

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Aliya Glagoleva

**PhD Program:** Materials Science and Engineering

**Title of Thesis:** Development of kW Scale Hydrogen Energy Storage System

**Supervisor:** Prof. Keith Stevenson


**Co-advisor:** Dr. Vasily Borzenko

**Chair of PhD defense Jury:** Prof. Alexei Buchachenko

**Email:** a.buchachenko@skoltech.ru

**Date of Thesis Defense:** 09 October 2018

**Name of the Reviewer:** Dmitry O. Dunikov

I confirm the absence of any conflict of interest  (Alternatively, Reviewer can formulate a possible conflict)	<b>Signature:</b>  <b>Date: 05-09-2018</b>
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*The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.*

*If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.*

### Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The thesis of Glagoleva Aliya titled "Development of kW Scale Hydrogen Energy Storage" focuses on application of metal hydride technology for energy storage in distributed renewables for energy access systems are renewable-based systems (stand-alone and off-grid systems as well as mini-grids) that generate and distribute energy independently of a centralized electricity grid.

The thesis consists of 5 chapters, including:

- a comprehensive literature review (Ch.1), in which observes the state-of-the-art technologies and formulates a proposed concept,
- development of the experimental equipment for low power (200W) proof-of-concept for the proposed technology and experimental investigations (Ch.2)
- a hardware-in-the-loop simulation methodology has been designed and developed and simulation results are obtained (Ch.3)
- experimental investigations on the possibility of FC exhaust heat utilization in a 1 kW system (Ch.4)
- development of a 1 kW hydrogen energy storage system and experimental investigations (Ch.5)
- and economic evaluation of the concept (Ch.6).

The actual content of this thesis is directly relevant to the topic of the dissertation. The quality of the text is sufficient to fully describe all the problems, methods and results. The thesis is good structured, the main idea is consequently revealed and supported by the experimental results.

The methods used in the dissertation are described in the literature and relevant. Author has published 5 works in peer review journals, including the Q1 journal publication in the International Journal of Hydrogen Energy, which is the top journal for hydrogen energy storage technology. These publications serve as the proof of the high level of the performed research. Additionally, the work was presented at the number of international and Russian national conferences.

There are some shortcomings in presentation of the results. For example tables 1 and 2 are presented as pictures, there are some misprints and so on. The work has to be proofread.

Nevertheless, these shortcomings have no impact on the quality of the results of investigation and I recommend to evaluate the thesis positively, and in my opinion the author Aliya Glagoleva deserves the PhD degree.

#### **Provisional Recommendation**

*I recommend that the candidate should defend the thesis by means of a formal thesis defense*

*I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

*The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*