizational adaptation, updating the understanding of audit and active communication between internal and external auditors on the one hand, and management units, on the other.

The results of the interview clearly outline the dominant perception of audit as a key element in building trust among external stakeholders – investors, regulators, and financial institutions.

2.4.2. Thematic emphasis 2 – Identifying the risks and weaknesses of the accounting and control environment

The data analysis reveals significant heterogeneity in the level of development of internal control in the energy sector – from good practices with a high degree of institutionalization to dangerous improvisation. This highlights the need for a comprehensive transformation of the control culture, with an emphasis on prevention, ethics, and integration into management processes.

2.4.3. Thematic emphasis 3 – Audit contribution for improving accounting and limiting frauds

The main conclusions from the analysis of the results show that audit has a significant capacity to improve the accountability in energy enterprises, especially when corrective actions are implemented based on the auditors' recommendations. Enterprises acknowledge the value of audit not only as a means of detecting non-compliance, but also as a process that can lead to significant improvements in the quality of financial reporting. Audit is an important tool for

strengthening internal control, increasing the transparency of financial information, and securing compliance with the regulatory requirements. Accounting in enterprises under code 35.1 is associated with multiple risk areas, including capital-intensive operations, complex long-term contracts, regulatory dependence, and high sensitivity to market fluctuations. In this context, the role of audit as a mechanism for optimizing internal control and external verification is not just complementary, but essential for preserving the truth of reporting.

2.4.4. Thematic emphasis 4 – Cooperation between internal and external audit

At a theoretical level, the results can also be analyzed within the framework of the concept of organizational learning, which suggests that energy enterprises progress in the management of their control functions gradually – moving from isolated actions to more integrated practices. Therefore, the observed state cannot be interpreted unambiguously as a deficit, but rather as a phase in the evolution of the audit culture in the sector.

The research confirms that in the energy enterprises in Bulgaria (code 35.1) there are initial forms (signs) of coordination between internal and external audit, although to varying degrees of formalization. The data give us the reason to argue that this process is in transition from an episodic to a more sustainable and institutionalized form. Supporting this transition, through policies, training, and regulatory standards, can significantly improve the quality of reporting, the efficiency of internal control and the trust of stakeholders in the sector.

2.4.5. Thematic emphasis 5 – Challenges and opportunities for developing the audit practice

The analysis of the barriers to internal and external audit in energy enterprises reveals a complex issue. The greatest difficulties are observed in the line of regulatory dynamics and the specific aspects of accounting. These challenges require high expertise and adaptability on the part of auditors. Intra-organizational factors, such as weak internal control and limited expert resources,

further complicate the process, although signs of improvement in the culture of cooperation are also observed. In this regard, efforts should be directed towards professional development, improving internal control mechanisms and building trust between auditors and enterprises.

The results obtained emphasize that the energy sector strives to comply with international practices in the field of audit. The answers to the questions show that many enterprises strive to develop their audit processes in the spirit of international standards, but these efforts do not always lead to full synchronization with global requirements.

The main conclusion is that to increase transparency of the reporting in energy enterprises, a comprehensive approach must be adopted, including both internal controls and a thorough attention to sustainability and publication of reports. Regardless of the existing efforts, future actions shall focus on improving these processes and provide the necessary resources for the implementation of new standards and technologies.

2.5. Analysis and suggestions for improvement

The research highlights not only the weaknesses found but also emphasizes the need for new strategic approaches in the context of the modern dynamics of energy markets, technological innovations, and regulatory changes. Based on the data obtained, recommendations have been formulated to increase the efficiency of audit and reporting activities, as well as to optimize the internal and external control mechanisms in the sector.

2.5.1. Identified weaknesses and problems

The lack of integrated and efficient mechanisms for coordination between internal and external audit leads to significant gaps and inefficiencies in the audit practice in energy enterprises. Duplication of efforts, unclear priorities, and the risk of gaps in findings can compromise the quality of reporting and the overall stability of the enterprise. To solve these problems, it is necessary to create integrated and coordinated audit practices that ensure full cooperation and

exchange of information between internal and external auditors. Inadequate adaptation of information and accounting systems to new technological and regulatory requirements creates problems for energy enterprises. The lack of modern ERP systems and efficient reporting processes leads to risks for the compliance with the regulatory requirements and reduced efficiency of the reporting process. To overcome these challenges, it is very important for enterprises to invest in modern technologies and systems, train their staff and create processes for the regular adaptation of information and reporting systems to the changing requirements.

2.5.2. Established good practices

The implementation of integrated ERP systems in the energy sector is a strategic move to increase the efficiency of reporting and secure the transparency and accuracy of data. ERP technologies not only facilitate data collection and processing, but also reduce the risks of errors, facilitate management accountability, and improve the communication with external stakeholders.

Another good practice outlined by the respondents is the establishment of channels of efficient communication and coordination between internal and external audit in some energy enterprises. Energy enterprises that have achieved success in this aspect have created clear and well-defined processes for information exchange and cooperation between internal and external audit. These efforts lead to the establishment of permanent channels of communication and joint initiatives that significantly increase the efficiency of the overall audit activity.

When internal and external auditors coordinate, they can analyze together existing control mechanisms and detect weaknesses that would easily be missed if the audit were carried out independently. This leads to more in-depth and substantiated conclusions regarding the efficiency and reliability of reporting, clarity of internal processes and publicity of the enterprise's business activities.

Teamwork leads to the improvement of internal control mechanisms, which is extremely important for securing sustainable management and transparency.

2.5.3. Suggestions for optimization of the processes of internal and external audit

The results obtained are the grounds for forming a view that the use of a centralized digital platform for coordination and exchange of information between internal and external audit can be crucial for increasing the efficiency of accountability and transparency of the audit. By integrating different systems and providing easy access to data, energy enterprises could optimize their audit activities and achieve better results in the short and long term.

Organizing regular training sessions and joint audit simulations for internal and external audit teams is an important step towards the improvement of coordination, communication, and efficiency of the processes in the energy sector.

CHAPTER THREE. ERP SYSTEMS IN ENTERPRISES IN THE ENERGY SECTOR – ACCOUNTING FUNCTIONS, CHALLENGES AND PERSPECTIVES

3.1. Essence and role of the ERP systems in energy enterprises

The introduction of ERP systems in the energy sector represents a technological transition that completely transforms the way accounting information is generated and processed. These innovative systems combine different aspects of business processes into a single software package, providing enterprises with a comprehensive view of their activities, including accounting activities.

Despite the challenges, the integration of ERP systems in the energy sector brings significant benefits, such as more efficient management, better accountability, and the ability to cope with a rapidly changing environment.

Addressing these challenges requires good planning, training efforts and commitment from the management and the staff.

3.1.1. The role of the ERP systems in securing integrated accounting information for making managerial decisions

In the context of the dissertation and its focus on accounting information as a factor for optimizing management, ERP systems can be analyzed not simply as technological solutions, but as a strategic infrastructure.

The systems of the ERP class unify data from different modules, securing high quality of the financial reporting process through reliable algorithms compatible with IFRS/IAS. In addition, the systems allow for rapid adaptation to changes in accounting standards by updating parameters, without the need to rework the entire system.

One of the essential features of modern ERP systems in energy enterprises is the ability for integrated regulatory reporting and full traceability of data in real time.

In energy enterprises, where reporting often involves complex contractual relationships, multi-component pricing, regulatory limited tariffs and assets with a long-life cycle, ERP systems allow for the creation of regulatory templates and automatic reports that comply with the requirements of the energy regulator and international standards. The systems generate reports with a high level of detail, providing full justification for each record – from the primary document to the final reporting line, which increases reporting traceability and reduces the risk of sanctions during inspections.

ERP systems not only increase the technical level of accounting, but also turn it into an integrated, traceable, and regulatory-resistant system, capable of meeting the requirements of the complex regulatory framework in the energy sector in real time.

3.1.2. ERP systems as a tool for improving the compliance with accounting standards and regulatory requirements

The accounting activities in energy enterprises require strict compliance with a complex set of standards, normative acts and specific regulations, especially in the context of the increasingly strict requirements for accountability and transparency. The ERP systems are establishing themselves as a strategic tool through which enterprises can automate processes, introduce internal control mechanisms and ensure full compliance with the applicable standards. One of the most important aspects in this regard is the automation of accounting processes with built-in control mechanisms. One of the most essential features of modern ERP systems in energy enterprises is the ability for integrated regulatory reporting and full traceability of data in real time – especially important for the compliance with legal obligations and maintaining the trust of regulators, investors and the public. In energy enterprises, where reporting often involves complex contractual relationships, multi-component pricing, regulatory-constrained tariffs, and long-life assets, ERP systems enable the creation of regulatory templates and automated reports that meet the requirements of the energy regulator and the international standards. The systems generate reports with a high level of detail, providing full justification for each entry – from the primary document to the final reporting line, which increases the reporting traceability and reduces the risk of sanctions during inspections. Overall, ERP systems not only raise the technical level of accounting, but also turn it into an integrated, traceable, and regulatory-resilient system capable of meeting the real-time requirements of the complex regulatory framework in the energy sector.

3.2. Challenges and opportunities in implementing ERP systems in the accounting practice in the energy sector

3.2.1. Problems in the migration of accounting data and the integration with inherited financial systems

ERP systems provide a rich analytical and reporting architecture, which, however, requires clearly defined relationships between primary, analytical and regulatory levels of accounting information. This is precisely what forces energy

enterprises to invest in “bridge models” between the old and new structure – including the development of temporary translation tables, account verification, and reporting simulations, before the actual migration is finalized.

A good solution to avoid such risks is a preliminary data quality audit and the development of a transfer strategy that involves: validation rules, phased transfer, test migration with a control sample, as well as training of accounting staff on the interpretation of the transferred information. In this way, it can be ensured that the ERP system will start functioning on the basis of a complete, accurate and verified accounting history – especially important for enterprises (under code 35.1) in a highly regulated sector such as the energy one.

3.2.2. Possibilities for real time automation and control of information flows

The automation and real-time control possibilities that ERP systems provide represent a significant upgrade to the traditional accounting model. Through automated event-based accounting and implemented audit trail mechanisms, energy enterprises achieve higher efficiency, reduced risks, and enhanced accountability. In this way, accounting activities are transformed from reactive to proactive, supporting timely and informed management decisions.

3.3. Perspectives and future development of ERP in the accounting of the enterprises in the energy sector

3.3.1. Possibilities for intelligent automation and prognostic analysis in accounting by ERP

Reporting is elevated to a new level, as forecasts are integrated in real time into the reports of expected cash flows, planned balance sheets and budgets of the enterprise. The models automatically calculate probabilistic scenarios and signal potential risks of liquidity shortages or budget overruns for certain items.

Based on this type of automation, accounting activities move from a “registration-reporting” role to a prognostic-strategic one, thus creating added value for overall corporate management.

This type of “intelligent internal control” works continuously in the background and activates signals or workflow escalations when an event with a high probability of deviation or fraud is detected. An important role is also played by the construction of the so-called baseline models of normal accounting behavior, against which each new transaction is assessed.

These automated mechanisms increase the reliability of accounting information and also serve as a proactive risk management tool. Systems can train their algorithms to improve the accuracy of detecting deviations in repeated cases, distinguishing between acceptable exceptions and real risks.

3.3.2. The contribution of ERP for sustainable financial management and ESG accounting

The ERP systems of the new generation provide tools for detailed tracking of sustainable costs and initiatives – from the moment of initiation to their final financial and non-financial impact. Through structured project modules and analytical levels of reporting, energy enterprises monitor the efficiency of individual initiatives focused on the environment, social practices, or good corporate governance.

This reporting allows for measuring the return on sustainable investments – not only in monetary terms, but also through indicators such as carbon footprint reduction, improved public reputation, access to “green” financing or optimization of operating costs through energy efficiency. The system provides a basis for building integrated scenario planning models, which simulate the effects of different climates, regulatory and market scenarios on the financial sustainability of the enterprise.

In this way, ERP systems from a technical reporting platform become a strategic tool through which financial management and corporate responsibility are synchronized. This allows the management of energy enterprises to make informed decisions in the context of transformation towards sustainable business models, balancing economic efficiency and socio-environmental responsibility.

3.3.3. The implementation of analytical tools

In the Energy sector, predictive analytics provide unique opportunities for innovation and optimization of management decisions. They not only predict future trends, but also actively support intelligent decision-making in real time. An important aspect of predictive analytics in the energy sector is the ability to forecast energy consumption. At the same time, it favors the optimization of energy resources, optimization of financial processes, monitoring of infrastructure, etc. This allows the enterprise to efficiently manage energy production and distribution, adapting resources to future needs and challenges. The optimization of the use of energy resources is crucial for achieving sustainable and efficient energy management. Predictive analytics identify time periods with low consumption and offer strategies for the efficient use of equipment, which reduces operating costs and optimizes the production process.

CONCLUSION

As a result of the research conducted, it can be reasonably stated that the set goals have been consistently achieved within the framework of the development and the main research objectives have been fulfilled with a high degree of methodological and analytical depth. The formulated goal, to understand and assess the significance of accounting information as a strategic resource for optimizing the management processes in enterprises in the energy sector (under code 35.1), has been achieved through a systematic interdisciplinary approach, which has included a critical theoretical review, applied-empirical analysis and conceptualization of innovative management guidelines. We have substantiated the view that contemporary accounting, especially in the conditions of digital transformation and regulatory intensification, is establishing itself as an integrating element of strategic management, corporate accountability, and risk management of energy enterprises. The research has outlined a clear perspective for the future development of AIS as an intelligent platform for managing value,

risks, and sustainability, in accordance with the requirements of contemporary regulations and the expectations of stakeholders.

Based on the literature review and empirical research, the research thesis has been proven: the combination of technological innovations and strategic management decisions, based on in-depth analysis of accounting information, is an essential tool for increasing the sustainability and adaptability of energy enterprises. ERP systems integrated with AIS provide the opportunity for automated processing of accounting documents, precise maintenance of analytical and synthetic registers, as well as timely preparation of financial, management and sustainability reports. They contribute to improving the accountability, the control function of accounting and the timely disclosure of information to stakeholders. In the future, the development of digitalization of accounting in the energy sector shall be directed towards the implementation of AI for predictive cost analysis, automatic recognition of accounting discrepancies and integration with ESG indicators in real time. In this way, accounting will have a strategic function and its contribution to risk management, regulatory compliance, and the management of reputational and financial risks in the context of the energy transformation will be strengthened.

IV. REFERENCE OF THE SCIENTIFIC AND SCIENTIFIC AND APPLIED CONTRIBUTIONS IN THE DISSERTATION

First. Based on the thorough analysis of the specialized literature and applicable regulations on the topic of the research, the specific and regulatory challenges which the enterprises in the energy sector face are revealed and identified. The fundamental interrelationship between traditional financial reporting and the growing importance of sustainability reporting is examined in detail. The synthesis between these two types of information provides not only data, but a comprehensive picture of the performance of the enterprise – from its economic viability to its impact on the environment and society.

Second. The author's vision for an integrated model for optimizing audit processes in enterprises in the Energy sector is proposed, based on the synergistic interaction between internal and independent financial audit. Through comprehensive empirical research, conducted through interviews with experts from the sector, key challenges in the audit practice have been identified, including insufficient adaptation of reporting systems to new regulatory requirements, difficulties in integrating non-financial reporting and inefficient communication between audit teams.

Third. The role of ERP systems as a key factor for the overall transformation of accounting in energy enterprises is argued. The opinion is advanced that they provide opportunities for the integration of financial and non-financial data, which leads to operational improvement, intelligent automation and achieving ESG accountability. The claim is substantiated that ERP systems provide increased efficiency and strategic management support, allowing the sector to successfully meet the challenges of digitalization, sustainability, and regulatory intensification.

IV. LIST OF PUBLICATIONS OF THE DOCTORAL STUDENT

Articles:

1. **Marinova, N.** The Significance of the Accounting Information for Effective Management of Energy Sector Enterprises. e-Journal VFU, issue 20, 2023, pp. 146-162.
2. Chipriyanova, G., **Marinova, N.** The Role and Significance of Internal Audit in Energy Sector Enterprises. Dialog, issue 3, 2024, pp. 45-62.

Conference papers:

1. **Marinova, N.** The Role of the Accounting Information System in Enhancing the Management of Energy Industry Enterprises. In: International Scientific and Practical Conference: Challenges for Finance and Economic Accounting in Conditions of Multiple Crises – Conference Proceedings, 9-10 November 2023, Tsenov Academic Publishing House, Svishtov, pp. 421-424.
2. **Marinova, N.** Adapting the Accounting Information System of the Enterprises in the Energy Sector to the CSRD and ESRS Directives. In: International Scientific Forum Global and National Business Transformations – Proactive Management, Financial-Accounting and Planning Solutions, 25-26 October 2024, Tsenov Academic Publishing House, Svishtov, pp. 207-214.
3. Chipriyanova, G., **Marinova, N.** Impact of new information technologies on the generation and processing of accounting information in enterprises in the energy sector. International scientific conference 105th anniversary of the department of Accounting and analysis “Accounting, Digitalisation, Sustainability – Science and Practice”, 25-27 March 2025, Volume 1, Academic publishing house – UNWE, Sofia, 587-596.

VI. RERENCE OF MEETING THE MINIMUM NATIONAL REQUIREMENTS FOR OBTAINING THE EDUCATIONAL AND SCIENTIFIC DEGREE OF DOCTOR

Indicator	Points
Group of indicators A.	
<i>Indicator 1. Dissertation for awarding the educational and scientific degree of doctor.</i>	
Accounting Information as a Factor for Optimizing the Management of Enterprises in the Energy Sector	50
<i>The dissertation has been discussed, and a defense procedure has been opened.</i>	
Group of indicators D.	
<i>Sum of indicators from 4 to 10</i>	
<i>7. Articles and papers published in unreferenced journals with scientific reviewing or published in edited collective volumes</i>	

Marinova, N. The Significance of the Accounting Information for Effective Management of Energy Sector Enterprises. e-Journal VFU, issue 20, 2023, pp. 146-162.	10
Chipriyanova, G., Marinova, N. The Role and Significance of Internal Audit in Energy Sector Enterprises. Dialog, issue 3, 2024, pp. 45-62.	5
Marinova, N. The Role of the Accounting Information System in Enhancing the Management of Energy Industry Enterprises. In: International Scientific and Practical Conference: Challenges for Finance and Economic Accounting in Conditions of Multiple Crises – Conference Proceedings, 9-10 November 2023, Tsenov Academic Publishing House, Svishtov, pp. 421-424.	10
Marinova, N. Adapting the Accounting Information System of the Enterprises in the Energy Sector to the CSRD and ESRS Directives. In: International Scientific Forum Global and National Business Transformations – Proactive Management, Financial-Accounting and Planning Solutions, 25-26 October 2024, Tsenov Academic Publishing House, Svishtov, pp. 207-214.	10
Chipriyanova, G., Marinova, N. Impact of new information technologies on the generation and processing of accounting information in enterprises in the energy sector. International scientific conference 105th anniversary of the department of Accounting and analysis “Accounting, Digitalisation, Sustainability – Science and Practice”, 25-27 March 2025, Volume 1, Academic publishing house – UNWE, Sofia, 587-596.	5
Total points – sum of the indicators from 4 to 10	40
Required points – sum of indicators from 4 to 10	30

VII. DECLARATION OF ORIGINALITY OF THE DISSERTATION

The dissertation in a volume of 248 pages under the title: “Accounting Information as a Factor for Optimizing the Management of Enterprises in the Energy Sector” represents the author’s own scientific production. It uses original ideas, texts and visualization through graphs, diagrams, tables, and formulas, and complies with all the requirements of the Copyright and Related Rights Act by duly citing and referring to other authors’ thoughts, as well as data, including:

1. The results achieved in the dissertation and the contributions made are original and have not been borrowed from research and publications in which the author has no participation.

2. The information presented by the author in the form of copies of documents and publications, personally compiled reports, etc. corresponds to the objective truth.

3. The scientific results that have been obtained, described, and/or published by other authors are duly and comprehensively cited in the bibliography.

Date: 11 July 2025

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