Proceedings World Geothermal Congress 2005
Antalya, Turkey, 24-29 April 2005

Financing Strategy for Geothermal Based Energy Projects

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Keywords: long-term investment, project financing, cash flow, increasing equity return.

ABSTRACT

Most projects in the energy sector require large capital-intensive investments, which may reach hundred million up to billion US Dollar of capital investments. A single geothermal-based energy project may require funding as much as US$ 400 Million for 220 MW capacities. This size of capital investment requirement, however, may create difficulties for the company to finance this type of project using its own internal funds. Alternatively, the company may rely more on the available external financing sources in the market to funding its project development in power sectors.

1. INTRODUCTION

According to Iman S Suriawinata (2003) project financing is a method to finance a project investment which is a stand alone project through financial engineering. Project financing is well known as a financing method based on assets, because both the creditor or sponsorship company, as a shareholder will be able to count only on cash flow and project's asset to get its fund back and also to take profit or return comparable to the risk.

1.1 Why Project Financing?

Contemporary corporate finance theory explains the advantage of external financing scheme for investment project, such as to avoid agency problem (Jansen 1986), to reduce bankruptcy cost (Modigliani & Miller, 1958, 1963), reduce underinvestment problem and asymmetric information (Myers 1977). Beside those benefits which are theoretically explainable, there are pragmatic reasons why a corporation may prefer to use project financing rather than conventional lending such as increasing equity return, increasing interest-tax shield, increasing debt-capacity, extending loan duration, managing & distributing risk, credit enhancement.

This study will focus on project financing evaluation to increase equity return or IRR (internal rate of return on equity) through leverage usage. As the case study, we have applied a geothermal project with typical data.

2. METHODOLOGY

Long-term projects are worthy of special attention because of the fact that they frequently require large investments, and because the cash outlay to start such projects often precedes the receipt of profits by a significant period of time. How we can evaluate long-term projects and determine whether the expected return from the project is great enough to justify taking the risks that are inherent in long-term investment. Several different approaches to evaluate long-term projects are the pay back method, the net present value (NPV) method, and the internal rate of return (IRR) method.

2.1 Internal Rate of Return

IRR is the discount rate that makes the present value of the investment's income stream total to zero. The logical reasons for the investor to use IRR method are 1) The IRR is an expected rate of return of the project, 2) When the IRR is larger than the cost of capital, it means the project will generate a positive margin for the shareholder. 3) Therefore, a project with an IRR greater than the cost of capital will increase the shareholder's worth.

The IRR is represented by following formula:

$$\sum_{t=0}^{N} (CF_t)/(1 + IRR)^t = 0$$

CF_t = Cash Flow at year t

2.2 Cash Flow

The most important step to calculate IRR is to estimate project cash flow which means the difference between investment expenditures and yearly cash inflow after the project is running.

Net cash flow is defined:

Net Cash Flow = Return on Equity + Return on Investment.

Cash flow consists of four elements e.g. sales, costs without depreciation, operating margin and tax, and investment costs

2.2 Pro and Cons of IRR Analysis

Investment decision based on NPV and IRR usually have the same result, meaning that if an investment proposal is feasible according to the NVP evaluation, so it is according to the IRR evaluation.

According to the academics, the NPV method is supposed to handle multiple IRRs and rank conflicting project phenomena instead of the IRR method. However, the NPV method has a weakness, it does not explain the safety margin.

Investors are usually interested in the IRR method because it is comparable directly to the cost of capital. Besides, multiple IRR phenomena can be explained by the modified internal rate of return (MIRR).

3. GEOTHERMAL PROJECT DISCRIPTION

In the implementation phase of the geothermal project, activities involved include 1) reconnaissance, 2) pre-feasibility, 3) resource feasibility, 4) plant feasibility, 5) field development and 6) plant construction. Time, schedule and cost of this phase depend on the characteristics of geothermal reservoir as ascertained during the resource feasibility stage. As a case for this study, we use most-

likely scenario from a typical implementation plan, investment cost and operating expenses.

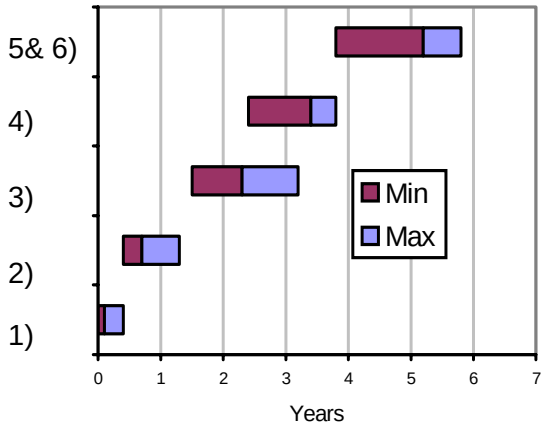

Figure 1: Typical implementation phase of a geothermal project.

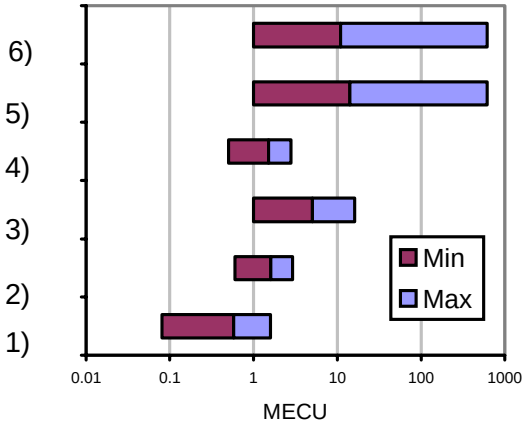

Figure 2 : Investment cost of a typical project.

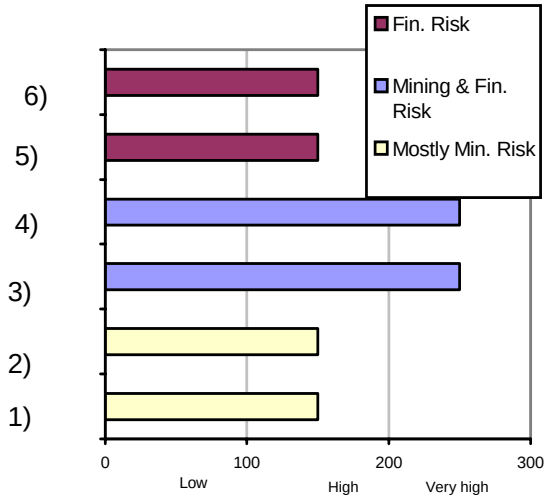

Figure 3: Risk management of a geothermal project.

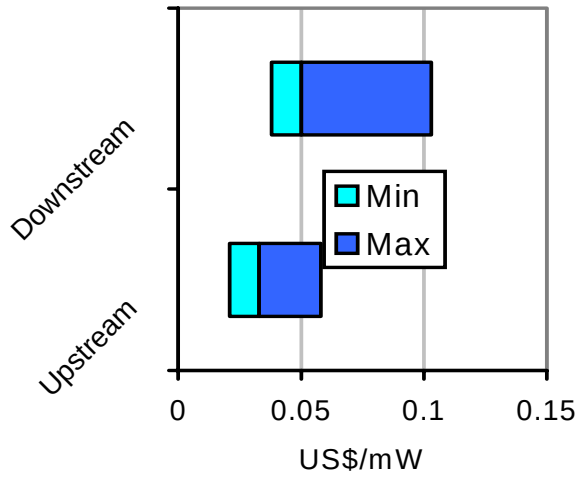

Figure 4: Typical operating expenses of upstream and downstream activities

4. SENSITIVITY ANALYSIS OF DEBT RATIO

Sensitivity analysis has been done in this study based on assumptions that the upstream activities is funded by equity and downstream activities is funded by external financing with tenor period of 15-years. The debt cost or interest rate increase proportionally with the increment of debt to investment ratio or leverage. Energy price is USD 7c/kWh.

Table 1: Relationship between debt ratio and IRR.

Debt Ratio (debt/total investment), %	Interest Rate (cost of debt), %	IRR, %
40	8	19.75
50	10	20.12
60	12	20.29
70	14	20.23
80	16	19.84

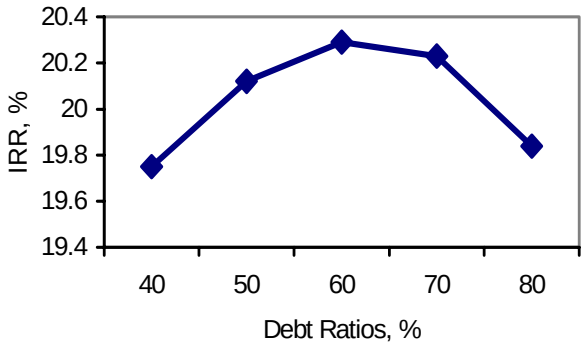

Figure 5: An appropriate debt to investment ratio implies an optimal debt level.

Figure 5 shows the optimum debt ratio is between 60% and 70% which generates maximum IRR in range of 20.23% to 20.29%.

5. CONCLUSSION

Increasing equity return or internal rate of return on equity can be generated through the leverage usage.

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