ИР - БАН
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REVIEW

For the competition for occupying the academic position **"Professor"** in the field of higher education **5. Technical Sciences**, professional field **5.2. Electrical Engineering, Electronics and Automation** (specialty: *Elements and Devices of Automation and Computing Technology*) for the needs of the **Section "Robotics in Energy"**; announced in *State Gazette No. 61/29.07.2025*;

Candidate: *Assoc. Prof. Ilian Hristov Iliev, PhD, Doctor of Technical Sciences*;

Reviewer: *Prof. Avgust Yordanov Ivanov, PhD*;

Grounds for preparation of the review: Order No. 116 / 26.09.2025 of the Director of the Institute of Robotics – BAS for appointment of a scientific jury and the decision of the Scientific Jury – Minutes of the first meeting of 03.10.2025 for the selection of reviewers.

1. Brief Biographical Data

From the documents and materials submitted for the competition, it is evident that the candidate graduated with a **Master's degree in Engineering Physics (2001)** from the **Technical University of Gabrovo**. He defended his **PhD** in 2016 at the same university, in the professional field *5.2. Electrical Engineering, Electronics and Automation*. In 2017, he was appointed **Assistant Professor** at the Department of "Electric Power Supply and Electrical Equipment" at the **University of Mining and Geology "St. Ivan Rilski"**, and later, from late 2017 to 2019, served as **Chief Assistant Professor** at the same department. Since 2019, he has held the position of **Associate Professor**, and in 2024 he became **Head of the Department**. In 2024, he joined the **Institute of Robotics "St. Apostle and Evangelist Matthew" – BAS** as **Associate Professor** and **Head of the Section "Robotics in Energy"**, where he continues to work presently. He has over **twenty years of experience** in various structures related to the energy sector of the Republic of Bulgaria. Since 2012, he has also served as a **Chief Expert** in the Department "Licensing and Control", Directorate "Regulation and Control – Electric Power and Heat Energy" at the **State Energy and Water Regulatory Commission (SEWRC)**.

2. General Description of the Submitted Materials

The candidate has submitted:

- a **PhD dissertation** titled *"Investigation, Analysis and Quantitative Assessment of the Real Contribution to the Deterioration of Electric Power Quality by Industrial Consumers and the Residential-Communal Sector"*;
- a **monograph** titled *"Optimal Technical and Highly Efficient Solutions in Power Supply"*;
- **2 scientific papers** published in internationally indexed journals (Scopus/WoS);
- **19 scientific publications** in peer-reviewed but non-indexed journals or edited collective volumes;
- **1 citing publication** in indexed sources (Scopus/WoS);
- **5 citations** in peer-reviewed monographs or collective volumes;
- **44 citations** in non-indexed sources.

Assoc. Prof. Dr. Iliev has supervised **three successfully defended PhD students** (one jointly supervised) and has authored **two university textbooks** submitted for this competition. No documents have been presented (e.g. official attestations) regarding participation in or implementation of developments, evidence of practical benefit, or data on achieved economic effect. Based on the above, it can be concluded that the **scientific topics of the publications fully correspond to the field of the announced competition**.

According to the **Summary Table** for compliance with the minimum national and institutional requirements for the academic position "Professor," and pursuant to the rules of the Institute of Robotics – BAS, the candidate achieves the following results:

Indicator	Achieved	Required
A	50 pts	50
B	100 pts	(optional)
C	100 pts	100
D	202.35 pts	200
E	113 pts	100
F	200 pts	150

3. General Characteristics of the Candidate's Research, Applied Science, and Teaching Activity

The candidate's research interests are focused on **current challenges in optimizing electrical energy consumption** in the Republic of Bulgaria, namely:

- analysis of the relationship between the power system and its main energy characteristics (power and energy losses, quality of energy efficiency, and reliability of power supply);
- identification of economically justified and optimal operating regimes and assessment of their influence on the system's efficiency;
- reliability evaluation of power supply systems and their correlation with national energy efficiency;
- assessment of energy processes in the power system and the balance of capacities in multi-factor environments;
- evaluation of operating regimes of multi-transformer substations.

Teaching activity:

- Lecturer in **six Bachelor-level courses** in the specialty "Electric Power Supply and Electrical Equipment" at the University of Mining and Geology – Sofia;
- Lecturer in **three Master-level courses** in the same specialty;
- Contributor to the development of **six new Bachelor-level** and **three new Master-level curricula, lectures, and laboratory exercises**;
- **Supervisor of 24 successfully defended diploma theses** and **5 PhD students (3 defended + 2 ongoing, 2025)**;
- Declared participation in **ten national research and technological projects**;
- **Member of the Chamber of Engineers in the Investment Design** sector.

4. Main Scientific and Applied Contributions

Assoc. Prof. Dr. Ilian Iliev claims the following **scientific and applied contributions**, which can be grouped into five categories:

4.1. Energy Efficiency

- Developed a **methodology** accounting for the ratio between reactive and non-active loads and PT power.
- Established that the change in LED source power (P, Q, S) is **non-proportional to dimming level**, due to distortion power *D* caused by higher current and voltage harmonics, affecting the total power balance.
- Provided **guidelines for updating the National Action Plan** in cases of reduced renewable energy share in final energy consumption, including cross-border renewable energy acquisition within the EU.
- Proposed a **new technical solution** optimizing deviation angles (γ) from main power lines according to the "minimum annual cost" criterion.
- Designed a **calculation method** for determining critical loading of 10 kV / 1000 kVA transformers in dual-beam supply schemes.
- Analyzed methods for **network design in photovoltaic systems**.

4.2. Electromagnetic Compatibility

- Evaluated **the additional influence of electromagnetic disturbances on active power losses**, contributing to more rational design of electric drives.
- Demonstrated that **longitudinal compensation of reactive loads** is an effective method for improving power quality in supply systems.

4.3. Power Quality Indicators

- Clarified that **harmonics** in supply systems differ from episodic disturbances (spikes, sags, etc.) and are continuously present due to harmonic-generating equipment.
- Developed a **methodology for quantitative assessment of additional costs** due to power quality deterioration.
- Investigated **economic losses** caused by voltage asymmetry, including reduced insulation lifespan and power losses.
- Found **uneven distribution of power consumption** across feeders, indicative of inefficient usage.
- Applied a **correlation–resonance method** to minimize dispersion components of load schedules and reduce power losses.
- Proposed **optimization regimes** for asynchronous loads using voltage control with negative deviation under low-load conditions.

- Identified **non-sinusoidal and asymmetric operating regimes** in mining facilities, recommending schematic and compensatory improvements.

4.4. Reliability of the Power Supply System

- Developed a **reliability assessment methodology** for the national sectoral structure using the principle of equivalent transformation, allowing both differential and global evaluation.
- Analyzed the relationship between **electromagnetic compatibility, power quality, reliability, efficiency, and system stability** as integrated parameters.
- Investigated **occupational safety risks** for crane operators exposed to electric fields exceeding permissible limits.
- Studied **resonance phenomena** arising from specific ratios of capacitive and inductive resistances in capacitor banks and nonlinear loads.

4.5. Reactive Power Compensation

- Developed a **universal methodology** for evaluating the payback period of compensation devices, considering power losses in lines and transformers, and assessing system-wide benefits such as loss reduction, equipment life extension, and improved power quality.

The above contributions are accepted as substantial and sufficient for the academic position of **Professor**.

5. Authorship and Individual Contribution

Out of the **22 submitted works**,

- **5 are single-authored** (Monograph, Nos. 4, 5, 7, 12);
- **9 list the candidate as first author** (Nos. 6, 8, 10, 14–16, 18–20);
- **3 list him as corresponding author** (Nos. 13, 17, 21).

This confirms that the **majority of the research output and contributions are the candidate's own work**. All requirements of the **National Evaluation and Accreditation Agency (NACID)** and **Regulations under the Academic Staff Development Act** have been met for the position of *Professor* in professional field 5.2. *Electrical Engineering, Electronics and Automation (Elements and Devices of Automation and Computing Technology)*.

6. Critical Notes and Recommendations

No significant omissions or deficiencies were found in the candidate's work. It is recommended that future research results be **published in high-impact international journals** to enhance global visibility, and that the candidate **engage more actively in project-based activities** to attract additional research funding for the Institute's thematic areas.

7. Personal Impressions and Reviewer's Opinion

I have known **Assoc. Prof. Dr. Ilian Hristov Iliev** as **Head of the Laboratory "Robotic Systems in Energy"**, later transformed into the **Section "Robotics in Energy"**. Within a relatively short time, he successfully established a **fully functional research team** in this important and promising area. Within approximately one year, **two of his PhD students successfully defended their theses**.

My impression is of a **competent, energetic, and well-organized researcher**. As a scientist, specialist, and leader, he possesses the **qualities required for the position of Professor**. His appointment would enrich the **Institute of Robotics "St. Apostle and Evangelist Matthew" – BAS, Sofia** with a **highly qualified expert, researcher, and organizer**.

I have **no joint publications or research** with Assoc. Prof. Dr. Iliev. There are **no known claims or disputes** by third parties regarding authorship, contributions, or intellectual property related to the materials presented.

CONCLUSION

My overall evaluation of the candidate's submitted scientific works is **positive**. The presence of a **monograph, twenty-one publications, significant scientific contributions, active research, applied, and organizational work**, as well as the **national dissemination of his results**, provide sufficient grounds to **confidently recommend** that **Assoc. Prof. Dr. Ilian Hristov Iliev** be appointed to the academic position **Professor** in the scientific field **5. Technical Sciences**, professional field **5.2. Electrical Engineering, Electronics and Automation** (*Elements and Devices of*

Automation and Computing Technology) for the **Section "Robotics in Energy"**, at the **Institute of Robotics "St. Apostle and Evangelist Matthew" – BAS, Sofia.**

Date: 03.11.2025

Signature

/Prof. Avgust Ivanov, PhD/