OPINION

by Assoc. Prof. Dr. Eng. Hristo Todorov Ibrishimov
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on the dissertation thesis entitled: "Enhancement of Energy Efficiency in Power Supply Systems",submitted by M.Eng. Desislava Ivanova Delcheva for the award of the educational and scientific degree "Doctor"in the scientific specialty "Elements and Devices of Automation and Computer Engineering" within the professional field 5.2. Electrical Engineering, Electronics, and Automation.

1. Relevance of the developed problems in the dissertation work in scientific and scientific-applied aspect.

The quality of electrical energy can be regarded as a set of technical and regulatory requirements that define its reliability and the possibility for continuous utilization in accordance with pre-established standards. It encompasses a complex of supply voltage parameters—such as frequency, amplitude, waveform, and phase symmetry—which must be maintained within specified limits in order to ensure the proper functioning of electrical equipment and consumers.

A distinctive characteristic of electrical energy is that it cannot be stored on a large scale and is instead generated and consumed simultaneously in real time. This renders the quality of electricity supply the outcome of a bilateral process—on the one hand, the producers and suppliers of electrical energy, and on the other, the consumers. Consequently, both producers and consumers share responsibility for maintaining the required quality.

The expanded application of converter devices in recent years, based on modern semiconductor components, is inherently linked to the global trend toward automation and the enhancement of energy efficiency in both industry and the public sector. These devices provide opportunities for more precise control of electrical processes, increased production flexibility, and reduced operating costs. Nevertheless, their widespread implementation also gives rise to considerable challenges regarding power quality. The main negative effects are associated with the occurrence of: harmonic distortions—caused by the nonlinear operation of converters; voltage and current asymmetry; voltage fluctuations; and an increased risk of power supply interruptions. These issues lead to a decline in the reliability of electricity supply and result in economic losses, including higher electricity costs, accelerated aging of equipment, and the need for additional investments in compensatory measures.

The objective of the present dissertation is to investigate and develop up-to-date theoretical approaches for minimizing power losses in power supply systems, with the aim of applying them to the processes of studying and optimizing the power balance in industrial facilities and sectors. A techno-economic evaluation of the operating modes is carried out under a defined optimization criterion.

Based on the above considerations, as well as the stated objective addressed through the main research tasks, it can be asserted that the topic of the dissertation is highly relevant.

2. Degree of knowledge of the state of the problem and creative interpretation of the literary material.

In the presented dissertation, a total of 116 literary sources are cited, of which 75 are in Cyrillic and 41 in Latin script. The majority of the references date from the past 20 years. The doctoral candidate has carried out a thorough and precise analysis of the literature, and on this basis has appropriately identified the problems to be addressed in the dissertation. This provides sufficient grounds to state that the author has a solid knowledge of the current state of the research problem.

3. Evaluation of the Doctoral Candidate's Abstract Related to the Dissertation Thesis.

The abstract reflects the essence of the dissertation thesis and has been prepared in accordance with the requirements established over the years.

4. Evaluation of the dissertation publications

The doctoral candidate, M.Eng. Desislava Delcheva, has presented five publications related to the dissertation thesis, all co-authored with her scientific supervisor. They have been published in the Annual of the University of Mining and Geology "St. Ivan Rilski" and in Energy Forum (2023 and 2025). I consider that these publications adequately reflect the research results of the dissertation and that the required level of dissemination to the scientific community has been achieved.

5. Scientific and / or applied scientific contributions to the dissertation.

I accept the contributions formulated by the doctoral candidate. The main contributions of the dissertation can be attributed to the enrichment of existing knowledge, the application of scientific achievements in practice, and the realization of economic benefits. I believe that the results achieved are the personal work of the doctoral candidate, carried out under the scientific and methodological guidance of her supervisor.

6. Critical comments and recommendations.

In view of the relevance of the addressed problems, the developed approaches and methodologies, the presented analyses, and the proposed solutions, I consider that the dissertation represents a completed scientific-applied study.

I have no substantial remarks regarding the dissertation. Nevertheless, the following recommendations may be made:

Although rarely, some typographical errors appear in the text;

I recommend that the author continue her research in this field and publish the results in reputable scientific journals.

The observations and recommendations stated above do not in any way diminish the merits of the dissertation prepared by M.Eng. Desislava Delcheva.

7. Conclusion with a clear positive or negative assessment of the dissertation.

My overall assessment of the doctoral candidate's work is positive. I consider that the presented dissertation meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and its Regulations for the acquisition of the educational and scientific degree Doctor.

The results achieved give me sufficient grounds to recommend to the scientific jury that M.Eng. Desislava Ivanova Delcheva be awarded the educational and scientific degree Doctor in the field of higher education 5. Technical Sciences, professional field 5.2. Electrical Engineering, Electronics, and Automation, in the scientific specialty "Elements and Devices of Automation and Computer Engineering".

Date: 15.09.2025 Member of scientific jury:

/ Assoc. Prof. Hristo Todorov Ibrishimov, PhD /