

## OPINION

of the dissertation for awarding the educational and scientific degree "Doctor"  
by professional field 5.2. "Electrical Engineering, Electronics and Automation",  
Scientific specialty "Automated systems for information processing and control"

Author of the dissertation: Milena Biserova Haralampieva

Topic of the dissertation: INTELLIGENT MANAGEMENT OF SOURCES FOR HEAT  
ENERGY STORAGE

Scientific adviser: Prof. Dr. Dimitar Karastoyanov

Member of the Scientific Jury: Prof. Dr. Rumen Trifonov, Technical University of Sofia

### **Common part**

The presented dissertation is in the volume of 126 pages, structured in 4 chapters, contributions, list of publications. The list of used literature includes 61 literature sources.

### **1. Relevance of the problem developed in the dissertation**

The dissertation refers to technological solutions for conversion, storage and use of renewable energy sources for household purposes. Technological solutions for the use of solar energy as a source of heat for home heating and domestic water are analyzed. The object is solar thermal energy systems. As a result, innovative solutions for the design of solar thermal storage systems have been developed.

The relevance and importance of the developed topic is obvious.

I positively evaluate the research in the dissertation. The applied part is visible, the obtained results give a positive certificate for the qualification of the candidate.

### **2. Degree of knowledge of the state of the problem and creative interpretation of the literary material**

The dissertation presents the problems in the operation of renewable energy sources.

Chapter 1 provides an analysis of the principles of the use of renewable energy sources.

Chapter 2 analyzes the existing technological solutions and tools that use energy from such sources - solar panels, heat exchanger, control system, domestic heating system.

Chapter 3 presents a synthesis of a domestic heating system with a main energy source of solar radiation and phase-change materials for the storage of solar energy and its conversion into heat.

Chapter 4 quantifies the characteristics and indicators of a heating system using solar radiation for domestic heating. The evaluation of the parameters is determined on the basis of constructive decisions and parameters.

### **3. Correspondence of the chosen research methodology and the set goal and tasks of the dissertation with the achieved contributions**

In the Dissertation the aim is to develop a technological solution for the use of solar radiation, the storage of its energy for heating purposes.

The PhD student is well acquainted with the process of designing domestic heating systems using solar energy and calculating the thermal and operational characteristics of the systems and its technological components.

#### **4. Scientific and / or scientific-applied contributions of the dissertation**

The developed topic has a scientific-applied character.

I positively evaluate the results of the doctoral student's research.

The applied contribution is also proved by the interest of a company, stated in a letter.

I appreciate the contributions as sufficient for this dissertation.

The dissertation shows that the results are mainly the personal work of the candidate.

#### **5. Significance of the research and applied contributions of the dissertation**

PhD student Milena Haralampieva shows a good knowledge of the technological features of building installations with renewable solar energy.

I believe that the research is useful and gives pragmatic results and exemplary technological solutions for the use of solar energy for domestic heating.

#### **6. Some recommendations and critical remarks**

I positively evaluate my dissertation.

I have no comments on the contributions claimed.

I have shared some technical remarks and stylistic inaccuracies with the PhD student.

I believe that PhD student Milena Haralampieva shows experience in conducting independent research in the field of analysis and technological development of systems using solar energy for domestic heating.

### **CONCLUSION**

I appreciate the positive scientific and applied contributions of Milena Haralampieva's dissertation. I believe that the requirements of ZRASRB, PPZRASRB and the internal rules of IICT are met. **This gives me reason to recommend to the Scientific Jury to award Milena Biserova Haralampieva the educational and scientific degree "Doctor" in professional field 5.2 "Electrical Engineering, Electronics and Automation".**

03/24/2022

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