

## Reflections of Exploration Drilling Insurance Mechanism on Geothermal Sector Country Experience

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### ABSTRACT

First geothermal exploration & investigations in Turkey started by MTA in 1962. Throughout this process, 230 geothermal fields have been discovered by MTA (Mineral Research & Exploration General Directorate). No. 5686 "Law on Geothermal Resources and Mineral Waters" was enacted in 2006, by this law geothermal fields discovered by the MTA (Mineral Research & Exploration General Directorate) are transferred to investors through a tender process. Almost 10 years after the change of law; with the support of the government, today Turkey is the 4th geothermal power producer in the world ranking. Turkey has taken its place in history by presenting the fastest growth in geothermal power production in the world.

From the other side of the development process, the significant slowdown in new geothermal exploration activities is observed due to the inappropriate risk allocation and lack of commercial debt finance to the private sector. Access to finance is generally not available for investors until the geothermal resource has been validated through drilling. Since MTA is generally no longer performing the high-risk exploration, it is observed that the exploration rate of the new sites decreased.

As the exploration drilling process creates the highest financial risk for the geothermal investor, Exploration Drilling Insurance Mechanism, also known as risk sharing mechanism, has been introduced in Turkey to accelerate the use of potential renewable energy sources.

### 1. INTRODUCTION

Turkey ranked fourth in the global geothermal energy sector by the help of Geothermal Law and its regulations. Especially the feed in tariff application for electricity production; the Turkish Renewable Energy Resources Support Mechanism (YEKDEM) which would have expired on 2020 but extended to June 2021.

YEKDEM offers a feed-in tariff of \$0.073 per kilowatt-hour (kWh) for wind and hydropower projects, \$0.105 for geothermal facilities and \$0.133 for solar energy and biomass geothermal plants.

The most important phase of a sustainable geothermal power plant construction process is the geothermal resource exploration and verification phase. However, as access to financial resources is limited at these stages, and there is the possibility of not finding a viable source, it becomes very risky for companies. That's why, to support geothermal energy, the first phase must be supported financially.

The development objective of Geothermal Development Project including Risk Sharing Mechanism (RSM) for Resource Validation, aimed to promote private sector development of renewable geothermal energy projects in the early stage geothermal exploratory and confirmation drilling stages by sharing the risk of failing to validate a geothermal resource among two parties investor and CTF Fund by World Bank.

This paper aims to understand whether the RSM is sufficient to accelerate geothermal investments and to discuss the need for other additional mechanisms.

### 2. GEOTHERMAL ENERGY SECTOR IN TURKEY

Turkey is located on an active tectonic zone as geological and geographical location and for this reason the country is rich in terms of geothermal energy resources. Geothermal energy development offers reliable and cheap energy supply. In terms of environmental aspects, it has undisputed advantages over fossil fuels and has a capable of supporting the primary energy supply.

With an installed capacity of 1,628 MW in geothermal power generation capacity by the end of November 2020 Turkey is ranked first in Europe and is part of only five countries that have more than 1 GW installed capacity, this is higher than the Government's target of 1,000 MW by 2023 so the government last year announced that it was revising the target to 4,000 MW by 2030.

The issue of the Law for the Use of Renewable Energy Resources for Electricity Production (No: 5346, Date: May 10, 2005) has started the acceleration in utilization of renewable energies (geothermal, hydro, wind, biomass and sun). The law gives the prices of electricity as incentives for different renewable energy resources. The produced geothermal electricity received a price of 10.5 USD cent/kWh.

After 20 years; with support of the Government, today Turkey is the 4th geothermal power producer in the world ranking. Turkey has taken its place in history by presenting the fastest growth in geothermal power production in the world.

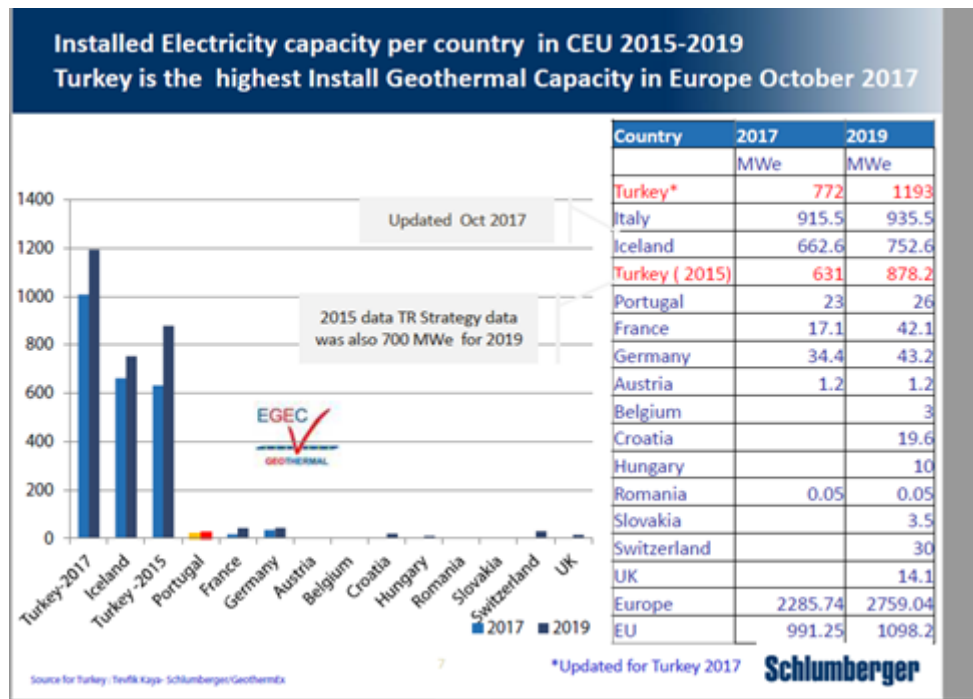


Figure 1. Installed Capacity

#### KEY FINDINGS | GEOTHERMAL POWER

Fig. 2 | New geothermal power plants in 2018 (country, number, capacity)

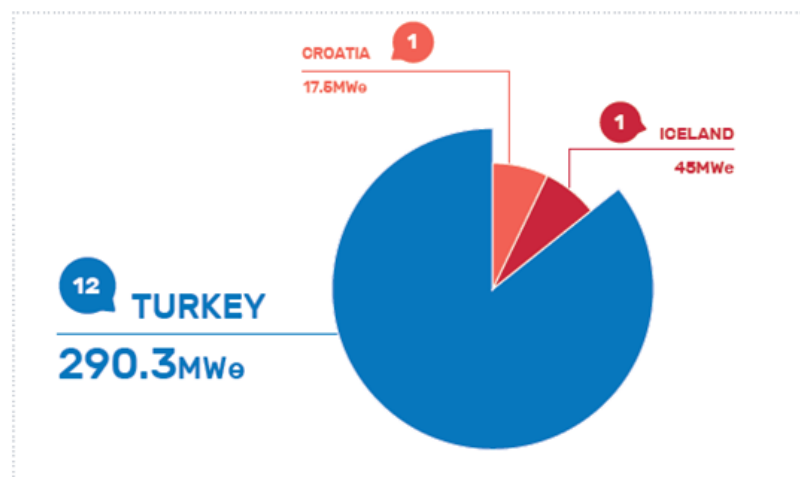


Figure 2. Number of geothermal power plants in Europe; operational, under development, under investigation

#### 2.1 Risk Sharing Mechanism (RSM)

The exploratory drilling phase represents the highest financial risk to the geothermal program and is therefore the primary focus of the RSM tool.

The size and budget of the exploration phase changes accordingly:

- Exploration objectives,
- Expected the resources to be found,
- Planned utilization of the resource.

Understandably, any reduction in the number or size of the projected drilling will lead to a decrease in costs; but this will also lead to a corresponding increase in risk of error or failure. On the other hand, decreasing exploration risk may increase the overall project cost. The economic success of a geothermal exploration program centers on finding the right balance between cost and risk.

The development objective of Geothermal Development Project for Turkey approved on November 1<sup>st</sup>, 2016 by the board of the World Bank was to scale up private sector investment in geothermal energy development. The project had two components. The first component, Risk Sharing Mechanism (RSM) for Resource Validation, aimed to promote private sector development of renewable geothermal energy projects in the early stage geothermal exploratory and confirmation drilling stages by sharing the risk of failing to validate a geothermal resource among two parties: the administrator of an RSM, capitalized by a Clean Technology Fund (CTF) contingent recovery grant, and the geothermal developer (that is, the beneficiary).

The project objected to provide partial coverage of exploration wells' drilling costs in case of unsuccessful wells. Funding of the RSM will be provided by a contingent grant from the Climate Technology Fund (CTF). It was expected that a total of 38 million USD will be available for exploration drilling projects by the RSM. The implementing agency had been a dedicated unit (RSM Unit) within the Development and Investment Bank of Turkey (TKYB).

The RSM has been designed to reduce the beneficiary's exploratory drilling risk under a standard three well program by paying up to 60 or 40 percent of the average estimated drilling cost of an unsuccessful well depending on the region.

In case a well fails to yield outputs at a pre-agreed level of well productivity, the RSM will cover a pre-defined percentage of the drilling expenditures up to a total of \$4,000,000 under a scheduled program. Higher coverage would be given for wells outside the provinces of Aydin, Denizli and Manisa where geothermal exploration is less advanced. A success fee, amounting to 10% of the estimated well cost, is paid upfront by the Beneficiary to the RSM.

## 2.2 How RSM proceeded:

The RSM program started in TKYB on July 5<sup>th</sup>, 2018 by the Workshop prepared to introduce the program to Geothermal Investors. The interest was high to the program but when the application period started mostly the new investors came for the 60% supported parts of Turkey.

This is caused by both currency risk and time limit for incentives. Although the applications started on July 5<sup>th</sup>, 2018, until July 2019 there is no beneficiary agreement signed and in accordance with the information given on World Bank page 7 agreements seems to be signed by the end of August 2019.

As a developing country with high amount of foreign investment; currency is an important factor in the investment environment and once increased US Dollar doesn't come back to the original but stops somewhere in the middle. In August 2019 the Turkish Lira lost its value against the US Dollar since the beginning of the year due to some political events. Turkey's foreign debt increases its vulnerability and stability is an important characteristic when it comes to currency.

Under the YEKDEM system, power plants that generate energy from sources such as geothermal are selling their electricity to the government with a 10-year long-term contract. The system aims to guarantee stable long-term income for the plants that require high amounts of investment and limited equity. However, this system after June 2021 will not be applied in power plants. It is not known whether YEKDEM will be replaced by a system that will facilitate similar funding.

Besides currency risk, uncertainty regarding short term developments as a result of upcoming changes to incentive schemes, threaten the viability of future investments.

## 3. CONCLUSION

As a developing country, Turkey needs the foreign investment to improve its economic performance. On the other hand, international political affairs are an important effect in Turkey's economy due to country's unique geographical place. In 2019 international politics-based fluctuations in economy placed in the center of investment environment. During this term, investors' risk aversion behavior has been observed to increase, which has played a role in reducing the interest in RSM mechanism.

In Turkey it is observed that development of Geothermal Sector depends mostly on incentives. Regarding that exploration phase is important to reach the source and obtain a sustainable power plant unfortunately risk insurance mechanism because of currency risk and uncertain incentives cannot be a proper solution to accelerate new investors and new areas for geothermal development. Financial support should be given not only in terms of insurance but also mechanism including prepaid funds as demands of the sector should be taken into consideration after obtaining the required guarantees.

The exploration phase is an important step to reach the validated geothermal source and obtain a sustainable power plant. However, during the transaction period of the innovative systems such as RSM and without getting feedback; it is observed that the feed in tariffs will be in the center of the business plans of investors. The investor tendency is that the funds provided during the research phase are prepaid. This is a situation that needs to be addressed and evaluated, especially in developing countries where continuously new financial resources are needed. On the other hand, such a mechanism would require more detailed work and more effective public participation during the management and installation phase. Undoubtedly, the biggest debate is the extent to which the public support and the added value to be obtained as a result of support; and the self-sustainability of the mechanism.

By the end of 2020; 7 companies selected for RSM and it has not been declared by any leading companies in the sector that applied for RSM, besides only 3 firms have finalized the negotiations to sign the agreement and be the beneficiary of the program.

Reflections of the risk insurance mechanism for Turkish Geothermal Sector indicates that insurance mechanisms in the exploration phase is not enough to boost the sector, without the reliable feed in tariff system reassuring the long term business plans of the geothermal investor.

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