Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Tatiana Bondarenko

PhD Program: Petroleum Engineering

Title of Thesis: Evaluation of High-Pressure Air Injection Potential for *In Situ* Synthetic Oil Generation from Oil Shale: Bazhenov Formation

Supervisor: Prof. Alexey Cheremisin

Chair of PhD Defense Jury: Prof. Alexei Buchachenko ***Email**: a.buchachenko@skoltech.ru*

Date of Thesis Defense: December 03, 2018

Name of the Reviewer: Sudarshan A. (Raj) Mehta, Professor of Oil and Gas Engineering, University of Calgary

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Signature:** **S. A. (Raj) MEHTA** **Date: 26-11-2018**

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

Ms. Tatiana BONDARENKO's PhD thesis entitled "Evaluation of High-Pressure Air Injection Potential for *In Situ* Synthetic Oil Generation from Oil Shale: Bazhenov Formation," is generally well-written however, it requires some minor editorial changes throughout the text. The thesis research project focuses primarily on a systematic and detailed experimental investigations of the *in situ* combustion (high-pressure air injection - HPAI) process for enhanced hydrocarbon recovery from a hydrocarbon-bearing shale formation and the associated pyrolysis, oxidation, and hydropyrolysis processes involving the actual shale reservoir samples.

In order to examine the kerogen conversion efficiency and the hydrocarbon recovery potential using HPAI, it was necessary to understand the influence and contributions of the various associated, highly complex processes on the kerogen conversion during the HPAI, at actual reservoir conditions using actual reservoir samples. Accordingly, the thesis contains results of a comprehensive and integrated experimental investigation of the HPAI and some of the associated processes such as pyrolysis, oxidation and hydropyrolysis. The results provide significant insights into the highly complex and interrelated processes associated with the kerogen conversion and displacement of the hydrocarbons in tight shale formations. In addition, based on the experimental results, an attempt has been made to develop set of reactions and pseudo-components involving the organic matter/conversion over the various temperature ranges for numerical simulation. Ms. Bondarenko has made good use of available open literature and contributed significantly towards enhancing understanding and advancing the state-of-the-art for hydrocarbon recovery from unconventional reservoirs involving shales. Her finding will be excellent reference resource for further studies and field application of the HPAI enhanced hydrocarbon recovery processes in tight shale reservoirs.

There is no doubt that Ms. Tatiana Bondarenko has contributed excellent original work. I believe that her thesis, with minor editorial corrections, certainly satisfies the thesis requirements of her PhD program. Ms. Bondarenko has certainly demonstrated her capabilities of performing research work of high caliber.

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*