Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Sajjad Asefi

PhD Program: Engineering Systems

Title of Thesis: Advancements in power system state estimation: innovative algorithms and solutions for enhanced reliability and efficiency

Supervisor: Assistant Professor Elena Gryazina

Name of the Reviewer:

I confirm the absence of any conflict of interest Qiuwei Wu (Alternatively, Reviewer can formulate a possible conflict)	**Date: 23-11-2023**

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

This thesis presents significant advancements in the field of power system state estimation, aiming to enhance the reliability and efficiency of modern power grids. The thesis is well organized and easy to follow. The thesis consists of 7 chapters including the introduction, literature review, measurement data, state estimation algorithms, implementation and simulation, impact and applications, and conclusions. The quality of the thesis is high and contributions of the PhD work are good considering the quality of the scientific publications.

The contents of the thesis are consistent with the thesis topic.

The PhD candidate developed a novel algorithm for the detection and classification of single/multi-bus

sudden load change and single/multi-state false data injection attack has been developed. Furthermore, an optimal power system partitioning method has been introduced to reduce communication overhead in distributed state estimation, significantly decreasing the number of iterations required to attain a reasonable solution. The blockchain technology is integrated to enhance the security of data transfers within the distributed power system state estimation framework, ensuring the integrity of critical information. Overall, the work is novel and advances the power system state estimation, offering practical solutions to enhance the reliability and efficiency of power grid operations.

The PhD candidate published 4 papers as the first author and 2 other papers as a co-author. The publications are of high quality and are in the high end for PhD students.

Issues to be discussed during the defense:

1 The anomaly detection is investigated. For the developed method, is it possible to also consider the cyber security issue? is it possible to detect cyber attacks? are there any counter measures to deal with the cyber attacks?

2 The privacy is a very important issue. The blockchain technology is used. How about other methods?

3 is it possible to test the methods with real measurement data?

Provisional Recommendation

X *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*