

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Ali Mazhar


PhD Program: Engineering Systems

Title of Thesis: Voltage Feasibility Boundaries

Supervisor: Prof. Janusz Bialek

Date of Thesis Defense: 09 December 2019

Name of the Reviewer: Prof. Keith Stevenson

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p>Signature:</p>  <p>WJV 19 2019 Date: DD-MM-YYYY</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

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

I am writing this letter to provide an evaluation of Mazhar Ali on his original creative work (i.e. thesis) entitled "Voltage Feasibility Boundaries," in the completion of PhD requirements at Skoltech.

Overall, his thesis contains original and forefront work on the calculation of power flow solution boundaries with a set of proposed algorithms that enable faster convergence and less computational demands as well as ease of programming. His thesis is arranged into main components: Mathematical Formulation, Characterization and Numerical Studies. The scientific outcomes are reflected in 6 publications. Most are published in high impact factor journals and conferences and his contributions to the work are clearly outlined in the beginning of the thesis. What is represented in the thesis is a significant body of work given complexity of the power systems modeling and simulation field. First with regard to the introduction part of the thesis. The background literature, methods, and basic description of field is well described and documented. The literature (references) overviewed is fast moving and several new works are being published on a daily basis so what is presented is thorough but not quite up-to-date.

The most significant part of the thesis focuses on Numerical Studies I and II. These two sections are well done with regard to applying the mathematical formulations. A broad range of problems are considered including maximum loadability, transfer capability to assess the computational execution of the proposed TENR algorithm with a different choice of transversality conditions. IEEE bus cases were evaluated with different modes. While the extension of this approach for applications is somewhat in the infancy stages it is understandable that the algorithm developed could find a solution on the boundary of feasible with faster time, better convergence, and scalability to large networks in comparison to traditional approaches.

In reading over thesis there are noticed here and there small typos and grammatical miscues. These should be corrected in the final version of the thesis.

Overall this thesis work, highlights the essential importance of coupling both fundamental science with pragmatic engineering models to establish new algorithms in power flow systems area. Mazhar has done outstanding original work and addresses many challenges of this field.

Considering his performance in original research achievements, I wholeheartedly recommend the acceptance of his PhD thesis with possible consideration of slight modifications especially with regard to formatting of his thesis.

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