



REVIEW

on a dissertation for obtaining the educational and scientific degree "**doctor**" in field of higher education **3. Social, economic and legal sciences** , professional field **3.8 Economics** , the scientific specialty **Economics and Management (Agriculture)**

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

Topic of the dissertation: Sustainable electricity production from photovoltaic systems

Reviewer: Assoc. Prof. Dr. Georgi Aleksiev Aleksiev , Trakia University , Stara Zagora, Faculty of Economics, Higher Education Area **3. Social, economic and legal sciences** , professional field **3.7 Administration and management** , scientific specialty **Organization and management of production (agricultural business)** 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. Brief presentation of the candidate.

PhD student Svetoslav Zhorov Lavchev graduated in "Agricultural Economics" from the Agricultural University - Plovdiv, with a bachelor's degree in 2013, then a master's degree in "European Expert in Euro Funds and Agriculture" again from the Agricultural University - Plovdiv. In 2015, he continued his studies abroad, as a postgraduate student at the Humboldt University of Berlin in the field of Project Development and Development. Since June 2023, he has been a part-time doctoral student at the Department of Economics of the Agricultural University, Plovdiv.

He speaks English and German, has good communication, organizational and teamwork skills.

2. Relevance of the problem.

The presented dissertation examines a current and significant problem for the country. Sustainable energy production in Bulgaria in the long term is based on the increase in the share of renewable energy in total production. The presence of limited energy resources turns this problem into a strategic one. Renewable energy

production also carries environmental risks related to the production of photovoltaic cells, their application and recycling or disposal. A new approach is needed for the assessment of photovoltaic systems, including both economic parameters and social and environmental ones, forming the triad of the sustainable development model. The doctoral student has managed to present the relevance of the researched problem and its significance for the sector.

3. Purpose, tasks, hypotheses and research methods.

The goal and objectives of the dissertation are correctly and clearly formulated, adequate to the subject of research, with an emphasis on the analysis of the sustainability of photovoltaic energy production in Bulgaria. The influence of technological, economic and institutional factors that influence the development, implementation and operation of photovoltaic systems is taken into account.

The research methodology used, encompassing various methods and approaches, is appropriate for the purpose and objectives of the study, and has been applied correctly.

4. Visualization and presentation of the results obtained.

The thesis is presented in four chapters, achieving a good balance in terms of the individual paragraphs, part of the four chapters. A popular approach of structuring a thesis with distinguishable and interconnected theoretical, methodological, analytical and project parts, which in their entirety represent a self-completed study, has been adopted.

The dissertation submitted for review has a total length of 272 standard pages and consists of an introduction, four chapters, a conclusion, and a bibliography. The material is visualized through 32 figures and 55 tables.

The structure (title page, table of contents, introduction, presentation, conclusion and bibliography) and the content of the dissertation work are in accordance with the requirements of Art. 27, para. 2 of the Regulations for the Implementation of the Act on the Development of the Academic Staff in the Republic of Bulgaria.

5. Discussion of the results and literature used.

Chapter *one* presents in detail the energy resources, through their classification, their features, as well as the technological and institutional potential for their sustainable use. The nuances of the specific role that energy plays in the development and economic growth of the country are correctly taken into account. Key elements and determinants of the growing global and local energy consumption are presented. The concept of sustainable development is presented and the role of the energy sector is assessed in its context. The European and national legislative frameworks in the energy sector are presented in detail, and the contemporary challenges facing it, specifically related to the construction of photovoltaic systems, are also taken into account.

Chapter two is dedicated to the methodology and methodological tools for studying the sustainability of photovoltaic systems. A wide range of established research methods were used, including document and case study analysis, conducting unstructured and in-depth interviews, and evaluating investment projects.

Chapter *three* analyzes the sustainability of energy production from photovoltaic systems in Bulgaria, based on the assessment of investment projects in the sector. The energy market in Bulgaria and the EU is studied, and the role of renewable energy is assessed. The state of the sector in Bulgaria is assessed based on the analysis of information from centralized sources, as well as on the assessment of specific investment cases.

Four common examples of photovoltaic systems for electricity generation in Bulgaria are analyzed. In the first case, an existing system is analyzed, and the implementation of a plan for the construction of photovoltaic systems for a period of four years is monitored - from 2021 to 2025. The second presented case study is aimed at building its own electricity production, which will be used by the company itself. The difficulties in adapting to the seasonality of electricity production from photovoltaic systems with less dynamic energy use by the company are assessed. The third case study examines a company that is entirely market-oriented and the electricity production is intended for the open market. Three scenarios have been

developed reflecting pessimistic, basic or optimistic production and, respectively, economic results of the investment process. The last fourth case study evaluates the investment in a larger-scale electricity production from photovoltaic systems. Three scenarios are again proposed - pessimistic, baseline and optimistic, assessing the risks and challenges of building larger-scale production.

Chapter *four* presents the prospects for the development of solar energy in Bulgaria. The integrated energy and climate plan of Bulgaria in relation to the priorities of the EU Green Deal has been analyzed, and the strengths and weaknesses of the plan have been assessed in detail. The doctoral student has also derived recommendations and opportunities for its development. Conceptual models for the sustainable development of photovoltaic systems in Bulgaria have also been presented , including a model for a photovoltaic system for self-consumption , a model for a hybrid rooftop photovoltaic system (self-consumption and sale of electricity), as well as a model for a photovoltaic system completely for sale of electricity (Feed-in model). In the development of these models, the risks of the external environment and the influence of price dynamics on the electricity market have been analyzed in detail. Decentralized models of solar energy development have also been presented, which take into account the importance of energy communities in the country.

In the conclusion of the dissertation, the doctoral student presents summarized results, based on which he formulates adequate recommendations for increasing the sustainability of electricity production from photovoltaic systems in Bulgaria.

I believe that the dissertation is a thorough scientific study, the author's personal work. The doctoral student has complied with the rules of scientific ethics, by correctly citing the literary sources used. The computational procedures and the statistical processing of the empirical data have been carried out correctly. The dissertation is well illustrated and illustrated.

The abstract is presented in a form that meets the requirements, reflecting in a volume of 35 pages the content of the dissertation and the main scientific and applied results achieved. The reference for contributions correctly reflects the

results achieved by the author, which I generally accept.

The dissertation submitted to me for review proves that the doctoral student has acquired in-depth theoretical knowledge of the research topic and has the ability to conduct independent scientific research, justify recommendations, and present optimization opportunities.

Literature used - the bibliographic list includes a total of 327 sources - monographs, studies, articles, reports, regulatory documents and documents from official websites of institutions.

6. Contributions of the dissertation work.

Several major scientific and scientifically applied contributions can be noted in the dissertation submitted to me for review.

Scientific contributions

A comprehensive theoretical framework for analyzing the sustainability of electricity production from photovoltaic systems in Bulgaria is presented. It combines economic, technological and institutional dimensions and contributes to expanding existing scientific approaches to the assessment of renewable energy sources.

The main factors influencing the selected exploitation model and the economic efficiency of photovoltaic investments are systematized, revealing the differences between the individual models that can generate significant differences in profitability, risk and financial sustainability indicators.

Scientific and applied contributions

The models for evaluating investment projects have been systematized, and the methodological tools for analyzing their application for the development of electricity production from photovoltaic systems in Bulgaria have been specified.

The main factors influencing the effectiveness of photovoltaic projects, including market, technological and natural determinants, have been researched and evaluated, contributing to a more precise investment assessment.

Recommendations are presented for the development of the institutional environment to

support the production of electricity from photovoltaic systems in Bulgaria.

7. Critical notes and questions.

I have a question and a recommendation for the doctoral student:

What opportunities and challenges do photovoltaic and agro-photovoltaic systems present to the agricultural sector in Bulgaria?

I recommend that the doctoral student, in his future scientific activities, continue to publish his research in specialized, refereed and indexed scientific journals.

8. Published articles and citations.

The doctoral student has published 3 independent articles on the topic of the dissertation, two of which are in English, one of which is in a peer-reviewed journal with IR.

CONCLUSION:

Based on the various research methods learned and applied by the doctoral student, the correctly derived analyses and assessments, the generalizations and conclusions made, I believe that the presented dissertation meets the requirements of the Law on the State of the Republic of Bulgaria and the Regulations of the Agricultural University for its application, which gives me reason to evaluate it **POSITIVELY** .

I would like to propose to the esteemed Scientific Jury to also vote positively and award SVETOSLAV ZHOROV LAVCHIEV the educational and scientific degree of " **Doctor** " in the scientific specialty of **Economics and Management (Agriculture)**.

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