OVERSEAS GEOTHERMAL DEVELOPMENT STRATEGIES -AS AN ENTERPRISE-

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ABSTRACT

From the perspective of integral geothermal consultants, workable strategies are necessary to maintain or to improve not only the market size but also its stability. The strategies shall be addressed to create a sense of reliability among the developers and financiers by providing advice based on State-of-the-art technology as well as those based on in-depth knowledge of their market situation, which consequently leads them in the development of their geothermal resources within manageable risk level. Risk emerges in several forms during the course of development and all shall be duly addressed at due timing in order to avoid unnecessary prolonging of the lead time. Though the geothermal energy is a resource owned by the state, when it comes to the question on whether its development should be carried out by public or private entities, it always requires Public-Private synergies. Our experience shows that strategies directed to fortify the mutual understanding of each party and to identify particular barriers to help understanding the other party's role will bring in successful and smooth development of the geothermal resources, and therefore solid and stable market environment for business.

Keywords: Development strategies, Geothermal, Consultants perspective

1. INTRODUCTION

In our concept an integral geothermal consultant is the one with capabilities of providing all or parts of the engineering services necessary to develop a geothermal project from the very early stages up to the operation and maintenance of facilities. Very early stages might include project formation and assistance to clients in securing the finance for their projects. From the perspective of the consulting firms, both market size and market stability are important to maintain smooth and sound operations. A good market size will result in securing constant workload and market stability will enable to deploy resources in a programmed manner. Therefore in order to succeed in attaining these two objectives, the company has to take measures to drive the market rather than being driven by the market. In order to drive the market, synergies between the objectives of the consulting firms and those of the clients are necessary. In our belief, there is a process to create these synergies.

a) First of all there should be a commitment in the country or region where the development is taking place, that geothermal energy shall bring a contribution to their needs of energy supply.
b) Second, it is necessary to assess the size of that contribution; i.e., to establish the inventory of "economically exploitable" geothermal sites.
c) Third, it is necessary to establish whether or not appropriate conditions are present in the country to cope with long leading time and/or high-risk geothermal venture (country risk, market risk and resource risk); i.e., the price level the market would be willing to pay for the geothermal product. Since this aspect correlates to the aspect of "economically exploitable", the size of inventory will depend on this evaluation.
d) Forth, it is necessary to create a national plan so as to design and implement actions to ease or to maximize the portion of geothermal energy in the energy portfolio of the country. This includes design (modification) and enactment of necessary laws and regulations to mitigate the country risk, definition of the role and level of participation of the public sector to mitigate the market risk, creation of the critical mass of the necessary local human resources and plans to provide

incentive to reinforce of create local industry capable of supporting the development and exploitation of geothermal resources to mitigate the resource risk.

e) Fifth, the creation of synergies. Since it will be difficult for the country to provide support in all the participants of geothermal development, especially those requiring state of the art technology (mitigation of resource risk), by following this process, the integral geothermal consultant can establish its position in the respective market while measuring size and stability during its planning.

2. THE PROCESS TOWARDS SECURING MARKET SIZE AND STABILITY

It is well known that the utilization of geothermal energy represents benefits to the society unmatched by other sources of energy; however it is also known that its exploitation is a very risk prone business and that these risks persist all the time until the end of the exploitation. Basically there are three kinds of risks; market, country and resource risks (Fig. 1). The degree of combination of the three will determine the ease of the development and therefore the strategies to follow to mitigate and overcome the risks. The life of a geothermal project from its development until the end of its exploitation (Fig. 2 with examples of what West JEC does within the assistance of the Japanese government) is affected by these risks and have to be identified and their mitigation measures have to be secured or at least steps to their mitigation must be secured to make decision whether the project should continue to the subsequent development stages. Evaluation of country risk, such as the awareness of geothermal energy and the will to develop it in the political and administration strata of the country is as important as the evaluation of the political-economic stability. It is because if this awareness and the will are in place, adequate legal frame work to proceed to geothermal development will be easier to attain than the otherwise. Evaluation of the market risk is also important to realize the competitiveness of the geothermal product (electricity or others) and to identify barriers that could prevent the amortization of investments. The awareness of the authorities and the will to utilize geothermal energy will help promoting a fair competition of geothermal energy. Therefore the awareness of the authorities while seeding in them the bases for motivating the will to develop geothermal resources plays a key factor. We believe that regional or country wise workshops (training courses) addressed to politicians and administrators are more important than the technical training courses in early stages of development.

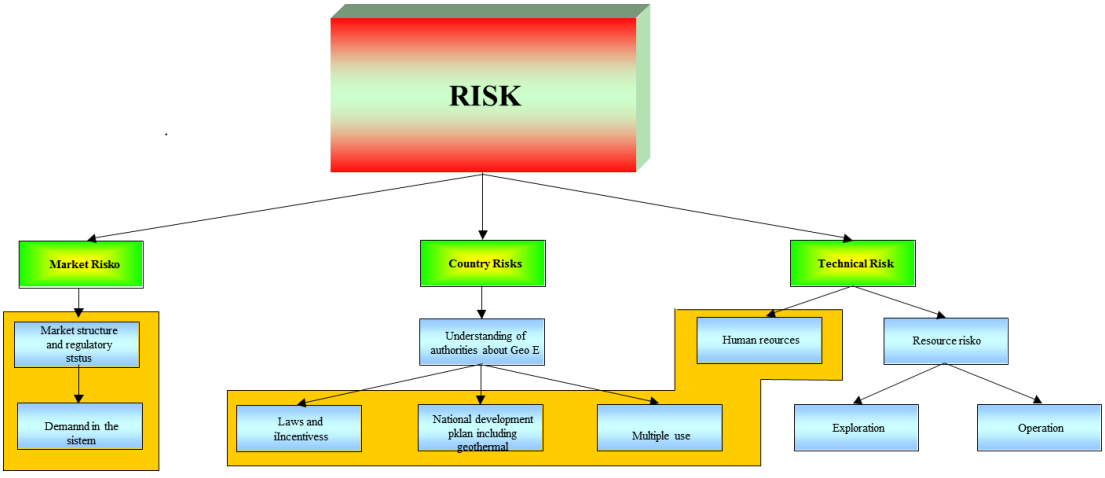

Fig. 1 Risks in the exploitation of geothermal resources

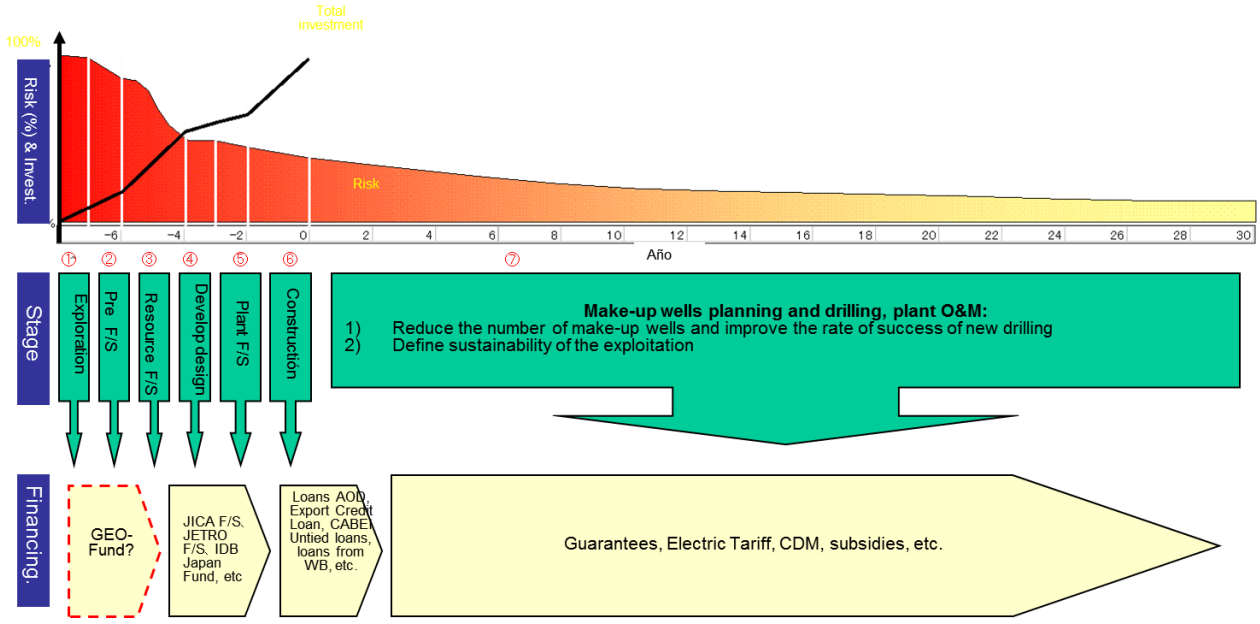

Fig. 2 Process of development and exploitation of geothermal resources

The mitigation of resource risk falls rather in the technical arena. Its analysis comes during the feasibility studies and during the exploitation of the resource. Its mitigation is equally important as the mitigation of the country and market risk to secure competitiveness of the geothermal product all along the time of is exploitation. Well drilling success (it implies two meanings; one is to tap a permeable zone with good characteristics either for production or reinjection purpose and another is to reveal very slow decline in well production or reinjection characteristics) is the most critical aspect of resource risk followed by the chemistry of fluids (Silica and/or carbonates contents and amount of non-condensable gases and their variation with time). To mitigate the resource risk, the geothermal consultant has to offer advice, methods, procedures and solutions to increase the rate of success of the well drilling and to forecast the variation with time of the reservoir properties. The solutions are field dependent; therefore, not only state of the art technology but experience is what is required for the consultant. State of the art technology is gained through R&D but experience is only gained through exposure to numerous situations of problem solving during the development and the exploitation stages. Solutions are usually multi-tasking and interdisciplinary; therefore clients should be supported by coordinated groups of experts or by integral geothermal consultants.

The national authorities should be aware that the different development steps may be needed and the risks are involved in the development of geothermal energy. These are the reasons for the long leading time and for the high initial investment requirement as well as for the comparatively high generation cost. Therefore there should be awareness among them that the development of geothermal resources requires their strong support to motivate investors and the strong support should be all the way along so as to promoting seamless and smooth progress of activities from exploration, through evaluation, construction and exploitation stages. Once this awareness is attained, it is only when the knowledge of the potential of their exploitable geothermal resources will crystalize in realization of projects.

We at West JEC try to secure all these aspects and try to create awareness among the authorities and synergies between us and potential clients (public or private) by executing what we call geothermal

master plans. In these master plans we study aspects from legal framework, national policies and market situations as well as inventory of geothermal resources and in case of electricity production applications, it is the study per each of the inventoried sites, the possible capacity of power plants and the price (including environmental considerations) of their power to be injected into the grid. Also the study includes the need of reinforcement of the grid in order to accept power from the inventoried geothermal sites. The integration of all of the above tasks makes it possible to draw a road map for the country and for the institution in charge of energy and or power. Then we proceed to complete the five steps mentioned in the introduction, including the coordination of the financing institutions and the potential clients.

3. RESULTS OF THE STRATEGY

Although the strategy is yet subject to improvements, until today, we have completed four such master plan studies, the Plan Puebla Panama Region, the geothermal master plan for Indonesia, the geothermal master plan for East Rift Valley Countries and the geothermal master plan for Peru. From these efforts, several pre-feasibility studies and feasibility studies have been implemented in in Latin America, Indonesia and Kenya. Financing operations have been also possible and several power plants are in construction and in operation.

4. SUMMARY

The solid and smooth progress of geothermal development wherever in the world depends on the depth of awareness by the authorities of the country (where the development is planned to be done) regarding the benefits derived from this energy and regarding the barriers and risks its development may face. The study of all the factors affecting the development and exploitation of the geothermal resources, an overview of the usable geothermal potential their countries possesses as well as a road map intended to lead them to the final goal of making sound use of geothermal energy for their society, will create the necessary synergy between all actors (country, developers, IPPs, public power facilities, off-takers, customers and engineering companies) for an smooth development and exploitation. Geothermal master plan studies are addressed to fulfill the objective of creating awareness and synergies.

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