

UNCONVENTIONAL ENERGY SOURCES AS A WAY TO DECARBONIZE THE CONSTRUCTION INDUSTRY (USING THE EXAMPLE OF THE CHECHEN REPUBLIC)

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Annotation. *The article considers the possibility of using unconventional energy sources in the construction industry of the Chechen Republic as a way to decarbonize the industry. The initial conditions of the Chechen Republic make it possible, without large monetary injections, to provide the districts of Grozny with heat due to geothermal deposits located in the city district. In addition, the republic has a great solar energy potential, which allows it to be used by solar installations of any type.*

Keywords: *non-traditional energy sources, geothermal energy, solar energy potential*

Introduction

The electric power industry is the largest source of greenhouse gas emissions, accounting for about 35% of global emissions. At the same time, the construction industry is one of the largest consumers of electricity (up to 38%) [4], therefore, decarbonization of the construction industry is a priority. Despite the fact that many environmental strategies encourage the introduction of energy-saving technologies in construction, the pace of their implementation is still low. This is due to the fact that the main benefit from the introduction of innovative technologies in construction falls to the end user of the building, while for the developer, the introduction of innovative technologies only increases the cost of the construction process. In this regard, the use of non-traditional energy sources, in our opinion, is promising.

Results

The Chechen Republic today is a dynamically developing region of the Russian Federation, which is experiencing a construction boom. Over the past decade, many new modern buildings and high-rise apartment buildings have been erected in the capital of the Republic of Grozny.

The most promising in the Chechen Republic is the use of solar and geothermal energy.

The Chechen Republic has a good solar energy potential. The values of solar energy resources in the Chechen Republic are approaching the maximum values in the Russian Federation. The annual amount of total (direct plus diffuse) radiation on a horizontal surface is 4,900 MJ/m², with a maximum in Russia of 5,019 MJ/m². The annual amount of direct radiation also has high values – 2,800 MJ/m², with a maximum in Russia of 2,859 MJ/m² [1].

Solar energy can be used by various types of solar installations (thermodynamic and photovoltaic). The use of solar power plants is advisable for such large facilities under construction as, for example, the Akhmat Tower, the international terminal of the Severny Airport, or facilities already in operation, for example, the Grozny Mall shopping center. The use of solar installations will significantly save energy resources during the operation of buildings, especially in the summer, when indoor air conditioning is required.

Providing heat to residents of Grozny through the use of geothermal resources is very promising and does not require huge costs. There are four thermal water deposits around the city of Grozny: Khankalskoye, Petropavlovsk (Grozny), Goytinskoye and Gunushki. The largest is the Khankalskoye field. The Khankalskoye thermal water deposit is the largest thermal energy water deposit in the Chechen Republic, located 10 km southeast of Grozny. It is multi-layered with a water-pressure regime, 22 aquifers are allocated. The

strata are composed mainly of quartz sandstone and contain poorly mineralized thermal waters with a total mineralization of 0.6 to 3.5 g/l and a temperature of 65 to 110 °C. The area of the deposit is estimated at about 15-20 km².

From 1976 to 1994, the field was exploited, and then, like the entire industry of the republic, it fell into disrepair. In 2013-2015, a pilot geothermal plant was built on the basis of the Khankalskoye field based on the implementation of a circulation scheme for the use of deep Earth heat. The resulting thermal energy is used to heat nearby greenhouses (Fig. 1).

In addition to thermal energy, the waters of the Khankalskoye field, according to the conclusion of the Pyatigorsk Research Institute of Balneology and Physiotherapy, the waters of the XIII reservoir of well 4t belong to therapeutic mineral siliceous nitrogen therms. They can be used for balneological purposes for external and internal use [2].



Fig. 3. Pilot industrial geothermal plant based on the implementation of a circulation scheme for the use of deep Earth heat. Khankalskoye thermal water deposit.

According to estimates by Farkhutdinov A.M. et al. [3], with the sustainable use of the Khankalskoye field, a decrease in temperature in the well should not occur within 30 to 40 years.

Conclusions

The use of unconventional energy sources contributes to the decarbonization of the construction industry. Due to its geographical and geological features, the most promising in the Chechen Republic is the use of solar and geothermal energy, as their use is the most affordable and does not require large investments for their implementation.

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