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First Geothermal Dialogue: Effective financing of geothermal development – what have we learned?

24 October 2014

UN City Copenhagen FN Byen, Marmorvej 51, Denmark

A meeting organized by **Climate Policy Initiative**
in partnership with the **Climate Investment Funds & ESMAP**

On 25th October, Climate Policy Initiative (CPI) and the Climate Investments Funds (CIF), in partnership with Energy Sector Management Assistance Program (ESMAP), and with the support of UNEP-DTU and the Danish Ministry of Foreign organized the **First Geothermal Dialogue** at the UN City in Copenhagen, in conjunction with the **2nd Global Geothermal Development Program Roundtable**.

This meeting was the first in a **series of Geothermal Dialogues** that will take place over the next year, aimed at **bringing together major actors in financing geothermal development, to enable a global sharing of experiences and to explore emerging lessons in the quest to scale up effective geothermal finance**. The dialogues will assemble countries receiving support from the CIF for geothermal projects and host countries involved in other ('non-CIF') geothermal projects, donor countries, project developers & financiers, multilateral development banks, representatives of the CIF Administrative Unit and a few selected additional participants.

Summary

Geothermal energy is broadly cost competitive with fossil fuel alternatives, even without a carbon price. The levelized cost of geothermal electricity makes it one of the cheapest renewable energy options available. Its ability to provide low-cost, low-carbon power reliably and flexibly means it is well-placed to meet developing countries' growing energy needs while displacing polluting fossil fuel power plants. However, its rate of deployment has been slower than other renewables over the last thirty years and will need to speed up rapidly if this technology is to deliver on its promise. The key questions of this Geothermal Dialogue were whether public financing is essential to geothermal deployment due to long implementation timelines and high resource risks, and if so how it can be used most effectively.

The Geothermal Landscape: Setting the Scene

After an introduction to the current state of geothermal markets and deployment and the main challenges for geothermal investment based on [CPI's geothermal background paper](#), representatives of countries engaged in geothermal development in Indonesia, Kenya, and Armenia, shared their perspectives and experiences on the sector, in particular suggesting:

- **The host country government has a key role in enabling the roll out of geothermal electricity.** This includes setting the regulatory framework, such as rules related to concession-based licensing or tendering (which needs to be time bound), resource data availability and a price incentive, but also in terms of political drive and development objectives (for political acceptability of tariff). Know-how within public agencies is also key to bring in project developers and financiers.
- **It is important to optimize risk allocation between private and public actors.** Future geothermal deployment will largely depend on how risks are allocated between public and



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private actors across the project development chain. The government / public sector has a role to play in particular with resource risk coverage, but it needs to be mindful of not crowding out private actors. In order to redistribute risks to the optimal bearer, the private sector profit motive should be aligned and balanced with public sector macro-political objectives.

- **To assess the development model for geothermal it is important to characterize effectiveness.** Comparing effective use of public resources requires more data on the costs of exploration, not only capex but also cost of capital (equity). This will allow comparison between different forms of insurance, guarantees or public implementation. Comparing geothermal with other energy sources is also important as long as the perspective of both upstream and downstream costs is taken into effect (e.g. including coal mining with coal power).

Financing Geothermal Development: The roles of the public and private sector in the Gümüşköy Geothermal Power Plant project

This session discussed CPI's case study on the Gümüşköy Geothermal Power Plant Project (GPP) by BM Holding Group in Turkey. Although small in scale (13.2MW), the Gümüşköy GPP has significant private sector involvement and financing throughout the development cycle. Furthermore, it was the first private sector high enthalpy geothermal discovery in Turkey in 2008. Main takeaways from the discussion include:

- **The Gümüşköy project demonstrates the potential of private sector-led development.** Under a clear and consistent regulatory framework combined with high level mapping/surveys performed by public sector, the private sector project developer BM Holding were willing to take on exploration and drilling risk on a site discarded by the Government General Directorate of Mineral Research and Exploration (MTA) responsible for field development as unsuitable for power generation. While the private sector is typically reluctant to take on exploration and drilling risk, BM Holding were seeking to develop their geothermal development capacity. The channeling of European Bank for Reconstruction and Development (EBRD) debt financing through the Turkish Mid-size Sustainable Energy Financing Facility (MidSEFF) facility and Yapikredi bank enabled the financing of the project construction and meant BM Holding could refinance the equity they put in for the drilling costs early and take the share of equity invested in the project down to 30% from 100%. The \$10.5c/kWh 10-year feed-in tariff (FIT) provided by the Turkish government was a key factor in the project developer's decision to invest in the project.
- **Even within one country, there is room for multiple development models.** The private-led development model can exist alongside the predominant model, where the public sector (MTA) performs exploration and drilling activities on site before tendering the field for power plant construction. The private-led model has focused on regions where extensive survey and exploratory drilling was already carried out by the government. Such work will also be required in other regions of Turkey before the private sector are willing to participate. Both models exist under the one policy mechanism (FIT). There is a question as to which is more cost effective from a private sector perspective. The costs of competitive tendering under the MTA model must be balanced against the higher cost of the risk capital deployed under a private-led model where the project developer carries out exploration and development. The government has taken in approximately \$500m in auctioning of proven fields.
- **The broader economic, environmental and energy system impacts of geothermal power in Turkey need to be carefully considered.** The benefit of the geothermal FIT to the project developer to improve bankability is often highlighted but what is often overlooked is the benefit to the economy and the energy system as a whole. In Turkey, it helps to reduce the trade deficit and offers baseload stability to the power grid. Turkey spent \$56 billion on energy imports in 2013 which corresponds to 56% of the total trade deficit. The Gümüşköy project generates



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revenue from the non-condensable gases arising out of the reservoir by, for instance, selling CO₂ to greenhouses and industrial end-users. This model could address environmental issues associated with some geothermal reservoirs in Turkey.

- **Private financial institutions are increasingly willing to invest in the geothermal.** Participants heard that the commercial banks in Turkey are considering offering debt for drilling activities for projects due to their increased familiarity with the key indicators involved for project feasibility. This is thanks in part to successful engagement by public finance. The question then is under what conditions would public finance withdraw or reduce its engagement to avoid crowding out the private financial institutions.

Financing Geothermal Development: Perspectives from project developers and financiers - Panel and roundtable discussion

This session focused on recent developments in geothermal financing, with insights from projects developers, technology providers, and both public and private investors, including Ormat, Reykjavik Geothermal, Garanti Bank of Turkey and Mexico's national development bank, NAFIN. Main takeaways included:

- **Commercial financiers operating in developing countries lack technical know-how and expertise for financing geothermal projects making project financing more costly to developers as a result.** Many commercial financiers have little or no experience of financing geothermal plants. In particular, first time commercial financiers typically do not have experience to finance geothermal plants and perform related credit risk assessment. As a consequence, they undertake more extensive analyses and rely more extensively on consultants' opinion. This translates into more expensive due diligence processes, and additional time-consuming requirements to private project developers. The lack of an appropriate regulatory/incentive framework can also hinder financiers from extending loans at the tenor needed by project developers.
- **Project financing has to be developed and defined phase by phase.** The ability to secure debt financing changes depending on the stage of development of the plant. Currently there is not yet project finance from commercial banks at the early stages of development, however in some cases it is possible to obtain debt when half of capacity of the project is drilled, and if good debt service cover ratio (DSCR) provisions are available.
- **Several strategies are employed to mitigate risks and attract private sector investment.** The approach currently considered optimal is for governments to auction more mature projects or brownfield sites where they have already carried out test drilling to private project developers, who are better suited than the public sector in the construction of the plant. To improve bankability for earlier stages of the project, solutions include the involvement of third party actors in the independent assessment of geothermal resources (reservoir temperature, permeability and flow rate) and of the appropriate actions taken by the developers, as well as by ensuring that each developer / independent power producer (IPP) has full control of the reservoir. Power purchase agreements (PPAs), in addition, allow project developers to secure loans with longer tenors, which ensure sufficient revenues to repay debt services. In countries with low creditworthiness PPAs should be backed by government guarantees. For the reduction of resource risk at exploration phase, low cost concessional financing could help.

Early lessons

The concluding session invited a broad discussion amongst participants to highlight priorities for going forward. Taking stock of the rich discussions, three preliminary findings emerged:

- **Exploration and financing are both bottlenecks for geothermal development.** Public resources are limited and it is important to use public resources effectively to drive private



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investment from commercial financiers and, possibly, institutional investors. Much of debt financing has been raised at the point of power plant construction, even from development finance institutions. A greater focus on providing suitable early stage risk capital as well as support to late-stage refinancing in domestic capital markets would be welcome.

- **It is useful to understand the broader picture of geothermal within countries.** Many are favorable to geothermal energy because of the baseload position in the energy mix/load curve. It is important to understand where the critical value for geothermal stands as energy systems emphasise more flexible, dispatchable power sources or in the ability of providing baseload energy.
- **There is not yet a dominant project development model to scale up finance flows - what matters is understanding effectiveness.** Lessons from individual case studies are important but are not necessarily applicable to all technologies and country-specific circumstances. Within countries, multiple development models with different roles for public and private sector actors are possible, but this also creates fragmentation which can limit the replication and scale-up of the sector. A better understanding of what works and what doesn't in specific circumstances can help speed up the implementation of effective business models.

CPI remains committed to improving the understanding of how to effectively finance geothermal, distilling lessons from ongoing geothermal case studies and continuing to convene this series of dialogues in partnership with the CIF Administrative Unit.