Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Rahim Samanbakhsh

PhD Program: Engineering Systems

Title of Thesis: Design of power converters for renewable energy sources

Supervisor: Assistant Professor Federico Martin Ibanez, Skoltech

Name of the Reviewer: Petr Vorobev

I confirm the absence of any conflict of interest	**Date: 21-10-2022**

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

The thesis is dedicated to development, analysis and experimental realization of a multilayered inverter and a new type of Z-source converter. The thesis is comprehensive, literature review is sufficient, and the description of results is present in much details. In my opinion, the thesis definitely satisfies all the requirements for a successful PhD defense. The high level of the thesis results is confirmed by an impressive list of publications. I have some number of rather minor technical questions.

1. Specific need for 3 DC sources for the multilayer inverter: what would be the power distribution between them, and how this affects the harmonics?
2. PV voltage can change quite rapidly and in a big range. Are you supposed to quickly regulate the DC-DC converter step-up ratio to keep all three DC inputs to your converter constant? Must then these converters to have large range of step-up coefficients?
3. How do the switching losses for your proposed multilayer compare with classical inverters?
4. For the multilayer converter, what kind of switches are needed? How many quadrants you need for the operation?

5. For nearest level control technique, are there any drawbacks?
6. In formulas 6.25 and 6.26 is D a constant, of it depends on the operation?

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*