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# Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Tagir Karamov

**PhD Program:** Petroleum Engineering

**Title of Thesis:** Void space evolution and organic matter transformation of Bazhenov Formation rocks during high temperature treatment

**Supervisor:** Professor Mikhail Spasennykh

**Name of the Reviewer: Dmitry Koroteev**

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| I confirm the absence of any conflict of interest | **Date: 30-04-2022** |

| **Reviewer's Report** |
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| Tagir's thesis focuses at the void space of Bazhenov rocks at thermal treatment. This is very important scientific direction for understanding the transport mechanisms and potential thermal impact effect of one of the biggest unconventional formation in Russia and worldwide.<br><br>The thesis is of an extremely high quality and is structured very well. The topic is fully relevant to the actual content of the dissertation. Tagir uses all the up-to-date experimental methods including microCT, SEM, XRF and others in his study.<br><br>The results and recommendations derived by Tagir are definitely the state-of-the art in the area worldwide. I haven't seen such a detailed study of kerogen-rich formation void space anywhere.<br><br>The conclusions of dissertation are straightforward for their application in real field pilots in real wells. I would highlight the excellent rock typing approach with respect to applicability of thermal treatment.<br><br>Tagir has published his research outcomes in the well-recognized peer-reviewed journals. This supports the scientific strength of his thesis.<br><br>I have two issues that Tagir may want to tackle before the defence. |

1. Microscopic issue. When characterizing segmented 3D and 2D images, is it possible to consider topological characteristics responsible for connectivity (percolation thresholds or others) characterization and directional anisotropy of the voids (pores, fracs)?
2. When recommending the thermal impact for particular lithotypes with particular mineral content and TOC, is it possible to estimate the effectiveness of such impact on a well scale? Is it possible to estimate how much hydrocarbons one need to burn to extract an extra ton of the "new" hydrocarbons from the rocks that look appropriate for the thermal treatment?

**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*