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HEAT FROM BELOW

Geothermal energy represents a significant renewable energy source with considerable potential to contribute to the decarbonization of the district heating system and enhance the security and sustainability of heat supply in the city of Košice.

From a geological perspective, the Košice Basin is considered one of the most promising regions in Slovakia for the development and utilization of geothermal energy. The "Utilization of Geothermal Energy in the Košice Basin" project represents an important initiative, implemented jointly by the partner companies Teplárenský holding a.s. and GEOTERM KOŠICE, a.s. The main objective of the project is to provide a reliable supply of geothermal heat for space heating and domestic hot water preparation for consumers in the city of Košice, while simultaneously reducing fossil fuel consumption and increasing the share of renewable energy sources in the local heat supply system.

The site of interest for the development of the geothermal water resource is located in the area between the municipalities of Svinica, Ďurkov, Olšovany, and Bidovce. At present, the project is focused on the Svinica – Ďurkov site, where drilling operations for three geothermal wells, GTD-1, GTD-2, and GTD-3, were carried out between 1998 and 1999. The well depths range from 2625 to 3210 metres. The geothermal water is highly mineralized and must be returned underground after heat extraction through a dedicated reinjection well.

Between 2025 and 2026, three additional wells, GTD-4, GTD-5, and GTD-6, were drilled, the depths range approximately from 2860 to 3600 metres. Initial tests confirmed water

temperatures of 125–135°C and flow rates of 55–60 liters per second.

The total exploitable potential of the Svinica–Ďurkov site has been estimated at approximately 30–35 MW of thermal capacity. In the future, the project is expected to be expanded and include additional geothermal facilities located in the Olšovany and Bidovce areas.



Geothermal energy will form an integral part of the district heating system in Košice.

INTERCONNECTION WITH THE DISTRICT HEATING SYSTEM IN THE CITY OF KOŠICE

The heat exchange system at the geothermal facility is designed as a closed-loop geothermal system. Geothermal water is extracted from the production wells and transfers its thermal energy to a secondary heat-transfer medium via a heat exchanger station. Following heat extraction, the cooled geothermal water is reinjected into the geothermal reservoir through dedicated reinjection wells, thereby maintaining the integrity and sustainability of the geothermal system.

This approach minimizes the consumption of geothermal water while maintaining the pressure regime within the geothermal reservoir over the long term. The use of a closed-loop system eliminates the need to discharge highly mineralized geothermal water into surface water bodies or groundwater.

A key component of the project is the integration of the geothermal facility into the district heating system in Košice. The project includes the construction of an approximately 15.7 km long hot-water transmission pipeline connecting the Svinica–Ďurkov geothermal facility to the Košice Heating Plant. The geothermal facility will also include a heat exchanger station, a pumping system, and the equipment required to connect the geothermal heat source to the existing district heating infrastructure.

Geothermal energy will form an integral part of the district heating system in Košice. Based on the current project plans, geothermal energy is expected to meet approximately 20–25% of Košice's heat demand.

TECHNICAL AND OPERATIONAL CHALLENGES

Despite its significant potential, geothermal energy utilization presents several technical challenges. One of the most important is the high mineral content of the geothermal water. The equipment must

therefore withstand corrosive conditions while minimizing scaling and fouling in heat exchangers. Long-term sustainability of the geothermal reservoir is equally important and requires continuous monitoring of reservoir pressure, temperature, and water quality.

The construction of the approximately 16 km hot-water transmission pipeline is another major challenge. As a significant infrastructure project crossing existing utilities, watercourses, and transport routes, its successful implementation will depend not only on the geothermal resource itself but also on the technical, permitting, and economic viability of the associated infrastructure.

ENVIRONMENTAL AND ENERGY BENEFITS

The most significant benefit is the reduction in fossil fuel consumption for heat generation. The estimated supply of 195,120 MWh of geothermal heat to the Košice district heating system is expected to reduce CO₂ emissions by approximately 66,252.1 tonnes per year.

The project also represents an important step towards diversifying the fuel mix for heat generation in the city of Košice. The utilization of a local geothermal resource will reduce dependence on imported energy commodities and may contribute to greater stability in heat generation costs. In recognition of these environmental benefits and within the

framework of the PSK-MIRRI-006-2023-NP-FST call, the "Utilization of Geothermal Energy in the Košice Basin" project was awarded funding of EUR 56,185,233.00. The project is co-financed by the European Union under the Slovakia Programme through the Just Transition Fund.

CONCLUSION

The Košice Basin represents one of Slovakia's most significant areas of potential for the utilization of renewable energy resources, particularly deep geothermal energy. The integration of the Svinica–Ďurkov geothermal facility into the Košice district heating system represents a significant step towards the transformation of the city's heating sector. The combination of the geothermal resource, existing district heating infrastructure, and other low-emission energy sources creates favorable conditions for the gradual reduction of fossil fuel use while maintaining a reliable and secure heat supply for the city of Košice. In the long term, the "Utilization of Geothermal Energy in the Košice Basin" project could serve not only as an important energy project for Košice, but also as a model for the development and utilization of deep geothermal energy in other Slovak cities.

SOURCES:

1. GEOTERM Košice
2. Acta Montanistica Slovaca, issue 1, p.171-175, (2007)
3. Ministry of Investments, Regional Development and Informatization of the Slovak Republic (MIRRI)