

## Jury Member Report – Doctor of Philosophy thesis.


**Name of Candidate:** Mikhail Pugach

**PhD Program:** Engineering Systems

**Title of Thesis:** Vanadium Redox Flow Batteries modeling and performance analysis

**Supervisor:** Assistant Professor Aldo Bischi

### Name of the Reviewer:

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p><b>Signature:</b></p>  <p><b>Date: 23-09-2020</b></p>
-----------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------

*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 is a high quality PhD thesis of a very difficult topic in that it requires introductory coverage of both experimental methods and theoretical methods to study the complex performance parameters of vanadium redox flow batteries. The introduction is well written and thorough. The overall organization of chapters flow in level of complexity and more towards the development of modeling simulation approaches to understand performance parameters and efficiencies that need to be fit to experimental data. This topic will transform the current redox flow battery management systems and in evolving simulation and modeling approaches for redox flow batteries. As you can see four papers have been published on this topic in top journals in the field. Although not mentioned in thesis the work has also resulted in filing of invention disclosures, application to STRIP program and in awarding of external grants such as two Horizon 2020 grants. This further demonstrates the topic is at the top of research prominence.

**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*