PEER REVIEW

to a competition for occupation of the academic position of Associate Professor in Professional field 5.4. Power Engineering, scientific specialty Power stations and substations,

announced in the State Gazette nr. 105/18-12-2018 for the needs of TU-Varna, Department of Power Engineering

with a candidate: Nikolay Deyanov Nikolaev, PhD, Head Assistant, TU-Varna

Reviewer: Dimo Georgiev Stoilov, PhD, Associate Professor, TU-Sofia

1. General requirements and biographical data

The competition was announced in the State Gazette nr. 105 of 18-12-2018 following the decision of the AC of TU-Varna dated 26-11-2018. The decision to organize the competition was taken at a meeting of the FC of the Faculty of Electrical Engineering at TU-Varna held on 25-06-2018 as suggested by DC of Power Engineering Department, held on 11-04-2018.

The candidate for the Associate Professor competition Head Assistant Dr. Nikolay Nikolaev is 32 years old. He has worked as a lecturer and researcher (part-time assistant, assistant, head assistant) for the Department of Power Engineering at TU-Varna for almost eight years. He has been a PhD in Power Grids and Systems since 2014, Master of Electrical Engineering in Power Stations, Grids and Systems since 2011, Bachelor of Electrical Engineering in the same specialty since 2009. He went to a secondary technical school with professional qualification of Telecommunication Technician.

2. General description of the presented materials

The candidate has submitted for reviewing a total of 23 research works, which are apart from his dissertation. All of them are on the subject of the competition and account for the final evaluation. The main fields of the candidate’s research, to which belong the presented works, are: contemporary problems of design, construction and operation of power stations and substations; development and application of smart power grids; research on stability, steady-state and transient modes of power systems.

All the presented research works are in English and are published in reviewed editions with ISBN or ISSN. The candidate is the sole author of 4 works. The others are in co-authorship, the candidate being the first author in 9 of them. A total of 14 works are indexed in the SCOPUS database. Ten of them are presented as a substitute of monographic work. The contents of most works were reported at prestigious international research conferences.

References have been given on: the candidate’s publication contributions; contribution to the modernization of the material and technical facilities of the department; the candidate's lecturing workload; developed teaching materials; participation in national scientific projects;

participation in projects for VTP-TUV EOOD company, research projects for TU-Varna, specializations in Russia and Spain.

The enclosed reference, according to Art. 2b of the Law on the Development of the Academic Staff in the Republic of Bulgaria, and the inspection made by the reviewer of all the enclosed documents show a significant over-fulfillment by the candidate of the minimum national requirements in Field 5 of University Education (Technical Sciences) as per all indicators: for group C, the over- fulfillment is 60%, for Group D is 10 %, for group E is 20% and for group G is 453%.

3. General description of the candidate's research and applied research activities

The research and applied research activities of Head Assistant Dr Nikolai Nikolaev are mostly in the field of contemporary problems of the design, construction and operation of power stations and substations; development and application of smart power grids; study of stability, steady-state and transient modes of power systems for both conventional electrical energy systems (EES) and the ones with renewable energy plants. His research works amount to 46 in number. The broad spectrum of fruitfully developed subjects in the field of power engineering testifies to the diverse interests and good preparation of the candidate.

Head Assistant Dr Nikolaev participated in the successful implementation of two national research projects at the National Science Fund, managed a project for applied research studies, which was funded by the state budget, was a member of the research teams in five other similar projects, as well as of the teams which worked on four contracts with VPT-TUV EOOD company. During his specializations abroad he worked with international research teams.

In 2014, he was awarded the Zlatan Bruchkov Prize for a young scientist of Varna in the category of Technical Sciences. He has also been awarded prizes and certificates by TU-Varna and others.

4. Evaluation of the candidate's pedagogical preparation and activities

Head Assistant Dr Nikolaev is a highly qualified lecturer, respected by his colleagues, with proven didactic, organizational and teamwork skills. He has delivered lectures and conducted exercises on the subjects of Electrical parts of power stations and substations, Technology of power generation, Power stations and electric energy grids, Stability of EES, High voltage facilities, Relay protection and automation of EES, and others. His lecture workload exceeds five times the minimum national requirements for taking the position of Associate Professor. He is the author of 5 textbooks: lecture notes on 4 subjects and one manual, as well as of educational software used in seminars and laboratory exercises. He has compiled 5 curricula for Bachelor’s degree in Power Engineering. He has helped and assisted a number of students - he has supervised 27 diploma theses of students from the Master’s and Bachelor’s degree

programs. The candidate has contributed to the renewal of the material and technical facilities in the training laboratories for the subjects of Power stations and substations, Modern electric energy systems and Power grids and systems.

5. Major scientific and applied science contributions

According to the reviewer, the contributions submitted by the candidate have been correctly defined. They are mainly in the field of proving by new means the substantial new aspects of already existing scientific areas, problems, theories or hypotheses, as well as in the development of new methods and confirmation of scientific facts. The most important among them all and the ones which determine the evaluations are as follows:

Scientific contributions:

Using the theory of fuzzy sets to identify passive electrical devices (C.4-1, C4-4) - to formulate a hypothesis, to develop new methods and to obtain confirmatory facts;

The developed approach, based on the Monte Carlo method, which takes into account the specific characteristics of electric energy systems when solving the problem of testing the stability of large electrical energy systems while also taking into account the uncertainties presenting in the mathematical model. Demonstrating its advantages over the μ-analysis (C.4-2). The reviewer reckons that the contribution has the character of developing new methods and obtaining confirmatory facts;

The presented models for studying the influence of RES-based power stations on the regulation of frequency of EES and the algorithm for optimization of the parameters of their power regulators according to the frequency (C.4-8) - formulation of a hypothesis, development of new methods and obtaining confirmatory facts;

The evidence that the trend of introducing an increasing number of automatic controllers in the future will require specialized methodologies to coordinate their operation in order to ensure the stability of the EES (G.8-6) - detecting new manifestations of existing problems;

The two algorithms developed to determine the stability limit and the shortest path to its reaching on the basis of the Monte Carlo method and on the basis of decomposition by singular numbers (G.7-1, G.7-2) - development of new methods and obtaining confirmatory facts;

The evidence of the ability of the algorithm with decomposition by singular numbers to indicate the path to the closest point of instability (G.7-3). Suggested improvements in the application of the algorithm by the Newton's second-order method. The reviewer reckons that the contribution has the character of proving by new means new substantial aspects of existing problems and obtaining confirmatory facts;

Applied research contributions:

Developed models for studying wave processes in direct lightning strikes on EES facilities. Results have been obtained that can serve to evaluate the effectiveness of surge

protectors (C.4-5, C.4-6). The reviewer reckons that the contribution has the character of developing new methods and obtaining confirmatory facts;

Developed mathematical models for analysis of electromagnetic transition processes and showing their advantages over the existing ones (C.4-7) - creation of new methods and obtaining confirmatory facts;

Developed new algorithm for initializing the mode parameters of double-supplied wind turbines and showing its superiority over those described by literary sources (G.8-4) - creating new methods and obtaining confirmatory facts;

Developed approach for presenting wind turbines and photovoltaic generators through a synchronous generator model (G.8-5) – formulating and defending a hypothesis, creating new methods and obtaining confirmatory facts;

Applied contributions:

Obtaining confirmatory facts of the benefits from the use of multichannel power system stabilizers (PSS4B) in large electric energy groups to damp inter-system and inter-zone electromechanical oscillations without adversely affecting the reduction of local variations for a particular synchronous aggregate (G.8-1);

Obtained data filling the gaps with respect to the capabilities of PSS3B to provide adequate phase compensation for a wide range of frequencies (G.7-4);

Implemented method for linearization of the EES mathematical description and stability test for small disturbances, adjustment of system stabilizers with a phase compensation method. The implementation is in the form of specialized software for use in General Electric Corporation;

Designed and built electronic system for Supervisory Control and Data Acquisition (SCADA) introduced in Laboratory 710E „Power stations and substations“ (G.8-7);

Implemented in the learning process new open source software related to mode calculation and control in electrical energy systems (C.4-7; reference for developed teaching materials).

Most of the scientific and applied research contributions, as well as the most significant among them, are available in the ten selected publications presented by Head Assistant Dr Nikolaev as habilitation work.

As a result of the analysis of the number and the arrangement of the co-authors of the works, it can be concluded that a significant part of the contributions are the candidate’s personal work, the others are the result of a joint creative activities in the scientific group of Prof. Gerasimov to which the candidate belongs.

The contributions of Head Assistant Dr Nikolaev are well known among the scientific community - data have been presented of 6 references to his works in the works of foreign authors indexed in SCOPUS. Therefore, the requirements for this indicator are over-fulfilled.

6. Significance of the contributions to science and practice

The fields of research in which the candidate is working are up-to-date and significant. Part of his contributions are applied to solving practical tasks in the operation of power generation facilities (AES Maritza East 1, AES Geo Energy), others are in the basis of the software used by General Electric, still others are integrated into the teaching work of the candidate and his colleagues. His achievements have become public and have received the recognition of the scientific community as a result of publications and numerous presentations at conferences both at home and abroad. He enjoys an authority among his colleagues in TU-Varna, in the country and abroad.

The references to Head Assistant Dr Nikolaev are made entirely by foreign authors. This is probably due to the publication of his works only in English. Therefore, it may be advisable for him to also publish in Bulgarian, which will create a prerequisite for greater popularity of his work among the national electricity community.

The over-fulfillment of all the minimum quantitative indicators for the occupation of the academic position of Associate Professor (according to the appendix to Art. 1a, para. 1 of the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria and appendix 1 to the Regulations for the Terms and Procedure for Occupation of Academic Positions in TU-Varna) is significant, respectively: for group C it is 60%, for group D is 10%, for group E is 20% and for group G is 453%.

7. Critical remarks and recommendations

I have none of critical remarks about the candidate. I recommend that he should continue being so dedicated to research and teaching work while trying to publish his results in journals with an impact factor. The scientific and professional journals in Bulgarian should not be neglected either, for it is through them that the national engineering community is maintained in the course of technologies and scientific research. The recognition by and feedback from the engineering community is important for the useful development of scientists and lecturers in the field of engineering. I also recommend active work with PhD students and young scientists to form teams capable of handling significant research tasks.

8. The reviewer's personal impressions and opinion

I have known Dr Nikolaev since the period of his doctoral studies, when we met and talked at scientific conferences. Right from the beginning of our acquaintance he impressed me as a young scholar with diverse interests, solid training in the field of power engineering and mathematical modeling, rapid and critical thinking. Getting acquainted more closely with his

current achievements, has convinced me in the positive development of these qualities of his and his endeavour to implant and cultivate them in future electrical engineers.

CONCLUSION

The candidate's presentation in the competition for the academic position of Associate Professor fully meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the LDASRB and the Regulations for the Terms and Procedure for Occupation of Academic Positions in TU-Varna.

Based on my acquaintance with the candidate's scientific, teaching and organizational work, the contents of his works, the assessment of their significance, the scientific work, applied research and applied contributions, I convincingly propose that Head Assistant Dr Nikolai Deyanov Nikolayev should occupy the academic position of Associate Professor in the professional field 5.4 Power Engineering, under the research specialty Electric power stations and substations.

Date: 28-03-2019 **REVIEWER:**

/Dimo Stilov, PhD, Associate Professor/