# REVIEW

regarding a competition for the occupation of an academic position of "associateprofessor" in professional direction 5.2 “Electrical engineering, electronics and automation”, scientific specialty "Electrical power supply and electrical equipment",
with candidate: **chief assistant professor, eng. Mladen Antonov Proykov, PhD**

Reviewer: **prof., eng. Bohos Rupen Aprahamyan, PhD** – Technical University of Varna

## 1. General and biographical data

Chief assistant professor, eng. Mladen Antonov Proykov, PhD, has graduated from the Technical University - Varna in 1999, specialty "Electrical power supply and electrical equipment of industrial enterprises" and has obtained the qualification "Master - Engineer". In 2016, he has been enrolled in full-time doctoral studies in the doctoral program "Electricity power supply and electrical equipment" at the Technical University - Varna and in 2018 he successfully has defended his dissertation on the topic "Research, analysis and recommendations for achieving electromagnetic compatibility in electrical power supply systems in the mode of reduced load" with scientific supervisors assoc. professor, eng. Rumen Kirov, PhD and assoc. professor, eng. Rosen Vasilev, PhD. Since 2014 he has been an assistant and since 2019 he has been a chief assistant at the "Electronics, electrical engineering and mechanical science", department at University "Prof. Dr. A. Zlatarov" - Burgas.
Chief assistant professor, eng. Mladen Antonov Proykov, PhD, has participated in a competition for the academic position "Associate profesor" in professional direction 5.2 “Electrical engineering, electronics and automation”, scientific specialty "Electrical power supply and electrical equipment" for the needs of the department "Electronics, electrical engineering and mechanical science" of University "Prof. Dr. Asen Zlatarov" - Burgas. The competition has been announced in the the State Gazette, issue 97 from 21.11.2023 and on the university's website.

## 2. General description of the presented materials

For participation in the competition, chief assistant professor, eng. Mladen Antonov Proykov, PhD, has submitted a curriculum vitae, a copy of the diploma for the acquired educational and scientific degree "doctor", a certificate proving work experience, a list of publications on the dissertation for the acquisition of the ESD „Doctor“, a table certifying the completion of the minimum national requirements for occupying the academic position ”Associate Professor” from RBCPASDTAP at the University "Prof. Dr. A. Zlatarov" - Burgas, list of scientific works submitted for participation in the competition for the acquisition of academic positions "Associate Professor", reference for scientific, scientific and applied contributions, reference for study load, reference for defended graduates, reference for scientific and scientific-applied developments, a reference for developed teaching materials, a reference for personal contribution to the modernization of the material and technical base of the Department of "Electronics, Electrical Engineering and Mechanical Science", declarations of co-authorship, scientific publications submitted for participation in the competition in full text, the textbooks and handbooks submitted for participation in the competition in full text.
For participation in the competition, chief assistant professor, eng. Mladen Antonov Proykov, PhD, presents a total of 30 scientific works, of which 1 monograph, 2 articles in scientific journals, 21 reports at scientific conferences and 6 articles in the Annual of "Prof. Dr. A. Zlatarov" University - Burgas. Of the scientific articles and reports submitted for participation in the competition, 8 are indexed in the Scopus database, 27 are in English and 2 in Bulgarian. In 20 of the submitted publications the candidate is the first author, in 4 he is the second and in 5 he is the third or subsequent author. There are 9 independent publications. 21 publications in Bulgarian and English are in publications included in the National Reference List of modern Bulgarian scientific publications with peer review.

The presented works are generally directly related to the current competition for occupation of academic position " associate professor " and are in the professional direction 5.2 "Electrical engineering, electronics and automation", scientific specialty "Electrical power supply and electrical equipment". After comparing the presented materials with the minimum required points by groups of indicators for occupying the academic position "Associate Professor" regarding to the Regulations for the Application of LDASRB and RBCPASDTAP at the University "Prof. Dr. A. Zlatarov" - Burgas, the following results have been obtained:

| A group of indicators | Content | Indicator | Number of points, required for occupation of AP "Assoc. prof" according to the LDASRB | Number of points, required for occupation the AP "Assoc. Prof." according to RBCPASDTAP at the University "Prof. Dr. Asen Zlatarov" | Number of points of the candidate | |
|---|---|---|---|---|---|---|
| A | Indicator 1 | 1. Dissertation for the award of the educational and scientific degree "Doctor" | 50 | 50 | 50 | |
| C | Indicator 3 | 4. Habilitation thesis - monograph | 100 | 100 | 100 | |
| D | Sum of indicators 7 and 8 | 7. Scientific publication in editions that are referenced and indexed in world-renowned databases of scientific information | 200 | 300 | 184,66 | 452,67 |
| | | 8. Scientific publication in non-refereed peer-reviewed journals or in edited collective volumes | | | 268,01 | |
| E | Sum of indicators 12 and 14 | 12. Citations or reviews in scientific publications referenced and indexed in world-renowned databases of scientific information or in monographs and collective volumes | 50 | 100 | 150 | 164 |
| | | 14. Citations or reviews in non-refereed peer-reviewed journals | | | 14 | |
| F | Sum of indicators 23 and 24 | 23. A published university textbook or a textbook that is used on the school network | 0 | 100 | 60 | 100 |
| | | 24. A published university handbook or a handbook that is used on the school network | | | 40 | |

**3. General characteristics of the candidate's scientific-research and scientific-applied activities.**

The scientific research and scientific-applied activity of the assistant professor eng. Mladen Antonov Proykov, PhD, which is reflected in the publications and in the projects in which he has participated, is mainly aimed at the electrical power supply and electrical equipment and is in the field of the competition.

I accept the main directions of scientific research formulated by the candidate, which are summarized as:

- Research, analysis and improvement of the energy efficiency of electrical networks - 9 publications;
- Research, analysis and assessment of indicators of the quality of electric power and electromagnetic compatibility in electric networks - 5 publications;
- Study of models of photovoltaic systems and study of their impact on power supply systems - 3 publications;
- Research on the reliability of power supply systems - 3 publications;
- Study of the operation of the devices for control and protection of electrical networks and energy equipment - 4 publications.

The research activity of the Chief Assistant Professor eng. Mladen Antonov Proykov, PhD, defines him as a scientist with good theoretical and practical knowledge to successfully cope with research tasks in parallel with teaching activities, as well as with a high potential for future successful development.

**4. Evaluation of the pedagogical preparation and activity of the candidate.**

Chief Assistant Professor, eng. Mladen Antonov Proykov, PhD, has been an established lecturer at the Department of "Electronics, Electrical Engineering and Mechanical Science" at "Prof. Dr. A. Zlatarov" University - Burgas. He has led lectures on disciplines such as "Theoretical electrical engineering", "Electric drive", "Electrical engineering and electrical measurements", "Lighting technology", "High voltage technology", "Relay protection and automation", "Electrical machines and devices", "Reliability of electrical machines and apparatus', etc. to the students of the "Bachelor's" and "Master's" Degree of the University "Prof. Dr. A. Zlatarov" - Burgas.
He is the co-author of 2 textbooks and 2 university handbooks.
Chief Assistant Professor, eng. Mladen Antonov Proykov, PhD, is the supervisor of 18 graduates studying at the Master's Degree.
I believe that his educational and teaching work meets the requirements for holding the JSC "Associate Professor".

**5. Basic scientific and scientific-applied contributions.**

I accept the applicant's reference for the main contributions in the presented works. Based on the publications submitted for review, it can be generally concluded that a number of positive results of a contributing nature have been achieved, the most significant of which are:

**Scientific and applied contributions:**

1. Confirmatory research results have been obtained on the influence of energy management systems on the achievement of energy efficiency of energy equipment. Studies have been conducted and the negative consequences of increased reactive power consumption and reduced power factor have been evaluated. The effect of installing LED luminaires and introducing a lighting control system into existing lighting arrangements has been investigated [2.2, 2.3, 2.5, 2.8, 3.3, 3.4, 3.5, 3.6, 3.15]:
- Confirmatory data has been obtained for active power losses in a large resort complex. Recommendations has been made for streamlining the operating modes of its electrical power system. The relationship between energy efficiency and electrical energy losses due to highly uneven loading has been determined;
- Confirmatory results has been obtained from a study of energy efficiency in a large industrial facility and the impact of the implemented dispatch control and energy management system on it;
- Confirmatory data has been obtained for the optimization of the reactive power in the electrical power supply system of the Burgas port complex, in the conditions of non-symmetrical and non-sinusoidal mode. A new method has been proposed to reduce these losses by using modern devices for compensating reactive power, balancing the electrical network and reducing the harmonic levels in it;
- New data have been obtained from studies of work modes and energy processes in the power supply system of a port complex. The losses of electricity for individual groups of users and for the

entire electricity supply system as a result of deteriorated indicators of the quality of electrical energy have been determined. The influence of the load on the power factor and active power losses has been established;

2. Confirmatory data has been obtained and the indicators for the quality of electrical energy and the electromagnetic compatibility of the power supply systems of several large industrial sites in Bulgaria has been evaluated. Methods for increasing the quality of electrical energy and electromagnetic compatibility are proposed [2.1, 2.4, 2.7, 3.1, 3.14]:
- Confirmatory data has been obtained on the relationship between energy efficiency, power quality and electromagnetic compatibility. The influence of the voltage deviation on the specific consumption of electrical energy at different load levels has been determined;
- Confirmatory results has been obtained from a study of the influence of some powerful electrical consumers (power transformers, electric arc furnaces, welding units, electrolysis and compensating devices) on the indicators of the quality of electrical energy and on electromagnetic compatibility;
- Confirmatory data have been obtained from the study of the operation of power transformers under different loads.

3. New simulation models have been developed and the performance of photovoltaic systems has been analyzed using Matlab/Simulink software. Methods have been proposed for rationalizing the schematic characteristics of photovoltaic systems and improving their energy characteristics [2.6, 3.19, 3.20]:
- In Matlab/Simulink programming environment, a new model of inverter with phase control has been synthesized. A comparative analysis has been made between the performance of the phase-controlled algorithm inverter with different input voltage fill factors. The active power losses, the total harmonic distortion and the harmonic composition of the output voltage and current have been determined for the inverter operating modes.

4. Confirmatory data have been obtained from studies of the reliability of power supply systems at large industrial sites. The influence of transient processes and resonance phenomena on the reliability of power supply systems have been studied. The relationship between electromagnetic compatibility and the reliability of power supply systems has been evaluated [3.12, 3.13, 3.18]:
- Confirmatory data has been obtained from a study on the multiplicity of overvoltages during commutation of a group of powerful synchronous motors. The probability of penetration of electromagnetic disturbances into automation, control and protection systems has been confirmed;
- New data have been obtained by applying probabilistic-statistical methods for the correlation between electromagnetic compatibility and power supply reliability. It has been proven that electromagnetic compatibility is influenced not only by power quality indicators, but also by the reliability and sustainability of the power supply system.

Applied Contributions:

1. A comprehensive solution has been proposed for the rehabilitation of the existing lighting system of the "Meden Rudnik" residential complex, Burgas. The achieved lighting technical indicators and realized energy efficiency have been presented. A new method for automated lighting control has been proposed [3.3].
2. A complete solution has been proposed for the rehabilitation of the existing lighting system of the bike lane on the Burgas - Lozovo road and the pedestrian zone to it. The comparative analyzes between several solutions with different types of street LED lighting fixtures has been presented. A new method for automated lighting control is proposed [3.5].
3. The achieved energy efficiency in a single-family residential building has been investigated. The costs of electrical energy at the site with and without a "smart home" system have been calculated [3.6].

4. Data were obtained on the level of power losses at different loads on power transformers, as a result of the deteriorated indicators of electric energy in "Elkabel" JSC, Burgas. To minimize these losses, reactive power compensation and increase the reliability of the power system have been proposed [3.15].
5. The operation of several crane systems of a large port complex have been investigated. Load graphs have been drawn and harmonic components of current and voltage have been recorded. The influence of higher harmonics on the losses of active power and voltage in the supply lines have been determined [2.4].
6. A study has been conducted and an analysis has been made of the energy efficiency of an operating photovoltaic plant. The influence of the location, angle of inclination and type of photovoltaic panels on the operation of the plant has been investigated. Recommendations have been given for optimizing the operation of the photovoltaic plant and increasing the quality of the generated electrical energy [3.19].
7. New experimental setups have been developed. A new mock-up has been developed and the performance of an inverter for controlling an induction motor has been investigated. A new mock-up have been developed and the operation of a soft starter for soft starting of an induction motor have been investigated. A new layout has been developed and the operation of DC and AC relays has been investigated [3.8, 3.9, 3.17, 3.21].
8. A new laboratory device for automatic transverse compensation of reactive power has been developed. The effect of applying transverse compensation of reactive loads in electrical networks has been investigated. The possibility of the occurrence of resonance in electrical networks has been investigated [3.4].
9. A new laboratory model has been developed and the operation of a power supply system for consumers of the first category has been studied [3.18].

**6. Significance of contributions for science and practice.**

The relevance of research in the field of electrotechnical materials makes the teaching and research work, as well as the works of the chief assistant professor, eng. Mladen Antonov Proykov, PhD, significant for science and education.
The significance of the scientific contributions of the chief assistant professor, eng. Mladen Antonov Proykov, PhD, for science and practice is indisputable. It can be judged by his publications and participation in international scientific conferences. He is well known to the scientific community at home and abroad and is undoubtedly a leading specialist in the field of electrical power supply and electrical equipment.
The quantitative indicators of the criteria for occupying the academic position "Associate Professor" have been met and in most groups of indicators the candidate significantly exceeds the minimum requirements.

**7. Critical notes and recommendations.**

I have some critical remarks about the materials submitted for participation in the competition, namely:
1. The scientific work "Reliability of power supply (theoretical foundations of reliability in power supply systems)" presented as a monograph has more the character of a textbook and does not meet the requirement for a scientific monograph set by LDASRB, namely: "The monograph is a scientific work that does not repeats or summarizes existing knowledge'.
2. The candidate's submitted contributions are scientific and applied. There is no evidence presented of the applicant's scientific contributions, expressed in formulating and justifying a new scientific field or problem, formulating or justifying a new theory or hypothesis, proving by new means essential new aspects of already existing scientific fields, problems, theories and hypotheses.

3. The reference for scientific contributions is not correctly compiled. The recommendations for formulating contributions given by NACID were not used. Often, instead of contributions, short abstracts of the publications are presented, some with many technical errors.
4. The submitted materials lack a declaration of credibility, a declaration of originality of contributions and a declaration of non-plagiarism in the submitted scientific works, although the applicant's application states that they are attached.

I also have two recommendations:
1. I would recommend the candidate to focus on publishing in scientific journals with impact factor and impact rank, which will increase the prestige of scientific publications.
2. In the candidate's materials, there are no presented documents about the results of scientific research applied in practice. It would be good to think about specific applications in practice, as well as patent or utility model protection.

**8. Personal impressions and opinion of the reviewer.**

I know the candidate vaguely, whom I have only met as a doctoral student at the Technical University - Varna, which is why I cannot express personal impressions about him. However, the impression created by the materials presented for the competition is very good.
For me, as a reviewer, there is no doubt that the main scientific and scientific-applied contributions in the works submitted for the competition are the personal work of the candidate and with his direct participation.
Undoubtedly chief assistant professor, eng. Mladen Antonov Proykov, PhD, has established himself as a good specialist in the field of electrical power supply and electrical equipment with a marked interest in modern achievements in this scientific field and great potential for future development.

## CONCLUSION

The materials presented in the competition for the occupation of AP "Associate Professor" allow to evaluate the teaching and research activities and the qualities of the candidate chief assistant professor eng. Mladen Antonov Proykov, PhD, and to define him as a highly qualified and established scientist in the field of electrical supply and electrical equipment with national and international authority.
The minimum requirements for occupying the academic position "Associate Professor" in professional direction 5.2 "Electrical engineering, electronics and automation", determined by RBCPASDTAP at University "Prof. Dr. A. Zlatarov" - Burgas, which also cover the minimum national requirements according to the Regulations for the Application of LDASRB are fulfilled.
Based on the acquaintance with the presented scientific works, their importance, the scientific-applied and applied contributions contained in them, and despite the critical remarks, I find it reasonable to propose chief assistant professor, eng. Mladen Antonov Proykov, PhD, to take the academic position "Associate Professor" in professional direction 5.2 "Electrical engineering, electronics and automation", scientific specialty "Electrical power supply and electrical equipment" for the needs of the department "Electronics, electrical engineering and mechanical science" of the University "Prof. Dr. A. Zlatarov" - Burgas.

**Date:** 11.04.2024 **REVIEWER:**

/prof. eng. Bohos Aprahamyan, PhD/