R E V I E W

by Prof. Dr. Eng. Anatoliy Trifonov Alexandrov,
Technical University of Gabrovo

on the materials submitted for participation in the competition for the academic position of "Professor" in the field of higher education – 5. Technical Sciences, professional field – 5.2 Electrical Engineering, Electronics and Automation, specialty – "Electric Power Distribution and Electrical Equipment" (Lighting and Installation Technology).

In the competition for the position of Professor, announced in the State Gazette, issue 48 of 13.06.2025 and on the website of the Technical University of Gabrovo, the candidate is Assoc. Prof. Dr. Eng. Plamen Tsenkov Tsankov.

1. Brief Biographical Data

Plamen Tsenkov Tsankov graduated from the Dr. Nikola Vassiliadi Technical School of Mechanical and Electrical Engineering in Gabrovo in 1989, specializing in "Electric Power Distribution and Electrical Equipment for Industrial Enterprises." In 1995, he obtained a master's degree in " Electric Power Distribution and Electrical Equipment" from the Technical University of Gabrovo (TU-Gabrovo), and in 2013 he obtained a Doctor of Science degree in the scientific specialty "Lighting Technology and Light Sources" in the professional field 5.2 Electrical Engineering, Electronics, and Automation. He has participated in the following qualification courses in the field of the competition: Training course for trainers in "Energy Auditing and Certification of Buildings"; UNESCO course "Expert in the design, installation, and management of renewable energy systems - photovoltaics," Enel SpA, Catania, Sicily, Italy; Professional training on the technical characteristics of lighting products from Beghelli-Elplast and Praezisa GmbH, Brno, Czech Republic; Course on "Energy Management and Renewable Energy Sources" at the Technical University - Berlin, Germany; Professional Certificate for Successfully Completed International Training Course "Municipal Energy Planning and the ENCON Process", UNDP/GEF, ENSI - Norway, NOVEM - Netherlands; Training in the field of renewable energy technologies (photovoltaic applications) under Contract 6.7211-40 / I / 97-005, WIP, Munich, Germany; Training course on hybrid renewable energy systems, Sulina, Romania.
From 1997 to 2025, Plamen Tsankov held the academic positions of assistant, senior assistant, chief assistant, and associate professor in the Department of Electric Power Distribution and Electrical Equipment at the Faculty of Electrical Engineering and Electronics at the Technical University of Gabrovo. From 2016 to 2020, he was head of the Department of Electric Power Distribution and Electrical Equipment, from 2020 to 2024 he was Deputy Rector for Research, and from 2024 to the present, he has been Deputy Rector for Academic Affairs at the Technical University of Gabrovo.

2. General Description of Submitted Materials

Assoc. Prof. Plamen Tsankov participates in the competition for the academic position of "professor" with 34 scientific papers, of which: publications equivalent to a habilitation thesis in editions referenced and indexed in world-renowned scientific information databases (indicator B4) – 10 [B4.1 – B4.10]; scientific publications in journals referenced and indexed in world-renowned scientific information databases (indicator G7) – 3 [G7.1 – G7.3]; scientific publications printed in peer-reviewed journals and collections (indicator G8) – 21 [G8.1 – G8.21]. Two textbooks have been published (indicator E23) – 2 [E23.1, E23.2]
The publications can be classified as follows:

- By type: articles – 14 [B4.1, B4.2, B4.6, B4.10; G7.1 – G7.3; G8.2, G8.5, G8.11, G8.14, G8.16, G8.19, G8.20]; reports – 20 [B4.3 – B4.5, B4.7 – B4.9; G8.1, G8.3, G8.4, G8.6 – G8.10, G8.12, G8.13, G8.15, G8.17, G8.18, G8.21].

- By significance: articles in publications with impact factor (WoS) – 4 [B4.6 (IF 7.1), G.7.2 (IF 3.2), B.4.10 (IF 2.5), G.7.3 (IF 0.7)] and impact rank (Scopus) – 3 articles (except those with IF) [B.4.1 (SJR 0.173), B.4.2 (SJR 0.173); G.7.1 (SJR 0.173].

- By place of publication: publications in refereed international journals – 13 [B4.1 – B4.10; D7.1 – D7.3]; articles in foreign journals – 4 [D8.2, D8.14, D8.19, D8.20]; articles in national journals – 3 [G8.5, G8.11, G8.16]; reports in proceedings of international scientific conferences in Bulgaria – 14 [G.8.1, G.8.3, G.8.4, G.8.6 – G.8.10, G.8.12, G.8.13, G.8.15, G.8.17, G.8.18, G.8.21].

- By language: in English – 17 [B.4.1 – B4.10; G7.1 – G7.3; G8.2, G8.14, G8.19, G8.20]; in Bulgarian – 17 items [G8.1, G8.3 – G8.13, G8.15 – G8.19, G8.21].

By number of co-authors: solo – 6 [B.4.1, B.4.2; G8.2, G8.18, G8.19, G.8.21]; with two co-authors – 9 [B.4.8; G.8.1, G8.3, G8.5, G8.6, G8.8, G8.10, G8.14, G8.16]; with three or more co-authors – 19 [B.4.3 – B.4.7, B.4.9, B.4.10; G.7.1 – G.7.3; G.8.4, G.8.7, G.8.9, G.8.11 – G.8.13, G.8.15; G.8.17; G.8.20]. In 20 of the joint works [B.4.3, B.4.5, B.4.7 – B.4.9; G.7.3; G.8.1, G.8.3, G.8.7 – G.8.17, G.8.20], the candidate is listed first.

The candidate in the competition has published two university textbooks. All publications, as well as both textbooks, were reviewed prior to publication.

3. Reflection of the candidate's scientific publications in the scientific community (known citations)

Assoc. Prof. Plamen Tsankov has submitted a report on 31 citations in scientific publications, referenced and indexed in world-renowned scientific information databases, of which 11 citations are in publications with IF (indicator D12 – 310 points). Seven scientific papers are cited, one of which is cited seven times. A report was also presented on six reviews in scientific publications, referenced and indexed in world-renowned scientific information databases.

All this gives me reason to conclude that the candidate in the competition is a well-known author who has published in significant scientific journals and collections in the field of the competition.

4. Overview of the content and results in the presented works

The candidate in the competition meets and exceeds the minimum national requirements in certain indicators. Assoc. Prof. Plamen Tsankov holds a doctoral degree in "Lighting Technology and Light Sources" from the Technical University of Gabrovo. He defended his dissertation on the topic: "Optimization of optical systems of lighting fixtures" (indicator A – 50 points). The following are presented: 10 publications, equivalent to a habilitation thesis, which are in editions referenced and indexed in world-renowned scientific information databases (indicator B – 260.57 points); 24 scientific publications (indicator D – 244.02 points), of which 3 publications (indicator D7 – 30 points) are in publications referenced and indexed in world-renowned scientific information databases (Scopus, Web of Science), 21 publications (indicator G8 – 214.02 points) in non-referenced peer-reviewed journals or in edited collective volumes; 31 citations and 6 reviews in scientific publications referenced and indexed in world-renowned scientific information databases (group of indicators D – 370 points – all in indicator D.12).

The scientific and implementation activity of Assoc. Prof. Tsankov (indicator E – 380 points) includes: supervision of two successfully defended doctoral students (indicator E17 – 80 points); supervision of 8 national scientific or educational projects (indicator E20 – 180 points); publication of 2 university textbooks (indicator E23 – 40 points); one published patent application (indicator E25 – 20 points); two recognized utility models (indicator E26 – 80 points).

With minimum national requirements for participation in the competition of 600 points, Assoc. Prof. Plamen Tsankov, PhD, has 1304.59 points.

Group of indicators	Minimum national requirements for the academic position of "professor"	Assoc. Prof. Plamen Tsankov, PhD
A	50 p.	50 p.
B	-	-
C	100 p.	260,57 p.
D	200 p.	244,02 p.
E	100 p.	370 p.
F	150 p.	380 p.

Assoc. Prof. Plamen Tsankov meets and exceeds certain scientometric indicators according to the minimum requirements of TU-Gabrovo. With a requirement of 30 publications, including 5 independent publications and 3 with IF, he has 34 publications, 6 of which are independent and 4 with IF (impact factor). With a requirement of 20 citations, the candidate has 31. Assoc. Prof. Tsankov is co-author of 2 textbooks. With a requirement of 1 defended doctoral student, he has 2, and with a requirement of 3 projects supervised, he has supervised 8 projects.

Indicator	Minimum requirements of TU-Gabrovo for the academic position of "professor"	Assoc. Prof. Plamen Tsankov, PhD
Total number of publications	30	34 (including 4 with IF)
Independent	5	6
Number of known citations by other authors	20	31
Published textbooks	2	2
Successfully defended doctoral students	1	2
Project management	3	8

5. General Characteristics of the Candidate's Activities

5.1. Teaching and educational activities (working with students and doctoral candidates)

Assoc. Prof. Plamen Tsankov, PhD, is an established lecturer at the Technical University of Gabrovo. He has 27 years of experience in higher education as a lecturer at the Technical University of Gabrovo.

According to the information provided on the number of hours taught at the Technical University of Gabrovo over the last 5 years, he has spent 2,147 hours with students majoring in "Electrical Power Engineering and Electrical Equipment" (full-time and part-time) in the following disciplines: "Lighting and Installation Technology"; " Electric Power Distribution"; "Industrial Power Distribution Systems"; "Automated Design in Electric Power Distribution and Electrical Equipment" - for Bachelor's degree; "Automatic Devices in Electrical Power Engineering", "Optimization and Management of Electric Power Distribution Systems" and "Automated Design in Electrical Power Engineering" (course project) - for Master's degree.

Assoc. Prof. Plamen Tsankov is co-author of two new textbooks:

- Tsankov, P., M. Yovchev. Textbook on Lighting and Installation Technology. Vasil Aprilov University Press, Gabrovo, 2024, ISBN 978-954-683-701-1 - https://epublish.tugab.bg/uchebni-materiali?task=download.send&id=126&catid=35&m =0;

- Tsankov, P., M. Yovchev. Textbook on Industrial Electric Power Distribution Systems. Vasil Aprilov University Press – Gabrovo, 2025, ISBN: 978-954-683-723-3 - https://epublish.tugab.bg/uchebni-materiali?task=download.send&id=139&catid=55 &m=0.

The candidate in the competition is a co-author of curricula in the following academic disciplines:

- "Lighting and Installation Technology," "Electric Power Distribution," "Industrial Electric Power Distribution Systems," "Automated Design in Electric Power Distribution and Electrical Equipment," "Electric Power Distribution" – course project, "Design of Lighting Systems," "Power Plants with Renewable Energy Sources," "Technical Operation of Electrical Equipment," "Relay Protection," "Automatic Devices in Power Engineering," "Control and Measurement in Electric Power Distribution Systems," "Optimization and Management of Electric Power Distribution Systems," "Technical and Economic Assessment of Electrical Power Facilities" and "Automated Design in Electrical Power Engineering" – course project – for the specialty "Electrical Power Engineering and Electrical Equipment," bachelor's and master's degrees;

- "Light Sources" and "Energy Efficiency of Lighting Systems" – for the doctoral program "Lighting Technology and Light Sources";

- "Renewable Energy Sources" and "Computer Design of Lighting Fixtures and Lighting Systems" for doctoral programs in "Lighting Technology and Light Sources," "Electric Power Distribution and Electrical Equipment," and "Electromechanics";

- "Technical and Economic Assessment of Engineering Projects" for doctoral programs in professional fields 5.1, 5.2, 5.3, and 5.13 at the Technical University of Gabrovo.

Assoc. Prof. Plamen Tsankov has supervised 186 graduates who have successfully defended their theses.

The above data give me reason to assess the pedagogical training and activity of Assoc. Prof. Tsankov as very good.

5.2. Scientific and Applied Research

Assoc. Prof. Plamen Tsankov has been the head of:

- 5 university research contracts: No. E1506/2015 "Research on autonomous power supply of consumers from renewable energy sources"; No. D1621E/2016 "Design and optimization of innovative LED lighting fixtures"; No. 1809E/2018 "Improving the energy efficiency of lighting systems through the introduction of LED lighting fixtures"; No. 2408E/2024 "Simulations, modeling, and research of modern objects and systems in the electric power industry"; No. NIP2025-20/2025 "Research and analysis of the electric power balance of buildings with photovoltaic systems";

- 3 contracts with external contractors related to the survey and construction of street lighting systems.

According to Assoc. Prof. Tsankov's personal page in the University Information System of TU-Gabrovo (http://umis.tugab.bg/plamen), he has participated in, coordinated, or led 19 international projects, 34 national projects, and 16 university projects with contractors outside TU-Gabrovo.

Assoc. Prof. Plamen Tsankov has participated in the construction of two specialized research laboratories ("Electric Power Distribution and Lighting Technology" and "Renewable Energy Sources and Energy Efficiency") and two teaching laboratories ("Electric Power Distribution" and "Lighting and Installation Technology").

Assoc. Prof. Tsankov is a member of the following organizations: International Commission on Illumination (CIE); IEEE; Bulgarian National Committee on Lighting; Union of Physicists in Bulgaria. He is the chair of the EAST Professional Section in the Regional College - Gabrovo of the Chamber of Engineers in Investment Design and of the Territorial Organization of the Scientific and Technical Union - Gabrovo. He is a member of the Management Board of the Federation of Scientific and Technical Unions in Bulgaria, the Management Board of the National Committee on Lighting in Bulgaria, and the Management Board of the Union of Electronics, Electrical Engineering, and Communications.

The candidate's work in the competition can be systematized into three thematic areas:

I. Research, modeling, and optimization of the lighting and electrical parameters and characteristics of LED light sources and luminaires [B.4.3 – B.4.5, B.4.7, B.4.9, C.8.3 C.8.5, C.8.6 C.8.17 C.8.18, D.8.20]

LED luminaires for various applications – domestic, industrial, and street lighting – have been studied. Their photometric, spectral, and electrical parameters, the influence of temperature on the characteristics of light sources, and the possibilities for optimization through three-dimensional computer modeling and the design of new structural solutions have been analyzed. A comparative analysis of luminous flux, light distribution, brightness, and glare when using different secondary optical systems was conducted, and it was found that the choice of optics has a significant impact on lighting quality and energy efficiency. It was shown that changes in correlated color temperature and color rendering index occur during the heating process. The presence of blue light hazard radiation was investigated, and dependencies between color temperature and risk level were obtained. The shapes of lenses and optical systems have been optimized using computer modeling and Monte Carlo Ray-tracing methods. The electrical parameters of SMART LED luminaires have been analyzed, including the quality of electricity during dimming and color temperature changes. Values for harmonic distortion, power factor, and efficiency were established, which are essential for the mass implementation of LED technologies.

A new laboratory, "Ecological, Energy-Saving, and Electromagnetic Compatible Lighting, LED and RES components and technologies" has been established in the Technology Park of the Technical University of Gabrovo, accredited by the Bulgarian Accreditation Service under BDS ISO 17025 for testing lamps, luminaires, and lighting systems, which also creates conditions for in-depth experimental research.

II. Investigation, design, and optimization of indoor and outdoor lighting systems [G.7.3, G.8.1, G.8.4, G.8.10, G.8.12, G.8.16]

The research focuses on practical aspects of lighting technology – surveying, designing, and optimizing lighting systems for buildings, streets, and industrial enterprises. Methods for technical and economic assessment of the modernization of lighting systems with LED technologies have been developed, and the return on investment has been analyzed for different scenarios for electricity prices, inflation, and payback period. Practical results have been achieved in the implemented street lighting modernization projects, with electricity savings of 67% to 79% and a significant reduction in CO_2 emissions. Intelligent remote control and monitoring systems have been implemented via GSM/GPRS and cloud platforms, which facilitate the operation and maintenance of lighting systems. The modernization of street lighting with LEDs and intelligent control with economic and environmental profitability is presented.

III. Investigation of electric power distribution systems with photovoltaic power plants [B.4.6, B.4.8, B.4.10, D.8.2, D.8.14, D.8.19]

The characteristics of different types of photovoltaic (PV) modules, the influence of climatic and operational factors on their efficiency, and their integration into the electricity system are examined. The temperature coefficients of amorphous and polycrystalline PV modules under real conditions are analyzed, as well as the hourly variations in solar radiation. Regression models are created to predict the energy yield from PV systems. The influence of dust and ash on the efficiency of PV panels is examined, and data on power losses in continental climate conditions are provided.

Technical and economic analyses of the development of PV power plants in Bulgaria have been carried out, and the profitability of grid-connected and stand-alone systems, as well as their contribution to reducing greenhouse gas emissions, has been assessed. Experimental PV power plants have been built at the Technical University of Gabrovo, incorporating five different technologies (mono-Si, poly-Si, a-Si, CdTe, CIGS), as well as a PV-thermal hybrid system. The issues of cybersecurity of PV systems with hybrid inverters were examined and the potential risks to the stability of the power supply system and the need to develop protective mechanisms were discussed.

6. Contributions

I accept the contributions formulated in the presented works. They are scientific, scientific-applied, and applied in nature and are related to proving, with new means, significant new

aspects of existing scientific problems and obtaining confirmatory facts in the field of research, modeling, optimization, and application of light sources and lighting systems in lighting technology and in electric power distribution systems with photovoltaic power plants.

6.1. Contributions in publications equivalent to a habilitation thesis

Scientific contributions

– Methods have been developed for analyzing the photometric characteristics of LED luminaires with different optical systems [B.4.3, B.4.4, B.4.7].

– Optimization tasks have been formulated for the design of street lighting - to optimize the power of the luminaires, the height of the poles, and the angle of the luminaires [B.4.4].

– A model for predicting the yield of a PV power plant has been created using regression analysis of hourly variations in solar radiation [B.4.8].

Scientific-applied contributions

– Summary information is provided on the basic principles of lighting, light quantities, color characteristics of light sources, thermal and luminescent light emission, and the photobiological safety of light sources. Solar radiation, renewable energy policy, and solar energy research centers in Bulgaria and photovoltaic power plants are discussed [B.4.1, B.4.2].

– Spectral changes during the warm-up of LED lamps and their effect on correlated color temperature and color rendering index are investigated [B.4.9]. Spectral measurements and comparative analysis of blue light hazard emission from different LED luminaires are performed [B.4.5].

– The effect of dust and ash on the efficiency of photovoltaic panels in a continental climate was investigated [B.4.6]. Cyber risks for photovoltaic systems with hybrid inverters in terms of the stability of the power system were analyzed [B.4.10].

6.2. Contributions in publications, other than those equivalent to monographic work

Scientific contributions

– Methods have been developed for: three-dimensional computer modeling and analysis of optical systems using Monte Carlo Ray-tracing to optimize the shape of LED lighting lenses [G.8.5, G.8.6]; technical and economic assessment of lighting system modernization, including sensitivity analysis to changes in electricity prices and inflation. Optimization tasks for street lighting design have been formulated [G.8.1, G.7.3].

Scientific-applied contributions

– The following have been studied: spectral changes during LED lamp warm-up and their effect on correlated color temperature and color rendering index [G.8.3, G.8.8, G.8.9, G.8.13] and the temperature coefficients of voltage, current, and power of amorphous and polycrystalline PV modules under real conditions [G.8.2]. The higher harmonics of the current and the power factor of LED luminaires during dimming and color temperature control were analyzed [G.8.17].

– Economic analyses of the development of PV energy in Bulgaria have been carried out, including an assessment of the profitability of grid-connected and stand-alone systems [G7.1, G.8.14, G.8.19].

Applied contributions

– A prototype of a greenhouse LED luminaire with controlled spectral distribution has been created [G.8.7].

– Measuring stands and laboratory methods for testing photometric, spectral, and electrical parameters have been developed [G.8.11, G.8.18].

– Projects for the modernization of street lighting have been implemented, leading to savings in electricity and a reduction in CO_2 emissions [G.8.4, G.8.10, G.8.12].

– Intelligent monitoring and remote-control systems (GSM/GPRS, cloud platforms) have been implemented, which increase reliability and reduce maintenance costs [G.8.4, G.7.3].

– Energy audits and optimizations of indoor lighting in industrial enterprises have been carried out, with proven cost-effectiveness and rapid return on investment [G.8.16].

– Experimental photovoltaic power plants have been built at TU-Gabrovo using different technologies (mono-Si, poly-Si, a-Si, CdTe, CIGS) and a hybrid photovoltaic-thermal system, allowing for a comparison of five types of photovoltaic modules under real conditions [G.8.19].

– A device has been developed to control the charge of a battery for an autonomous photovoltaic lighting system (PV-LED) [G.8.15].

7. Assessment of the candidate's personal contribution

My assessment of the candidate's contributions and achievements in the competition is high. The presented works, citations, and participation in projects comply with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (ZRASRB) and its implementing regulations, as well as the minimum requirements of TU-Gabrovo for scientific and teaching activities for acquiring the academic position of "professor".

8. Critical Remarks and Recommendations

I found no significant weaknesses in the candidate's work. I believe that the results achieved can be summarized in a monographic work.

9. Personal Impressions

I know Assoc. Prof. Plamen Tsankov as a respected colleague, lecturer, and manager. I have no joint publications with him. I am not a person related to him within the meaning of paragraph 1, item 5 of the Additional Provisions of the ZRASRB.

Conclusion

In conclusion, I can give a positive assessment of the overall research and teaching activities of Assoc. Prof. Plamen Tsankov, PhD, Eng., which fully meet the requirements for the academic position of "professor".

In view of the above, I propose that Assoc. Prof. Plamen Tsankov be elected as a "professor" in the field of higher education – 5. Technical Sciences, professional field - 5.2 Electrical Engineering, Electronics and Automation, specialty - "Electric Power Distribution and Electrical Equipment" (Lighting and Installation Technology).

31.10.2025 Reviewer:

/ Prof. A. Alexandrov /