Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Dmitry Smirnov

PhD Program: Engineering systems

Title of Thesis: Innovative technological pathway for new commercial applications of Stirling cycle-based systems

Supervisor: Assistant prof. Henni Ouerdane

Name of the Reviewer: Prof. Clement Fortin

I confirm the absence of any conflict of interest	**Signature:**  **Date: 5 Oct 2019**

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 research work presented by Dmitry Smirnov is of interdisciplinary nature and of very high quality. His proposal to join the various design methods developed during his research work into an overarching design methodology called a technological pathway is very innovative for a PhD thesis.

The various chapters are well presented and organized in a logical manner which correspond to the various stages of the product development process.

The two chapters on the literature review of Stirling engines and refrigerators are well structured and cover both the scientific and the patent literature combined. They also offer excellent depth and breadth of coverage of the research and technology development domains.

The chapter on the application of Game Theory to the collaborative design process is of very high scientific value and proposes a novel approach to the application of both the Pareto and Nash fronts to the analysis of decision making in concurrent design studies. This high-quality research work has been published in a high impact journal. The other 2 publications are also of high quality with significant impact factors for the field.

This is the best thesis that I have ever seen with respect with the application of research work to real word problems and technology development. This research work can be highly commended for this and represent seminal research work for Skoltech and the academic world in general.

I find that each of the other chapters are also of sufficient quality and depth to be published in high level publications.

The idea to structure the thesis around a common design methodology has high potential; however, the content presented in section IV.1 on the relation with other schools of Design Thinking is very brief and merits some more development and extension of its content.

The quality of the English language is generally very good but a final revision is required to make sure that all small grammatical errors are removed.

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*