Presented at Short Course on Geothermal Project Management and Development, organized by UNU-GTP, KenGen and MEMD-DGSM, at the Imperial Botanical Beach Hotel, Entebbe, Uganda, November 20-22, 2008.

UNITED NATIONS UNIVERSITY
GEOTHERMAL TRAINING PROGRAMME

KenGen DGSM

GEOTHERMAL PROJECT MANAGEMENT IN EL SALVADOR

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ABSTRACT

Geothermal is a capital-intensive business, where up-front costs of projects, not the cost of operating or maintenance over the life of the investment, usually determine economic feasibility. There is, therefore, much stress on efficient, effective project management. Geothermal power plants have been – justifiably – compared with regular thermal steam plants, where the fuel for the life of the plant must be bought up front. Beyond the critical nature of the cost of the project, geothermal is again peculiar because projects are delightfully complex. Several systems have to work in synchronous unison to produce the desired result, so teams of geoscientists, drillers, and mechanical, civil, electrical, and chemical engineers must all work together seamlessly under one project manager – no small task.

In El Salvador, geothermal developments are almost exclusively for power production. The organisation in charge of these developments was originally CEL (Comisión Ejecutiva Hidroeléctrica del Río Lempa, a government agency), later the geothermal unit – assets and personnel - was spun off into LaGeo. LaGeo is now charged with developing geothermal projects, both plants and field components, from the initiative stage, through plant and field operation, to the electricity market.

1. ORGANISATION

All large investment projects are decided by the Board of Directors, the highest body of administration in the Company. After the Board had given its approval to execute a project, it is managed by the Projects Manager, the head of a department of LaGeo equal in hierarchy to the Production Manager, the Administrative/Financial Manager, and the Commercial Manager. While projects are in the initiative and development stage, they are handled by the Projects Manager, who turns the project over to the Production Manager once it is completed (Figure 1).

The Projects Manager has two subdivisions under his command: that of the Studies Manager, consisting of all geoscientific and laboratory personnel and equipment; and that of the Engineering Manager, where the civil, mechanical, electrical, and chemical engineering design and supervision are prepared.

Most of the work to identify, drill, develop, and operate a project is done in-house at LaGeo. A few years ago, much support was required from consulting firms and individual consultants, to do geoscientific surveys, design a project, produce the technical specifications, and finally supervise construction. However, as of 1997 (roughly) most of the geoscientific and engineering work is performed by LaGeo´s own personnel. There is still some work contracted to external engineers and scientists, but only when the local personnel are not experienced in or lacking knowledge on a specific task, when a second opinion is required, or when locals are too busy in another project to devote their time to the problem at hand.

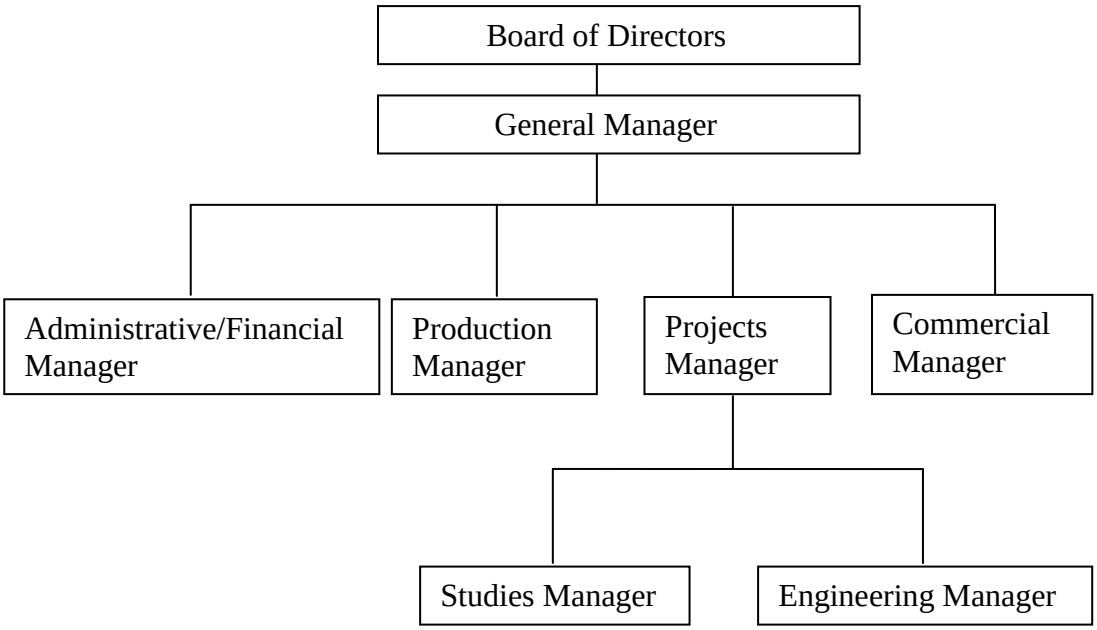

FIGURE 1: Management system in LaGeo

Drilling services are contracted with Perforadora Santa Barbara (PSB), a wholly-owned subsidiary of LaGeo. PSB was started up in 2003 when the only Central America – based drilling contractor, Forasal, was put up for sale, and was bought by LaGeo. It was deemed critical to ensure that a drilling contractor was dedicated to the Central America geothermal drilling, and that experienced personnel were also preserved. PSB is operated as an arms-length contractor, in order to allow them to provide drilling services to other clients aside from LaGeo. However, drilling services can also be considered in-house. Ancillary drilling services, such as cementing, electronic logging, and directional drilling, are usually contracted to third parties.

2. PROCESS

2.1 Prefeasibility stage

The purpose of the prefeasibility stage is to identify an area with geothermal potential, then obtain the rights to exploit it through a concession agreement with the State. Geothermal concessions in El Salvador are given by the electricity regulator, SIGET. Concessions are awarded to interested parties at their request, after a public bidding process, and are permanent and transferrable.

The interested geothermal operator will do reconnaissance work in several areas, and then focus on a smaller, more specific area of interest. In this smaller area, the developer must carry out geological, geochemical, and geophysical surveys necessary to define the boundaries of the resource, and its productive potential. An environmental impact assessment must also be completed at this stage, in

order to request a concession. Once a concession for the exploration and exploitation of an area is requested, and the complete documentation required by SIGET is submitted, SIGET issues a public announcement that a request for concession has been submitted, and asks whether there are other projects that compete for the use of the same resource, or whether there is opposition to the project. SIGET will decide which of the competing projects – if any – are "in the nation's best interest", and if the opposition to the project –if any – merits any modification of the original project. Once SIGET has decided what should be done with the resource, the concession is put to tender among qualified bidders. The project originator can then obtain the concession by bidding 85% of the highest bid. As mentioned before, a concession is permanent and transferrable, so it may be sold to a qualified developer. The concession agreement describes the rights and obligations of the concessionaire for the exploration and exploitation of the resource, *for subsurface only*. The surface rights must be negotiated with the landowners on an individual-case basis.

2.2 Feasibility stage

The feasibility stage comprises additional geoscientific studies (like magnetotelluric and seismic), plus the drilling of exploratory wells. The additional information obtained at this stage should be enough to refine the integrated geoscientific model, perform an economic evaluation of the project, and complete a bankable feasibility study. If feasible, this study is taken to banks and financial institutions in order to obtain the funds to develop a project. It should be observed that, if the feasibility study shows *beyond any reasonable doubt*, then a geothermal project is feasible (for example, if exploration wells flow with commercially-useable pressures and flow rates) and financial institutions, and especially multilateral banks, will be very interested in financing the geothermal development project.

2.3 Construction stage

As mentioned previously, most of the design and supervision in LaGeo are done in-house. Drilling services are contracted directly with PSB, and ancillary drilling services are contracted externally. The rest of the project may consist of several components; each contracted and managed separately, but articulated with other components.

Power plant and other such installations (pumping stations, etc.) are usually contracted on a turnkey basis, in order to keep the responsibility of construction and start-up on a single contractor. There may be significant cost reductions, however, in contracting equipment supply, civil works, and electromechanical erection separately. It must be decided with care how far to divide a project into several contracts, as the responsibility for the entire system falls increasingly on the developer the more he contracts are divided.

Another important component is the gathering system, which is usually contracted in two separate parts: materials supply (pipes, valves, joints, etc.), and construction. Construction itself may be further subdivided into civil works and mechanical erection, but, as before, care must be taken to examine responsibilities. If a project is broken up into many contracts, it makes it difficult to pinpoint responsibility when something goes wrong.

The final component of a major project is the transmission line, which is usually contracted separately from the rest of the components.

In summary, a complete development project will have at least eight major components, each with its own contractual arrangement: (i) design and supervision; (ii) drilling services; (iii) ancillary drilling services; (iv) civil works for drill pads and access roads; (v) power plant installations (EPC contract); (vi) gathering system materials supply; (vii) gathering system construction; and (viii) transmission line. There should be an experienced team to design and supervise each component, even if the engineering is contracted externally. The complexity and diversity of the project, and the crucial nature of the investments, led LaGeo to create a division to deal specifically with projects, all under

one Projects Manager, who must work closely with the Production Manager, who will in turn receive the final product.

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