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## Assessment of Geothermal Potential in the Tbilisi Geothermal Reservoir

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Taking into account the world-wide energy crisis, the search and rational use of cheap and

ecologically pollution-free renewable energy sources are extremely important. Among these sources the geothermal energy is of great potentialities. Tbilisi has a high potential of geothermal sources, which have been in use since ancient times. The major areas of utilization are balneology and local heating of community and residential buildings. It also should be noted that most of the geothermal wells are non-operational. Therefore, a re-assessment of the geothermal potential of the Tbilisi deposit is of major importance from the standpoint of economic development based upon renewable, ecological cleaner energy sources. Field hydrogeophysical investigations (tentative testing, regime hydrodynamic and hydrochemical observations) have been carried out to assess the main thermo-hydrodynamic parameters of water containing horizons. In the field and laboratory conditions thermal properties of aquifer matrix rocks as well as vertical and horizontal zonality of thermal flow have been investigated.

During testing the hydrodynamic influence of well Lisi 5 on wells Lisi 7 and 8, as well as on well Saburtalo 1 was established. It appears that wells Saburtalo 4 and 6 are out of influence area, they are not influenced by well Lisi 5, which points to their independent regime. For the proper characterization of this water regime and assessing its influence area additional testing should be carried out in the future.

Based on previous and newly obtained geologic, hydrogeological and geophysical data, 3D model of Tbilisi thermal region was created which takes into account complexity of area, its separation into domains by faults, and their different hydrodynamic zonality. For modeling computer softwares such as Feflow 5.3, AquiferTestPro, etc. have been applied, which enabled to define hydrothermal resources and assess hydraulic parameters of water containing layers. As a result of modeling work, the 10-year perspective of thermal deposit of Tbilisi was assessed at the present conditions of exploitation.

In the whole region subsidence of water horizon is expected. For example, in the Lisi district, if mean yearly discharge (exploitation rate) is preserved, water table drops by 2-5 m and the released thermal energy decreases from  $5.5 \cdot 10^{20}$  to  $1.578 \cdot 10^{17}$  J. According to the simulated geothermal circulation system, when the used water of well 5 ( $1690 \text{ m}^3/\text{day}$  cooled down to  $30^\circ\text{C}$ )

was reinjected to the well 1 with negative level, 'cooling of horizon and subsidence' tendency became slower. Therefore, in the future creation and implementation of geothermal circulation systems are recommended. This will help to achieve economical and ecologically approved exploitation of geothermal resources.