Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Anuar Shakirov

PhD Program: Petroleum Engineering

Title of Thesis: Determining thermal properties of sedimentary rocks from well-logging data

Supervisor: Professor Yuri Popov

Name of the Reviewer: Dimitri Pissarenko

I confirm the absence of any conflict of interest	**Date: 24-08-2021**

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

The thesis manuscript presented by Anuar Shakirov entitled *"Determining thermal properties of sedimentary rocks from well-logging data"* consists of five chapters, including Introduction and Conclusions, and represents a well structured and complete account of a high quality research work. The problem of accurate determination of thermal properties of rock based on well logging information is of high relevance for modern geoscience, and the subject treated in the thesis has a direct applied value for the energy industry at large. At the same time, the presented study of various techniques and approaches for determination of thermal conductivity and of volumetric heat capacity of rocks under ambient and reservoir conditions, including techniques based on machine learning, represent a valuable scientific contribution. The results on well-log based techniques are novel and original, and their potential industrial applicability is illustrated in a number of publications and joint studies with the industry. The material on determination of anisotropic thermal properties, in particular in sedimentary rocks with high organic content, are of great novelty and interest, and to my best knowledge, the results of such quality and extent of validation are published for the first time.

The methodology of the research performed during the thesis project is adequate and rigorous, and the manuscript accounts for the motivation, materials, and methods in a systematic way in each chapter.

Theoretical frameworks, results of modeling, laboratory and field investigations are presented in a clear and well documented style. Overall, the thesis manuscript is structured and written up to the modern international standards. The candidate has published three articles in high-ranking international scientific journals (one more publication is under review), and filed one Russian patent. Six extended abstracts of contributions to international scientific and industrial conferences have been published as well. The candidate is thus fully compliant with the formal requirements of Skoltech with regard to the publications.

I am fully satisfied with the volume and quality of the work performed by the candidate in the course of the thesis project, as well as with the quality of the presented manuscript.

I confidently recommend the present thesis for the defense.

Kind regards,

Prof. Dimitri Pissarenko

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*