

O P I N I O N

for dissertation work
for the acquisition of the educational and scientific degree "doctor" in
field of higher education – 5. Technical sciences
professional direction - 5.2. Electrical engineering, electronics and automation
doctoral program - Power supply and electrical equipment

Author: **Eng. Elisabetta Trajko Arsova**

Topic: **Analysis of the possibilities for implementing new photovoltaic power plants in the electricity system of the Republic of North Macedonia**

Member of the scientific jury: **Assoc. Prof. Orlin Lyubomirov Petrov, PhD**

1. Topic and relevance of the dissertation work

In recent years, the traditional production of electricity from generally accepted energy sources has been the largest source of industrial air pollution. Air quality deterioration, global warming data, as well as local energy crises require the use of new primary energy sources that do not pollute the environment and provide additional opportunities to increase energy independence.

In line with these trends, the dissertation includes a study and analysis of the electric power capacities in North Macedonia, as well as an assessment of the energy production after the construction of two large new photovoltaic power plants. By increasing the installed capacity from renewable energy sources, the European Union's green energy directives will be met, which will lead to a reduction in air pollution.

The relevance of the research is determined by the fact that good practices from countries in the region have been analyzed, a methodology has been developed to study the potential of solar radiation in the Republic of North Macedonia, the operation of photovoltaic plants with high power has been modeled, the energy balance of the Republic of North Macedonia has been modeled.

2. Research methodology

The research methods and methodologies used in solving the formulated tasks in the dissertation work are adequate and applicable for solving the tasks. Theoretical analysis, computer-aided design, computer-based modeling and simulation studies were used, using methods of mathematical statistics for data processing. Two conceptual electrical engineering projects have been implemented, and a simulation of the mode of operation of two new photovoltaic plants and their connection to the energy system of the Republic of North Macedonia has been carried out.

3. Dissertation Contributions

I accept the claims for the contributions made in the dissertation work of Eng. Elisabetta Arsova (total of 5). In short, they can be summarized as: enrichment of

existing knowledge and application of scientific achievements to optimize the operation of the electricity system of the Republic of North Macedonia and analyze the possibility of connecting large photovoltaic capacities.

The contributions are formulated as follows:

Scientific and applied contributions - 2 pcs.;

Applied contributions – 3 pcs.

I believe that the contributions achieved are the work of the dissertation and are significant for science, as well as practically applicable in the field of design and operation of photovoltaic plants.

4. Publications and citations of publications on the dissertation work

In the dissertation and the abstract, 5 publications of the author are presented, 2 of which are independent and 3 in co-authorship with her scientific supervisor. They are presented as follows: 2 pcs. at the TechCo 2023 conference (Lovech); 2 pcs. at the UNITECH 2023 conference (Gabrovo) and 1 pc. at the EEPES 2023 Conference (Greece).

One of the publications (A1) is indexed in Scopus.

They reflect the main research shown in the dissertation work.

The submitted publications, according to the minimum national criteria (Indicator G, for science field 5), bring the author 73.33 points, which is more than twice the required minimum of 30 points.

Citation data is not presented in the doctoral student's materials.

5. Authorship of the results obtained

It is evident that the author has made efforts to carry out the individual studies and analyses, as well as to subsequently display the obtained results in an appropriate manner. The good presentation of the material, presented with rich graphic and tabular content (more than 100 figures, more than 30 tables and 4 appendices) is impressive.

The obtained results are undoubtedly the work of Eng. Elisabetta Arsova.

6. Opinions, recommendations and remarks on the dissertation work

The following more important notes and recommendations can be made on the presented dissertation work and the author's reference to it:

1. A number of spelling and punctuation errors were made;
2. The abbreviation "TS" (transformer post), which was assumed to be "TP" was used incorrectly;
3. In table. 1.1, I believe that the data in the "Premium manufacturers" row is incorrect;
4. In table. 1.3, line "GWh", it is not clear what exactly it indicates;
5. I believe that the description of the "PVGIS" software and how to work with it is unnecessarily extended;
6. During the selection of power cables for the photovoltaic plants, no check was made for voltage loss, considering the long routes that will be obtained during the implementation of the projects;

7. Some of the attached figures are illegible.

Regardless of the critical remarks and recommendations made, which are of a purely editorial nature, I want to note the good scientific level of the dissertation work. It is evident that the author has made an effort to conduct the individual studies and subsequently to display the results in an appropriate manner.

I would like to make a recommendation to the dissertation student that before the final version of the dissertation is deposited in the various libraries, a complete editing and layout of the material should be done. This will make the dissertation easy to read and of very good quality.

7. Conclusion

I believe that the submitted dissertation **meets** the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria. The achieved results give me reason **to propose** that the educational and scientific degree "doctor" be acquired

by **Eng. Elisabetta Traiko Arsova** in

field of higher education – 5. Technical sciences,

professional direction - 5.2. Electrical engineering, electronics and automation,

doctoral program - Power supply and electrical equipment.

21.03.2024

Member of the scientific jury:

/signature/

/Assoc. Prof. O. Petrov/