



REVIEW

of a PhD thesis submitted for the award of the educational and scientific degree "Doctor" in the area of higher education 3. Social, economic and legal sciences, professional direction 3.8 Economics, scientific major "Economics and Management(Agriculture) "

Author of the dissertation: Svetoslav Jorov Lavchiev, part-time doctoral student, at the Department of Economics at the Agricultural University, Plovdiv

Thesis topic: „Sustainable production of electricity from photovoltaic systems“

Reviewer: Assoc. Prof. Georgi Dimov Georgiev PhD, Technical University - Sofia, Branch Plovdiv, in the area on the higher education 3. Social, Economic and Legal sciences, Professional direction 3.7. Administration and Management, scientific major "Economics and Management", appointed as a member of the scientific jury by order № РД-16-491/06.04.2026 of the Rector of Agricultural University.

1. Brief presentation of the candidate

Svetoslav Jorov Lavchiev has been a part-time doctoral student at the Department of Economics at the Agricultural University - Plovdiv. The candidate has consistent academic training in the field of agricultural economics, management and European policies. During the period 2009–2013, he has completed the educational and qualification degree "Bachelor" in the specialty "Agricultural Economics" at the Agricultural University - Plovdiv. Within the period 2013–2015, he has acquired a Master's degree in the specialty "European Expert in European Funds and Agriculture" at the same university.

In 2015, he specialized in Project Development at Humboldt University of Berlin, which further expanded his training in the field of project management and investment processes. Since June 2023, he has been a part-time doctoral student at the Agricultural University - Plovdiv.

Svetoslav Lavchiev's professional experience is related to the management of commercial companies with a diverse range of activities. Since 2023, he has been the manager of a commercial company. In addition to operational activities, his work includes developing business strategies. His professional experience also includes activities related to the development and implementation of photovoltaic power plant projects, consulting on European programs and investment projects in the field of renewable energy.

The candidate's scientific interests are focused on sustainable development, renewable energy sources, energy transition and economic aspects of solar energy.

2. Relevance of the problem

The transition to a low-carbon economy and the need to ensure energy security place the development of renewable energy sources among the key priorities of both the European Union and the national policies of the Member States. In this context, electricity production from photovoltaic systems is establishing itself as one of the fastest growing and strategically important drives in the energy sector.

The relevance of the dissertation work is determined by the need for in-depth research into the economic efficiency, sustainability and applicability of photovoltaic systems in the conditions of a dynamic market environment, energy transformation and increasing climate challenges. Of particular importance are the issues related to the investment attractiveness of solar projects, the possibilities for decentralized energy production, the role of energy communities and the adaptation of energy systems to new regulatory and technological requirements.

The dissertation has scientific and practical significance, as it studies the sustainability of different models of photovoltaic systems, analyzes the factors affecting their economic viability, and offers guidelines for improving policies and management decisions in the sector. The topic is particularly relevant for Bulgaria given the accelerated development of solar investments in recent years, the need to modernize the energy sector and the implementation of the European goals for climate neutrality and the Green Transition.

3. Purpose, tasks, hypotheses and research methods

The main objective of the dissertation is to study the economic, technological and institutional aspects of sustainable electricity production from photovoltaic systems and to assess their role in the development of a sustainable and competitive energy sector in Bulgaria.

To achieve the set goal, the doctoral student has formulated and consistently performed a number of research tasks aimed at:

- analysis of the theoretical foundations of sustainable development and energy transition;
- study of the development and importance of renewable energy sources in the European Union and Bulgaria;
- assessment of the regulatory and institutional framework in the field of photovoltaic systems;
- analysis of different models of production and operation of photovoltaic systems;
- research into the economic efficiency and sustainability of real investment projects;
- formulation of recommendations and conceptual models for sustainable development of the sector.

The research thesis is logically justified and based on the understanding that photovoltaic systems represent a strategic tool for a sustainable energy transition, with their long-term efficiency and sustainability depending on the interaction between economic, technological and institutional factors.

The methodological framework of the study is well selected and corresponds to the nature of the development. An integrated approach has been applied, combining qualitative and quantitative methods of analysis. Documentary and comparative analysis, case-study analysis, unstructured and in-depth interviews, investment and financial analysis, scenario modeling, as well as indicators of economic efficiency and profitability have been used.

4. Visualization and presentation of the results obtained

The dissertation is structured logically, consistently and in accordance with the set goal and research tasks. The work includes an introduction, four chapters, a conclusion, conclusions and recommendations, as well as a bibliography, with a total volume of 263 pages.

The presentation of the results is clear, systematic and analytically sound. The theoretical and empirical parts are well balanced, as the author successfully combines conceptual analysis with practical examples and investment assessments.

The study is illustrated with 55 tables and 32 figures, which contribute to the better visualization and interpretation of the analyzed processes, dependencies and scenarios. The presentation of real investment projects for photovoltaic systems, financial models, comparative analyses and scenario assessments makes a particularly positive impression. They increase the practical value of the dissertation work.

The empirical part is developed in detail and contains an analysis of different models of functioning of photovoltaic systems, including systems for self-consumption, electricity sales and agro-photovoltaic solutions. The presented results are interpreted correctly and allow for the drawing of reasoned conclusions regarding the economic efficiency, sustainability and prospects for the development of solar energy in Bulgaria.

5. Discussion of the results and literature used

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 in the context of the global energy transition. The specifics of conventional and renewable energy sources, the environmental, economic and social effects of the use of fossil fuels, as well as policies aimed at developing clean energy and overcoming global climate challenges are examined.

The second chapter is dedicated to the methodological framework of the study and the analysis of the economic aspects of investments in photovoltaic systems. The doctoral student presents and argues the use of various methods and indicators for assessing investment efficiency, including NPV, IRR, PBP and MIRR, examining their advantages,

limitations and applicability in evaluating projects in the field of renewable energy. The analysis is in-depth and demonstrates a good knowledge of the investment and financial tools.

The third chapter presents an empirical analysis of real investment projects in photovoltaic systems in Bulgaria. Different models of photovoltaic system operation, financial scenarios and factors affecting the economic sustainability of the projects are studied. Particular attention is paid to the influence of the market environment, electricity prices, access to financing, the regulatory environment and technical restrictions when connecting to the electricity grid. The results obtained confirm the significant potential of photovoltaic systems as an economically viable and sustainable investment.

Chapter four examines the prospects for the development of solar energy and the possibilities for integrating innovative models such as agro-photovoltaic systems, energy communities and decentralized energy solutions. The different business models, their economic characteristics and their potential for sustainable development of rural areas and the energy sector are analyzed.

The literature used is up-to-date, diverse and relevant to the research issue. 327 literary sources are included – scientific publications, monographs, regulatory acts, strategic documents of the European Union, as well as reports of international organizations. This indicates a good knowledge of the theoretical, institutional and practical framework of the study.

6. Contributions of the dissertation

The study contains scientific and applied scientific contributions that enrich existing research in the field of sustainable development, renewable energy and the economic efficiency of photovoltaic systems.

Scientific contributions

- An integrated theoretical framework for analyzing the sustainability of photovoltaic systems has been developed. It brings together economic, technological and institutional dimensions and contributes to expanding existing scientific approaches to the assessment of renewable energy sources.
- The theoretical framework on the role of renewable energy sources in the context of sustainable development has been systematized and enriched. Their significance for the energy transition, economic efficiency and climate neutrality within the European Union has been argued.
- A conceptual typology of photovoltaic system operating models is substantiated, deriving their structural characteristics, economic logic and specific risk profiles.
- The relationship between the chosen exploitation model and the economic efficiency of photovoltaic investments has been revealed. It has been proven that different models generate significant differences in profitability, risk and financial sustainability indicators.
- Theoretical understanding of decentralized energy systems as an element of sustainable energy transition has been developed, including through conceptualization of the role of energy communities and agrophotovoltaic solutions.

Applied scientific contributions

- An empirical analysis of real investment projects for photovoltaic systems in Bulgaria has been carried out, covering different scales and operational models, which allows an assessment of their economic viability and sustainability.
- An applicable methodological toolkit has been developed for evaluating investments in photovoltaic systems, based on cash flow analysis and the use of dynamic performance indicators, adapted to the specifics of the energy sector.
- The key factors influencing the efficiency of photovoltaic projects, including market, technological and natural determinants, have been identified and systematized.
- Conceptual models for choosing an investment strategy when implementing photovoltaic systems are proposed, which can be used by economic entities and public institutions when making management decisions.
- Practical guidelines have been formulated for improving policies and the regulatory framework aimed at stimulating investments in renewable energy and increasing the efficiency of the energy sector.

I accept the presented report on the doctoral student's contributions to the dissertation work.

7. Critical notes and questions

The following recommendation of a guiding nature can be made to the dissertation work, which does not diminish its scientific merits: in future research it would be useful to expand the comparative analysis of international experience in the development of photovoltaic systems and the implementation of innovative models for decentralized energy production and storage, with a view to deriving additional practical guidelines for the development of the sector in Bulgaria.

I have the following question for the doctoral student:

What do you think are the key economic and institutional factors that will determine the competitiveness of photovoltaic systems in Bulgaria in the context of an accelerated energy transition and a changing regulatory framework?

8. Published articles and citations

The PhD candidate has presented three publications on the topic of the dissertation. They have been published in scientific journals related to the issues of sustainable development, renewable energy sources and solar energy. The publications reflect the main aspects of the research conducted and show consistency in the candidate's research activities.

The publications meet the requirements for acquiring the educational and scientific degree "doctor" in terms of quality and quantity.

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

CONCLUSION:

The dissertation work proposed for defense by Svetoslav Jorov Lavchiev is in accordance with the norms of the Act on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the regulations of the Agricultural University. It presents a completed study with specific scientific and applied scientific results and meets the requirements for obtaining the educational and scientific degree "Doctor".

Based on the above arguments, I give a positive assessment of the dissertation on the topic „Sustainable production of electricity from photovoltaic systems“. I propose to the esteemed members of the scientific jury to make a decision to award Svetoslav Jorov Lavchiev the scientific degree "Doctor" in professional field 3.8 Economics, scientific major "Economics and Management(Agriculture) ".

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Plovdiv

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