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ГАЛАХИМ



Title:

**Energy efficiency improvement in geothermal hot water supply of
residential buildings in Russia**

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Keywords:geothermal heating system; heat supply;
hot water supply; cost efficiency;
Mostovsky settlement**Research Objective:**

The research objective is to compare the economic efficiency of geothermal hot water supply concepts for space heating systems of Russian localities exemplified by the present system of Mostovskoy settlement, Krasnodar Krai.

It is deemed that the conditions under which the existing Russian space heating systems operate are generally unfavorable for the use of geothermal water for space heating needs. This is due to low local price for conventional fuel – natural gas, high temperature of heat carrier specified for space heating systems, and rigid environmental requirements.

An additional constraint imposed by the Mostovskoy geothermal field itself is the technical infeasibility to reinject the discharged geothermal carrier. Nevertheless, the urgent necessity for upgrading the present local space heating/hot water supply systems forces to make economic performance calculations in order to select new concepts to leverage.

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Results

Table of estimated costs of various options for district heating and domestic hot water supply in Mostovskoy settlement

Pos.	Type of system	Costs	
		District heating, USD/Gcal	Domestic hot water, USD/m ³
1	Direct supply of geothermal carrier – present geothermal heating system	11.56	0.24
2	Direct supply of geothermal carrier – new geothermal heating system	17.07	0.35
3	Direct supply of geothermal carrier – new geothermal heating system with reinjection	32.96	0.67
4	Natural gas boiler plants system	16.31	1.30
4.1	Natural gas boiler plants system in terms of Europe*	47.18	2.99
5	Geothermal heating system with absorption heat pump	16.51	1.31

*Regarding 0.2 USD/m³ fuel cost and 50 USD/tonne carbon tax

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- For environmental reasons, the use of geothermal carrier for heating needs is viable either with heat pumps integrated to the system, or with the reinjection technology implemented (which is not applicable for Mostovskoy settlement).
- The economic dimension of operation of geothermal heating system with integrated heat pumps for space heating needs in Russia is about the same as gas heating. Thereupon, the latter option is more preferable for practical implementation given the complexity of construction of geothermal system with heat pumps compared to further development of natural gas boiler plants system.
- The integration of reinjection technology to the present geothermal system will increase the costs.
- Direct use of geothermal carrier for domestic hot water needs shows high economic efficiency, environmental friendliness and customer satisfaction.
- The studied status of Mostovskoy settlement geothermal heat supply system reflect the typical situation in this industry in Russia nowadays, so the conclusions above may be scaled up at country level.
- With the European cost of fuel and carbon tax, geothermal heat supply under studied conditions can be highly efficient.

References

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Thank you for your attention!

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