

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Tatiana Chernova

PhD Program: Engineering Systems

Title of Thesis: Specific aspects of peer-to-peer energy market design and operation

Supervisor: Assistant Professor Elena Gryazina, Skoltech

Name of the Reviewer: Dr. Henni Ouerdane, Associate Professor

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	Date: 05-11-2024
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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 thesis contains 6 chapters, including the Introduction and the Conclusion chapters. An extensive bibliography section (397 references) is also provided, which reflects the work done for a comprehensive literature review chapter. The thesis title could be improved as "specific aspects" is too vague – see suggestion for a change at the end of the report. The text is written with care and balanced throughout the thesis. The thesis goal is clear and the scientific novelty highlighted. Overall, this is a good quality PhD thesis.

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

Peer-to-peer (P2P) allows direct transactions involving exchange of information and resources between two individuals or entities without the need for a third party. As such it is a service which can be seen as a decentralized platform. P2P is becoming increasingly relevant in the power system sector, which evolves

towards digitalization due to the significant development of information and communication technologies and a decentralized architecture. Indeed, the penetration of renewable energy sources and the integration of energy storage technologies in electricity grids foster the decentralization of the power system. In this context, there is a growing interest for a P2P energy market, which as of yet is far from mature. The doctoral thesis is devoted to the study of the P2P energy market design and operation. It is therefore a valuable and timely contribution to a real-life challenge that need solutions for a sustainable evolution of power systems.

- The relevance of the methods used in the dissertation

The method used for the models is constrained optimization to assess the feasibility of the P2P market trades accounting for the actual physical infrastructure. Both the meshed and radial topologies of electricity grids are considered. Game theoretic approaches are also used for the study of P2P energy trading and sharing to include self-interested agents, which are varied and whose preferences and actions influence the P2P market. These methods are quite relevant for the problems studied.

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

The scientific significance and their compliance with the current state of the art and international level standards is shown by the journal article published in a leading international journal as well as the two conference proceedings papers.

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

The research work certainly opens up perspectives in the P2P markets evolution, but it may require further work to be widely adopted in real-life.

- The quality of publications

The doctoral work presented in the thesis manuscript has resulted in 3 Scopus-indexed publications: 1 journal article (2021) in a Q1 leading international journal and 2 international conference proceedings papers (2021 and 2023). The journal article attracts attention and citations.

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

Overall the work is sound and the thesis well-written. I have no particular concern nor objection to express. However, I suggest to address the following points.

1/ A suggestion for a more specific title can be: "Peer-to-peer energy market design and operation: from conceptual representation to real-life market requirements". This is only a suggestion; other options are obviously possible, but the PhD thesis title should not contain elements that make it too vague.

2/ In the publication list, separate the articles that report the doctoral research work from articles that contain contributions that are not directly related to the thesis. Manuscripts that are not yet accepted for publication, should be listed apart.

3/ Update the publication information and organize it in reversed chronological order.

4/ A clear formulation of the research question(s) is missing in the Introduction chapter. Please try and formulate such a question.

5/ The main assumptions which support the theoretical approach are not clearly formulated. Please try and formulate the main assumptions with bullet points in the Introduction. We also need to better see in the Conclusion chapter if these assumptions have been validated or not considering the obtained results.

6/ Question: how is your work perceived by stakeholders in the P2P markets sector? Do you have feedback on your work beyond academia?

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