

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Andrey Churkin


PhD Program: Engineering Systems

Title of Thesis: Game-theoretical approach to cooperation stability analysis in cross-border power interconnection planning

Supervisor: Professor Janusz Bialek, Skoltech

Co-advisor: Assistant Professor David Pozo, Skoltech

Name of the Reviewer: Elena Gryazina

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p>Signature:</p>  <p>Date: 20-10-2020</p>
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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

- Brief evaluation of the thesis quality and overall structure of the dissertation.

The thesis “Game-theoretic approach to cooperation stability analysis in cross-border power interconnection planning” applies cooperative game theory to the transmission expansion planning of cross-border power interconnections. The thesis consists of 7 chapters accompanied with the profound list of references (169 resources), every chapter contains its own summary and conclusions. The thesis written in the academic style with clear and consistent content, with smart epigraphs selected for each chapter. The conclusions of the Thesis are of high theoretical and practical importance, all the statements are equipped with technically sound justifications.

- The relevance of the topic of dissertation work to its actual content

The title and the content of the Thesis are perfectly relevant.

- The relevance of the methods used in the dissertation

The Thesis is built around the application of game theory to power interconnections. Cooperative Game Theory becomes a prominent tool for cross-border power interconnection projects evaluation, more than forty years of relevant research are carefully analyzed in the Thesis. However, Andrey Churkin goes beyond – he examines manipulability of certain cooperative game theory concepts and proposes bilevel game-theoretic approach.

- The scientific significance of the results obtained and their compliance with the international level and current state of the art

The obtained results correspond to the international research level. Besides, novel approaches such as the metric of cooperation stability based on the coalitional excess theory and bilevel transmission expansion problem model definitely extend the current state of the art.

- The relevance of the obtained results to applications (if applicable)

It’s hard to imagine that the decision makers will take into account the published results right now. However, the proposed approach may bring the new angle to look at the established cross-border cooperation strategies.

- The quality of publications

The research summarized in the Thesis was published in highly rated Q1 journal and two reputable conference proceedings. Besides, Andrey Churkin presented his work in the number of seminars in Russia and abroad during his intensive international internships. His research was discussed in the power systems community as well as in mathematically strong control systems society.

The publication record demonstrates that the Thesis satisfies all the requirements of the Skoltech Engineering Systems PhD program.

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

Taking into account the decentralization trend (in particular, microgrids development) I'm just curious if the approach proposed in the Thesis could be used to analyze cost and benefits of turning to autonomous mode significant part of the grid with developed distributed generation. Although in the Thesis the transmission grides were analyzed, the proposed mathematical framework seems to work regardless the voltage level.

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