O P I N I O N

by Associate Professor Eng. Nikolay Luboslavov Hinov, PhD

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of the materials submitted for participation in the competition for the academic position of "associate professor" in the field of higher education: 5. Technical Sciences,

professional direction: 5.2. Electrical Engineering, Electronics and Automation,

specialty " Electric Power Supply and Equipment " (Electrical machines I).

In the competition for the position of “Associate Professor”, which has been announced in The State Gazette, issue 55 from 27.06.2023 and also on the website of the Technical University of Gabrovo, as a candidate for the needs of the Department of Electric Power Supply and Equipment at the Faculty of Electrical Engineering and Electronics participates Chief Assist. Prof. Eng. Dimitrina Yordanova Koeva, PhD.

1. General overview of the submitted materials

After the analysis of the scientific works, which Ch. asst. Dimitrina Koeva submitted for the competition for the academic position of associate professor, I conclude that they can be grouped into the following thematic fields:

- Electrical machines: induction motors, power transformers and electric drives for industrial applications:

The following publications can be referred to this field: **[B.4.2], [B.4.3], [B.4.4], [B.4.8], [B.4.10], [Г.8.1], [Г.8.2], [Г.8.3], [Г.8.4], [Г.8.14], [Г.8.15], [Г.8.17], [Г.8.19], [Г.8.32].** The main part of these works presents researches that consider methodologies, algorithms and mathematical models of the electromechanical system of drive motors with industrial application and power transformers. Another direction of the candidate's research interests is related to the study of the operating and energy characteristics of electrical machines in order to describe the variation of their parameters on the operating and energy characteristics. In this regard, an analysis of the specific technical characteristics of the operation of nearly 1700 induction motors in two enterprises with significant energy consumption: a chemical and a food factory was carried out.

- Energy transition, sustainable energy and renewables. Application of forecasting models for the analysis of electricity prices and markets:

The following publications can be referred to this field: **[B.4.7], [B.4.11], [Г.7.1], [Г.8.6], [Г.8.5], [Г.8.8], [Г.8.9], [Г.8.11], [Г.8.13], [Г.8.18].** The problems, current status and prospects for the implementation of the energy transformation and the "Net Zero" scenario in the context of the energy-intensive industrial sector of Bulgaria are discussed. On the basis of analysis, systematization and summarizing of the most common failures in the power generators and definition of the priority subsystems that maintain the operability of wind turbines for electricity generation, the key factors that ensure their operability and reliability are evaluated. An overview is provided of the methods, algorithms and techniques used for diagnostics to be subsequently combined with the wind turbine control and monitoring system. On this basis, a model for the

construction of a diagnostic system is proposed, with appropriately chosen algorithm and implementation techniques, through an optimal selection of sensors and their appropriate placement to realize reliable operation of the devices. A comparative analysis of the merits of different methods for the prediction of the consumption of energy generated and/or consumed by energy objects is proposed, and conditions for the selection of adequate models for the assessment of the degree of adaptation to the energy transformation are defined.

- Electrical loads and their impact on the power grid: losses, harmonics, energy and resource efficiency in industry:

The following publications can be referred to this field: **[B.4.3], [B.4.6], [Г.8.1], [Г.8.13], [Г.8.14], [Г.8.15], [Г.8.18], [Г.8.20], [Г.8.24], [Г.8.26].** The operations of specific power plants are studied in order to identify technological, technical and other problems in the context of optimal energy and resource efficiency management. For this purpose, load schedules of different types of non-linear loads from industrial production and public sector have been measured and taken by means of Scada systems. In this regard, an approach for optimal consumption allocation of combined nonlinear loads is proposed for energy efficient and reliable operation of the power transformer and minimum impact to the power grid. This approach has been validated by studying the operation of specific power plants in order to identify the technological, technical and other problems in the context of realizing optimal energy and resource efficiency management.

- Electric machines with application in pumps, water systems, turbomachines:

This thematic group includes publications with the following numbers: **[B.4.9], [Г.8.1], [Г.8.2], [Г.8.16], [Г.8.19], [Г.8.1], [Г.8.30], [Г.8.31], [Г.8.32].** By using mathematical models of electric drives with specific parameters, an optimization with a minimum power loss objective function is performed. With the help of mathematical modeling, the dynamic behavior of an electric drive is described and numerical values for the variation of electric power losses in specific designs of induction motors under the application of different control methods are obtained. The possibility of energy saving of drives by applying optimal control is considered.

- Electromobility:

To this group belong the following publications: **[B.4.4], [B.4.8], [Г.7.1], [Г.8.4], [Г.8.21], [Г.8.22], [Г.8.23], [Г.8.25], [Г.8.27], [Г.8.28].** By making complex researches, the processes of operation of electric motors driving electric vehicles are analyzed in order to achieve energy and economic efficiency. Charging processes of electric vehicles are investigated and on this basis, predictive models for electric energy consumption of charging stations are developed. A model-based optimization of the charging infrastructure in terms of location and capacity is proposed in order to limit network overloading and ensure its sustainability.

2. General characteristics of the candidate`s performance

2.1. Teaching practice (work with undergraduate and postgraduate students)

Chief asst. Dr. Eng. Dimitrina Koeva has a long teaching activity (since 1991), having joined the Department of Electric Power Supply and Equipment of Technical University of Gabrovo in 2015. She teaches 6 courses for the Bachelor's degree and 5 for the Master's degree, and she is the author and co-author of 10 teaching programs. Additionally, the candidate has

submitted 3 textbooks for the competition. In the last 5 years, under the mentorship of the candidate, more than 70 graduates from Bachelor and Master degree programmes have successfully defended their studies.

2.2. Scientific and scientific-applied activities

According to the reference issued by the University Center for Scientific Research and Technology at Technical University of Gabrovo, it can be seen that Ch. Assist. Prof. Dr. Eng. Dimitrina Yordanova Koeva has participated in the development of 6 scientific research projects, funded by the State Budget for scientific research. One of them - Contract № 2104E/2021 – is the one, which she was in charge of. The thematic direction of the contracts with the participation of Dimitrina Koeva is related to the study of drive systems in industry and transport, and also to improving energy efficiency.

2.3. Deployments activities

The candidate has submitted official documents for: the design and implementation of an induction motor to drive an electric vehicle; and for participation as a consultant in energy efficiency audit reports for industrial objects. She has also been granted a utility model certificate by the Patent Office of the Republic of Bulgaria. A review of the materials submitted for the competition gives me reason to confidently assert that the Chief Asst. D. Koeva has excellent qualifications and very good achievements in the field of energy efficiency and electric drives.

3. Contributions (scientific, scientifically-applied, applied). Significance of contributions to science and practice

I accept most of the contributions formulated by the author on the basis of the publications for participation in the competition for the academic position "Associate Professor" - a total of 44 scientific articles and reports. In general, they are mainly of scientific and applied nature and can be summarized as follows:

- Research and optimization of electric drives with application in industry and transport.
- Study of the influence of non-linear loads on the power supply network and determination of energy and resource efficiency in industry.
- Development and application of forecasting models for the analysis of electricity prices and markets.
- Research on electrical machines with applications in pumps, water systems, turbomachinery.
- Development of electromobility.

4. Evaluation of the personal contribution of the candidate

Chief asst. Dr. Dimitrina Koeva is a long-standing lecturer and researcher with scientific research related to the topic of the competition. After reading and analyzing her works and achievements presented in the scientific papers, I consider that the candidate has a serious personal contribution and leading participation in them.

5. Critical notes and recommendations

My overall impression of the submitted materials for the competition is very good. On the other hand, I would make the following comments and recommendations:

- the contributions presented in the authors' abstract largely reflect the results achieved and it is good that they are specific. In my opinion, they should be summarised and edited in such a way as to better highlight the author's claims and avoid any duplication, as they are essentially quite similar for the main areas of work presented above;

- some of the papers contain figures and diagrams of poor quality, making them difficult to use effectively;

- with the author's demonstrated good knowledge of and proficiency in modern software, a natural extension and confirmation of his research is to perform modelling and simulation studies with the ORCAD, PSIM, PLEX, MATLAB/Simulink, etc. packages.

- I recommend the candidate to participate in other international scientific conferences in Bulgaria and Europe and also to publish in journals with impact factor (IF) and/or impact rank (SJR).

6. Personal impressions

I do not know the candidate and do not have personal impressions. The submitted materials for the competition give me grounds to claim that the chief asst. Dimitrina Koeva has excellent qualifications and is a well-known specialist in the field of electrical machines and energy efficiency.

7. Conclusion:

Taking into account the above, I propose that Ch. Asist. Prof. Eng. Dimitrina Yordanova Koeva, PhD, to be elected as "Associate Professor" in the field of higher education: 5. Technical Sciences, professional direction: 5.2. Electrical Engineering, Electronics and Automation, speciality "Electric Power Supply and Equipment " (Electrical machines I).

12.11.2023

Member of the jury: /signature/
/Assoc. Prof. Eng. Nikolay Hinov, PhD/