



OPINION

on the dissertation for the award of the educational and scientific degree "Doctor" in the field of higher education 3. Social, economic and legal sciences; professional field 3.8. Economics, scientific speciality, Economics and Management.

Author of the dissertation: SVETOSLAV ZHOOROV LAVCHIEV, doctoral student (part-time) at the Department of Economics at the Agricultural University, Plovdiv

Topic of the dissertation: SUSTAINABLE PRODUCTION OF ELECTRICITY FROM PHOTOVOLTAIC SYSTEMS

Reviewer: Prof. Dr Ivan Penov, Agricultural University - Plovdiv; Department of Economics; field of higher education 3. Social, economic and legal sciences; professional management 3.8. Economics; scientific speciality Economics and Management (by industry), appointed as a member of the scientific jury by order No. RD-16-491/ 06.04.2026 by the Rector of the Academy of Sciences.

1. Relevance of the problem.

Electricity production from photovoltaic systems, as part of renewable technologies, has gained particular importance over the last decade. Fossil-fuel energy systems pollute the environment and are considered a major driver of climate change. The European Union's Green Deal policy aims to promote the use of clean energy sources. The instability of the oil and gas markets in recent years also raises questions about the security of energy sources. The topic of renewable energy sources in Bulgaria has not been sufficiently studied. The information for conducting an in-depth analysis is not widely available. Therefore, the dissertation topic is relevant and timely.

2. Purpose, tasks, hypotheses and research methods.

Purpose: To assess the sustainability of photovoltaic energy production in Bulgaria through an analysis of technological, economic and institutional factors that influence the development, implementation and operation of photovoltaic systems.

Tasks: (1) Derivation of a theoretical framework; (2) Analysis of European climate strategies and their consequences at the national level; (3) Derivation of the research methodology; (3) Analysis of trends in the European and Bulgarian energy sectors; (4) Assessment of different types of solar parks in terms of efficiency and impact; (5) Presentation of models for energy production from photovoltaic plants in Bulgaria; (6) Formulation of conclusions and recommendations on the opportunities for the development of solar energy in Bulgaria.

3. Visualization and presentation of the obtained results.

The dissertation is 263 pages long, of which: Introduction (3 pages); Chapter One (theoretical part) – 63 pages; Chapter Two (methodological part) – 9 pages; Chapter Three (analytical part) – 70 pages; Chapter Four (constructive part) – 61 pages; Conclusions and recommendations (17 pages); Conclusion (2 pages); Literature (36 pages). 327 literary sources, 55 tables and 32 figures were used in the text.

The dissertation is well-structured and includes all necessary elements.

4. Discussion of the results and the literature used.

The introduction presents the problem's relevance, the purpose of the work, the main thesis, and the study's tasks.

The first chapter is theoretical. It examines the historical development of energy sources. A classification of energy sources is presented: conventional (fossil) and renewable. The external effects of using fossil fuels are discussed: environmental, economic, and social. The concept of sustainable development and the role of the

energy sector are presented. A review of policies related to renewable energy (European and Bulgarian legislation) and photovoltaic systems is made. Challenges in implementing photovoltaic systems are discussed.

The second chapter is methodological. It presents the study's methodology. The methods presented are: document analysis; case analysis; unstructured, in-depth interview; and evaluation of investment projects.

The third chapter is empirical. The importance of renewable energy in the EU and Bulgaria is analysed, and the electricity markets in both are compared. Solar energy could be a driver of rural development and of photovoltaic energy production in Bulgaria. Four projects for the construction of photovoltaic power plants are analyzed.

The fourth chapter is constructive and focuses on the prospects for solar energy development. Based on the integrated plan in the field of energy of Bulgaria and the priorities of the Green Deal, three models of photovoltaic systems have been developed: (1) for self-consumption; (2) rooftop system (self-consumption and sale of electricity); (3) for full sale of electricity. Energy communities are also presented as an alternative to individual production. Recommendations for improving the institutional environment are made. The conclusions and recommendations stem from the study.

5. Contributions of the dissertation work.

Scientific contributions

- The literature related to renewable energy sources has been systematized.
- The external effects of using fossil fuels have been analyzed.
- A theoretical framework for analyzing photovoltaic systems has been developed, uniting economic, technological and institutional factors.
- Decentralized energy systems, energy communities and agro-photovoltaic solutions have been examined.

Scientific and applied contributions

- Investments in several types of photovoltaic systems have been evaluated.
- Scenarios have been developed for different levels of production and prices of electricity.
- Models for implementing photovoltaic systems have been proposed.
- Guidelines for improving policies and the regulatory framework have been given.

6. Critical notes and questions.

I have the following critical notes about the work:

- When citing sources, it is good to indicate the year.
For example, p.120, figure 5, Source: Ember.
- When using figures from official documents, it is good for the text to be in Cyrillic. For example, p. 139, figure 16: the country names.

I have the following questions for the doctoral student:

- The internal rate of return when evaluating various photovoltaic systems is quite low, 10-15%. The same applies to the net present value. What is this due to, and why is there a lot of interest in investing in photovoltaic systems?
- How do externalities affect the supply of electricity from fossil and renewable energy sources?

7. Published articles and citations.

Three published articles are presented in: the Scientific Papers of the Agrarian University; Scientific Papers Series Management, Economic Engineering in Agriculture & Rural Development of the Agrarian University of Bucharest; Trakia Journal of Sciences of the Trakia University. One publication is independent, and two are co-authored.

The presented abstract accurately reflects the dissertation's structure and content.

CONCLUSION:

Based on the various research methods learned and applied by the doctoral student, the correctly performed experiments, and the generalisations and conclusions made, I consider that the presented dissertation meets the requirements of the Law on the Development of the Academic Staff, the regulations of the Agricultural University, and the rules for their application. This gives me a reason to evaluate it POSITIVELY. Therefore, I would like to propose to the esteemed Scientific Jury also to vote positively and award SVETOSLAV ZHOROV LAVCHIEV the educational and scientific degree "doctor" in the scientific speciality 3.8. Economics; scientific speciality Economics and Management (by branches)

Date: 09.05.2026
Plovdiv

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заличени
във връзка с чл.4, т.1 от Регламент
(ЕС) 2016/679
(Общ Регламент относно защитата на
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