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Deep geothermal energy

New Frontiers – Exploring Geothermal Resources of Eastern Anatolia

Neue Grenzen - Erkundung geothermischer Ressourcen in Ostanatolien

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Ignis H2 Energy holds four exploration licenses and one exploitation license in the Bingöl and Muş provinces, located in the Eastern Anatolia region of Turkiye. This region is characterized by its rugged terrain, high altitude, and significant geothermal activity, making it a strategic location for energy exploration. The area is also rich in natural resources and has a history of mining and energy production, which contributes to its economic importance within Turkiye. The combination of these factors makes Eastern Anatolia a key area for Ignis H2 Energy's operations, as the region offers promising opportunities for the development of sustainable energy resources.

The license portfolio sits at the intersection zone of The Varto Fault Zone (VFZ), East Anatolian Fault Zone (EAFZ) and the North Anatolian Fault Zone (NAFZ) which is also called Karlıova Triple Junction. Favorable structures, such as fault segments of the NAFZ and VFZ are the primary controllers of geothermal fluid circulation in geothermal systems. Around the main fault zone, features like extensional cracks, pressure ridges, pull-apart regions, and step-over/bending areas have been identified within the concessions. The presence of various hot springs, travertine depositions, alterations, and volcanic elements further indicates significant geothermal activity in the area.

While faults in geothermal fields control hydrothermal activity and the resulting alteration, formations observed in pre-Miocene units provided data on situations such as the solution cavities in the rocks being filled by hydrothermal fluids over time. Hot water springs have deep circulation and originate from basement carbonate rocks, and some are affected by meteoric waters while circulating among younger volcano-sedimentary units. The temperatures of existing shallow wells vary in the ranges considered medium-low enthalpy, while the maximum temperature determined was measured as 80°C at 100 m depth.

In Q4 of 2023, the first geophysics campaign was performed and Magnetotelluric (MT) data from 76 points and 310 gravity measurements were collected at the exploitation license. Additionally, 17 rock samples, 1 snow and 9 water (hot & cold) samples were analyzed along the concession areas. Based on the findings a geological conceptual model was built and interpolated with geophysical and geochemical data sets. A larger MT campaign in 2024 is complementing data

from 394 stations to model subsurface of exploration licenses. The drilling of two exploration wells is also planned to test the build model of the exploitation license area in the same period.

An initial evaluation indicates that this system could potentially support geothermal power generation from relatively shallower depths ranging between 1,000 meters to 2,500 meters. Considering Turkiye's mid-term (2040) calculated potential for geothermal power generation 6,000 MWe where current installed capacity is 1,700 MWe, Eastern Anatolia is the primary candidate hosting the outstanding un-tapped giant.

This paper will detail the exploration efforts at Eastern Anatolia of Turkiye to the date, offering insights into the geothermal power generation capacities based on the performed studies. It will also address the incentives and benefits provided under Turkiye's geothermal law and legislation.