



ACADEMIC OPINION

on a dissertation for obtaining the educational and scientific degree "Doctor" in the field of higher education: 3.0 "Social, economic and legal sciences", professional field: 3.8 "Economics", scientific specialty "Economics and Management (Agriculture)",

Author of the dissertation: Svetoslav Zhorov Lavchiev, PhD Student, Department of Economics, Agricultural University – Plovdiv

Topic of the PhD thesis: Sustainable production of electricity from photovoltaic systems

Reviewer: Assoc. Professor Dr. Rositsa Petrova Beluhova-Uzunova, Agricultural University-Plovdiv, Department of Economics, 3. Social, economic and legal sciences, 3.8. Economics, scientific specialty "Economics and management (Agriculture)", appointed by Order – 16-491 / 06.04.2026 of the Rector of the Agricultural University - Plovdiv as a member of the scientific jury.

1. Relevance of the topic

The presented dissertation addresses a relevant and significant topic related to the sustainable production of electricity from photovoltaic systems in the context of the ongoing energy transition, decarbonization processes, and the broader goals for sustainable development. The subject is of particular importance in light of global climate challenges, the European Green Deal, and the European Union's policies promoting the expansion of renewable energy sources.

The PhD candidate considers photovoltaic systems not only as a technological solution, but also as a strategic instrument for achieving energy security, economic efficiency, and environmental sustainability. The research is highly relevant from both scientific and practical perspectives, as it examines the opportunities and limitations associated with the development of solar energy in Bulgaria and across the European Union.

2. Aim, tasks, hypotheses and research methods

The aim of the PhD thesis is clearly formulated and focused on assessing the sustainability of photovoltaic energy production in Bulgaria through an analysis of the technological, economic, and institutional factors influencing the development, implementation, and operation of photovoltaic systems.

The research thesis is logically grounded and based on the understanding

that photovoltaic systems are a key element of Bulgaria's sustainable energy transition, while their long-term effectiveness depends on the interaction between technological, economic, and institutional factors.

The research tasks are consistently structured and aligned with the overall objective of the study. They encompass a theoretical analysis of the energy transition, an evaluation of European and national policies, an analysis of photovoltaic projects, as well as the formulation of conceptual models and recommendations for the sustainable development of the sector.

The methodological framework is appropriately selected and is based on an integrated approach combining qualitative and quantitative methods of analysis. The study employs document analysis, case study analysis, unstructured and in-depth interviews, investment analysis, scenario modelling, and financial profitability indicators. The methodological toolkit is well suited to the nature of the research and enables the achievement of reliable and well-grounded results.

3. Visualization and presentation of the results.

The dissertation is logically and consistently structured. It consists of an introduction, an exposition divided into four main chapters, a conclusion, and a bibliography- total of 263 pages.

The research results are clearly illustrated and presented through 55 tables and 32 figures.

4. Discussion of the results and theoretical background.

The first chapter of the dissertation provides a theoretical analysis of energy resources, the concept of sustainable development, and the role of renewable energy sources within the context of the energy transition. The author examines the characteristics of the traditional energy model, its environmental limitations, and the necessity for economic decarbonization. Particular attention is devoted to European and national policies in the field of renewable energy, as well as to the role of photovoltaic systems in sustainable development.

The second chapter is dedicated to the methodological framework of the study. The PhD candidate applies an integrated approach combining document analysis, case study analysis, unstructured and in-depth interviews, as well as investment analysis through financial profitability indicators. The methodological framework is well structured and enables a comprehensive examination of the economic, technological, and institutional aspects of sustainable electricity production from photovoltaic systems.

The third chapter presents the empirical analysis of investments in photovoltaic systems in Bulgaria. The study examines trends in the energy mix of both the European Union and Bulgaria, as well as real photovoltaic projects of different scales and business models. The results confirm the research thesis that photovoltaic investments are economically viable and possess significant potential

for sustainable development, while their effectiveness depends on market conditions, the regulatory framework, and risk management.

The fourth chapter explores the future prospects for the development of solar energy and outlines conceptual models for the sustainable development of photovoltaic systems. The author presents self-consumption models, hybrid models, and models oriented toward electricity sales, as well as decentralized solutions such as energy communities and agrivoltaic systems. The analysis highlights the need for an integrated approach combining economic efficiency, technological applicability, and institutional support.

The literature used in the PhD includes 327 references and is both current and highly relevant to the research topic. The bibliography encompasses scientific publications, strategic documents of the European Union, regulatory acts, as well as reports from international organizations such as the IEA, IRENA, and the European Commission, demonstrating the author's strong understanding of both the theoretical and practical dimensions of the research field.

5. Contributions of the PhD thesis

I accept the PhD student contributions to the dissertation. Among the most significant contributions, the following may be highlighted:

Scientific and theoretical contributions

- An integrated theoretical framework for analyzing the sustainability of photovoltaic systems has been developed, combining economic, technological, and institutional dimensions, thereby contributing to the expansion of existing scientific approaches to the evaluation of renewable energy sources.
- A conceptual typology of photovoltaic system operating models has been justified, identifying their structural characteristics, economic logic, and specific risk profiles.
- The theoretical understanding of the role of decentralized energy systems, energy communities, and agrivoltaic solutions in the process of sustainable energy transition has been further developed.

Scientific and applied contributions

- An empirical analysis of real investment projects in photovoltaic systems in Bulgaria has been carried out, covering different scales and operating models, which enables an assessment of their economic viability and sustainability.
- Practical guidelines for improving policies and the regulatory framework have been formulated, aimed at stimulating investments in renewable energy and increasing the efficiency of the energy sector.

6. Critical remarks and questions.

The following recommendation of a guiding nature may be addressed to the dissertation: it would be beneficial for future research to develop more detailed scenarios for the development of the photovoltaic sector beyond 2030, including a more in-depth assessment of the role of energy storage technologies and their impact on the sustainability and economic efficiency of energy systems.

7. Publications and citations.

The PhD student has presented three publications related to the topic of the dissertation, one of which is independently authored. The publications meet both the qualitative and quantitative requirements for the acquisition of the educational and scientific degree "Doctor".

The presented abstract objectively reflects the structure and content of the dissertation.

CONCLUSION:

Based on the different research methods applied by the PhD student, the correctly performed analysis, the formulated recommendations and conclusions, I consider that the presented dissertation meets the requirements of the Law for Development of Academic Staff in the Republic of Bulgaria, The Regulation for the Application of the Law for Development of Academic Staff in the Republic of Bulgaria and the Regulations of the Agricultural University - Plovdiv for its application, which gives me reason to evaluate it **POSITIVE**.

I would like to propose to the Scientific Jury to vote **POSITIVELY** and award Svetoslav Zhorov Lavchiev the educational and scientific degree "Doctor" in the scientific speciality "Economics and Management (Agriculture)"

Date: 11.05.2026
Plovdiv

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