GEOTHERMAL ENERGY FOR HEATING AND COOLING OF FACILITIES IN THE TERRITORY OF VISEGRAD

Project title	Geothermal energy for heating and cooling facilities in the area of Visegrad
Sector	Energy sector and ecology
Location	Visegrad Municipality
Location description	It is located in the eastern part of the Republic of Srpska and Bosnia and Herzegovina at a distance of 112 km away from Sarajevo, and is connected to by the main road M5 Sarajevo-Uzice.
Company description/ Project background	Municipality of Visegrad is a Local Self-Government that covers an area of 448 $km^{2,}$ with population of 10.118 citizens. It is well known as a place attractive for tourists. Annual tourist visits go up to 8.563 and it keeps continuously growing by 10% annually. The location of geothermal water is Visegrad Spa, 6 km from the urban part of the town, while the location of underground waters, replacement of heating installations, building of secondary pipelines and installation of fan coils is in the urban zone of the town. The pipeline would cover the Visegrad Spa-town centre direction.
Project status	An analysis of the geothermal potential of the municipality of Visegrad was made by an expert in which, based on previous research and experience, the possibility of using thermal waters and groundwater for heating and cooling facilities in the area of Visegrad is clearly confirmed. Prepared Municipality of Visegrad Geothermal Potential Analysis and project entered in the NAMA Registry.
Project description	**The heating system on heat pumps in the municipality of Visegrad** should be gradually established, in several phases. Priority should be given to public facilities with high heating costs, in order to achieve maximum performance in the beginning.

The project involves investing in infrastructure and machinery. The expected time limit for the realization of the project is 2 years.

The heating system of the municipality of Visegrad should be done in such a way that thermal water from the Visegrad spa is introduced into urban and suburban areas via pipelines. Depending on the location and needs of the settlement for heating, it is necessary to combine the use of thermal water and underground springs.
The proposal is to install five water pump housings with a capacity of 3-4 MW (5-6 water pumps per housing), which would use the available geothermal potential.
All the wastewater of the spa center can be fully utilized, and their geothermal potential would be slightly reduced.

Reasons to invest in the project

- The estimated area for heating and cooling is 400,000 m^2.
- Estimated incremental costs are 2,425,308.00 KM. Calculated as the difference in costs between central heating via pumps and via biomass (period of 20 years).
- Estimated reduction of CO2 emissions is 5,819 t CO2 / a.
- Reduction of sulfur dioxide emissions amounts to 107 tons per year.
- Primary energy savings are 3,084tOE per year. Long-term reduction in energy costs is guaranteed.
- Cooling is provided in buildings, especially in those that did not previously have a cooling system.
- Complete renovation of obsolete heating and cooling systems.
- Reduced health problems of the population caused by icy air from air conditioners during the summer and drying of the air in the winter.
- A more comfortable heating system, with digital thermostat for temperature regulation with the possibility of long-term temperature programming.

The geothermal potential of Visegrad can be divided into two sources:
1. Groundwater
The city center of the municipality of Visegrad is located at the confluence of the two rivers Drina and Rzav. This results in alluvium containing a large amount of groundwater at shallow depths (10-15 m) and relatively easy exploitation of that groundwater.
Recently, at the confluence of the rivers Rzav and Drina, the complex "Andrićgrad" was built with an area of about 30,000 m. The geothermal potential of groundwater is used for heating and cooling of "Andrićgrad" with water-water heat pumps. Water pumps were installed in 2013 and since then the geothermal energy of groundwater has been used successfully. Seven wells for heating and cooling of "Andrićgrad" were drilled at this location with an average flow of 8 l / s and an average inlet water temperature of 12˚C. These capacities are sufficient for heating and cooling the facilities of this complex.
Based on the above experience and research, it can be assumed that there is a very large untapped potential of geothermal groundwater at this location and locations next to these rivers in the amount of at least 200 l/s groundwater, which is enough for about 4 MW capacity for heating and cooling facilities.

	2. Thermal water In the immediate vicinity of Visegrad there is a spa center "Vilina vlas" with four sources of thermal water. The total capacity of all four springs is 120 l/s "C" exploitation model. There is a huge excess of geothermal potential, because all water from the source, even use of the spa can be used as a source of geothemal energy.All water from sources that are currently under exploitation of about 30 l/s is discharged into a stream that after 2,000 m flows into the river Drina.The temperature of thermal water ranges from 31 to 34˚C. The establishment of a heating system (pipeline), which would bring water to the city, would allow the use of this potential for heating the buildings, for domestic hot water and for cooling. The spa is 6 km away from the city, so that there would be a drop in temperature in the heating system from 1 to 2˚C, depending on the quality of insulation of the heating system. It should also be noted that due to the difference in height between the position of the spring and the city of Visegrad, no special power would be needed to supply thermal water. Given the above, it can be calculated that the thermal potential of water from thermal baths and groundwater below the urban area of the municipality, with the use of water/water type pumps, has the following heating capacities: - Spa center "Vilina vlas" 12.6 MW - Groundwater 5.9 MW. The sum of these capacities is sufficient for heating and cooling about 154,000 m^2 of buildings.
Estimated total investment cost	Total project costs are **8 840 237 EUR**, including : - Costs of digging wells 46 016 EUR (30 wells with an average price of 1 533 87 EUR) - Visegrad spa pipeline - city center 613 550 EUR (6,000 m pipes Ø 150mm or 6 ”) - Heat pumps 3 067 751 EUR (5-6 heat pump stations with a total capacity of 18.50 MW) - Replacement of heating installations, production of secondary pipelines and installation of fan convectors 5 112 919 EUR
Inputs provided by local partner	**Value** / **Description** The municipality would provide construction sites and necessary building permits. Municipal administration would provide all necessary support to the investor in obtaining the concession.
Form of cooperation with foreign partner	**Financial** / **Technical** The mutual relations between the municipality and the partners would be regulated by a **public-private partnership** agreement.
Supporting information available	For additional information about this project, please contact FIPA either by e-mail: fipa@fipa.gov.ba or phone number: +387 33 278 080.