

MOL Geothermal Power Plant Project – New Segment in the Hungarian Geothermal Exploration

Attila Kujbus, Project Manager, MOL Hungarian Oil and Gas Company

79 Budafoki str. Budapest, H-1117

akujbus@mol.hu

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ABSTRACT

MOL Hungarian Oil and Gas Plc. launched a Geothermal Pilot Project that aims to establish the first geothermal power plant in Hungary. Three companies, MOL Plc, the Icelandic Enex hf and the Australian (GreenRock) owned Vulcan Kft formed a consortium to finance the Project in which MOL is the operator.

The consortium wishes to utilize existing hydrocarbon wells in the South-Western part of Hungary to produce and reinject thermal water. However, the exact flow rate is still unknown because the exploration drilling focused on hydrocarbons initially, therefore thermal water production and reinjection tests were necessary. The wells are 3000 meters deep and the water temperature is expected to be above 135°C at well-heads.

Utilizing abandoned hydrocarbon wells, establishing an international consortium for thermal water exploration, the unusual depth, the fairly high temperature (in the European continent), the focus on power plant establishment highlight a new approach in Hungarian geothermal exploration.

Besides the exploration activity the Project has some other curiosities as well. Risk management implied partner involvement and the conclusion of an Exploration Grant Agreement with Worldbank-GEF. Geothermal projects are not competitive with hydrocarbon projects, therefore all possible ways of financial support and subsidy are inevitable.

In case the exploration is successful as a result of the partners' efforts the first Central-Eastern European geothermal power plant can be established in Hungary.

1. INTRODUCTION

MOL is the integrated oil and gas group in Central and Eastern Europe and one of the largest company in the region in terms of sales revenues. MOL Group is committed to contributing to sustainable development: supporting research, innovation and environmental protection, promoting best practices and complying with regulations. In November of 2003 MOL decided to set up a team to develop a Pilot Project to explore power plant opportunities offered by geothermal resources in Hungary. This team analysed potential geographical locations where the volume and heat of extracted water would be adequate for the construction of a geothermal power plant.

The Pilot Project has been set up with investor partners. In March of 2006 MOL, Enex of Iceland and Vulcan Kft. (its owner is Green Rock of Australia) established a consortium.

The well completions started in December 2006, well tests were performed early 2007. Data of the tests are being analysed and evaluated until July 2007, when partners can make decisions.

2. THE ROLE OF GEOTHERMAL ENERGY IN THE HUNGARIAN RENEWABLE ENERGY CONCEPT

Hungary possesses a geothermal potential considerably exceeding the world average, it is one of the most perspective area of Europe, except for the volcanic areas. Nevertheless, geothermal energy producing systems are hardly operating in Hungary and even those operate with the less environment protective re-injection technology.

According to MOL's present concept it is possible until 2012 to establish 3-4 geothermal power plants with 2-5 MW capacity. As a result, 10-15 MW power plant capacity and 100 GWh/year electric energy can be generated from geothermal energy. With such results further development is also possible in the years beginning in 2012. This concept meets with the National Renewable Energy Concept that is under preparation.

3. TECHNICAL ISSUES

3.1. Technical opportunities

The two existing wells designated for testing purposes in the thermal energy exploration phase were originally hydrocarbon exploratory wells, therefore the aquifer in three kilometers depth is relatively unknown. In order to determine the output of the power plant, well testing was necessary.

During the exploration two currently out-of-order hydrocarbon wells are converted into thermal water production or reinjection wells. From the wells thermal water was extracted into a 2000 m³ pit near the well. Then the produced thermal water was reinjected back to its own aquifer through the same well. With this testing protocol, we obtained the data necessary for the construction and operation of the proposed geothermal power plant in terms of both the wells and the aquifers. From the data obtained the size and type of the technology to be installed on the geothermal energy can be determined.

Considering the fact that the temperature of the thermal water is below 150°C, the power plant would be binary type. The power plant turbine would be driven by either the classical method in ORC (Organic Rankine Cycle) system using organic interim media, or in the so-called Kalina system with the mixture of ammonium and water. This can be decided upon completion of the thermal energy exploration phase after the public procurement procedure. Based on the currently available data the output of the first geothermal power generating facility has to be above 1.5 MW in order to be profitable.

3.2 New segment in the Hungarian geothermal exploration

The above-mentioned technology requires new approach in the Hungarian hydrocarbon exploration concepts. The MOL-Enex-GreenRock pilot project started a new segment in the Hungarian geothermal exploration history. The main characteristics of this new segment are:

- deeper wells (2-4 km)
- higher temperature (120-170 °C)
- reinjection 100% of the produced thermal water into its own reservoir.

4. FINANCIALS

Consortium members finance the project according to their respective shares.

According to the project calculations the internal return rate of the project is relatively low and therefore not competitive with hydrocarbon based projects.

Return may be ensured by the weighted average price of 24.76 HUF/kWh (9.6 eurocents/kWh) applicable for electricity generated by the use of renewable energy resources and to a small extent the sales of the so-called residual heat discharged by the power plant to direct consumption customers. Obligatory takeover price for electricity produced from renewable energy is regulated by the provisions of the Electricity Act.

High productivity makes geothermal projects competitive. Operating time is 7000-8000 hours/year. It means HUF180 - 200 million income per year.

According to the calculations, breakeven point of a power plant project is 1.6 MWe plant capacity + 2 MWt thermal heat sales without any external support.

Key question in financial concept is the handling of the geological risk by financial method (Exploration Risk Guarantee).

These are the reasons why the geothermal power plant project is exposed to extremely high levels of risk. The costs of the exploration phase (about HUF 800 - 1000 million) is necessary to confirm that the power plant is feasible at all (in case of successful exploration this amount is absorbed by the project). This is the risk factor of the project.

In order to mitigate this risk an Exploration Grant Agreement has been signed with Worldbank-Global Environment Facilities. In case of the exploration fails because of low thermal water flow rate, Worldbank refunds a significant rate of the financial loss.

5. POSITIVE EFFECTS OF THE GEOTHERMAL DEVELOPMENT

5.1 Environmental issues

The planned thermal water pipeline system providing energy to the power generator ensures closed loop re-injection of the water. According to the proposed final configuration at least two wells will operate in production operation mode and the other two will reinject. Injection of the closed system, overpressure thermal water is made into its own original aquifer and thus both long term operability and the pressure of the aquifer will be ensured.

The geothermal power plant to be established does not emit considerable carbon dioxide therefore, taking into account the current emissions of a power generator to be replaced is obvious that it will result a reduction in emissions.

During the operations the focus strongly was on environmental issues. In the project preparation phase, an Environmental Impact Study was completed for the full process of the power plant establishment.

The establishment licensing and planning documentation was based on the technologies permitted in the environmental impact study.

Considering the fact that several international contracts had to be signed during the project preparation, an Environmental Management Plan (EMP) was also prepared. The EMP discussed all environmentally sensitive risk factors during the construction and the subsequent operational and organisational and cost implications of mitigation.

5.2 Social issues

The operator, MOL maintains regular contact with the affected communities. The Major's Office at the related village was informed on every preparatory step and personal meeting was organised with the village clerk. The direct heat consumption technology associated with the project may create new jobs, consultations have been held and will be held in the future on the subject.

The environmental impact assessment prepared for the preliminary feasibility study of the project has been made available to the local public according to the relevant laws and regulations.

Through the local government, the establishment application was also published as part of the licensing procedure. Any further steps will also be announced to the local public.

In the preparatory phase a study was made to confirm that the project will not affect any geothermal sources that are under exploitation and this study was presented to the cognizant committee of the related local government.

6. CONCLUSION

The geothermal potential of Hungary is well over the world average and except the active volcanic areas it is one of the most prospective territories in Europe. In spite of this, there is hardly any geothermal energy facility in this country, and those few are operated on a less environmentally sound basis not injecting the 100% of the produced water back. No geothermal power plant facility exist in this country, moreover such technology can not be found in the entire Central Eastern European region.

The MOL-Enex-GreenRock Pilot Project finished its well completion and testing activity. Evaluation of the data is going on now. During summer, early autumn partners will make decisions not only on the Pilot Project, but also on a middle-term program. Independently from the final result of the Pilot Project a Middle-term Geothermal Program is under planning with several projects that aims small-scale power plants as well as direct-heat technologies. This program can be a stable basis of the development of Hungarian geothermal energy industry.