Stages in Project Financing: A Comparative Analysis of Independent Power Projects in Three Developing Countries – India, Indonesia, and Peru

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Abstract

Infrastructure needs is growing fast specially on developing countries. Governments on those countries cannot afford the large capital investments needed to fund infrastructure projects and are relying on the private sector to design, build, and operate them. The private sector has accepted the challenge and is starting to play an active role on infrastructure development on developing countries. At the same time, governments have committed to private sector participation and are responsible for preparing the legal and regulatory framework to allow and promote private investments. Private sector will also look at the economic stability of the country, the size of the market and growing demand, and the clarity and transparency of the government when granting approvals and concessions. In addition, the private sector will perform extensive research on the country and will evaluate the technical and economical feasibility of the project.

Before committing to a project, the sponsors will perform a technical and economical evaluation to analyze the feasibility and opportunities that the project will bring to the company. The evaluation is a very important part of the development phase and depending on the level of uncertainty different evaluation methods are available to analyze the economic feasibility of the project. On this thesis, the methods have been divided on two main groups; project evaluation under certainty and project evaluation under uncertainty. Once the project has demonstrated it is worth, the sponsor will start looking for financial sources to fund the project construction following a project financing approach.

Project financing is very complex. There are many participants involved on the different project phases and being exposed to different levels of risk within several risk categories. The thesis will describe the role of each participant, the different phases within the project life cycle, and the different risk categories that can be a threat for the project and the participants. To perform the analysis, the thesis author had chosen three projects on equal number of developing countries and focusing on the power sector. These three projects are the Dabhol Project in India, the Paiton I Project in Indonesia, and the Quitaracsa I Project in Peru. Risk exposure of each participant on every project phase will be analyzed and the three projects will allow a comparison of the different approaches followed by the sponsors to manage the risk.

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Abbreviations

B	Benefit
B / C	Benefit-Cost Ratio
BHP	PT. Batu Hitam Perkasa
BJP	Bharatiya Janata party
BMMG	Consortium formed by Mission, Mitsui, and GECC on the Paiton I Project
BOO	Build Own Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
C	Cost
C / E	Cost-Effectiveness Ratio
CAPM	Capital Asset Pricing Model
COES	Economic Operation Committee of the System
CPI	Consumer Price Index
CTE	Energy Tariff Commission
DEI	Duke Energy International
DGE	General Electricity Commision
DPC	Dabhol Project Company
ECHCO	Energy Capital Holding Company
EDC	Enron Development Corporation
EPC	Engineering Procurement and Construction
GDP	Growth Development Product
GE	General Electric
GECC	General Electric Capital Corporation
GOI	Government of Indonesia
GOM	Government of Maharashtra
GWh	Giga Watt Hour
IFC	International Finance Corporation
IPP	Independent Power Producer
IRR	Internal Rate of Return
LNG	Liquefy Natural Gas
MEM	Ministry of Energy and Mining
MSEB	Maharashtra State Electricity Board
MW	Mega Watt
NPV	Net Present Value
O & M	Operation and Maintenance
PEC	PT. Paiton Energy Company
PLN	PT. Perusahaan Listrik Negara
PPA	Power Purchase Agreement

S & Z	S & Z Engineering Consulting
SPC	Single Purpose Company
SS	Shiv Sena party
WACC	Weighted Average Cost of Capital

Chapter 1: Introduction

The needs for infrastructure on developing countries are large. In addition, population is growing at much higher rates than in developed countries generating an increasing demand for infrastructure in the future. Electricity, water, wastewater, highways, and housing are some examples of basic services that would need to be provided in developing countries. However, on most developing countries there are severe restrictions to develop infrastructure projects due the governments' lack of funds to invest on all the projects needed. In the past, these countries have relied on multilateral and bilateral agencies financing to develop infrastructure in addition to commercial banks. Governments borrowed money from the World Bank, IMF, or commercial banks and build most of the infrastructure needed in their countries. Their role was not only to make sure that the basic needs of the population were covered, but they played the role of developers, sponsors, operators, and owners of basically the entire infrastructure developed in their countries. This dynamic is evolving and governments pressured by financial constrains and inability to raise as much funds as needed to build infrastructure are forcing them to rely on the private sector as a mean to attract investments and develop infrastructure to meet their countries' requirements.

Countries such as India, Indonesia, and Peru cannot afford the large capital investments needed to at least provide the country population with the minimum levels of infrastructure requirements. The governments have to play a more active role on infrastructure development. Not only their commitment is enough, but they also have to prepare the strategy to attract private investors. Part of this strategy will be to prepare the legal and regulatory framework promoting private investments, economic stability, and transparency and clarity when granting the approvals and concessions. Consensus among different political parties on the policies promoting private investment on infrastructure projects seems to be an important achievement to guarantee long-term stability and avoid

negative actions against projects that were promoted by questioned governments. Once these questioned governments step down, then the projects supported by them faced problems such as in the Dabhol and Paiton I projects.

1.1 Thesis Motivation

During 1998 and part of 1999 the thesis author have had the opportunity to participate during the development phase of the Quitaracsa I Project. This participation covered different phases within development and generated the strong interest and motivation to work on project financing. On a first stage, the work performed on the Quitaracsa I Project within those years was focused on the technical side preparing the Optimum Development Plan for the project. On a second stage, the work was focused on performing economic analysis to evaluate the feasibility of the project and its exposure to changes in variable such as tariff, construction cost, or any other parameter that can affect its feasibility.

Project financing is very complex but very important to facilitate investments for infrastructure projects on developing countries. Risk sharing among participants is a key aspect of project financing and differs from project to project. A good understanding on the strategies followed on different project and their advantages and disadvantages will help to improve the risk sharing strategies and as a result reduce the total project costs. Developing countries cannot afford expensive projects and improving risk-sharing strategies can generate a benefit to this countries. The sponsors understand the mechanisms, but it seems that country official do not and as a result the project developed under project financing structure are not creating the expected benefits to the countries. However, the countries facing this type of problems are those making their first attempts on allowing private sector participation on infrastructure development.

1.2 Thesis Scope

Project finance analysis is restricted to projects on the power sector. Projects on three developing countries were chosen to perform the analysis and comparison. These projects are the Dabhol Project in India, the Paiton I Project in Indonesia, and the Quitaracsa I Project in Peru, and are all power generation projects developed by the private sector.

The information about the three projects was mainly base on publicly available information.

The information of the Dabhol I project was mainly obtained from three cases prepared by the Harvard Business School. These case studies are Enron Development Corporation: The Dabhol Power Project in Maharashtra, India (A), (B), and (C). In addition, extensive research through the Internet was performed to obtain more specific and recent information about the project.

In the case of the Paiton I Project, most of the information was obtained from the Master Thesis prepared by Diana Yuliyanti and submitted to the MIT Department of Civil and Environmental Engineering. The title of Diana's thesis is "Project Financing for Independent Power Producers in Developing Countries: The Paiton I Power Generation Project in Indonesia." In this case, additional research was also made using the Internet.

The thesis author collected the information of the Quitaracsa I Project and prepared a case study as a basis for the thesis discussion and not to illustrate either effective or ineffective infrastructure development strategies.

1.3 Thesis Outline

Chapter 1 is the introduction of the thesis. On this chapter, the motivations, scope, and outline are described.

Chapter 2 presents and describes the different methodologies that can be used to evaluate a project when there are no major sources of uncertainty. These methods are the Net Present Value, Internal Rate of Return, Benefit / Cost Ratio, Payback Period, and

Cost-Effectiveness Ratio. All this methods are based on engineering economics. The last method described on this chapter is the Cost-Benefit Analysis. This methods is based on economics and is mostly used by governments and multilateral agencies to evaluate projects where in addition to consider the implicit benefits and costs of the projects such as in the first four methods mentioned, the analysis includes none implicit benefits and costs, which is also recognized as the social impact of a project. Decision maker will use these methods to analyze projects and will base their decisions on the results obtained from the evaluation. There are advantages and disadvantages of using each of the methods and is important that the decision maker is aware of this situation. The Quitaracsa I Project is used as a model to perform an economic analysis to illustrate how the calculations for the different methods are performed.

Chapter 3 presents and describes the different methodologies that can be used to evaluate a project when there are major sources of uncertainty and there is a possibility that different results can happen. Uncertainty will reduce the value of a project, however if the decision maker use the right methods to evaluate the projects, then as a result he will be able to make the right decision. The methods to deal with uncertainty covered on this chapter are Decision Analysis, Utility Function, and Options. The evaluation will include aspects such as probabilities of different results in the first method, risk behavior on the second method, and high uncertainty and volatility on the last method.

Chapter 4 covers the theory of project finance. The chapter will star with a general overview of project finance. Second, it will describe all the different participants that can play a role on a project financing deal. On this part, several tables were prepared to compare the three projects under analysis, the Dabhol Project in India, the Paiton I Project in Indonesia, and the Quitaracsa I Project in Peru. There are several advantages that project-financing structures bring to the sponsor. However, the sponsor will also face several disadvantages and as a result it will have to weight both of them, advantages and disadvantages, to define if the project will be funded using a corporate financing structure or a project financing structure.

Chapter 5 presents the risk management framework prepared to analyze the Dabhol, Paiton I, and Quitaracsa I projects. As in the previous chapter, an overview of risk management is made and the general framework used to analyze risk management is

presented. Second, the main risk categories are described and mitigation strategies are also recommended for these risk categories. Third, the four project phases are described. These project phases were identified as development, design and construction, start up, and operations. Within those phases, an analysis of the impact of the different risk categories was developed. To perform this analysis, the Dabhol, Paiton I, and Quitaracsa I projects were used and the risk exposure and mitigation techniques used by the project participants were described. Finally, the chapter briefly describes the improvement achieved on the construction phase, start up and operation phase, and in other factors such as government commitment, financial resources, demand, or contractual arrangements.

Chapter 6 presents the Quitaracsa I Hydroelectric Power Plant Case Study. This case was prepared exclusively for the thesis and was used throughout the thesis as an example of the theory that was covered. In addition, it was also used to compare the risk-sharing approaches followed by different sponsors on projects in different countries.

Chapter 7 describes some general conclusion based on the main two topics covered on the thesis, project evaluation and project finance.

Finally, the thesis includes and appendix where some general theory about financial analysis and structure are presented. This appendix is included to illustrate how the income statement and statement of cash flow are prepared and also to describe some of the terminology that can be found on this statements.

Chapter 2: Project Evaluation Under Certainty

2.1 Overview

Different methods can be used to evaluate projects. There is no single "best" method. In fact the method to be use to evaluate a project will depend on the specific characteristics of that project and the goals pursued by the evaluator. In the following two chapters, the different techniques will be presented and the advantages and disadvantages when using those techniques will de described.

Decision makers use project evaluation techniques to define among different project they are evaluating, which is the most valuable. The techniques used for this purpose should allow ranking the projects as clearly as possible. The goal of the evaluation is to be as useful as possible for the decision maker.

Projects are complex and the method used for evaluation will depend on the combination of precision, simplification, and realism chosen by the evaluator. Making more simplifying assumptions increases precision. However, more simplifying assumptions will produce a less realistic evaluation. The evaluator will analyze the project, make the more realistic assumptions and define the evaluation method that is tailored to that specific case.

Assumptions can be divided into two categories according to De Neufville:

1. Comparability between the elements of any evaluation.
2. Degree of uncertainty in the possible choices.

Comparability has to deal with the possibility of comparing objects over time, quantities of objects at any single time, different objects, and the preferences of different

decision makers[1]. Uncertainty deals with the issue that some consequences on a project are not known in advance and there is a probability that different results can be presented.

In many projects, especially large-scale infrastructure projects, large investments at the beginning of the project are back up with a stream of revenues through out the life cycle of the project. To evaluate these projects, time value of money has to be taken into account. The two parameters that are very important when comparing quantities over time are the number of years for which the analysis is going to be performed, and the discount rate. The number or years is also called life cycle of the project. If a major overhaul of the facility is going to happen in a certain period of time, sometimes this period is the one used in the analysis. The discount rate is a rate that is normally used to discount future amounts to determine their value now[2]. It denote the fact that one dollar today is worth one dollar tomorrow. It is used to compare amounts of money in the same period of time. Formulas used to evaluate projects that introduce the concept of time value of money are very sensible to the discount rate. In fact determining the discount rate for a project is a very critical decision in any evaluation of costs and benefits over time. Typical examples of discount rates can be 10% for electric power companies in the United States, 12% for banks, 10% for the World Bank on its feasibility studies, and 15% or more for manufacturing companies[3].

The discount rate is directly proportional to the risk borne by the company on a project. Low risk implies that low discount rates can be used. In contrast, risky projects will be discounted using higher discount rates. In some cases companies use their "corporate discount rate" to evaluate projects. However, each project should be evaluated considering its own discount rate. Companies should discount projects with their corporate discount rate, only when the risk relative to the project is equivalent to the risk of the business the company is performing. Discounting a high-risk project with a low discount rate or a low risk project with a high discount rate will produce misleading decision. In the first case, the company can be investing in a risky project that discounted

[1] Richard De Neufville, "Applied Systems Analysis", McGraw-Hill, 1990; p199
[2] The discount rate can be either used to calculate present value of a single value or a cash flow stream, and to calculate future values of a certain amount.
[3] Richard de Neufville, "Applied Systems Analysis", McGraw-Hill, 1990, Pp230.

at the project corresponding discount rate may produce a negative NPV. In the second case, the company can be avoiding investing in good low-risk projects.

Public sector's discount rate should be similar to the ones used by the private sector. Governments collected money from society. This money came from taxes and is used to finance projects. The money should be invested on those projects with higher productivity so the society will be receiving the higher value from government investments.

2.2 Project Evaluation Phases

Developing infrastructure is not an easy task. In fact, a long process will happened since the initial conception of a project moving through engineering, construction, operations, and until the project is decommissioned. This period of time is called the life cycle of the project. When a project is ready to be analyzed financially, it means that some previous evaluations of different possibilities for that specific project had been made. Variables such as demand, size, location, technology, regulations, investment, and many others had been considered[4]. The decision maker is looking for the best project on which to invest his money. If he manages a portfolio of projects, then he will invest in the project that will give more value to his portfolio[5]. The decision maker can consider projects with different sizes, investment, and industries. If he is analyzing a specific project, then the evaluation's goal is to determine for that project which combination of variables will result in a higher value. During this period, four engineering phases can be identified:

1. Pre-feasibility study
2. Feasibility study
3. Definitive study
4. Executive design

[4] Government methodologies include social benefits and costs generated by the project that are not quantified in a private project analysis. Methodologies such as Cost – Benefit Analysis are use to include on the evaluation the social costs and social benefits of a project.

[5] This is not necessarily true on public projects where governments sometimes made decisions based on political reasons rather than technical and economical reasons.

In a very early stage, a pre-feasibility study is made to determine if it is worth to analyze a project. A project can be compared with other projects and the decision maker can chose or not one project depending on his strategy and the potential value of the project. If the decision maker manages a portfolio of projects he will rank them and chose the project that will maximize the value of his portfolio. A generic analysis on the possible investments will be made in this phase. Different projects will be compared and the decision maker will decide based on the ranking. He will chose a project because it gives more value to his portfolio and maybe because it diversifies it. The second phase will be a feasibility study. In this phase, one specific project is analyzed and a more detailed analysis is made. Different possibilities for the project are brought into consideration and analyzed. For instance if the project is a power plant, then the size of the plant, the fuel to be used, the technology, location and other important variables will be analyzed. The purpose of the analysis is to determine the potential advantages and disadvantages of the different possibilities. Some fieldwork is done basically collecting some data but again, the analysis would no go very deep into every detail. After this phase, many variations of project are analyzed and ranked. The best two alternatives will be selected for further analysis. The third phase will consist on a definitive study, on which the two alternatives are studied in detail both at a technical level and at an economical level. More detailed data will be collected from the field. Engineering and economic analysis will be made and in general all factors that can influence the viability and value of the project will be analyzed in detail. After this phase the best alternative will be selected. The last phase in this process corresponds to the executive design or just design, where the facilities and equipment if there is some, are designed according to the standards and specifications.

The four engineering phases are not always followed as it was described above. Indeed, not all four phases are always followed. Depending on many factors such as which sector public or private is developing the project, regulations, country, demand, and several other reasons, the implementation of each of the four phases can take longer or not. In fact, different countries can have different approaches and within a country, public and private sector will differ on their strategy.

There are differences in the way governments and public sector behave during the life cycle of the project. This thesis will not analyze the different approaches of these two sectors. The goal is to analyze how the private sector deals with the evaluation and finance of projects. On this chapter, a description and evaluation of the different tools available to determine the feasibility of a project will be made.

Public and private sector follow different procedures when developing infrastructure projects. Generally, poor performance is achieved when a government develops infrastructure. In fact, some times the projects are not even economically feasible, but for political reasons are developed. There should not be confusion with "social" projects. These types of projects may not be economically feasible in a typical profitability analysis. However, the project can have many social implications that will add value to it. Local or regional development due to execution of the project would impact project economic analysis for example. This type of analysis will only make sense for governments and institutions such as the World Bank, but not for private sector. Depending on the country, the public sector can follow the four phases or not. In Peru, public infrastructure projects follow those four phases. It is mandatory for the public sector. However, the government is relying more on the private sector for developing infrastructure and the approach of the private sector is different compared with the public sector.

This development phases can be very long and take many years. The early stages are very risky in terms of investments, however the amount of investments needed to perform a pre-feasibility or feasibility study is normally insignificant compared to the cost of design and construction.

Private sector will behave in a different way. At the time they commit some money to a project, they will try to collect revenues as soon as possible. Within the private sector, a difference can be made between established developers that carry a portfolio of projects and small companies sponsoring single projects In the first case, the sponsor will have a couple of projects to decide on which of them resources will be committed. Maybe it has to decide on a power plant in Mexico, a toll road in Argentina, or another power plant in Florida. For this type of sponsor, a pre-feasibility and feasibility study can make sense. On the second case, a company can be evaluating the possibility to

develop a project; their only project and no comparison on different project will be made. Just the feasibility study can be enough for this type of sponsor. In some cases the feasibility study and definitive study will be made as one single study.

For the Quitaracsa Hydroelectric Power Plant project, the sponsor[6] is a local engineering firm specialized in the Peruvian electric market[7]. Due to deregulations, privatization, and government commitment to private development of power plants, the company found an opportunity to develop this power plant project. They have work in the area and specifically in the Quitaracsa River for several years prior to the opening of the Peruvian electric market. There was a previous knowledge of the area, the river, and its hydroelectric potential. The company developed a feasibility and definitive study at the same time and presented this study to the "Ministerio de Energia y Minas" (MEM) the Peruvian Minister of Energy and Mining. The sponsor followed this procedure in order to fulfill law requirements to get the energy concession.[8] The company used the Net Present Value method (NPV) to evaluate the most convenient development scheme. Different parts of the project were analyzed such as size of the plant[9], intake works characteristics and location, high-pressure or low-pressure conduction tunnel, underground powerhouse or not, and access roads were among the main considerations taken into account during the evaluation phase. There are different methods that can be used to evaluate projects in addition to NPV used by the sponsor. A description of all the methods available will be presented later.

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[6] "S & Z Consultores Asociados S.A." a private Peruvian engineering consulting firm founded in 1978 is the sponsor of the project that is still on development phase.

[7] Chapter 6 include the Quitaracsa I Hydroelectric Power Plant case study

[8] Electricity Concession Law (Law 25844) passed by the government on 1992.

[9] The size of the plant was determined using the historical hydrologic data available. In a hydroelectric power plant project, the size is directly proportional to the water flow and the height. The height is defined as the difference between the surface level of the water in the intake, and the level of the generation equipment. Base on the Quitaracsa historical flow, the sponsor optimized the relation cost / design-flow / capacity. The recommended design flow was 15 cubic meters per second. For this design flow, the install capacity of the plant is 115 MW. According to the sponsors, power plant sizes around 100 MW can be absorbed by the country's energy demand.

In the case of the Payton I Power Plant[10], the main difference is that the Indonesian government developed the early stages of the project. The Paiton I project is part of the Paiton Complex that consists of eight-generation units that will be installed on different phases. Units one and two (2x400 MW) were operating since 1994. The Government of Indonesia (GOI) developed this phase of the project through the state-owned electric company PT. Perusahaan Listrik Negara (PLN). The GOI bided the Paiton I project under a Build-Own-Operate (BOO) scheme and two consortiums bided for the project. Finally the government invited the BMMG[11] consortium to negotiate. On this project there was no necessity to make a lot of preliminary studies. The GOI defined the location,[12] size,[13] and fuel[14] for the project prior to the bid and commitment of the consortium. For the biding, BMMG performed an evaluation of the project's expected revenues and costs based on the information provided by the government, knowledge of coal technology available, and their experience in power plant construction and operation projects[15].

Enron Development Corporation (EDC) is developing the Dabhol project in India. Enron[16] is a large US corporation that manages an important portfolio of projects in

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[10] Yuliyanti, Diana. "Project Finance for Independent Power Producers in Developing Countries: The Paiton I Power Generation Project in Indonesia", Master Thesis, Massachusetts Institute of Technology, 2001

[11] The BMMG consortium was formed by Edison Mission Energy of the US, Mitsui & Co Ltd of Japan, General Electric Corporation of the US, and PT Batu Hitam Perkasa (BHP) of Indonesia.

[12] The project is located 140 km south east of Surabaya, in East Java.

[13] The Paiton I project bided by the government consist of 2x615 MW coal-fired power plant. In addition the bid required the developer to build the switchyard for units five and six, and also perform civil works for units three to six such as the water intake and discharge canals expansion so they can meet the required capacity when the eight units were operating. After construction completion, this "extra" works should be turned over to PLN.

[14] The fuel to be used is coal.

[15] In October 1991, the GOI selected a consortium formed by Intercontinental Electric Incorporated (IEI) of the US and PT Bimantara Bayu Nusa (BBN) of Indonesia and known as BNIE. However, in May 1992, the GOI reconsidered its decision and invited BMMG to negotiations.

[16] Enron's revenues were nearly $9 billion and $453 million in net income in 1994. This corporation diversified its services in the natural gas industry through five major subsidiaries. Enron Operations Corporation (EOC) for building and managing worldwide natural gas transportation, power generation, liquids, and clean fuels facilities. Enron Capital and Trade Resources (ECT) involved in risk management contracts for natural gas for which they managed the largest portfolio, and supply of natural gas for the US generation industry, for which they were the leaders. Enron Oil & Gas (EOG), competing in oil and gas exploration and production. Enron Global Power and Pipelines (EPP) built, managed, and operate natural gas pipelines and power plants in developing countries. Enron Development Corporation (EDC) develops and operates power plant projects in developing countries.

contrast with the sponsor of Quitaracsa, which is a local firm with limited resources and entering into its first project development. Enron and in particular EDC managed a big portfolio of projects and some rationality should have been followed for selecting this project. The country has to be a developing country to follow EDC focus. Within developing countries, they decided on India due to the attractiveness of the market. There was a solid democracy, extensive use of English, and a western-style legal code and contract. EDC selected Maharashtra state because within the country, the Maharashtra State Electricity Board (MSEB) was the strongest and credible buyer for the plant's output. Gas was the fuel selected by EDC because Enron was a global player on the natural gas industry and that was the sector on which they compete[17]. However there was a process for selecting the best gas source. Because there was no reliability on India's gas reserves, EDC decided to use LNG that can be imported from Gulf countries such as Oman, Yemen, and Qatar. LNG is supplied in "trains" each with a capacity of 2.5 million tons. Because there is no spot market for LNG, contract signed with suppliers will force the buyer to acquire the whole train. As a result, the size of the train mandates the size of the power plant. For 2.5 million tons the size of the plant should be around 2,000 MW. LNG facilities needed of special port facilities due to the size of the tanker carrying the fuel. The port of Dabhol in the Ratnagiri district of Maharashtra was selected because of its natural conditions that would avoid expensive dredging. That was the main reason why the project was constructed on the Port of Dabhol.

Private sector is more efficient in delivering, managing, and operating infrastructure projects. Companies competing in the development of infrastructure are finding more efficient ways to do business. Private companies adopt innovative delivery strategies to deliver projects faster and cheaper. In fact, important changes have been occurring in the construction industry in the last decade related to delivery methods. Clients want to pay less for more quality. The four phases of project evaluation are no longer applied in the traditional way. Principally in the private sector, not all the four phases are followed.

[17] Enron's vision, as stated in the 1995 annual report was "to become the world's leading energy company; creating innovative and efficient energy solutions for growing economies and a better environment worldwide."

After analyzing the scope of the project, design and construction can be contracted separated, a design-build company or team can be contracted, or a design-build company or team that includes financing can be hired. There is no right method. The developer will have to choose the method that is tailored to his needs. The advantages that the private sector can achieve by using alternative delivery methods can be[18]:

1. Reduce the duration of projects. This can be achieved in Construction Management, design-build, or design-build-finance contracts. Overlapping design and construction (fast tracking) and/or eliminating bidding time will allow time reduction.
2. More flexibility for changes during construction, without paying a premium for it is a result of having the owner, designer, and contractor working as a team.
3. Designer and contractor will work together as a team, not as competitors.
4. The contractor can participate in the early stages of design, when is easy and cheap to make changes to the project. The total cost can be reduced much more in the design phase rather than during construction. In addition, by combining the designer's expertise with the experience of the contractor in estimating, scheduling, and "real" fieldwork, the result will be the introduction of important savings during the construction phase
5. The contractor is stimulated to save money to the owner because the owner will share part of the savings with him.
6. There is access to new sources of finance.

All these reasons will motivate a private owner to choose and innovative delivery method instead of the typical design-bid-build followed by government agencies. Nevertheless, government agencies are starting to use innovative delivery method in some cases. There are still many regulations that block this strategy, but exceptions are more common on these days. These exceptions are allowing government agencies to use innovative delivery methods.

[18] Gordon, Christopher, "Innovative Delivery Strategies in the Public and Private Sector" class notes, Course 1.432, Massachusetts Institute of Technology, Cambridge 2000.

On the Quitaracsa Hydroelectric Power Plant project, the sponsor packaged the project in two parts. He bided separately the design and construction from the procurement of the equipment. The first package was the design and construction of the civil works. The second package was the design, procurement and installation of the equipment. The advantages and disadvantages of the method chosen would be discussed later. The sponsor's project documents mentioned an EPC[19] delivery method. However, because of the way they packaged the project it was not an EPC project. There was one design-build contract and one supplier and installation contract. Both contracts requested financing. If during the negotiation the sponsor achieves to bundle the designer, contractor, and supplier in one single contract, then this can be called an EPC contract. The operator is not involved when design decisions will be made. The result can be lower design and construction cost but higher operation costs that consequently can reduce the total value of the project.

On the Paiton I project, the government made the early development and bided the project using a BOT delivery method. They used a variant of this method called build-own-operate (BOO.) The developer will have the right to build, own, and operate the plant for a period of 30 years. Fast tracking will reduce time schedule. In addition, having the sponsor, designer, contractor, and operator in the same team should create synergies with a final benefit to all the parties.

On the Dabhol project, EDC was responsible for design, construction, procurement, finance, and operation of the plant for 20 years[20]. EDC was the owner of the plant. The operation period could be extended for 5 or 10 more years. If MSEB decided not to extend the operation contract, then MSEB will have to buy the plant to

[19] EPC is the abbreviation for engineering, procurement, and construction. The EPC method is used on projects where procurement of equipment is an important part of the project such as in power plant. The theory of delivery methods does not recognize EPC as a specific delivery method. However, this name can be found on projects where engineering, construction, and procurement are all significant parts of the project. EPC represent a mix of the Design-Build delivery method with the addition of procurement of equipment.

[20] Twenty years was the length of the initial power purchase agreement.

EDC[21]. According to the previous discussion, the delivery strategy followed was BOOT. In this case the delivery method chosen can allow the same benefits that can be achieved in the Paiton I project.

It is very important how a project is bundle. It is also important to know that the public and private sectors can follow different approaches. Also that within the private sector different strategies can be adopted. However, projects developed by the public or private sector will be affected due to changes on project scope or concealed conditions such as unexpected underground conditions. On an early stage, economic implications of changes are very small. However, once construction is started, changes became more expensive.

It is fundamental that technical and economic implications should be addressed on the early stage of the project. It is during this phase that changes can be made without expensive costs. Once the construction starts, a project is less flexible to modifications; later the changes, more expensive the constructions cost in addition to possible delays. At some point in the construction phase, modifications will not be technically or economically feasible. Figure 2.1 shows how the cost of making changes on a project increase over time. Technical issues will not be addressed on this thesis. Project evaluation techniques can be applied on the different engineering phases. The economic analysis is used to determine which alternative is more valuable. The best alternative from the technical and economic point of view will be chosen.

[21] According to the contractual agreement, if MSEB do not exercise the option to extend the power purchase agreement with EDC, MSEB will have to pay for the plant 50% of the depreciated replacement value of the plant at that time.

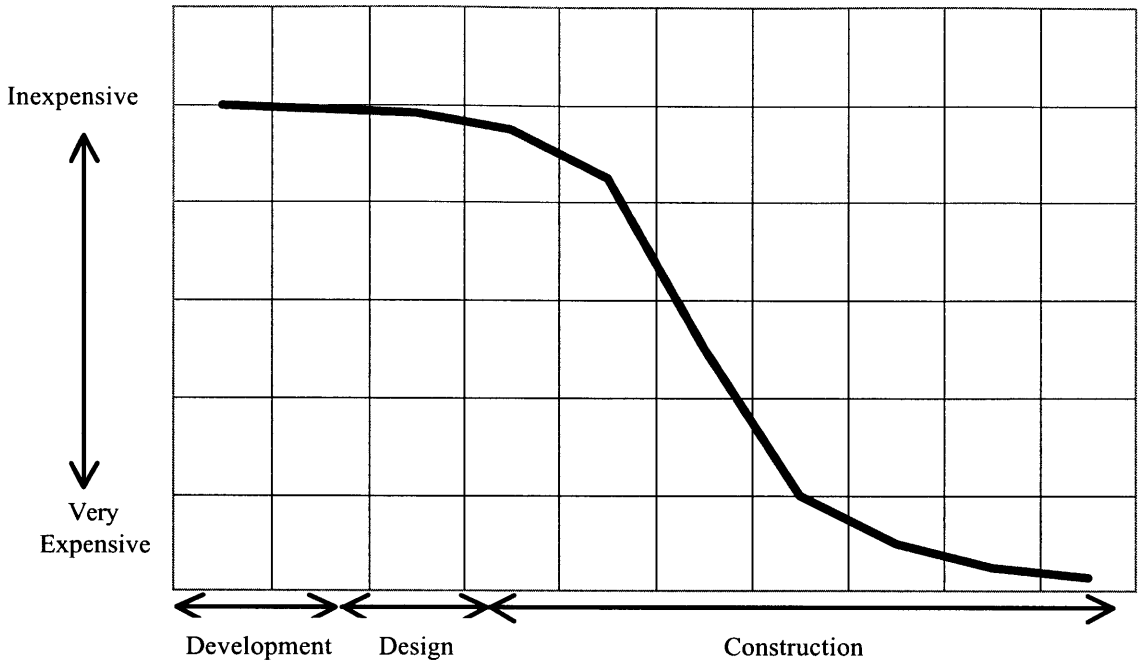

Figure 2.1: Impact of Changes in a Project During the Design and Construction Phase.

2.3 Project Economic Evaluation Tools

As a decision maker we will like to know if the project is worthwhile or to compare it from a list of projects and also know how does the projects rank on that list. The different methodologies to evaluate projects and the their advantages and disadvantages will be presented on this subchapter.

The first step in every economic analysis should be defining the streams of benefits and costs over time. A cash flow for the project will be built and discounted to the appropriate discount rate. Projects with discounted benefits higher than discounted costs are valuable for the company. The evaluation methods to be shown differ on each other because of the approach they follow to evaluate the benefits and costs. These methods are:

1. Net Present Value (NPV)
2. Benefit – Cost Ratio (B/C)
3. Internal Rate of Return (IRR)

4. Cost-Effectiveness
5. Payback Period
6. Benefit-Cost Analysis

All this methods are based on engineering economics. The first three methods are based on discounted cash flows. The next two methods deal with some difficulties that are found when using the first three methods. The last method is used when the decision maker includes in the analysis social benefits and social costs.

When evaluating the benefits and cost, the main assumption is that quantities vary linearly and that consequences are certainly predicted. Consequences are normally valued in terms of money, but in case of Cost-Effectiveness method for example, units are related to an objective. It can be the reduction on pollution achieved by certain environmental policy and the benefits are evaluated in terms of that objective. A description of each method and their advantages and disadvantages will follow[22].

2.3.1 Net Present value

The project revenues or benefits (B) and costs (C) are forecasted and the net cash flow is calculated by subtracting the costs from the revenues. This cash flow is discounted at an appropriate discount rate to calculate the net present value of the project. If the NPV of the discounted cash flow is:

Less than zero → do not accept the project

Equal to zero → Indifferent

More than zero → accept the project

$$NPV = B - C$$

[22] Richard De Neufville, "Applied Systems Analysis", McGraw-Hill, 1990, pp 197-257.
Part 2 of book deals with system evaluation. More detailed information on Comparison Over Time (Chapter 11), Choice of Discount Rate (Chapter 12) and Economic Evaluation (Chapter 13) can be found on this reference.

This methodology can be use to compare projects only when the projects have the same level of investment. The NPV method is not a good method to rank projects especially because projects will barely have the same size or budget. However, NPV give the value on money of a project. For that reason, it is a good method when evaluating quantity of money and optimizing this value.

In the Quitaracsa Hydroelectric Power Plant, the net present value was the method used to determine the optimal layout for the project. Several possibilities for the intake, tunnels, and powerhouse in terms of location, size, and technology were considered. A cash flow analysis was performed for each on of the alternatives. The sponsor adopted the most valuable alternative after comparing each NPV. The best alternative was called "optimal development scheme." The sponsor also calculated the IRR and B / C ratio for the project.

The NPV method was used as a guide to accept or reject the project and to determine the most valuable alternative[23]. Table 2.1 shows the economic parameters used to evaluate the project. Table 2.2 shows the spreadsheet results for the calculation. The NPV, IRR, and B / C parameters were calculated and are shown on Table 2.3[24]. Results of the economic evaluation for the Quitaracsa project will be shown only as an example of the project evaluation techniques and results.

[23] The author had the opportunity to work for a year in the Quitaracsa Hydroelectric Power Plant project. The comments through the thesis are base on the personal experience when working in the project and additional data provided by S & Z.

[24] Several assumptions were made when developing the economic evaluation at this phase. The model considered fixed rates for energy and power. The procedure followed to determine the energy rate was running a simulation program called "Junin" which is used by the Peruvian Energy Tariff Commission (CTE), a government agency. The tariff calculation is based on a 48 month planning horizon. All projects under construction or planed to be constructed are included in the model in addition to the forecasted demand for that period. The calculation is made two times in a year, in May and November. Base on the results an average of the rates were used. This was a conservative procedure because in the early years of operation, the expected energy rates were higher than the average. The cost of O & M was also kept constant through all the years of the analysis.

QUITARACSA HYDROELECTRIC POWER PLANT

Parameters for Economic Evaluation:

Description		
1 Investment	81,820.00	$x10^3$ US $
2 Install Capacity	115	MW
3 Energy	648.9	GWh - year
4 Construction Period	36	months
Construction Cost Distribution		
5 Up front payment	10%	of [1]
6 First year cost	25%	of [1]
7 Second year cost	35%	of [1]
8 Third year cost	30%	of [1]
9 O & M	700	$x10^3$ US $
10 Economic Analysis	25	years
11 Insurance	0.50%	of [1]
12 Energy rate	0.020	US $ / kWh
13 Transmission Losses	1.10%	of energy
14 Other Losses	0.70%	of energy
15 Power rate	65	US $ / kW - year
16 Transmission Losses	1.50%	of power
17 Other Losses	1.00%	of power
18 Power plant factor	0.97	
19 Power recognition	80.7%	
20 Legal Contributions	2.5%	Total Revenue
21 Discount rate	12.0%	

Source: S & Z Consultores Asociados S.A.

Table 2.1: Economic Parameters Quitaracsa I Hydroelectric Power Plant[25].

[25] Recent government decision to build a primary transmission line close to the project area would reduce total investment in around US $ 10 million if the transmission line is built.

C.H. QUITARACSA I (115 MW)

all values in thousand dollars.

Year	COSTS					REVENUES			TOTAL	Discount Factor	PV	NPV
	Investment	O & M	Contributions	Insurance	Total Cost	Energy	Power	Total Revenues				
0	8,182.00				**8,182.00**				(8,182.00)	1.0000	(8,182.00)	(8,182.00)
1	20,455.00	-	-	-	**20,455.00**	-	-	-	(20,455.00)	0.8929	(18,263.39)	(26,445.39)
2	28,637.00	-	-	-	**28,637.00**	-	-	-	(28,637.00)	0.7972	(22,829.24)	(49,274.63)
3	24,546.00	-	-	-	**24,546.00**	-	-	-	(24,546.00)	0.7118	(17,471.36)	(66,745.99)
4		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.6355	10,599.40	(56,146.59)
5		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.5674	9,463.75	(46,682.84)
6		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.5066	8,449.78	(38,233.06)
7		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.4523	7,544.44	(30,688.62)
8		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.4039	6,736.11	(23,952.51)
9		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.3606	6,014.38	(17,938.13)
10		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.3220	5,369.99	(12,568.14)
11		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.2875	4,794.63	(7,773.51)
12		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.2567	4,280.92	(3,492.59)
13		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.2292	3,822.25	329.66
14		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.2046	3,412.72	3,742.38
15		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.1827	3,047.07	6,789.46
16		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.1631	2,720.60	9,510.06
17		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.1456	2,429.11	11,939.17
18		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.1300	2,168.85	14,108.01
19		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.1161	1,936.47	16,044.49
20		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.1037	1,728.99	17,773.48
21		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.0926	1,543.74	19,317.22
22		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.0826	1,378.34	20,695.56
23		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.0738	1,230.66	21,926.22
24		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.0659	1,098.81	23,025.03
25		700.00	456.09	409.10	**1,565.19**	12,361.13	5,882.42	**18,243.55**	16,678.36	0.0588	981.08	24,006.11

Table 2.2: Economic Analysis Quitaracsa I Power Plant

Results	
NPV	$ 24,006,106
IRR	16.9%
B / C	1.32

Table 2.3: Results of Economic Evaluation

2.3.2 Benefit – Cost Ratio (B/C)

The benefit-cost ratio is calculated by dividing the present value of the benefits over the present value of the costs.

$$\text{Benefit / Costs} = \text{B / C}$$

If the B / C ratio is:

Less than one → do not accept the project

Equal to one → Indifferent

More than one → accept the project

The B / C ratio allows evaluating projects of different sizes, permitting a ranking of the projects according to their worthiness. For this reason, this method is more useful when comparing projects, especially projects of different magnitudes. However, a disadvantage of this method is that it favors large-scale projects with heavy investments against projects with high sales or operational costs. In addition, some benefits such as environmental impact, health care, education are difficult to quantify and so have little impact on the analysis.

According to Richard de Neufville, in the United States this method is associated with government proposals to build dams and canals. It is avoided by agencies dealing with irrigations, healthcare, education or similar activities with recurring annual costs, and is apparently never used by businesses.

2.3.3 Internal Rate of Return (IRR)

The Internal Rate of Return is the project rate of return and corresponds to the discount rate that makes the NPV equal to zero. The rate of return expected by the investors is called the hurdle rate (r). If IRR of the project is:

Less than (r) → do not accept the project
Equal to (r) → Indifferent
Greater than (r) → accept the project

Projects can be rank according to their IRR, and the method has the advantage that the evaluation do not depend on the discount rate which is difficult to determine and can be assigned without a technical criteria in some cases.

An important disadvantage of this method is that it can be ambiguous. This ambiguity happens when the projects have important closing costs when decommissioning. The result in the analysis will be two different and positive IRR for the project.

The three discount cash flow methods described above assume certainty on the different variables that can affect the project. However, there is always some degree of uncertainty around the parameter, especially when the period of time for the analysis is long such as on power plant projects. During the construction period, cost overruns or delays can affect the project and its economic viability. In addition, higher that expected costs of operations and lower energy or power rates are examples of changes on the project's variables that can affect its viability. Nevertheless, decision makers rely on sensitivity analysis as a mean to evaluate how the project is affected by variations on some variables.

Calculations during the technical and economic evaluation are based on what is expected to be reality. However, this is only an approximation and there is always the chance that some of the assumptions made finally will not correspond to the real situation. The sensitivity analysis will allow the decision maker to analyze the impact of

changes on the different variables of a project. The sponsor of the Quitaracsa project or the lenders can be concerned with costs overrun during construction or maybe with the possibility that energy rates will decrease over time. They will be interested to know how the project is sensible to those changes. Figure 2.2 shows how the NPV is affected by cost overrun. Figure 2.3 shows how NPV is affected by a reduction on the energy rate. Finally, Figure 2.4 shows a combination of both effects, an increment of 20% in the construction costs with a reduction on the energy rate. From the results, the sponsor was able to evaluate how construction cost overrun and changes on energy rates will affect profitability of the project. The project shows economic strength to variations on those important parameters.

This procedure is always followed when evaluating projects. Cost overruns, delays, or changes in some other conditions can be expected and it is very important to know how the viability of the project is affected. The consequence of the analysis will be implementation of strategies that will reduce fluctuations on project variables. On Chapter 5, different techniques of risk management will be discussed.

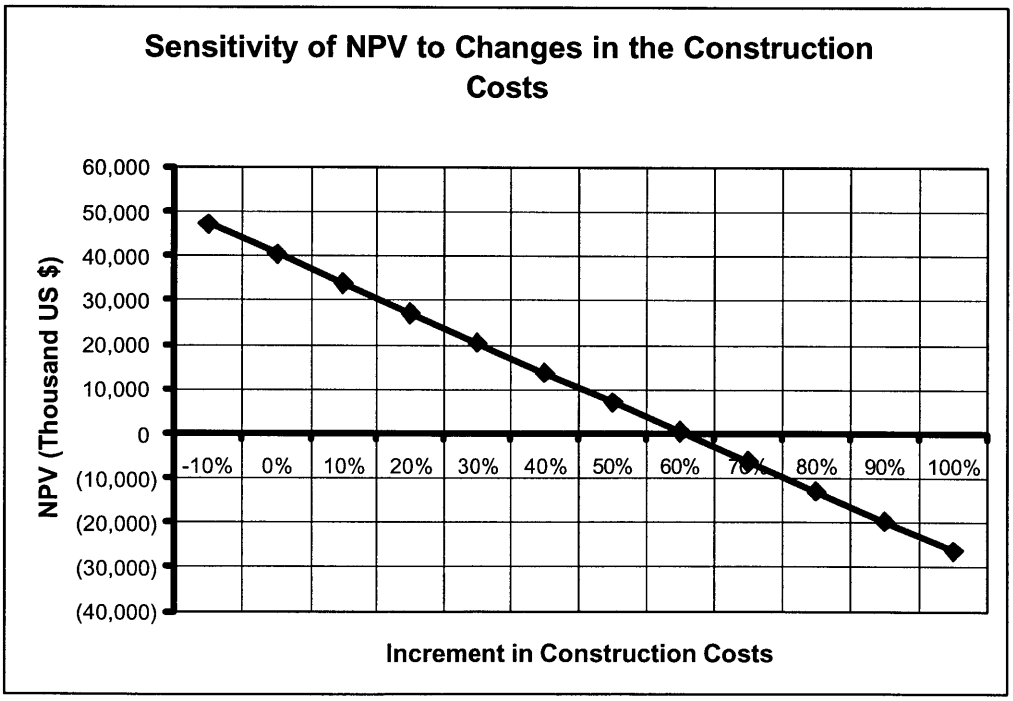

Figure 2.2: Sensitivity of NPV to Changes in the Construction Costs

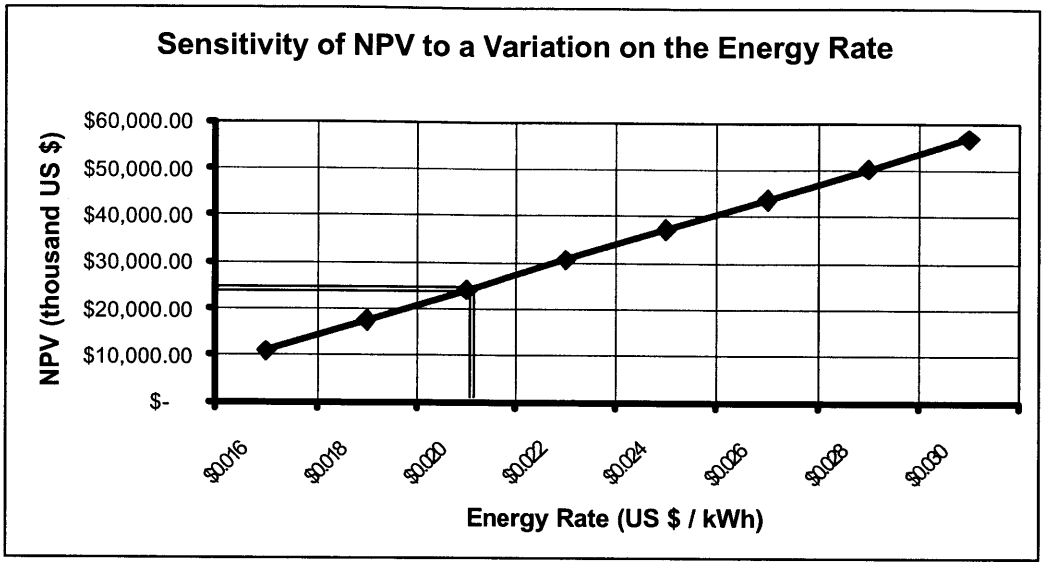

Figure 2.3: Sensitivity of NPV to Variation on the Energy Rate

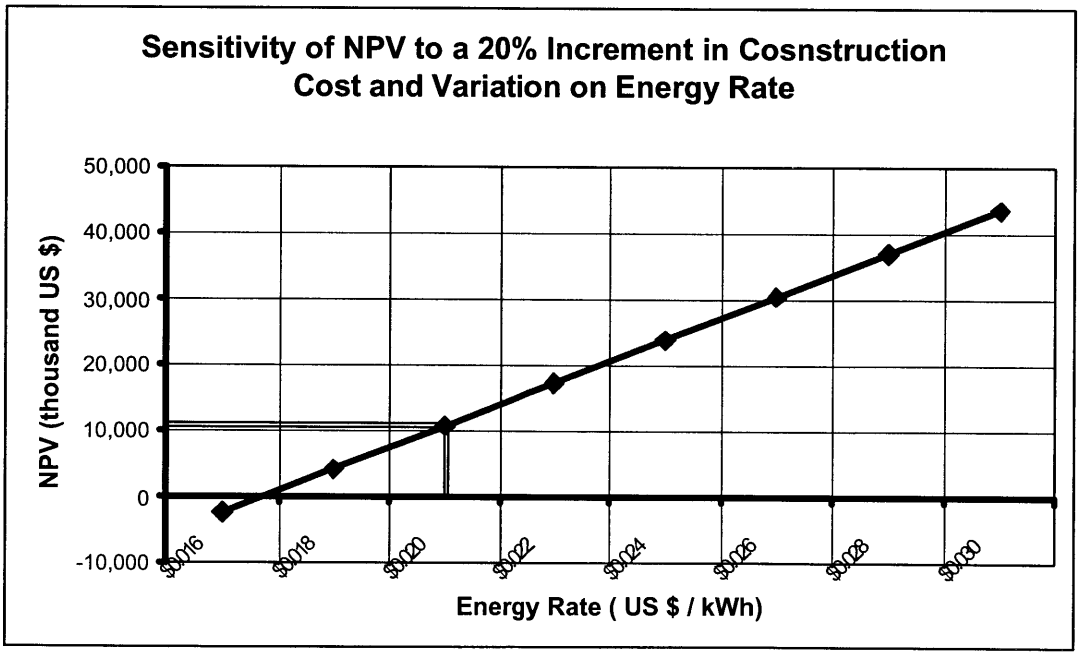

Figure 2.4: Sensitivity of NPV to a 20% Increment on Construction Costs and Variation on Energy Rates.

2.3.4 Cost-Effectiveness Ratio (C/E)

The cost effectiveness ratio is calculated dividing the benefits that are measured in a physical quantity rather than in monetary units.

Cost-Effectiveness = (Units of Benefits) / Cost

An important disadvantage of this method is that it allows the identification of the best design but this identification is valuable only if the project is going to be built. In addition, no minimum standard is define by this method and is not possible to compare projects with it. It is used by government agencies when the services provided do not have a market price. An advantage is that it allows to evaluate benefits such as environmental improves or lives saved, without having to give a monetary value to them.

2.3.5 Payback Period

By using this methodology, the investor wants to know how fast he will recover his investment. This method is mostly used when there is high volatility in the market and a lot of inflation. The investors do not care about long-term cash flow streams; instead they want to recover their investment as soon as possible. The payback period is calculated as the total investment divided by the net cash flow. The decision to invest will depend if the payback period is less than the required payback period.

The advantage of this method is that is very simple and straightforward. No need for a very detailed analysis. The greatest disadvantage of the method is that do not take into account the time value of money. In addition, it does not distinguish projects with different life cycle. The method does not give value to the cash flows that occur after the payback period.

2.3.6 Benefit-Cost Analysis:

This methodology is for the public sector as a profitability analysis is for the private sector. In this type of analysis, the evaluator wants to determine the social benefits and social costs associated with the project. The social benefit of a project is the value of the goods and services provided by that project, whereas the social cost of a project is the value of the goods and services foregone as a result of the project[26]. This method is of interest of government agencies and institutions such as World Bank and would not be analyzed in detail. It is a more complex methodology that would not be used by the private sector and because of that would not be covered on this thesis. Typical examples of Benefit-Cost analysis can include studies on: education programs, health programs, pollution control, housing programs, environmental reform, and disease control.

Infrastructure projects produce social impacts on the project area, region, and sometimes the whole country. Some project may not be feasible or profitable for the private sector, but the social benefit created by the project can largely justify its development by the government. Roads will integrate the country and its production and promote development on several areas. Power plants can promote development on the area or regions were the project is developed[27]. Private sector interest is on the cash flow generated by the project, the regulatory framework, and the risk that can affect the expected return. In the case of a power plant, they would not consider how the project impacts the surrounding areas. Unemployed people can be employed during construction as it happens in many developing countries. The project could impulse development in the area and region. On a local point of view, it can be a new attractive place to visit, promoting tourism. Dams built for hydroelectric projects can be use for recreational purposes. On a regional level, it can promote industrial development if the project is a reliable and less expensive source of energy. But not all the project effects are beneficial. The project can alter the environment. Power plants will create pollution when using fossil fuels or alter natural conditions of a river in the case of a hydroelectric project. Sometimes, hydro project will flood some areas, forcing people to move to other places.

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[26] Anderson, Lee G, Russell F. Settle, "Benefit-Cost Analysis: A practical Guide", Copyright 1977 by D.C. Heath and Company

[27] Will depend on the size of the project and its contribution to the total energy capacity.

An extreme example can be the Three Gorges Project in China, were entire cities would be flooded because of the project.

In all six methods, uncertainty is not a problem. In the first five methods, the costs and benefits will directly depend on the quantities and this dependence has a linear behavior. If there is an increment on the output, then revenues will increase. If there is an increase in operation costs, then costs will increase. In the last method, social costs and benefits are quantified and included on the analysis. When dealing with uncertainty and risk behavior other method should be applied to evaluate projects. In addition, when there is no linearity in the values obtained from certain consequence, then again a different method should be applied. Methods of evaluation dealing with uncertainty are explained in the next chapter.

Table 2.4 describes the hierarchy of the evaluation techniques from the simplest engineering methods to the more complex economics methods. Table 2.5 presents a comparison of criteria for economic evaluation.

		Assumptions Made				Operational Characteristics
Disciplinary Basis	**Evaluation Method**	**Time Value**	**Uncertain consequences**	**Nonlinear values**	**Multiple decision makers**	
Engineering Economy	Benefit-Cost, NPV, IRR	X				Easy Formulas
Operations research	Decision Analysis	X	X			Probabilities inaccurate. Computations easy.
Operations research	Decision Analysis with Utility	X	X	X		Utilities Approximate
Operations research	Real Options	X	X	X		
Economics	Social Cost-Benefit Analysis	X		X		Value data difficult to obtain
Economics	Welfare Analysis	X		X	X	Only general guidelines available

Source: Applied System Analysis; Richard de Neufville; 1990

Table 2.4: Hierarchy of Evaluation Techniques

Criterion	Characteristics				Advantages	Disadvantages
	Reflects Scale	Ranks Easily	Non $ Benefits	Easy of Use		
NPV	NO	NO	NO	OK	Focus on value	Not good for ranking. Difficult concept
B/C	YES	YES	NO	OK	Ranks easily	Bias vs. operations
IRR	NO	YES	NO	LOW	Approximates Rate of Return	Ambiguous solutions
C/E	YES	YES	YES	GOOD	Handles non-monetary benefits	Projects may not compare
Payback Period	YES	YES	NO	HIGH	Simplicity	Inaccuracy

Source: Applied System Analysis; Richard de Neufville; 1990

Table 2.5: Comparison of Criteria for Economic Evaluation

Chapter 3: Project Evaluation Under Uncertainty

3.1 Overview

Uncertainty deals with the issue that some consequences on a project are not known in advance and there is a probability that different results can be presented. In some of these cases, the analysis should include the probability distribution of the different outputs. In other cases, projects with negative NPV should not be rejected because of uncertainty. If the sponsor can wait before making a decision, he will have the opportunity to clarify those uncertainties and make better decisions. As a result, analysis under uncertainty will be more complex and extensive.

3.2 Evaluation Tools

In all the six evaluation methods described on Chapter 2, uncertainty is not a problem. The costs and benefits will directly depend on the quantities and this dependence has a linear behavior. If there is an increment in the output, then revenues will increase linearly. If there is an increase in operation costs, then costs will increase. The evaluator will perform a sensitivity analysis to analyze how changes in different variables, such as rates, demand, cost of raw materials, construction costs, delay, and any other important variable can affect the profitability of a project. When dealing with uncertainty and risk behavior other methods should be used to evaluate projects. In addition, when there is no linearity in the values obtained from certain consequence, then again a different method should be applied. The methods used to deal with project evaluation under uncertainty are:

1. Decision Analysis
2. Utility Functions

3. Options

3.2.1 Decision Analysis

In the methods described on Chapter 2, the consequences or outcomes were certain. Uncertainty on different consequences can be high on some projects and the possible outcomes will depend on particular probability distribution. A way to deal with uncertainty is by using decision analysis. The first real application of decision analysis was on the oil and gas exploration activities. Project evaluation can be very complex and managers should be able to recognize clearly the relation and connection between initial decisions and future decisions[1]. When today's decision may affect future investment decisions then decision analysis can be a useful tool. The idea of using this method is that it will help the evaluator to make better decisions, which means try to achieve the best outcome. In a typical decision analysis evaluation, there are different strategies that can be adopted to continue with a project or maybe abandon it. There is a flow of sequential decisions to be made and there is uncertainty. The NPV for every possible outcome will be calculated first in the future and then back to the present to evaluate which one is the best strategy. A good understanding of the problem and the most important issues that affect the outcome will drive the analysis to a good result. In this type of analysis probabilities are included in the model and risk attitudes can be evaluated too. Risk attitude is more complex and has to deal with subjective parameters.

Quitaracsa I Hydroelectric Power Plant is a good example of a project on which decision analysis methodologies should be applied to get a better understanding of the whole problem. This tool will help the sponsor to understand the whole picture and make decision based on a complete analysis of possibilities. The sponsor evaluated the project following the NPV rule, however, there is uncertainty that suggest that this method is not the one tailored for this project. The NPV rule assumes many uncertainty situations as facts and allows the sponsor to obtain the value and IRR under "ideal" conditions, but

[1] Kaufman Gordon, "Real Option", Decision Analysis class notes, Course 15.065, Massachusetts Institute of Technology, Cambridge 2000.

uncertainty may change the initial assumptions and then the previous analysis will be worthless and can drive the sponsor to make the wrong decision. Some important facts about the uncertainties on the Quitaracsa project will be described and a decision tree will be developed to show how the results can vary for the same project, depending on the method of analysis chosen.

The sponsor of Quitaracsa is waiting the government to grant the concession for power generation since late 1997. This concession is necessary for the sponsor to move forward and obtain financing to start construction. The sponsor has two options, which are sell or not to sell the water rights to Egenor. If they sell the water rights to Egenor, the sponsor predicts that there is a 40% chance that the concession to generate energy will be granted almost immediately, a 40% chance that will be granted in one year, and a 20% chance that will be granted in two years. On the other hand, if the sponsor refuses to sell the water rights, they predict that there is a 10% chance that the concession will be granted almost immediately, a 25% chance that will be granted in one years, a 50% chance that will be granted in two years, and a 15% chance that will never be granted. Chapter 6 includes a description of Quitaracsa I Hydroelectric Power Plant Project and the main issues related to the project. For more detailed information related to the decision that is facing the sponsor about the project, review Chapter 6.

To show how the analysis is performed under this theory, some trees will be built and analyzed. Figure 3.1 shows a very simple tree used to evaluate the uncertainty the company is facing. Figure 3.2 shows the results after rolling back the tree. It was considered a discount rate of 12% and a Right Fee payment of US $10 million in the case the sponsor decided to sell the water rights. Figure 3.3 shows the sensitivity of the decision to the water right fee. The sponsor can decide to sell the water rights or not depending on the compensation they can receive from the water rights. Figure 3.4 shows a more complex tree developed for this project. This tree included some additional uncertainties that are also described on Chapter 6.

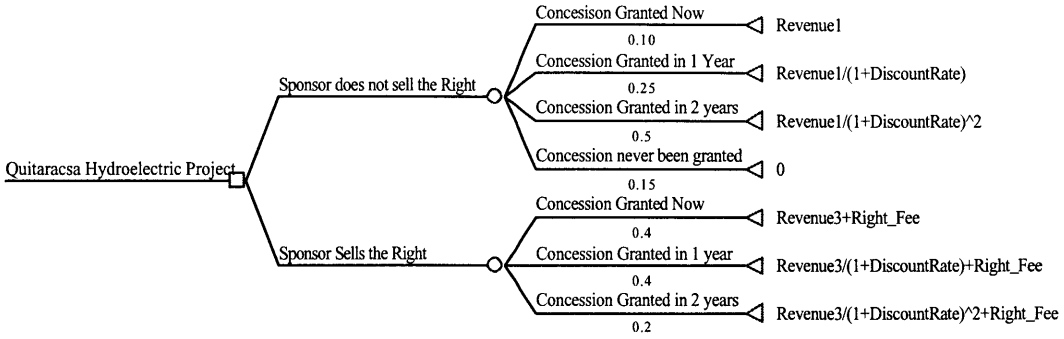

Figure 3.1: Simplified Decision Tree for the Quitaracsa I Project.

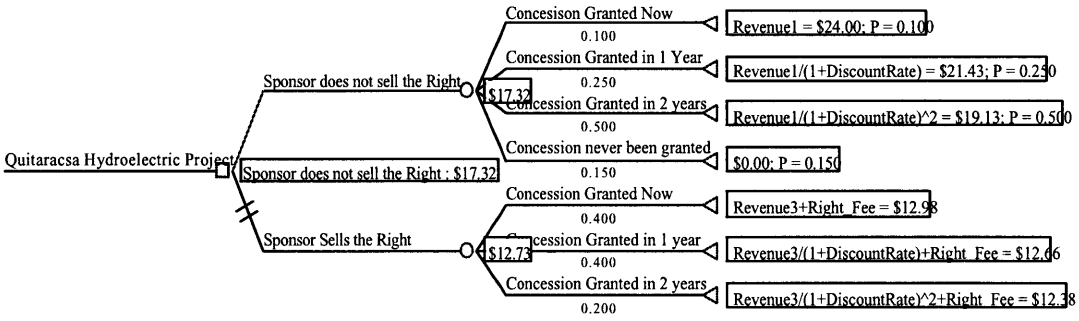

Figure 3.2: Solution for Decision Tree from Figure 3.1.

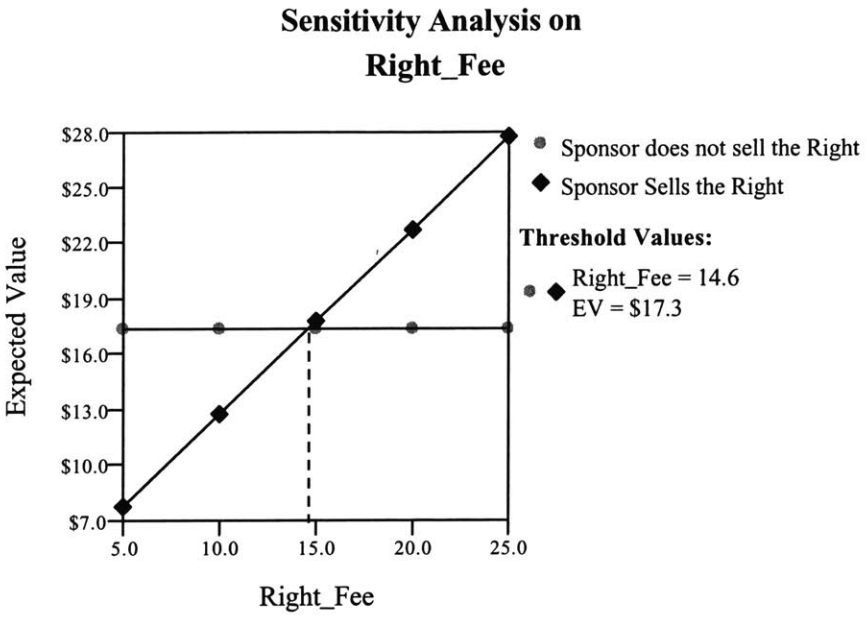

Figure 3.3: Sensitivity Analysis on the Water Right Fee[2].

[2] The Right Fee is the amount of dollars the sponsor should receive to compensate the value he is losing after selling the rights. In the analysis this fee is considered in made only one time and after the water rights are granted. The quantities are in million dollars.

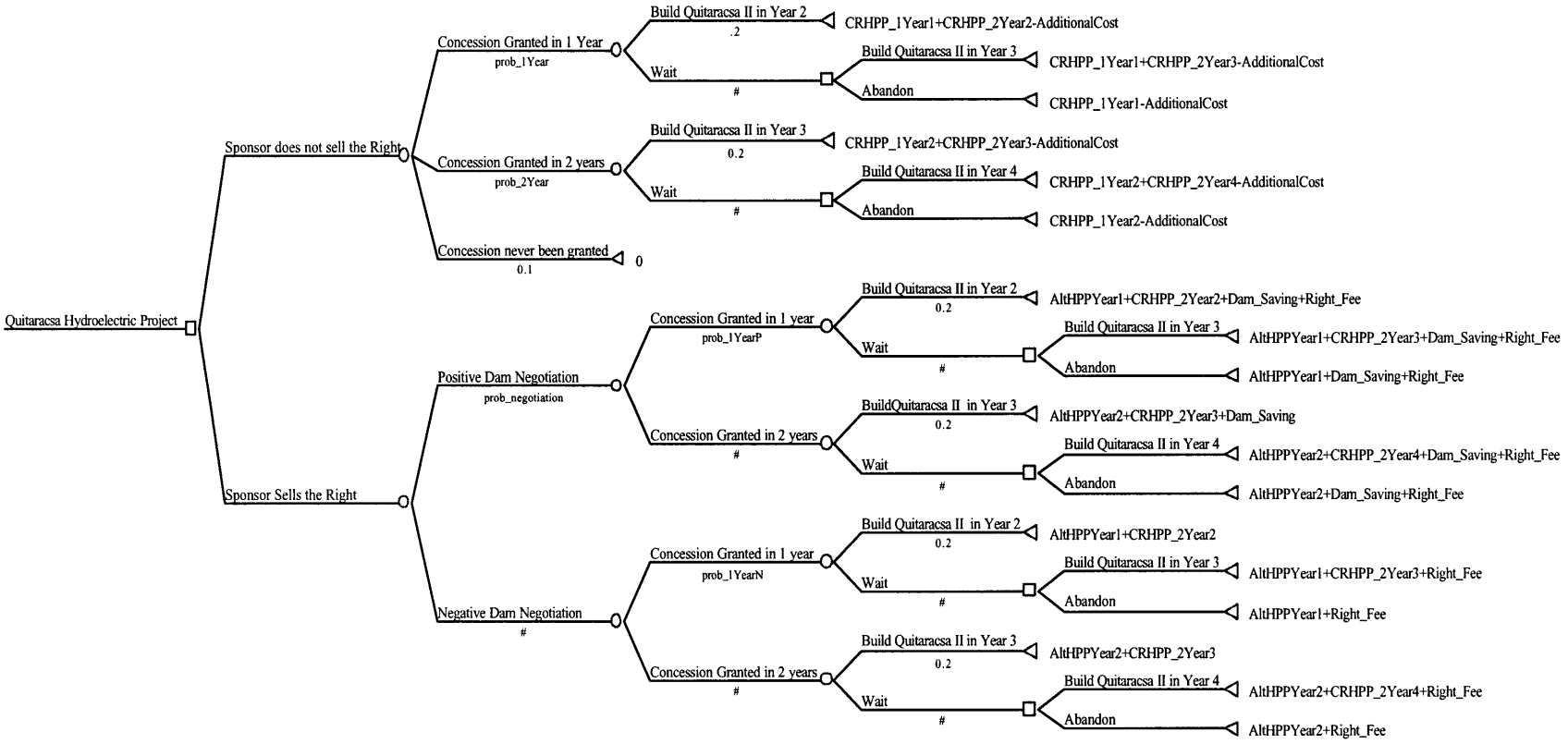

Figure 3.4: More Complex Decision Tree that Includes Some of the Issues that can be Negotiated.

The first obvious observation that can be made is that the value of the project using decision analysis have drop from US $ 24,006,106 to US $ 17,320,000 (US $ 6,686,106), which is a 28% reduction. This reduction in the project value was expected, because of the uncertainties the project is facing. The sponsor can be willing to sell the water rights if they receive a payment of US $ 14.6 million[3]. The concession can be granted now, in one year, two years, or never be granted. The probability distribution on each of those scenarios will affect the value of the project. In addition, those probabilities will change depending if the sponsor sells the water rights or not. Figure 3.4 shows a decision tree that includes some additional facts. The analysis of the actual situation of the project and different outcomes can be much more complicated that the one showed. However, it was important to illustrate how any additional uncertainty with future consequences can be included in the decision tree.

It is important to mention that determining the probabilities is not an easy task. In oil and gas exploration for instance, the probabilities of having success or not on drilling after performing a seismic test can be quantified based on past experience. In some situations such as the one the sponsor of Quitaracsa project is facing, there is no past experience and the manager's keen evaluation of the different possibilities and consequences will play an important role on the analysis.

3.2.2 Utility Functions

From the decision analysis theory, a decision can be divided into three basic components[4]:

1. Alternatives that the decision maker faces; what he can do.
2. Beliefs of the decision maker; what he knows.
3. Preferences of the decision maker; what he wants.

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[3] The decision analysis showed above was prepared by the thesis author to clarify the concepts of how uncertainty can affect a decision and can help to understand, structure, and solve complex problems. It was not made to show what the sponsor of the Quitaracsa project is doing or should be doing. The analysis was simplified to make it clear for the audience, and the data was modified in some extent to keep confidentiality.

[4] Gordon, Kaufman M., "Single Attribute Utility Theory: An Introduction", Decision Analysis class notes, course 15.065, Massachusetts Institute of Technology, Cambridge 2000.

In the decision tree analyzed before, the decision will be based on monetary values, which means that is based on the expected payoff from the project. Using utility functions will allow the model to introduce risk attitudes. Risk attitudes can be divided into people that is risk averse, risk neutral, and risk taker. Utility theory had developed a framework that is based on the concept of a lottery and can allow analytical evaluations even if there are different risk attitudes, with people having non-linear preferences[5]. This is a much more complex theory and its application is not straightforward.

Utility function is a much more complex analysis method and requires specific knowledge on that theory. The method is subjective, with means that different persons can have different decision on the same project based on their risk attitude. Risk attitude have to be determine for every decision maker. It is out of the scope of this thesis to explain the methodology to determine risk attitude and it was not possible to determine if this methodology is used by companies competing in the energy / electric sector. However, due to its complexity it is likely that utility functions is not a methodology commonly use by decision makers in the power sector. Yet it can be applied to energy project, especially because there is a lot of risk involved in this type of projects. Companies competing in the energy sector are by nature risk takers. There is a lot of risk involved on energy projects and these companies are used to deal with risk. Enron entering India, Edison Mission Energy, Mitsui & Co, and General Electric entering Indonesia, oil companies doing exploration on the Amazon or unstable countries are clear examples of having companies doing business in risky conditions.

Some times, risk attitude is not included in the analysis in a formal way but the final decision is affected by risk attitude of the decision maker. The decision maker evaluating the Quitaracsa project have just conclude that the project is worthiest if the sponsor does not sell the water rights. However, there is a 15% chance that the concession will never be granted under this scenario. If the concession is never granted, then the project is worthless for the sponsor. The final decision will be influenced by the risk attitude of the decision maker. If he is risk averse, then the final decision can be to sell the water right or if he is a risk taker, then maybe he will never sell the right and will

[5] To review more of Utility Functions see De Neufville, Richard, "Applied System Analysis" chapters 18 to 20. Kaufman, Gordon M., "Decision Analysis" class notes. Course 15.065, Massachusetts Institute of Technology, Cambridge 2000.

just follow the decision analysis results. The Right Fee calculated above is not an absolute number; it is just a reference for the decision maker. When negotiating the water rights, his final decision will be influenced by the risk attitude.

3.2.3 Real Options[6]

According to Brealy and Myers[7]:

"Real Options allow managers to add value to their firm by acting to amplify good fortune or to mitigate losses."

They identify the following real options in capital investments:

1. The option to make additional investments if the prior investment project succeeds
2. The option to abandon the project
3. The option to wait and learn before investing
4. The option to vary the firm's output or its production method

Real option approach is used when uncertainty is high and there is flexibility to respond to different situations in the future. Important investments can be delay until more information is available. New information available such as market conditions, energy rate trends, or future cash flows will allow managers to decide if it is on their best to invest, abandon, wait, or make changes in production. Real Option overcomes limitations associated with decision analysis approach such as the discount rate to be use when there is no symmetry on project payoffs. Different possibilities considered can involve different levels of risk, and then different discount rates should be use. In short, the real option approach creates value and reduces risk in addition to clarifying both of them.

Options can be used when evaluating power projects. Sometimes the decision maker can be using the "option" approach without knowing it. S & Z first investment on

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[6] To learn more about options and real options see: Samii, Massood V., "A Real Option Approach", Construction Finance reader (Part I, Section Five). Brealey, Richard A., Stewart C. Myers, "Principles of Corporate Finance", (Part 6, Options)

[7] Brealey, Richard A., Stewart C. Myers. "Principles of Corporate Finance"

the Quitaracsa project did not have an economic reward. On a typical project, S&Z would have prepared the study for a state agency or a private company, receiving some payment for the work. The government agency or private company will pay this work and the payment will include the costs plus the expected return for the company. There was no payment on the Quitaracsa project but there was the option to build a power plant if the studies were successful. The sponsor limited its initial investment and committed larger resources after the Quitaracsa project had demonstrated that could be profitable and could be finance under a project finance structure. In addition, S & Z has the option to develop Quitaracsa II, hydroelectric project upstream Quitaracsa I, if it is worthy.

On the Dabhol project, if MSEB do not exercise the option to extend the power purchase agreement with EDC, then MSEB will have to pay for the plant 50% of the depreciated replacement value of the plant at that time.

There are other cases were options can be a valuable tool. Decision makers can sometimes make better decisions when using the option methodology; it is valuable to keep options open when there is volatility and uncertainty. In some projects the option to change from one fuel to another in the future has some value that has to be considered. In Peru, Tractebel from Belgium built a power plant that uses coal as fuel. However, there was the possibility to use the gas from Camisea[8] if the gas-field project was developed. The Power Plant is operating now and is ready to switch from coal to gas if the gas is available at a convenient price. The company made an additional investment that allows them more flexibility and the option to use gas, a cheaper fuel, when available. Options are certainly dependent on uncertainty and time. Uncertainty and time are very important when considering this methodology. A project that is worthless now can be worthwhile if some of the uncertainties are solved or are clarify over time. The same project can be profitable in two years and decision makers have to realize when options have to be considered.

Enron discovered that gas was an option to generate electricity and is applying the option theory to evaluate projects. A standard NPV evaluation will calculate the value of

[8] Information about Camisea can be found on the case study on Chapter 6.

the project by predicting its revenues and expenses and discounting the project at the appropriate discount rate, which will include risk. However, NPV does not allow Enron's manager to react to changes in the assumptions. As a result, Enron's manager realized that it is valuable to invest a small quantity up front, see how things develop, and finally depending on what happens in the future, abandon or move forward with the project. The company is just finishing to build three gas-fired power plants in northern Mississippi and western Tennessee. These plants are very inefficient and generation cost will be 50% to 70% higher than the best in the industry. By choosing that technology they have save important amounts in construction but most of the time they would have the plants shut down because of these high production costs. On June 1999, the price of a Megawatt-hour of electricity in parts of the Midwest briefly climbed from $40 to $7,000. For Enron managers, it is possible to make money even if the plants will only operate a few weeks per year with such volatility. Real option theory gave them flexibility and the possibility to react to new circumstances. The plants in Mississippi and Tennessee are options. The company has the opportunity to produce electricity when prices are high but is not required to do so when prices are low.

Chapter 4: Project Finance

4.1 Overview

Project financing can be set when a particular asset or group or assets can generate enough cash flow, to pay for operating expenses, to pay back the funds raised to built the assets, and to provide an acceptable rate of return to investors. John D. Finnerty[1] defines Project financing as:

> "The raising of funds to finance economically separable capital investment project in which the provider of the funds look primarily to the cash flow from the project as the source of funds to service their loans and provide the return of and a return on their equity invested in the project."

For Scott L. Hoffman[2], project finance is used to refer to:

"A non recourse or limited recourse financing structure in which debt, equity, and credit enhancement are combined for the construction and operation, or the refinancing, of a particular facility in a capital-intensive industry, in which lenders base credit appraisal on the projected revenues from the operation of the facility, rather than the general assets or the credit of the sponsor of the facility, and rely on the assets of the facility, including any revenue-producing contracts and other cash flow generated by the facility, as collateral for debt."

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[1] Finnerty, John D., "Project Financing; Asset-Based Financial Engineering", John Wiley & Sons, Inc, 1996.

[2] Hoffman, Scott L., "The Law and Business of International Project Finance: A Resource for Governments, Sponsors, Lenders, Lawyers, and Project Participants", Kluwer Law International.

From the definition, important characteristics for project financing can be emphasized. Project finance implies collecting funds from different sources to principally build new assets that will generate an expected cash flow. The lenders will only rely on the cash flow of the project as the source to pay back the loans and the assets will serve only as an additional guarantee. The characteristics of project financing can be summarized as:

1. The sponsor creates a Project Company. This is a legal separated entity that owns the project.
2. The project is an independent economic unit that relies on its assets to operate and generate revenues.
3. Debt holders rely entirely on the cash flow generated by the project for debt services.
4. The only additional guarantee debt-holders will have is the assets built for the project.
5. Equity holders rely entirely on the same cash flow to get back their investments.
6. It is a non-recourse or limited recourse financing.

In the case of infrastructure projects, additional characteristics can be identified about project financing:

1. It is appropriate on projects were large investments are needed and where due to complexities and risk, traditional sources are not feasible.
2. Infrastructure projects are monopolies on many cases. In addition, the service or output from those projects can be essential for the country's population. As a result infrastructure projects can create political sensitivity to price changes and are highly exposed to political risk.
3. Infrastructure investments are sunk. The project value came from the cash flow from operation, not from the assets that were built. There is very little value if the project is abandon; the assets can be hardly redeployed. A sponsor developing a toll road, power plant, or water plant will recover its investment by operating the facility in a long period of time.

Non-recourse financing means that the lenders depend only on the cash flow of the project to get paid their loans. There is no recourse to the sponsor's assets that are non-project assets. In case of a project failure, the lender could not use the sponsor's assets to recover his lost. In addition, there is no obligation of the sponsor to pay back the debt. The lender can only recover losses through the sponsor equity in the project and the project assets. However, in most cases there is some responsibility and additional commitment from the sponsor. Depending on the risk of the project and the willingness of the financial markets to assume risk, sponsors can have limited obligations in order to achieve financial closure especially during the construction period. One mechanism use in this case is that sponsors will have to guarantee additional equity in case certain risk occur. This case of financing is known as limited-recourse financing[3]. Contrasting with project finance non-recourse or limited recourse financing is corporate financing.

On the Paiton I project, the sponsors were required to commit additional equity in case of cost overrun. The amount of equity fund to be utilized in case of costs overrun was US $ 175 million. In addition, commercial lenders provided a contingent standby facility of US $ 93,750,000 million, of which 75% was available after the entire equity fund was utilized.

Corporate finance differ form project finance on several aspects. First, the assets of the corporation are recourse to the debt holders. In case of default, debt holders can claim not only the assets of a specific investment were debt was used but also all other assets. The lenders will rely on the company balance sheet, the assets of the corporation and the revenues as a collateral to guarantee debt service. Second, the corporation will rely on internal funds or short-term debt to finance a project. They can access financial resources quicker than a SPC and can avoid capital markets scrutiny of the project by using internal funds. Once the project is operating, they will rely on different strategies to finance the project such as issuing new equity, or use debt. Third, managers can decide how to use free cash flow from the project. Sometimes these decisions are not made according to capital markets dynamics and shareholders can lose value due to managers'

[33] Hoffman, Scott L., "The Law and Business of International Project Finance: A Resource for Governments, Sponsors, Lenders, Lawyers, and Project Participants", Kluwer Law International.

decisions. In project financing, managers will have limited ability to use the cash flow. Contracts will force them to service debt and after that the remaining funds allocated to equity holders. Forth, leverage level for the company will depend on the industry they are competing. Normally the leverage level will depend on the cost of financial distress. This cost of financing distress is much higher compared to project financing. A firm highly leveraged incurring on financial distress can reject project that are beneficial for the company but not for the shareholders as it is demonstrated on the following example:[4]

Company XYZ's assets value:

State	Probability	Assets
Good	½	100
Bad	½	10

XYZ can invest in a project:

Today: Investment requirement $15 million.

Next Year: Safe return $22 million

NPV (for 10% discount rate) = -15 + 22/1.1 = $5 million

XYZ has debt with face value $35 million due next year.

With Out the Project				
State	**Probability**	**Assets**	**Lenders**	**Shareholders**
Good	½	100	35	65
Bad	½	10	10	0

With the Project				
State	**Probability**	**Assets**	**Lenders**	**Shareholders**
Good	½	100+22=122	35	65+22=87
Bad	½	10+22=32	10+22=32	0

[4] Scharfstein, David, "Capital Structure" Finance Theory II Notes, Course 15.402 Sloan School of Management, MIT, 2001. pp 45-46

The project is good for the company, however, shareholders will not fund it because the NPV for them is: -15 + [(1/2)*22 + (1/2)*0] / 1.1 = -$5 million.

Companies can face difficulties in financing projects when they are on financial distress. Figure 4.1 shows the difference in arranging loans and equity financing between project and corporate financing.

In a project financing deal, the lenders will lend money to the project through the Project Company. The equity investors and sponsors will contribute with funds also to the Project Company. Lenders and equity investors rely solely on the project cash flow, the first ones as a mean to service debt payments and the second ones to get an expected return on their investment. There is significant risk involved in this type of financing and contracts are used to allocate the risk.

The contract is a legal tool used as framework to define the scope and responsibilities of every party involved in the project in addition to allocating the risk. The relations between parties participating in project finance are governed by contracts that also serve as a parallel security to the lenders. Due to complexity and necessity of risk allocation using contractual arrangements, project financing is very lawyer intensive.

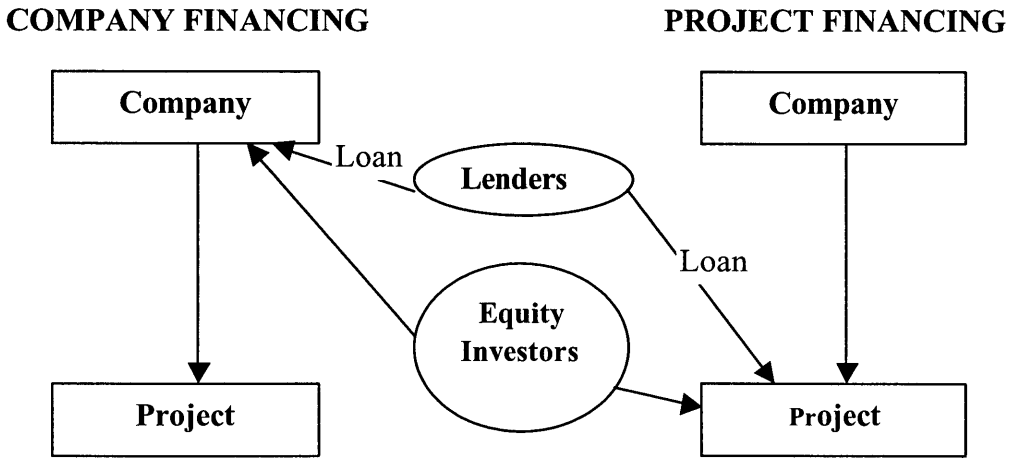

Figure 4.1: Company vs. Project Financing Structure.[5]

[5] Samii, Massood V., "Introduction to Project Finance", Construction Finance Reader (Part I), Course 1.45 Massachusetts Institute of Technology, Cambridge 1999.

Project financing is not a new method to fund projects. In fact, in 1299, a contract signed between the English Crown and an Italian Merchant Bank allows the bank to exploit the Devon Silver mines for one year. The English Crown needed funds to develop the mine and signed a one-year lease contract with the Italian bank, the lender, that was allowed to extract as much ore as it could during one year and should pay all the operational costs. Another case was the construction of the Suez Channel that was started in 1859 by Ferdinand de Lesseps after the Egyptian ruler granted the "concession." Sixteen year later, the project was operating. The Project company organized by Lesseps offered shares in 18 countries. He made the stocks of the company small enough that mid to low-income people were able to invest in the project. Recent examples for project financing can be the US $16 billion Euro tunnel project, that connects France and England, or the US $2.5 billions invested in the Paiton Power Plant in Indonesia.

In the last 10 years, important changes have been happening on infrastructure development. Private participation and financing of infrastructure projects is growing fast due to privatizations of state-owned infrastructure assets, changes on legislations that promote private investments and commitment showed by governments to private participation, and globalization of the world economies. Governments' ownership and operation of infrastructure projects have demonstrated in many cases inefficiencies, higher construction and operation costs, and political use of state-owned facilities. These inefficiencies were finally reflected on the rates and on customer service. In addition, developing countries' lack of resources to develop infrastructure and the high needs of it (i.e. water, energy, roads, telecommunications) have pressured the governments to look for creative ways to attract private investors to develop infrastructure. As a result, these countries should invest largest percentages of their growth domestic product (GDP) on infrastructure if they want to sustain their growth and improve the quality of life on their countries. However, governments would not be able to provide the magnitude of investment needed for infrastructure development. Developing countries are looking for alternative sources of funds to finance their infrastructure needs. The average investment on infrastructure projects from developing countries ranges between 8% and 16% of their

GDP[6]. Developed and developing countries use of project finance to privatize, build, and operate infrastructure projects is growing.

Private Capital flows to developing countries and economies in transition have increased 5 times in the period 1990 to 1997 from US $ 44 to US $ 244 billion, representing forth fifth of the total of the total capital flow in 1997. However, only 15% of total investment is allocated on infrastructure projects. According to World Bank projections for 1995-2004 on the East Asian countries, the required investment for infrastructure amounts for US$1.5 trillion, with the power sector accounting for one third of the amount.[7]

One strategy that many governments are adopting as a mean to develop infrastructure is through promoting competitions, private entry and foreign investments. According to studies on economic development, there is a direct relationship between infrastructure investments and an increase of the GDP. From IFC's experience, the cost of not supplying enough energy on India, Pakistan, and Colombia accrued for 1-2 percent reduction on their GDP[8]. Infrastructure development by the private sector is growing due to improvements in country regulations, privatization, contractual methods, infrastructure needs in developing countries, innovative delivery strategies, funds availability in financial markets, and some other reasons that have generated changes in the project-finance development environment.

One of the key aspects of a successful project finance structure is risk management. There is extensive literature on this field and on Chapter Five the thesis will describe the major issues related to risk management. In addition, an analysis on three power plant projects located in India, Indonesia, and Peru will be made. The project in India is the Dabhol Power Plant, a planned 2,015 MW gas fueled plant to be developed by Enron Corporation in two phases. The first phase with a capacity of 695 MW and the second phase with a capacity of 1320 MW. However, the project was cancelled during the first phase and after negotiations between Enron and the Maharashtra State Government some changes were made. The first phase on the project will be increased to

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[6] Engineering News Records (ENR), "World Market Overview Introduction: A $3.2 Trillion World Market", November 30 / December 7 1998, pp 36-65.
[7] The World Bank, "Infrastructure Development in East Asia and Pacific: Towards a New Public-Private Partnership", Washington D.C., 1996.
[8] IFC, "Financing Private Infrastructure. Lessons From Experience 4", Washington D.C., 1996 Pp. 43.

740 MW and the second phase to 1480 MW. On Chapters five this issues will be discussed more in detail. The Paiton I Power Plant Project in Indonesia is a 1,230 MW coal-fired power plant and part of the Paiton Power Complex. The third project to be considered is the Quitaracsa I Hydroelectric Power Plant in Peru, a 115 MW plant that uses the water of the Quitaracsa River to produce energy. Table 4.1 shows main characteristics of the three projects that are going to be analyzed within the thesis.

Project	Location	Capacity (MW)	Fuel	Investment[9] Million US $	Debt/Equity
Dabhol	India				
Before Cancellation					
Phase I		695	Distilled Oil	922	69.7 / 30.3
Phase II[10]		1320	LNG	1,878	[11]
After Negotiations					
Phase I		740	Naphtha	1,078[12]	
Phase II		1480	LNG	1,870	24.4 / 75.6
Paiton I	Indonesia	1230[13]	Coal	2,500	72.8 / 27.2
Quitaracsa I	Peru	115	Water	118[14]	70 / 30[15]

Table 4.1: Data on Three Projects Under Analysis

Project financing is very complex, and not only all the risk related to the different phases of a project made this type of deals very complex. There are several parties that

[9] Includes all financial fees but not contingencies in case of cost overrun during construction. The Paiton I project has a 300 million contingency fund to be use in case of cost overruns. The Quitaracsa I project has considered 8.4 million on contingencies. The final project cost to be considered in the financial analysis of the Quitaracsa I project will depend on the contractor and supplier price.

[10] Before the project was negotiated, MSEB had the option to commit phase of the project or not. After the negotiations, MSEB was forced to commit to buy the project's second phase output.

[11] The sponsor was building phase I, so no work was started for phase II. In addition, the second phase was supposed to be built depending on MSEB decision.

[12] Different sources provide different costs for Phase I. Further analysis on costs will be made on Chapter 5.

[13] The Paiton Complex will consist of eight-generation units. The Paiton I Project consist of units seven and eight (2x615 MW.) Units one and two (2x400 MW) are already in place and operating. The project was developed and owned by PT. Perusahaan Listrik Negara (PLN) the Indonesian state-own electric company. Units three and four (2x400 MW) and five and six (2x615 MW) should be developed by the private sector.

[14] Estimate made based on data provided by S & Z.

[15] Debt to Equity ratio recommended by financial advisors of S & Z

will interact during the period they commit to a specific financing deal. Risk will have to be share by them. Convenient contractual arrangements will have to be prepared specifying this sharing of risk. Risk should be assumed by the party that is better able to bear it. The different participant on a project finance deal will be described and their role on the project will be analyzed. These participants are:

1. Sponsor
2. Government
3. Lenders
4. Design and Construction firms
5. Operator
6. Suppliers
7. Output Purchaser
8. Other Governments
9. Other Equity Contributors
10. Technology Owner
11. Insurance
12. External Consultants
13. Multilateral and Bilateral Agencies

Project financing is not only related to infrastructure projects. It is very common to think on this type of projects when talking about project financing. However, there are other areas such as project financing for manufacturing facilities on which this financing technique is starting to develop. Sponsors are building industrial facilities that will perform as independent economic units according to the definition of project financing. The lenders will look firstly to the cash flow as a guarantee to recover their investment. This case of project financing will not be cover on this thesis.

Project financing has been growing rapidly the last ten years and there are several factors that have impulse this type of financing as it was explained before. Companies interested in developing a project under a project finance structure will have to evaluate the advantages and disadvantages of project financing. This Chapter will also discuss

advantages and disadvantages of choosing project finance structure to fund the Power Projects in India, Indonesia, and Peru.

4.2 Project Finance Participants

Project financing involves many different parties interacting in a very complex and sometimes uncertain environment. Risk management deals with the complexity and uncertainty on this type of financing structure and is the mechanism used by the several participants involved in a project. Risk management strategies are followed to make sure that the project will remain viable throughout the participant's commitment period. These participants that can play an important role on a project finance structure and are the following[16]:

4.2.1 Sponsors:

Entrepreneur, company or group of companies that have a special interest in the project such as developers, design firms, construction firms, suppliers, or users. They will constitute a Single Purpose Company[17] (SPC) that will be responsible to build and operate the facility. By using this strategy, the sponsor's risk in the project is restricted only to their investment on the Single Purpose Company. There is no legal responsibility for the sponsor's parent company if there is any problem with the project. The sponsor is not the SPC but is an equity holder of it.

The sponsor is a key component in a project finance deal. Reputation, strong track record, and corporate and financial data audited are some of the issues that will provide comfort to lenders about sponsors and that the project can be worthwhile. Lack of this characteristics, such as in the case of local sponsors in developing countries can make the financial closing much more difficult. Table 4.2 describes the sponsors of the three

[16] Hoffman, Scott L., "The Law and Business of International Project Finance: A Resource for Governments, Sponsors, Lenders, Lawyers, and Project Participants", Kluwer Law International.
[17] The Single Purpose Company is an independent legal entity.

projects under analysis, their equity contribution, and some comments about their expertise and capabilities.

Project	Capacity (MW)	Fuel	Sponsor[18]	Comments
Dabhol				
Before Cancellation			Enron (80%)[19] Bechtel (10%) GE (10%)	Well-known players in the sector with strong technical and financial reputation
Phase I	695	Distilled Oi[20]l		
Phase II[21]	1320	LNG		
After Negotiations				Well-known players in the sector with strong technical and financial reputation
Phase I	740	Naphtha	Enron (50%) MSEB (30%) Bechtel (10%) GE (10%)	
Phase II[22]	1480	LNG	Enron (80%) Bechtel (10%) GE (10%)	
Paiton I	2,050	Coal	Mission (40%) Mitsui (32.5%) GECC (12.5%) BHP (15%)	Well-known players in the sector with strong technical and financial reputation. In addition, the team included a local firm with political connections and country knowledge.
Quitaracsa I	115	Water	S & Z (40%[23]) Investor 1 Investor 2	Strong local reputation but lack of financial strength. Is looking for at least one investor that will bring additional expertise, equity, financial resources, and financial strength.

Table 4.2: Sponsors

[18] The percentages reflect the equity contribution and equity holding of the each company. However, in the Quitaracsa I project, the sponsor is willing to hold 40% of equity without having to contribute 40% of the equity.

[19] On February 1993, Enron considered giving 10% permanent equity to MSEB

[20] Switch to LNG on the phase II. Phases I and II were supposed to burn LNG.

[21] Before the project was negotiated, MSEB had the option to commit to the second phase of the project or not. After the negotiations, MSEB was forced to commit to buy the project's second phase output.

[22] MSEB has the option to acquire 30% of the 80% Enron's shares on the second phase of the project. The source of this information was a press release from Enron (May 1999.) Http://www.enron.com

[23] Expected equity

The sponsor benefits on using project financing are describes on subchapter 4.3 and are the main reason why the project finance approach is chosen. This reasons can be summarized as: non-recourse or limiting recourse financing; off-balance sheet accounting; increase leverage without affecting debt capacity of sponsor; avoid covenants restrictions; risk sharing; strong interest of lenders to keep the project operating rather than closing it.

4.2.2 Governments:

It is a very important participant within the life cycle of the project, and its commitment to private participation on infrastructure projects is fundamental. To attract private investors, governments will need:

1. Good policies in place
2. Macroeconomic stability
3. Predictable legal and regulatory frameworks
4. Adequate tariffs and independent regulatory agencies in case there is no possibility to establish market competition.
5. Supply of resources required for operation of the project

Government role on infrastructure development varies depending on the sector and on country risk. They will issue permits, grant the concession, and approve projects to be developed by the private sector. Depending on the sector[24], risk perceived by investors, and necessity to build the project, governments will support the project on different levels. This support can be in the form of guarantees, as a buyer of the project output, and some times as equity holder and helping the SPC to rise funds on the international markets.

Guarantees are provided by the government to make some project attractive to the private sector and can be direct or indirect. Direct guarantees are those issued to reduce certain risks that the government is on a better position to control and mitigate. Through the guarantee, the sponsor will recover the losses in case the event under government

[24] Power, oil, gas, telecommunications, water, roads, etc

control happens. Some governments will issue guarantees also in cases where the private sector is in better position to manage that risk. This happens because of the needs of private investment and the bargaining power of investors at that time. However, it also happens that once the project uncertainties disappear, then government tend to renegotiate the contracts because the uncertainty no longer exist; there is no longer bargain power from the private company.

Direct guarantees provided by the government can be in the form of take or/and pay contracts on the power sector. The public utility will commit to buy the project's output. However, the creditworthiness of the utility will not guarantee payments to the SPC and there is risk of default. The government will guarantee the payments to the SPC. In toll road projects, the government can guarantee a certain level of demand for the new project. Figure 4.2 shows how the direct government guarantee works.

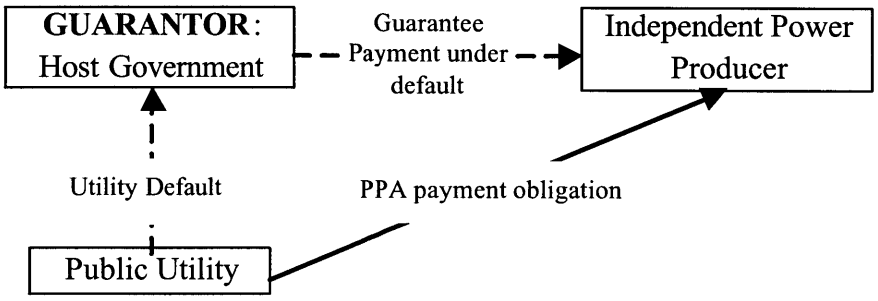

Figure 4.2: Direct Host Government Guarantee[25]

Sometimes risk bearing is not explicit in contracts and laws but the government will cover it as if there was a direct guarantee in place. In the case of the Mexican toll road privatization, the project companies were not able to serve debt to local commercial banks that were owned by the government. Debt default occurred because traffic on the roads was much less than the forecasted. As a result the revenues were not enough to service debt. The government did not assumed the demand risk, but finally they bailed it.

[25] Yuliyanti, Diana "Project Finance for Independent Power Producers in Developing Countries: The Paiton I Power Project in Indonesia." Cambridge, Massachusetts Institute of Technology, February 2001. (pp 41)

It was argued that the banks expected the bail out and because of this situation the final effect was similar to a government guarantee[26].

Some of the project risks, such as political risk, may not be possibly mitigated using private insurance companies. However, sponsor can rely on multilateral and bilateral agencies that provide insurance not acceptable to private insurers. Multilateral agencies such as the World Bank Group provide political risk insurance to foreign investment in developing countries. This insurance is only available for countries that are members of the agency. The five separate but affiliated organizations that compose the World Bank Group are:

1. International Bank for Reconstruction and Development (IBRD)
2. International Development Association (IDA)
3. International Finance Corporation (IFC)
4. Multilateral Investment Guarantee Agency (MIGA)
5. International Center for the Settlement of Investment Disputes (ICSID)

Bilateral agencies are created by particular nations to promote international investments of the companies where the agency is created. Countries will sign bilateral treaties and bilateral agencies, based on those treaties will be able to promote investments on projects. Figure 4.3 shows how the indirect host government guarantee mechanism works.

[26] World Bank Latin American and Caribbean Studies, "Dealing with Public Risk in Private Infrastructure", The International Bank for Reconstruction and Development / The World Bank, Washington D.C. 1997.

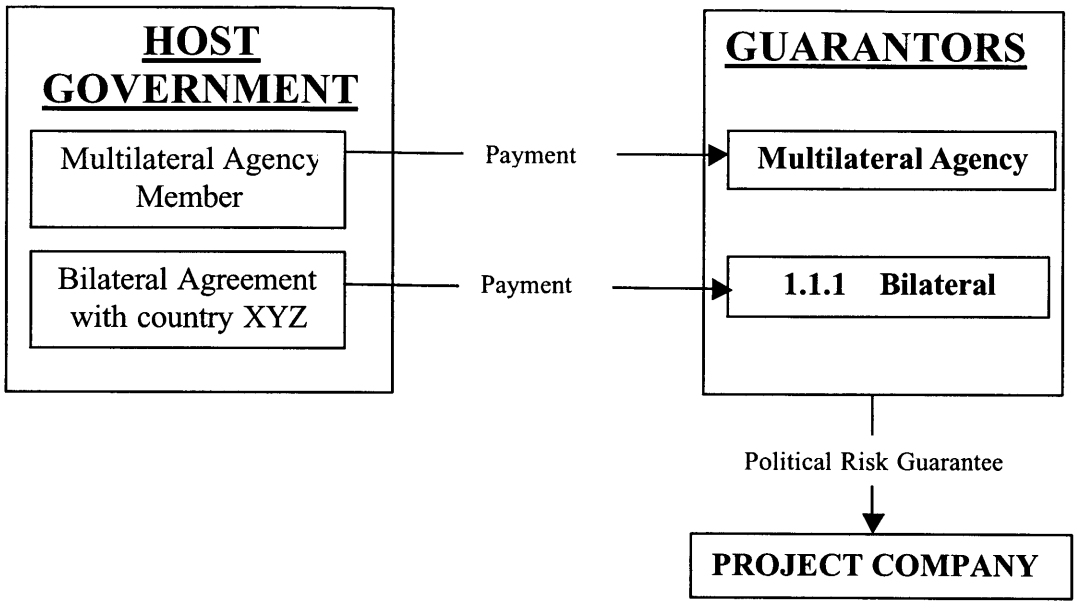

Figure 4.3: Indirect Host Government Guarantee[27]

From IFC's experience[28] projects where transactions were transparent and governments used experienced and impartial advisors had a better chance to meet all parties' expectations. Transparent transactions involve clarity, predictability, and competitiveness. There is clarity on a transaction when the government uses clear procedures to select the team in charge of building and operating the facility. Predictability is achieved when there is certainty on how the government will behave on previous commitments such as tariff adjustments or meeting fuel supply. The last important characteristic of a transparent transaction is competitiveness, which means that the project has to be able to compete with other projects in the long run. The projects should be open to the public and have to demonstrate that are really competitive.

However, not in all projects and countries, recommended procedures such as competitive biding can be applied. In some risky countries, first mover is bearing higher risk when entering a project finance deal. This higher risk means that first mover will

[27] Yuliyanti, Diana, "Project Finance for Independent Power Producers in Developing Countries: The Paiton I Power Project in Indonesia." Cambridge, Massachusetts Institute of Technology, February 2001. (pp40)

[28] International Finance Corporation. "Financing Private Infrastructure; Lessons of Experience 4", Washington D.C. 1996, pp 4.

expect a premium. In other cases the urgency of the project or its small scale will force direct negotiation between the government and the sponsor.

Government commitment is a key aspect in project finance success. From IFC's experience, risky or poor countries can finance private infrastructure development due to political commitment and successful risk management. Table 4.3 shows if there was macroeconomic stability on India, Indonesia, and Peru. In addition it shows if the governments provided direct or indirect guarantees to the sponsor and also if the government was a supplier of fuel for the projects' operations.

Country	Location	Macroeconomic Stability	Host Government Guarantee		Supplier[29] For Operations
			Direct	Indirect	
India	Asia	Yes	Yes	Yes	No[30]
Indonesia	Asia	Yes	Yes	Yes	Yes
Peru	Latin America	Yes	No	No[31]	No

Table 4.3: Government Guarantee and Macroeconomic Stability

4.2.3 Lenders:

The lenders can be a wide variety of entities that are willing to borrow money to the project under specific contractual arrangements. Due to uncertainties during construction, lenders are reluctant to commit long-term investments on this phase. Because of the risk involved, short-term debt is arranged with "construction lenders." Once the project is built and starting operations, short-term debt will be refinanced into

[29] The host government supplies the fuel to be used by the project.
[30] Before cancellation, phase I was supposed to burn distilled fuel supplied locally but one phase II was ready, both phases were supposed to burn LNG. After negotiations, DPC agreed to burn naphtha supplied locally instead of distilled fuel. There would not be swtch from naphtha to LNG once phase II is ready.
[31] There is no financial closing on this project. In fact, there is nothing clear about financing. The sponsor is waiting the concession to restart conversations with potential investors. In addition, the sponsors had not approached multilateral or bilateral agencies to provide guarantees on the project. But the sponsor will need at least one year to achieve financial closure once the project's concession is granted by the government and there is always the chance that the sponsors will turn to agencies such as MIGA to get political risk insurance for the project company.

long-term debt by "permanent lenders." Lenders will use contractual security arrangements as a mean to manage and reduce risk exposure. These contractual arrangements would not be the same for every project. In fact, they will depend on several factors such as risk, profitability, and financial strength of the parties involved. Contracts will assure that lenders get paid after O&M costs are covered.

4.2.3.1 Construction Lender:

They will commit funds on a short-term basis expecting a premium on interest rates. Design and construction phase is very risky for lenders. In fact, lenders rely on cash flow generated form the assets that were designed and are being constructed. If the assets are not in place on budget, on time, and operating according to specifications, then debt service can be uncertain. On the first two cases, project cost will increase. On the second case, revenue income will delay. In case the plant is not operating according to specifications, revenue streams will be lower than expected. There are several mechanisms to manage risk within these phases and will be discussed when describing the project phases.

4.2.3.2 Permanent Lender:

This type of lender will have to arrange for enough funds during the construction and start-up phase of the project. Permanent lenders will expect as less risk as possible. These lenders will commit fund for a long-term period. On average, maturity of project finance loans is close to 20 years[32]. These lenders face several risks that will be discussed when describing the project phases. Table 4.4 shows the lenders and their monetary contribution to the projects.

[32] Deep Akash, "A firm foundation for project finance", Privatization, Finance, and the Regulation of Public Infrastructure class reader (Course BGP-256, package sequence #3), John F. Kennedy School of Government, Harvard University, Cambridge 2001

Project	Total Investment Million US $	Lender	Contribution Million US $	% of Debt
Dabhol				
Before Cancellation				
Phase I	922	Bank of America	150	23.3%
		Overseas Private Investment Corp (OPIC)	100	15.6%
		Industrial Development Bank of India[33]	95	14.8%
		Export-Import Bank (USA)	298	46.3%
		TOTAL	**643**	**100%**
After Negotiation				
Phase II[34]	1,870	Indian Financial Institutions[35]	333	23.6%
		Commercial banks 1[36]	497	35.2%
		OPIC	60	4.2%
		Japanese Export Credit Agency	258	18.3%
		Commercial Banks 2[37]	175	12.4%
		Commercial Banks 3[38]	90.8	6.4%
		TOTAL	**1414**	**100%**
Paiton I	2,500			
		Export Import Bank (Japan)	900	
		Export Import Bank (USA)	540	
		Overseas Private Investment Corp.	200	
		Bond Financing (Rule 144A)	180	

[33] and other Indian Financial Institutions

[34] The debt financing information data was obtained from Enron's web page; press release 1999. http://www4.enron.com/corp/pr/releases/1999/ene/financerelease.html

[35] The leader of this arrangement was the Industrial Development Bank of India (IDBI) and the loan was in Rupee. Other participants in the Rupee loan are the State bank of India (SBI), the Industrial Finance Company of India Ltd., the Canara Bank, and ICICI Ltd.

[36] Coordinators for the syndicated loan were ABN AMRO, Credit Suisse First Boston (CSFB), ANZ Investment bank, Citibank, and SBI. Banks that acted as senior lead arrangers for this loan were Canara Bank, Bank of America, Development Bank of Singapore, and Credit Lyonnais.

[37] This was an export credit loan arranged by the Japanese Export Credit Agency (ECA), which provided US $ 258 of the total amount. Commercial banks insured by the Japanese Ministry of International Trade and Industry (MITI) completed the other US $ 175 million. The agent for this loan was the Fuji Bank.

[38] The Office Nationale du Ducroire (OND) from Belgium made available insurance for a US $ 90.8 million syndicate loan provided by commercial banks. This was an export credit having as the agent ABN AMRO. In addition, Indian financial institutions guarantee both export loans.

Project	Total Investment Million US $	Lender	Contribution Million US $	% of Debt
		Commercial Lenders		
		TOTAL	**1,820**	**100%**
Quitaracsa I	118.2	None Yet		

Table 4.4: Lenders

4.2.4 Design and Construction Firms:

Normally design and construction is bundle in a single contract. Different parties can be forming the team under a turnkey contract, but for the SPC it is only on entity. However, it also happens having the sponsor managing several contracts and dealing with more than one entity during the design and construction phase. This is the case of Enron developing the Sutton Bridge Power Station Project in England. Enron contracted separately design, construction, and procurement following a different strategy compared to the Dabhol, Paiton I, and Quitaracsa I projects. The relationships were different and risk bearing was different too when compared with the three projects under analysis. Enron was assuming more risk, but was not paying the premium that normally is included in a turnkey contract.

The design and construction firm can be equity holders of the SPC or can be selected to design and build the project after a competitive process. It is very common that engineering and construction firms hold equity on the project. These companies will have the responsibility to design, build the facilities and in many cases teaming with the supplier they will be also in charge of procurement and installation of the equipment under a turnkey contract. The construction team will want to face as less risk as possible. They will want to make sure that construction costs will be paid according to the specific schedule arranged. In regards to the construction cost, they will include a price premium on their budget due to the risk they are accepting or they will expect a bonus payment based on performance. Table 4.5 describes the major firms involved in the design, construction, and supply of the projects.

Project	Delivery Method	Team Members	Responsibilities	Comments
Dabhol	Construction Management			
Before Cancellation				
Phase I		Enron Power	Construction Manager	
		Bechtel	Design and Build	
		General Electric	Contractor	Equipment Supplier
After Negotiation				
Phase II		Enron Power	Construction Manager	
		Bechtel	Design and Build	Two power blocks 800 MW each.
		General Electric	Contractor	Equipment supplier
Paiton I	Turnkey			Delivered on time
		Mitsui[39]	Team leader	Took commercial, financial, procurement, and shipping responsibilities
		Duke / Fluor Daniels[40]	Power block area and plant schedule, coordination, test, start-up, and training	Obligations guarantee by Fluor Corp. and Church Street Capital Corp.
		Toyo[41]	Non-power block area	Undertook responsibilities as site general subcontractor
		Burns and Roe	Conceptual Design	
Quitaracsa I[42]	Turnkey			Not started construction
		Four offers	Civil works	All well known contractors
		Three offers	Electromechanical	All well known suppliers

Table 4.5: Design and Construction Teams

[39] Mitsui & Co. Ltd., is a global business conglomerate with headquarters in Tokyo, Japan.
[40] Duke / Fluor Daniels is a Nevada general partnership. Duke Coal Project Services Pacific, Inc., which was incorporated in Nevada, and Fluor Daniels Asia Inc., which was incorporated in California, composes this partnership.
[41] Toyo Engineering Corporation from Japan. This firms expertise is in design, equipment procurement, and construction of processing plants.
[42] S & Z received four offers for the civil works from the five companies invited to bid and three offers from the four companies invited in the case of the electromechanical supply, installment, and testing. However, S & Z wants to have one single entity responsible for the project under a turnkey contract.

4.2.5 Operator:

Will be in charge of operating and maintaining the facility for a certain committed period. Normally this period will last throughout the duration of the SPC. The life of the SPC depends on the concession agreement signed with the government[43]. The operator will commit to certain operation costs and will be responsible for assuring that the cost of the project will be kept according to its estimates. The contract is the mechanism where the operator agrees to operate the plant under a pre-established performance level, following local laws and industry practices. Table 4.6 shows who is the operator on the projects under analysis.

Project	Operator	Involved since Design	Comments
Dabhol Phases I and II	Enron Power Corp.	Yes	Main equity holder with extensive experience operating this type of power plants.
Paiton I	Mission[44]	Yes	Main equity holder with extensive experience operating this type of power plants.
Quitaracsa	Unknown	No	No operator has been contacted.

Table 4.6: Operator

4.2.6 Supplier:

Suppliers can be separated on two different types. The first is suppliers of the equipment and the second is suppliers of raw materials.

[43] There is no single rule or model followed by governments. The operator can be part of the development team, or operation can be awarded after following a separate biding process. It is beneficial for the project that the operator is involved on it since the design face. The operator can improve the total value of the project by reducing O & M costs. The analysis of the case studies will allow describing some differences in how the project is bundle.

[44] Through Mission O&M Indonesia

4.2.6.1 Equipment Suppliers:

This type of suppliers will deliver the equipment and accessories necessary for the project to operate. They are normally responsible for procurement, installation, and initial operation of the plant during the testing period. They have to demonstrate that the plant will operate according to performance levels that were agreed and are included in the contracts. It is common for equipment supplier to be equity holders of the SPC. Table 4.7 shows the equipment suppliers. In the case of the Quitaracsa project, no supplier was selected from the three biddings received by the sponsor.

4.2.6.2 Raw Material Supplier:

They are responsible of delivering the raw materials, such as coal, gas, or diesel necessary for the project to operate. Frequently long-term contracts are signed between the SPC and the raw material supplier to assure delivery on a regular bases, certainty quality, and price. Table 4.8 shows the fuel suppliers for the projects.

The IFC[45] recommends in the case that an equipment supplier is also a project sponsor:

1. The contracts between the sponsor and supplier should be independently reviewed in all aspects including competitiveness of the offer.
2. A fixed price, date-certain contract should be signed. The contract should include penalties for nonperformance.
3. The sponsors should be required to retain their stakes on the project through the operational phase.

[45] IFC, "Financing Private Infrastructure – Lessons of Experience 4." IFC, Washington D.C. 1996

Project	Equipment[46]	Supplier	Comments
Dabhol			
		GE	General Electric supplied the equipment for both, phase I and II
Paiton I	Steam Generator	ABB-CE[47]	
	Two Steam Turbine Generators	General Electric	
	Seawater scrubbing system	ABB-Flakt	
	Generator step-up transformer	Hitachi	
	550 kW switchyard	Cogelex	
Quitaracsa I		Three offers received	Not awarded. All offers received from well known suppliers.

Table 4.7: Equipment Supplier

Project	Fuel	Supplier	Long-Term Agreement
Dabhol			
Before Cancellation			
Phase I	Distillate Oil[48] / LNG	Locally / Imported from gulf countries	-
Phase II	LNG	Imported from gulf countries	This phase was still not sure
After Negotiations			
Phase I	Naphtha	Locally	-
Phase II	LNG	Oman LNG[49] Abu Dhabi Gas Liquefaction Company Ltd.[50]	20 years
Paiton I	Coal	BHP[51]	30 years
Quitaracsa I	Water	None	Not necessary

Table 4.8: Fuel Supplier

[46] Main equipment, the list does not include 100% of suppliers but the more important ones.
[47] Asea Brown Bovery Combustion Engineering
[48] This was the fuel proposed for phase I under the original agreement. However, under the renegotiated project terms, the phase I fuel was Naphtha. Once phase II is ready, fuel would be LNG as it was agreed before cancellation. After negotiations, naphtha will be the fuel also after phase II is ready.
[49] Will supply 1.6 million tons per year.
[50] ADGAS will supply 0.5 million tons per year
[51] PT. Batu Hitam Perkasa (BHP) is an Indonesian company with interests in the cement, petrochemical, and energy sectors. BHP will buy the coal from PT. Adaro Indonesia (Adaro), which has the rights to mine coal in the Tutupan area in South Kalimantan for 30 years.

4.2.7 Output Purchaser:

The output purchaser is to the SPC as the SPC is to the raw material supplier. They both want to buy a product with limited uncertainty, on a certain price, and a defined quality. However, in the case of the raw material supplier, the commodity, fuel, is world traded so is easier to get buyers in case of default. In contrast, energy is limited to a country and on certain cases to a specific region. If demand drops or no long-term agreements to deliver energy were signed, the project can face important risk.

Lender will request long-term contracts that assure that the project output will have some buyers. According to John Finnerty, the four factors that will determine the type of purchase agreement are:

1. Type of facility involved
2. Nature of purchase transaction
3. Parties to the contract
4. Project's inherent risk

In addition, he will identify six types of purchase contracts[52]:

1. Take if Offered Contract (Take and pay Contract)
2. Take or Pay Contract
3. Hell-or-High-Water Contract
4. Throughput Agreement
5. Cost of Service Contract
6. Tolling Agreement

On power projects, is very common to find long-term agreements signed between the SPC and the local utilities. The power purchaser will enter into a Power Purchase Agreement (PPA) with the SPC. From the six different types of contracts the Take or Pay Contract and the Take if Offered Contract are the preferred agreements used for long-term power purchases. In the Take or Pay Contract, the utility is obligated to pay for the

[52] Finnerty, John D., "Project Financing: Asset-Based Financial Engineering", John Wiley & Sons Inc. 1996. pp 60

project output in the quantities established in the contract regardless if the purchaser takes or not deliveries. Often the utility will have to pay even if the output has not been produced[53]. This type of contract provides a minimum payment with the intention to protect lenders. In the Take if Offered Contract, which is also known as Take and Pay Contract, the purchaser is obligated to take deliveries and pay for the output only if the project is able to deliver the output. In many developing countries the output purchaser is a local utility that frequently is state-own. After signing the long-term purchase contract, the sponsor will assure the cash flow revenues from the project and this will give more comfort to lenders. The state-own utilities are assuming most of the risk. Table 4.9 shows the project's output purchaser and describes the type of commitment that was signed with the SPC.

Project	Purchaser	Long-Term Agreement	Utility	Comments
Dabhol Phases I and II	MSEB[54]	20[55] years	State-own	After negotiation with State of Maharashtra, MSEB will have to purchase the output following the Take or Pay Contract. Initially, the commitment was only for Phase I.
Paiton I	PLN	30 years	State-own	Take or Pay
Quitaracsa I[56]	Merchant Plant. Sell on the spot market	No	Private	Delivers upon demand and production cost. Seems similar to Merit Order Dispatch Guideline implemented in India. The concept is s imilar.

Table 4.9: Power Purchaser

[53] Benoit, Philippe, "Project Finance at the World Bank: An Overview of Policies and Instruments", The International Bank for Reconstruction and Development / The World Bank, Washington D.C. 1996. pp 16
[54] Maharashtra State Electricity Board
[55] MSEB had the option to extend the agreement from 5 to 10 years. MSEB should purchase the plant at 50% of the depreciated replacement value at the time in case they do not extend the agreement to Enron
[56] The sponsor is expecting to sign a long-term agreement with a local utility company that is privately held. The plant under the existing conditions will deliver the output to the spot market, where all power plants without private contracts to sell energy compete to sell the output. Under the existing Peruvian Laws, the plants with lower production costs will delivery first, so normally all hydroelectric plants dispatch their output before fossil fueled power plants.

4.2.8 Other Governments:

This can be the case of bi-national projects such as Itaipu, on which the project ownership is shared between Brazil and Paraguay. Another typical case is when a project relies on a raw material that should be delivered from another country such as the "Bolivia – Brazil Natural Gas Pipeline Project", a 1,864 miles long US $2 billion investment where Enron is partner of the development company. Gas exploited in Santa Cruz de la Sierra, Bolivia, is exported to Porto Alegre, Brazil, where demand for the gas exists. These bi-national or multinational projects will depend on the political position of the governments owning the natural reserves and its financial goals. In the Dabhol Project, the fuel to be used in the Second Phase of the project is Liquefied Natural Gas (LNG) that will be obtained from the gulf countries. Enron had entered into a partnership with Qatari Government for LNG supplies and this was a possible source for supplying the gas. However, Enron finally signed a 20-years contract with Oman LNG to supply 1.6 million tons per year and with Abu Dhabi Gas Liquefaction Company Ltd. (ADGAS) to supply 0.5 million tons per year. Deliveries were expected to start late 2001.

4.2.9 Technology Owner:

If someone of the participants is using a licensed technology that is necessary for the plant operation, then the SPC has to be sure that the licensed agreement will allow them to keep that technology even though there is a default between the buyer and provider of the technology. The technology provider normally is not a direct participant on a project finance deal. There is no especial technology on any of the three case studies under analysis. They all three use well-known proven technology.

4.2.10 External Consultants:

Project finance is very lawyer intensive. Especially at the beginning were aspects such as regulations, or contracts needed lawyer's advice. Professional financial advice can be very expensive, but is highly recommended, especially for inexperienced

sponsors. In addition technical experts, independent consultants, public relation firms, and other firms can participate as consultants.

In the case of the Dabhol and Paiton I projects, the sponsors are well-known players on the energy and power sector. They probably do the most sensible part of the financing in house For the Dabhol Project, lawyers were hired to prepare the documents that will define the contractual agreements create to share risk among Enron, Bechtel, and GE as contractors, owners, and operators, and MSEB as the output purchaser. In addition, the World Bank was an external consultant for the government of India. In fact, a report prepared by the World Bank concluded that the cost of the power produced by the Dabhol Project was too high. The World Bank was not in a position to provide financing for the project as was stated in a letter sent by the country director for India to the secretary of the Department of Economic Affairs for the Indian Ministry of Finance because the project was not economically viable. The capacity proposed by Enron was too large for base load operations. In addition, LNG represented much higher power costs when compared with coal.

In the case of Quitaracsa I Power Plant, the sponsor required the services of a financial advisor. This advisor helped to define the most convenient financial structure for the project and will also be the link with private investors and lenders once the project starts moving again. In all the three projects probably several other firms were hired to perform different tasks but none of this firms plays a major role in the projects.

4.2.11 Insurance:

Insurance companies are important participants on project financing. The project will need sufficient insurance coverage to protect project participants. In case of unexpected events, insurance coverage should be enough to cover losses. Unexpected uninsured losses can be a disaster for the project participants. The insurance coverage must be available during both construction and operation of the plant.

4.2.12 Multilateral and Bilateral Agencies:

Bilateral Agencies are set up by governments as a mean to assist other countries. The largest agencies are in North America, Europe, and Japan. Examples of these agencies are: Japan International Cooperation Agency (JICA), Ministry of International Trade and Industry of Japan (MITI), and the Japan Export-Import Bank (JEXIM); Overseas Private Investment Corporation of the United States (OPIC), and the United States Export-Import Bank (USEXIM); Canadian International Development Agency (CIDA); and the Department of International Development of the United Kingdom (DFID). These agencies promote investments made by their own nationals in foreign countries lending money to projects such as those financed using project financing.

Multilateral Agencies are established and composed by government members. They agree to establish those agencies that will normally have several objectives. One of these objectives can be development assistance of country members. Examples of this agencies are the World Bank Group with its five affiliate organizations of which the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) support government projects on developing countries, the International Finance Corporation (IFC) will support project finance for private sector, and the Multilateral Investment Guarantee Agency (MIGA) that will mainly provide political insurance coverage for projects on developing countries. Other multilateral agencies are the development banks such as the African Development Bank, the Asian Development Bank, Inter-American Development Bank, and others such as the Andean Development Corporation, the Inter-American Development Corporation, and the European bank for Reconstruction and Development.

4.3 Advantages and Disadvantages

Some advantages and disadvantages to finance a project under a project financing structure have been explained in the introduction of this Chapter. To better understand the reasons why the sponsors of the Dabhol, Paiton I, and Quitaracsa I projects have chosen

project financing the following section will cover the advantages and disadvantages of using project financing.

4.3.1 Advantages of Project Financing

According to Finnerty:

"Project finance should be pursued when it will achieve a lower after tax cost of capital than conventional financing."

After reading this definition maybe is not clear why is better project financing in some cases especially because of the higher fees and longer period to close financing in a project financing structure. For Enron, finance the Dabhol project on balance sheet was not possible. The project was too large. But this is not the only reason why the company has chosen project financing. The following pages will cover those reasons in order to have a better understanding of the entire benefits that can be achieved when using this type of financing. The advantages of project financing are:

4.3.1.1 Non-Recourse Financing

Under a non-recourse financing structure, the lenders would not have as guarantees for the loans, the assets of the sponsor. They will only rely on the project's cash flow. However, depending on the risk that the lenders will be facing, they can require additional guarantees to the sponsor to have additional protection in case some events such as costs overruns happen. In this case there is no recourse the sponsor's assets, however there is limited-recourse to the sponsor because certain amount of equity has to be available in unexpected events such as cost overruns that are not responsibility of the contractor; it is difficult to have pure non-recourse financing. Nevertheless, the limited-recourse limits the risk exposure of the sponsor. In addition, limited-recourse will normally happen during the construction period; once the plant is operating then there is non-recourse to sponsor's assets.

In the Dabhol Project, cancellation of the project generated losses of US $ 175 million due to delays that Enron would bear. It was claimed that there was a cost decrease due to timing and luck. Decrease in costs, and increase in equipment efficiency resulted in cost reductions provided by Enron. Other sources claim that the cost overrun was US $ 28 million mainly due to delays. However, it is not clear if the losses due to delays were finally covered with the saving due to cost decrease. In addition, a US 92 million cost overrun is expected for the second phase of the project because of contract variation and geo-technical problems with the LNG contractors. The Project Company achieved an agreement with the LNG contractors to pay those extra costs. The source of funds to cover this cost overrun is the project completion support from the shareholders[57].

The Paiton project considered a US 300 million contingency and cost overrun fund to be provided by the sponsor. This amount represents 12% of the total investment.

On the Quitaracsa I project, the financial structure considers a contingent fund to cover some unexpected cost increases. The US $ 8.8 million contingency fund is supposed to be provided by the lenders. This amount represents 7.5% of the total investment

4.3.1.2 Off Balance Sheet Debt Financing

Project's debt is on the balance sheet of the SPC not on the balance sheet of the sponsors because the loans are to the project not to the sponsors. However, because of accounting regulations, companies have to present consolidate balance sheet. In the US if the sponsors holds 50% or more of the stocks of a subsidiary, such as the SPC, the company should prepare consolidate statements[58]. In other countries such as England, advantage of off balance sheet debt treatment had also disappeared due to changes on the accounting standards. As a result, off balance sheet debt treatment is no longer an advantage in some countries such as USA and England. However, the countries allowing

[57] The Financial Express, "...phase-II cost overrun bloats to $92 mn thanks to contract dues", Wednesday, September 13, 2000, http://www.financialexpress.com

[58] Other rules apply if the ownership is between 20% and 50% or if it is less than 20%. Footnotes on Financial Report are used to disclose such investments.

separate financial statement of parent companies and their subsidiaries will still take advantage of off balance sheet debt financing.

For Enron, there is no advantage in this case, because they hold 50% equity in the first phase and 80% in the second phase. In the case of Bechtel and GE, their 10% equity on the company does not allow them control, so the accounting treatment of this ownership will be different compared to Enron. In any case there is no benefit for them also.

For the Quitaracsa project, the sponsor will be able to separate project debt from debt generated from their day-to-day operations.

4.3.1.3 Project Highly Leveraged

The sponsors are able to borrow large amounts of debt compared to their equity contribution. In addition, they will still be on control of the SPC and would avoid dilution of their equity. In the power sector it is typical to find companies financing a project using highly leveraged debt. If fact, comparing power project with projects on different sectors and industries the former projects use to have the highest debt to equity ratios. The equity contribution on power project can range from 20% to 30% but in some cases 10% contribution or less had happened. This percentage will depend on many factors such as country risk, political risk, sponsors, and project economic strength. Lenders will require more equity contribution in case there are many uncertainties in the project. One of the main reasons why power project were able to be so highly leveraged is because of long-term contracts such as the PPA or supply for fuel. These agreements will give lenders the certainty on project revenues under the condition stipulated in the project's contract. However, as it happened in the Dabhol project, the PPA or other agreements are not always a complete guarantee. The Maharashtra cancelled the project in August 1995. Risk management covered on Chapter 5 will address these issues and in general all the several risks the different project participants face on the different project phases and how these risks can be mitigated.

4.3.1.4 Financing Will not Affect Covenants of Other Transactions

When a company issue debt, the lender many times impose restrictions to further leverage of the company as a mean to protect itself from default on debt service. This restrictions or covenants are in the form of coverage ratios and/or provisions on actual debt agreements and can make it difficult for a company to arrange additional debt. Project financing will allow the project company to borrow and this borrowing will not affect the debt capacity of the sponsor, which means would not alter coverage ratios or provisions.

4.3.1.5 Political Risk Diversifications

The sponsor can be developing projects in different countries. Enron, Bechtel, GE, Mitsui, Mission and other companies can diversify portfolio risk. In the event of political risk such as the one Enron, GE, and Bechtel faced in India, the sponsors are limiting their exposure to that specific project in India, not on their entire portfolio. In addition, these companies can be developing other projects in this country under a project financing structure and these projects should not necessarily be affected by political risk because the SPC is an independent legal entity. This is true in India and the Dabhol project, were the controversy to the project were generated by the high rates charged by the project and also insinuations of corruption and kickbacks. In a general case, political risk such as changes in tax rate will affect all projects in that country independently if they are under a project financing structure or not, and independently of the sponsor also. On Chapter 5 political risk will be covered more in detail.

4.3.1.6 Risk Sharing

The sponsor can share the risk with all the project's participants. Risk sharing will reduce sponsor exposure and will also improve risk allocation and mitigation. There is an additional cost if other companies are assuming risk. However, the concept is that companies in the better position to manage and control the risk are the ones assuming it.

As a result, the additional costs of having different participants assuming part of the risk should be less than the savings generated.

4.3.1.7 Only Collateral Are the Project Assets

The lenders will rely only on the project cash flow, and the only additional guarantee is the project's assets. Other sponsor's assets are not recourse to the project's lenders. This is the case of Enron, Bechtel, and GE in India, Mission, GE, Mitsui, and BHP in Indonesia, and S & Z in Peru where those companies can lose their equity in the project, but there is no risk to the other companies' assets.

4.3.1.8 Low Cost of Financial Distress

Financial distress occurs when debt services are broken or honored with difficulty. To analyze the cost of financial distress the following has to be considered. First, cash flow volatility can create financial distress. In most power project under project financing structure, PPA and fuel contracts create long-term stability for cash flows. As a result, cash flow volatility will have a low impact on power projects. Second, the needs for external funds for investment can be a source of financial distress. A highly leverage firm would have a hard time to raise funds but if possible it will be very expensive. For Independent Power Producers (IPP) the need for external funds is very low and would not be affected by the cost of financial distress. In the worst event, after an unexpected situation such as damage of the plant for example, the lenders are better off lending additional sources to the project to restart operations as soon as possible rather than abandoning the project. This is because the only way the lenders can recover their investment is by having the project operative and selling the output[59]. Third, there is competitive threat if needs of cash. Competitors can realize financial difficulties and start aggressive policies to gain market share from your company. IPPs would not have to worry about this issue because they normally sign long-term contract that will guarantee

[59] Lenders of course will analyze if it is worth to lend that money or abandon the project. This will depend on the level of damage if we follow the example described above.

their revenues and in case the utility does not pay for the energy dispatched, then there should be a guarantees such as a letter of credit from the host government or the project can have risk coverage insurance from a multilateral agency. On the Dabhol Project, there is an existing guarantee from the Government of Maharashtra and a counter-guarantee from the State of India. On January 2001, the Dabhol Power Company (DPC) announced that they would invoke the counter-guarantee from the Government of India because of the debt MSEB owes to DPC, the SPC created by the sponsors, from November and December bills[60]. Forth, financial distress can occur if customers care about it. Customers in the case of the power sector do not really care about financial distress of the IPPs. Finally, if the company's assets are hard to redeploys, then it can also create financial distress. In this case, the assets in a power plant are hard to re deploy. In fact, the value of selling the equipment and any other asset that can be sold is marginal compared to the investment. However, as it is described in the next advantage, lenders are interested in having the project operating. As a conclusion, the cost of financial distress for IPP is very low. In contract, the cost of financial distress can be high for the same company undertaking the same project but in this case funding it with company resources.

4.3.1.9 Lenders Interest is to Maintain Project Operations

The lenders will work closely with the SPC to keep the project operating because is the only way they can recover their loans. Some project assets can be sold, but the recovery will be marginal compared with the value of the loans. Lenders will require from SPC to improve operation costs and any other improvement that can result in having enough cash to service debt. Lenders will accept to stop operations of a project if the cash flow does not meet at least the operation costs. This does not normally occur in the power industry. However, in some mining project can happen that operation cost cannot be met due to a decrease in the market price of the mineral. The lender can accept to shut down the mining project until price for that mineral recovers.

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[60] The Hindu Business Line Internet Edition, January 27, 2001. http://www.hindubusinessline.com

4.3.1.10 Project Scrutiny From Financial Markets

The sponsor is not the only participant evaluating the project. Also the lenders will evaluate it. Lenders will hire experts to review the project documents and assess it feasibility. The level of scrutiny will depend on the expertise and reputation of the sponsor. This can be equivalent as a double check for the project feasibility. However, it does not assure that schedule, costs, and operations will happen as planned.

4.3.1.11 Expand Credit Opportunities

The output purchaser buys the output of the IPP under a long-term agreement. In the case the output purchaser has better credit rating than the project sponsor then the sponsor can benefit from this. As a result, the sponsor can borrow at lower interest rates because of the higher credit rating.

4.3.1.12 Make Financing Feasible

The credit rating of the sponsor can produce higher interest rates than those the SPC can get after its credit appraisal. An extreme case is the sponsors of the Quitaracsa I Hydroelectric Power Plant. S & Z does not have the capacity to raise funds as a company to finance the project. However, under the project financing structure it is feasible to finance the project.

4.3.2 Disadvantages of Project Financing

There are many advantages of choosing a project financing structure. However, if there are only advantages, this should be the only method chosen to develop projects but this is not happening because there are also disadvantages of choosing this type of financing.

4.3.2.1 Risk Allocation is Complex

Chapter 5 covers risk management that is a key aspect of project financing. Many participants as described in subchapter 4.2 are involved and risk has to be allocated among all of them. Contractual agreements have to be created and risk should be finally allocated on the party that is better able to manage it. However, this is not as simple as it seems and in fact, risk allocation is a major cause of having projects not achieving financial closure. In developing countries, multilateral and bilateral agencies play a major role assuming some of the risk that cannot be effectively managed by any project participant and as a result those agencies are helping the projects to achieve financial closure.

4.3.2.2 More Risk for Lenders

Lenders have usually relied on the companies' assets in addition to cash flows as collateral for any loan. However, on project financing there is no other guarantee that the project's asset. Lenders such as commercial banks are not supposed to be risk takers. However, in project financing they are assuming high levels of risk.

4.3.2.3 Higher Cost of Financing

The additional risk, the complexity, the supervision on the SPC, and additional insurance coverage can make this type of financing more expensive when compared with company finance.

4.2.3.4 Lender Supervision

When lenders lend money to a company, they will not be able to supervise managers an operation of the company. However, in project financing, the lenders will be supervising the managers, in addition to supervise construction, start-up, and operations

of the plant. The loan agreement will normally stipulate the degree of supervising imposed by the lenders.

4.2.3.5 The Project Would Require More Insurance Coverage

There is a lot of risk and many parties participating in the project. In addition, the capital requirements are large and having no insurance can jeopardize project's profitability. For this reason all the sources of risk have to be covered. An earthquake can produce major damages in a power plant for example and if not insurance covers those damages, then the lenders would not be able to recover their loans and equity investors will lose their equity contributions. The insurance coverage on project financing may be more expensive if compared with company financing.

4.2.3.6 Sponsors can Accept More Risk

There is no recourse to the sponsor's assets in case the project fails to generate enough cash flows to service debt. In addition, as projects are highly leverage the sponsor's only risk is their equity contribution on the project. In a power project, the equity contribution can range between 5%-30% depending on every particular project. Because of this reason, sponsors can be willing to assume more risk compared to company finance structure, where failure to service debt can make shareholder to lose the company.

Chapter 5: Risk Management

5.1 Overview

Risk management is a discipline for dealing with uncertainty[1]. The goal of risk management is to develop a framework, on which risk related to the project can be identified, analyzed, quantified, mitigated, and allocated. The objective is to share risk among participants and to maintain financial feasibility of the project. Hundreds of millions of dollars are spent on risk management problems especially on developing countries. For Cordell W. Hull, director of engineering at Bechtel Group on San Francisco, trustworthy risk analysis is expensive and should be added to the high development cost. He said that risk management could range from 2 to 10 percent of total project costs[2].

There are several parties involved in developing infrastructure projects as it was described on Chapter Four. Each one of them is responsible for managing certain risk. Risk is a key aspect to consider and adequate risk assessment and management are of vital importance for success of the project. The definition of risk in finance theory and applied fields of securities analysis is[3] " the volatility of returns around an average or expected return." Risk has to be assumed by the party that is in a better position to control and managed it. It should never be imposed but allocated after a careful review and analysis of the capabilities to control and manage the risk, and should be a strategic decision. The project will be more expensive if risk-allocation strategies are not followed and it will be more difficult to achieve financial closure.

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[1] http://www.nonprofitrisk.org/whatis.htm

[2] Michel, Henry, "Risk Management and Funding Mechanisms", Management of Professional Services in the Global Market class notes (Session 6), Course 1.961, Massachusetts Institute of Technology, Cambridge 1999.

[3] World Bank Latin American and Caribbean Studies, "Dealing with Public Risk in Private Infrastructure", Washington D.C. 1997, pp 4.

Every party involved in project financing will evaluate the risk that was identified and will basically have four options to manage that risk. The first option is to assume the risk. The party assuming the risk should be in a better position to bear it and would not get any insurance. Eventually, a company assuming the risk is self-insured. There are several reasons why a company may assume the risk. Among these reasons, maybe there is no insurance available or it is too expensive compared to the cost of bearing the risk. The second option is to share the risk to reduce the company exposure. In this option, the company will assume part of the risk and will let other participant the bear the remaining part of that risk. The third option is to get rid of the risk. In this case, the company is not in a good position to manage the risk. As a result, it will transfer the risk to the party that is in the better position to bear that risk. Finally, risk can be sold by getting coverage through insurance or through a bond from a bonding company[4].

The project's economic analysis can demonstrate that it is feasible such as it was demonstrated in the economic analysis performed for the Quitaracsa I Project and shown on subchapter 2.3. In addition, it can also demonstrate technically and environmentally feasibility. However, it also has to be financially feasible in order to achieve financial closure.

In subchapter 4.2, the role of the participants on a project was described and as it was mentioned on the previous paragraph, risk sharing among those participants is one of the key advantages of choosing project financing[5]. Within the project participants, the lenders will provide most of the funds necessary to finance the project. But the lenders have no financial record of the SPC so they will request for protection. This protection will come in the form of security arrangements. Security arrangements are implemented to reallocate the risk among participants; one party agrees to compensate another party if some risk event occurs. These arrangements are worked after the risk is identified, analyzed, and quantified following different risk categories and on the different project phases.

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[4] Michel, Henry, "Risk Management and Funding Mechanisms", Management of Professional Services in the Global Market class notes (Session 6), Course 1.961, Massachusetts Institute of Technology, Cambridge 1999.

[5] To review more advantages of choosing project financing, see subchapter 4.3.1, "Advantages of Project Financing."

Risk is a major issue in project financing and different authors follow different approaches to analyze the risk relative to a project. However, all authors agree that project participants must identify and evaluate the project risk that can threat their expected returns. According to Philippe Benoit[6], risk can be categorized as:

1. Risk related to a specific project, rather than to debtor that can be a company or a government. In case the debtor is a country, it is called sovereign credit risk.
2. Risk can be separated in commercial risk and political risk. In both cases, the risk is under control of the project participants.
3. There is some risk that the participant on the project cannot control as opposed to the risk that can be controlled by some party.

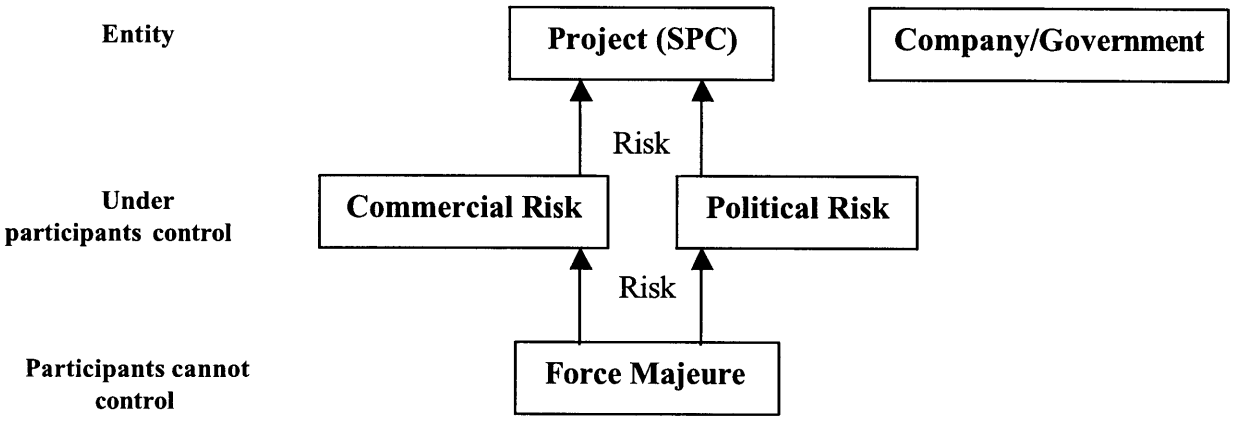

Figure 5.1: Risk Management Framework – Step 1.

The topic of the thesis is project financing not company or government financing. The analysis to be performed is limited to the risk that will affect the project company. Figure 5.1 present the general framework that will be used to analyze and allocate project risk. The risk affecting the project can be identify as commercial risk or political risk.

[6] Benoit, Philippe, "Project Finance at the World Bank: An Overview of Policies and Instruments", The International Bank for Reconstruction and Development / The World Bank, Washington D.C

Commercial and political risks are under the project's participants control in contrast with force majeure risk that is not under participants' control.

Commercial risk is also defined as project-specific risk and is related to technical, financial, economic, supply, and all other risks that can affect project feasibility and are independent of the country. In contrast, political risk is the risk related to a particular country and its government such as risk of expropriations, policy changes, and others. It is important to mention that the border separating commercial risk from political risk is not clearly defined in some cases. In fact, there is some overlapping between them when government policies affect interest rate or inflation for example.

Force majeure can be analyzed as commercial risk or as political risk. This type of risk differs from commercial and political risk because project participants cannot control it. Floods, earthquakes, and any natural disaster are included in this category. In addition, war and civil disturbance is also considered force majeure risk. Political and commercial risk can be controlled by some of the project's participants. In some cases, when only the private sector participates in the project, expropriations and other political risks are treated as force majeure risks according to Benoit.

The second step followed to build the risk management framework was to identify different risk categories that will be grouped as commercial risk or political risk. The thesis will focus on analyzing the risk affecting the project, not the sponsor company[7] or the government as it was mentioned before.

The third and last step to build the risk management framework is to identify risk categories effect on the different project phases. In some cases risk is exclusive of a project phase such as biding risk on the development phase. In other cases, risk can happen in any project phase such as inflation or force majeure risks. The framework will consider this differentiation.

Within the life cycle of an infrastructure project four different time periods or phases can be identified and risk exposure on each of these periods will be analyzed. The four phases of a project are:

1. Development
2. Design and Construction

[7] That is different from the SPC.

3. Start-Up
4. Operations

Many factors are allowing an incremental interest and use of project finance. Improvements in all the players' contribution are also promoting the growth of project finance. These improvements are occurring on the different phases of project financing. In this chapter, a description of the improvements on the following phases and aspects will be discussed:

1. Construction and Operation Improvements:
2. Star-up and operational phase improvements:
3. Contractual arrangements, financial resources, high demand, government commitment, and privatizations:

5.2 Risk Categories

The framework developed to analyze the different risks that the participants on a project face considers different risk categories that can threat project profitability and feasibility within the life cycle of the project. Two major risk categories are considered in the model, commercial risk and political risk.

Commercial risk is that risk that is specific of the project and that can be managed by the project participants. Development and construction risk, site availability, exchange rates, inflation, increase on interest rates, under performance, completion, technology environmental, and force major are some of the commercial risks a project sponsor face.

Political risk occurs because of some government actions that are not under control by the private sector. Expropriations, approvals, concessions are some examples of political risk.

Figure 5.2 shows the different risk categories based on the general risk management framework showed on Figure 5.1. Risk affecting the project will be analyzed considering those categories and types of risk.

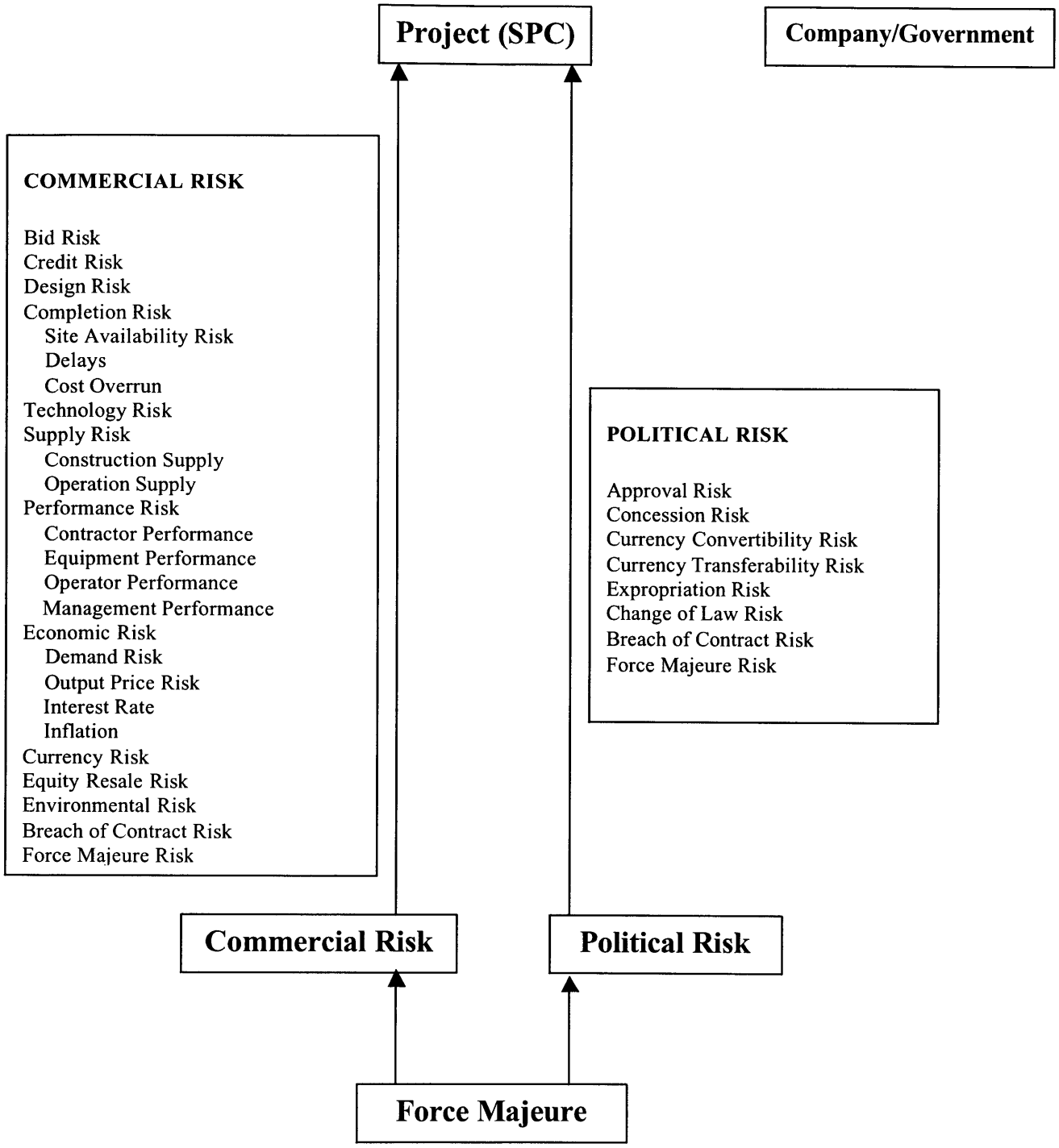

Figure 5.2: Risk Management Framework – Step 2: Risk Categories

5.2.1 Commercial Risk

This risk is project-specific and the private sector is in a good position to handle it and also mitigate it. Commercial risk can be classified in several categories, some of them occurring only on one project phase, but others occurring on several project phases.

5.2.1.1 Biding Risk

This risk arise when the company or consortium lose the biding. This risk is more to the company rather than the sponsor. However, in many cases the sponsor will work in the project proposal as a consortium and independently of the parent company. In fact, in some cases, the SPC will be set up since the development phase. Preparing a bid for infrastructure project is very expensive, especially when there are no previous designs and the SPC will be in charge of design, construction, and O&M. Contractor's experience is very important because of the risk exposure. Adding to many contingency costs can reduce the probability to win the bid. Not considering contingencies can improve the probability to win the bid however, there is a big chance that the contractor will have to bear over costs. The experience of the contractor will allow them to prepare a bid that will balance reality with uncertainty.

5.2.1.2 Credit Risk

This risk is related to the creditworthiness of the sponsor, the project, or the utility. There are several instruments that can be used to enhance credit. Sponsors will use letters of credit issued by a small to medium merchant bank on behalf of the developer. As a result, lenders will not have to rely solely on the sponsor's creditworthiness. In the case of state-own utilities, governments will issue guarantees in case of default of the utility.

5.2.1.3 Design Risk

The design can be unacceptable or present inconvenient that will delay successful construction start. The delay will happen mainly because the lender will not commit funds to the project unless they feel comfortable with the design. Lenders will hire a consultant or will use in house capabilities to review the project's designs.

5.2.1.4 Completion Risk

The project assets have value only if the project is finished. Three aspects related to this risk should be considered; site availability, cost overrun, and delays. In all cases there is the risk that the project is not finished and as a result the lenders will not be able to recover their investments. The assets have value only if operating because this is the only way lender can recover the money they lend to the project.

Site Availability

This risk arises when there is no availability of an appropriate site for the project. This risk is mitigated through a land use agreement frequently with a government agency or directly with the host government.

Cost Overrun

Construction cost increase can have a major impact on the project profitability. The total cost required to finish the project to get it operational can offset the future cash flow benefits. In this case the project will be no longer profitable. There is a difference between cost overrun that is under the contractor's control and that is not under the contractor's control. Depending on this difference is that the project participants will assume the risk.

In some cases costs overruns will be the responsibility of the contractor. His performance was not as expected and as a result the project became more expensive. In other cases, the contractor may have omitted some details on its biding or have under estimated some of the costs. The contractor is responsible for bearing this risk. The mechanism used by the SPC is to have a construction contract with fixed price and

certain delivery date. The construction price will include a premium because of the risk that the contractor is assuming. The contractor will have to guarantee that the project will be delivery on time and on budget and these guarantees can be in the form of letters of credit or performance bonds.

In other cases, the cost overrun in not under the contractor control. When the cost overrun is not under contractor's control, then several scenarios can be explored. The first one is when the event was insured, such as an accident. The insurance company will bear the risk. The second one is when a force majeure event occurs, but it was not insured. The contractor does not bear this risk because it is out of his control. Normally the sponsors will bear this risk. The third case is when there are changes in the legal framework and those changes increase the total construction cost. This is a political risk, and several parties can bear it. The sponsors can assume this risk. In some projects price escalation clauses can be included on the off take contract so the extra cost can be included in the tariff and finally the consumer will pay for that cost. These clauses will switch the risk from the sponsor to the power purchaser. Finally, the cost overrun can be due to concealed subsurface conditions. In this case, the party that assumes the risk is the sponsor. Additional equity is required by the lender to meet unexpected cost overrun during construction.

Delay Risk

Due to changes in design, delay on permits, delay on supply of materials or equipment, social disturbance, or many other reasons, the project can be delayed. Most of the delays will generate cost overruns and will also delay revenue collection because the project is not selling the output. As in cost overruns, delay can be responsibility of the contractors, or can be out of the contractor's control.

If the delay is under contractor's control, then it will assume the risk. Delay can be the result of inappropriate construction equipment, schedule or management. Under the fix-price certain time contract the contractor is responsible for delays under its control. Normally penalties will require the contractor to pay liquidate damages to the SPC. This will be very expensive for the contractor.

If delay is not responsibility of the contractor then several scenarios can be explored as in the cost overrun risk. The first one is when the event was insured, such as an accident. The insurance company will bear the risk. The second one is when a force majeure event occurs, but it was not insured. The contractor does not bear this risk because it is out of his control. Normally the sponsors will bear this risk. The third case is when there are changes in the legal framework and those changes increase the total construction cost. This is a political risk, and several parties can bear it. The sponsors can assume this risk but price escalation clauses can be included on the off take contract. These clauses will switch the risk from the sponsor to the power purchaser. Finally, the delay can be due to concealed subsurface conditions. In this case, the party that assumes the risk is the sponsor.

5.2.1.5 Technological Risk

This type of risk occurs when the project is implementing not-proven technology or when the technology can become obsolete very fast.

5.2.1.6 Supply Risk

This risk exist on projects were raw materials supply is fundamental for project construction and operation. During the construction phase, materials such as cement, and steel will be needed to build the facility. Most of the materials are commodities that are easily found and traded. However, lack of appropriate material in the quantities and qualities needed for the project can produce delays and cost overruns. The contractors bear this risk because they are in the best position to manage and mitigate it. When preparing their biding, the contractor will analyze and evaluate suppliers of raw materials and base on the market analysis it will take some precautions if needed.

On power projects, the raw material supply during the operation is fuel, such as coal, or gas. The SPC should assure enough raw material supply for a long-term period to avoid this risk. Long-term supply agreements are used to fix the quantities and quality of the fuel to be delivered. Price of fuel is frequently exposed to volatility of fuel prices, but

there are several techniques that can be implemented to reduce the exposure to price volatility such as forward or future contracts.

5.2.1.7 Performance Risk

Performance risk can impact the construction phase, and the operational phase. On the first case, it can increase construction costs and on the second the operation costs. On both cases, performance will affect the profitability of the project.

Contractor's performance can be critical. The effect of under performance can be cost overrun and delays. Delays will generate that revenues will be also delayed but debt payments are not postponed. The project participant that bears this risk is the contractor. The mechanism used by the SPC to transfer this risk is requiring performance bonds and liquidate damages coverage. The contractor will pay penalties in case the project is not operating on time.

Debt service will be based on revenues generated from the project. If the equipment under performs, then the revenues will be lower than expected. Depending on the seriousness of the problem, there can be a high risk that the project can default debt service. However, as in the previous case, the SPC will require guarantees for this risk. The supplier is in some cases part of the consortium in charge of the construction phase. This consortium will guarantee the equipment performance to the SPC. In addition, within the consortium the participant bearing this risk is the supplier of the equipment. Another guarantee required from the SPC is liquidate damages coverage to cover any lose because of the equipment underperformance.

Construction can be on time and on budget, the equipment performing according to specifications, but the company operating the project can have higher operating costs than expected. These higher costs can be responsibility of the operator because there was not skilled labor available and the personnel were not trained. The personnel operating the plant are not the appropriate and as a result the operating company can incur in higher costs. Other reason can be that management is not doing their best operating the plant. Higher operating costs can also be the result of increase on labor cost or fuel cost if the

operator is responsible for fuel supply, or any other fix and variable cost increase that was not expected.

5.2.1.8 Economic Risk

The project profitability and feasibility can be affected by changes in the economic environment of the host country due to changes in policies that may affect macroeconomic stability. Demand and price can be affected by new policies in addition to interest rates and inflation. The Asian crisis a few years ago is a clear example of how economics on a country can be affected by broader effects that can be a result of government policies or as in this case, can be a result of recession in a whole region. Currency risk is also an economic risk however it will be analyzed as a separate category.

Demand

Lower that expected demand would affect project revenues. This can be a result of bad forecast or changes in the macroeconomic condition of the country or the region. The project can have difficulties to service debt because revenues will not be enough as projected and depending on the severity of demand decrease, it can affect debt service.

Price Decrease

Other situations that can affect project's cash flow are a decrease in the price of the output or and increase in the cost of raw materials. As a consequence, the project may not be able to generate the expected return to equity investors or service debt payments, or in the worst case would not be able to cover operation costs.

Interest Rate

Interest rate fluctuations can increase the total cost of the project and also debt service. Interest rates can be floating rates or fixed rates. If the interest rate for debt floats, then any increase in the interest rate will make debt service more expensive and can also increase construction costs because more interests will accrue during the construction period. Floating rates are a characteristic of lenders such as commercial banks. Those banks are the type of lenders that are eager to assume more risk and lend

money to a project. A floating interest rate will be base on LIBOR[8], which is widely used as benchmark on dollar loans, plus a premium depending on the project risk. The premium is normally fixed. In contrast, insurance companies and pension funds will lend on a fix rate basis. There are several hedging tools available such as interest rate cap contract, and interest rate swap contract that can be used to mitigate this type of risk.

An interest cap contract will allow the SPC to get pay the difference between the market interest rate and the specified cap rate when ever the interest rate is higher than the cap rate.

On an interest swap contract, the SPC will pay to the swap counterpart a fix interest rate and in return will receive the LIBOR. The SPC will pay to the lender LIBOR plus the additional premium requested. Figure 5.3 shows the mechanism of the interest swap arrangement.

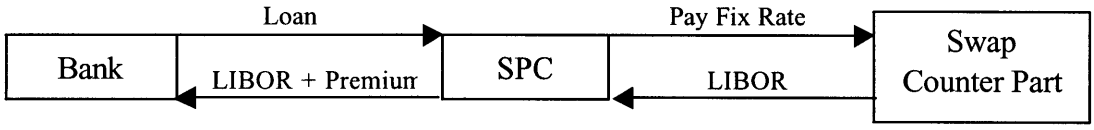

Figure 5.3: Interest Swap Agreement

Inflation Risk

There is a chance that the inflation rate in the country where the project is going to be built increases. If the loan for the constructions is in local currency and there is devaluation of this currency, then the funds would not be enough to pay for total construction costs. This risk will be borne by the contractor if its contract is in local currency and by the sponsor if it is in foreign currency.

In the same way, the operator's commitment to certain operational costs that are exposed to inflation can jeopardize its expected return in the case the operator have not hedge this risk.

[8] London Inter Bank Offer Rate

The mechanism followed to hedge this risk is through indexation of contract prices. In some cases, the escalation of construction or operational costs will be borne by the utility through a tariff adjustment. Finally the consumers will be the ones paying for the extra cost.

5.2.1.9 Currency Risk

This risk happens when some of the project's costs or revenues are in different currencies. Many of the currency risk cases happened when the project borrows money, normally US dollars, the revenues and some costs are in local currency, and there is devaluation of the local currency. The project has to service debt, but because debt is in dollars, then it becomes more expensive and there is the risk of default. This risk happened in many cases on developing countries, where high rates of inflation and local currency devaluation were typical in the eighty's and early ninety's[9]. There are several hedging tools that can be use to reduce this risk. The SPC can get currency forwards or can arrange currency swaps. In addition, other alternative is to borrow funds in US dollars. Figure 5.4 shows how a currency swap contract works.

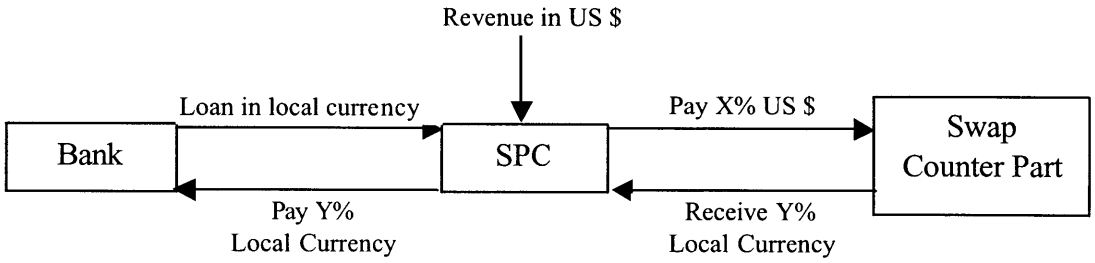

Figure 5.4: Currency Swap

[9] The Asian crisis generated strong devaluation of local currency in Asian countries.

5.2.1.10 Equity Resale Risk

Contractors or sponsors holding equity in the project may want or need to sell their shares on the SPC but there is no secondary market to sell that equity.

5.2.1.11 Environmental Risk

Projects will alter the environment in some extent. This type of risk can arise when project disposals can have important impact on the area surrounding the project. Many infrastructure projects had suffered delays due to environmental risk. A project can have all the permits required by the government, however, in some cases local and environmental groups have blocked project development or construction arguing that environmental risk mitigation procedures were not enough and developers needed to implement additional solutions to be allowed to continue with development or construction.

5.2.1.12 Breach of Contract

The project financing structure is composed of several contracts and some of the parties can violate some of the agreements previously made. Breach of contract can happen with several project participants but the project will be more sensible to those produced with the contractors, raw material supplier, operator, and output purchaser. The contractor may not be able to continue with the work because of bankruptcy. The raw material supplier can face problems to deliver the fuel at the price, in the quantities, and in the quality required in the contract. The operator may fail to fulfill its commitments because of bankruptcy. Finally, the utility company that in most of the cases is a state-own company may not be able to meet the payments to the SPC.

5.2.1.13 Force Majeure Risk

Some events are not possible to predict. Natural events such as earthquakes and floods are normally called external to a project. There is other type of event internal to the project but as the previous one, not possible to predict also. In this category can be

situated, strikes, fire, or an accident that damages the equipment during transportation for example. The consequence for the project can be disastrous. Fire can completely destroy a facility with the logical consequence that sponsor will not be able to operate the facility for a certain period of time, which means no debt service will be possible. Lenders will require to be protected against force majeure risk. In events such as fire and earthquakes, insurance is available. If there is insurance available, then lenders and sponsors will be protected.

5.2.2 Political Risk

Project finance success depends strongly on government's commitment. Stability, long-term policies promoting private investments, clear legal frameworks, and no government intervention on market forces are some of the necessary conditions needed for investors to commit to a project. However, political risk can arise when governments forget their previous commitments and start to interfere in the project development or operation. Government intervention can range from requiring additional facilities or some social works during construction phase to changes in tax burden during operation, controlling rates, or in the worst case expropriating the project.

5.2.2.1 Approval Risk

There is a chance that the project can face opposition on the host country. Civil groups or the government may oppose to it an several approval needed may not be granted because of this reason.

5.2.2.2 Concession Risk

In some projects, the sponsor can get all the approval and met all the requirements but still the government will not grant the concession.

5.2.2.3 Convertibility Risk

The sponsor can be a foreign company that is willing to convert local currency into foreign currency because debt service or other payments are on a foreign currency. When the sponsor cannot convert the local currency or the exchange rate is artificial, which means there is a penalty on the exchange then it faces currency convertibility risk. Conversion risk can be produced by imposition of exchange rate control from the government or can be a result of lack of foreign currency from the country's central bank.

5.2.2.4 Transferability Risk

The sponsor can be willing to transfer funds from the host country to its own country, but will face restriction from the country's central bank.

5.2.2.5 Expropriation Risk

In the past, many governments have nationalized private assets and have not pay a fair compensation for that. Infrastructure project were especially vulnerable to this type of risk because of the monopoly condition in some cases and because governments have been traditionally owners of infrastructure. Infrastructure projects have been used for political reason such as to attract voters. The way governments have done this is through tariff subsidy, and by having highly bureaucratic companies functioning as "employment agencies."

5.2.2.6 Breach of Contract

It is similar to the breach of contract in the commercial risk. However, in this case the government will arbitrarily violate or change contractual agreements

5.2.2.7 Force Majeure Risk

Force majeure risk is the risk that is not under the project participants' control. Under this criterion, political risk faced by a project developed entirely by the private

sector and without government participant is sometimes treated as force majeure risk. However, the government is always involved in a project. This involvement can be indirect because the government normally defines the legal and regulatory framework. In addition, infrastructure project will normally use public land and would always need some type of approval or concession.

5.3 Project Phases and Risk Analysis

There are four different phases that can clearly differentiate a project stage. This four phases are development, design and construction, start up, and operations. Project participants will be exposed to different types of risk within those phases. Some of the risk will be exclusive of a project phase, such as biding risk on the development phase or construction cost overrun on the design and construction phase, and some of the risk exposure of the participants will be within the life cycle of the project such as interest rates, inflation, or political risk.

Figure 5.2 showed the different risk categories on the risk management framework developed to perform the risk analysis. To complete the framework it is necessary to include the different project phases. Figure 5.5 shows the complete risk management framework that will be used to analyze the risk.

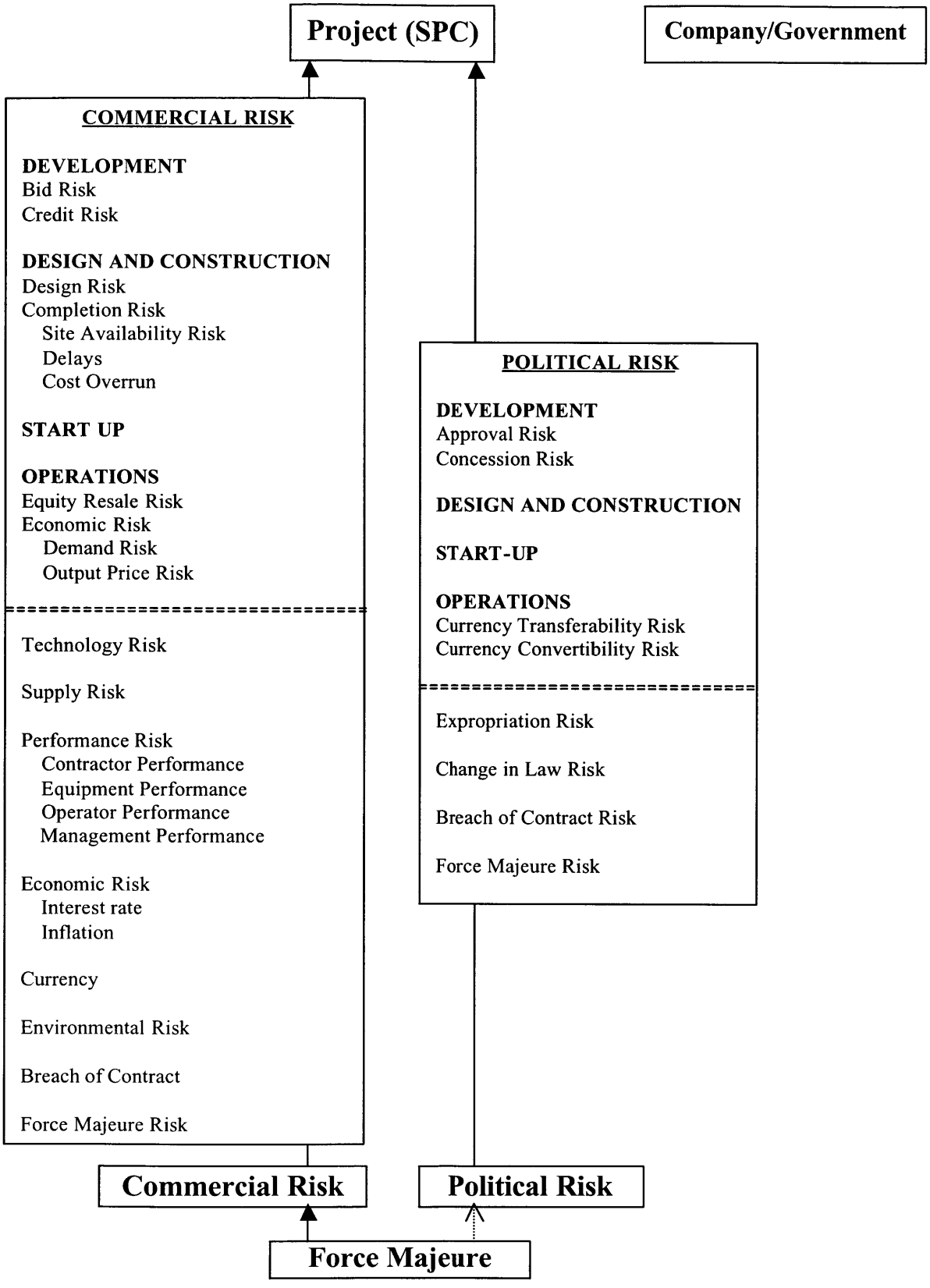

Figure 5.5: Risk Management Framework – Step 3: Risk Categories on Different Project Phases

5.3.1 Development Phase

This period corresponds to the time were there is no project and an opportunity to develop a project appears. This opportunity can happen due to changes in government regulations in a local market, availability of new technology, discovery of resources that can be used as raw material for the project, availability of funds in the financial market, increase in demand, or a combination of some of the previous reasons. Government changes on regulations had happened to be the most important source of opportunity for the private sector to develop energy projects on developing countries.

The three projects under analysis present similarities because all of three projects were a result of government commitment to private infrastructure and changes in regulations, but important differences within the development phase can also be found.

The Dabhol project in India was the result of the opening of the Indian electric sector, the encouragement from the Power Secretary to attract investments, and the opportunity that Enron found in India after investigating the country's investment potential. India's attractive market, western-style legal code and contracts, extensive use of English, and its strong democratic environment were the main reasons why Enron decided to invest in the country. The next step followed by Enron was to find a reliable buyer for the output and the MSEB appeared as the most reliable electricity board in India[10]. Enron is a global player in the gas industry so gas was the fuel alternative for the future power plant. Gas resources on India were not reliable but Enron found a good source of gas on the Gulf countries of Oman, Yemen, and Qatar. By using those gas resources, the project was forced to use Liquefy Natural gas (LNG), which is gas cooled to –160C and turned into liquid. This process is followed because it is the only way gas can be storage and transported long distances and still make the project economically feasible. LNG's suppliers like to enter into contracts were 95% to 100% of the LNG "trains" are secured because of the high capital cost of the trains. Tankers with a total capacity of 2.5 million tons transport LNG and each one of these tankers is called "trains." For that amount of LNG the size of the plant should be around 2,000 MW.

[10] Total base load capacity for the State of Maharashtra was 9,117 MW for year 1993.

Because of the mean of transportation available for the LNG, the project location needed port facilities to unload the LNG and the port of Dabhol was the most convenient location due to the deep-water characteristics of the port that would avoid expensive dredging. Enron followed a logical decision process starting with the most important issues that were country and market attractiveness to more practical ones such as the selection of the fuel and the location of the plant in the Dabhol port.

The Paiton I project followed a traditional biding competition and the risk to the sponsor was on the time and resources invested to prepare the bid. A key issue on this phase can be that the winning consortium had very strong political connections with the GOI through the Chairman of BHP. The development effort of the consortium biding for the project was to prepare the bid and after winning the bid, negotiate the contract with the GOI in order to obtain the final approval. The location, fuel, and capacity of the plant were defined prior to the biding by the government not the sponsor.

On the Quitaracsa Project, there is no bid and the sponsor is bearing all the risk. The total resources committed for the project are significant if compared with the company's total revenues. To develop a hydroelectric power project in Peru, a sponsor should find a river that can potentially be use for generating purposes. S & Z's extensive experience on the sector and the country allowed them to reduce development risk because of their knowledge of the project's area, the river potential, and the country's legal and regulatory framework. However, other type of risks such as political risk was out of the company's control and was the main reason why the project is still waiting for the concession. If considering the water as the "fuel" that is used to generate power, then the criteria to select the size of the project was driven by the fuel availability and quantities such as in the Dabhol Project in India.

Development can be probably the riskiest phase in a project for the sponsor. There is still no certainty that the project can be viable. However, the funds needed in this face are relatively small compared to those needed for construction. Lender will no lend money in this face because of the high risk and uncertainty. The sponsor will bear the risk

in this phase and will finance with its own resources the development phase. It is within this phase that the feasibility study for the project is prepared, and the government permits and concessions should be obtained. After the government grants the concession, then the project is ready to move to the next phase, design and construction. Before starting the design and construction phase, the project should have achieved satisfactory financial closure. The project needs to guarantee all the funds necessary for satisfactory construction and financial completion. Financial completion is achieved after the project is finished and is able to generate the revenues necessary for operations and debt service. Achieving financial closure means that agreements for the design, construction, procurement, operation and maintenance, supply of raw materials, and output purchase were already signed or are in the process.

Some risk will be exclusive of this phase such as biding risk and credit risk on the commercial risk category and approval risk and concession risk on the political risk category. In addition, there are other risks that participants face not only on the development phase but also on other phases such as technology risk, and environmental on the commercial risk category.

5.3.1.1 Biding Risk

On the Dabhol project and Quitaracsa I project there was no biding process. On the Dabhol project, the Government of Maharashtra (GOM) cancelled the project on August 1995 and one of the reasons was that the sponsor, Enron, never entered into a competitive bidding process. There was lack of transparency during the decision-making process and negotiation of agreements. They also claimed that there was no biding process to select the contractor and the supplier. On the Quitaracsa I Project, there was no need of competition under the Peruvian Electric Market Legal Framework. Competition will exist only if two companies are willing to exploit the hydroelectric potential of the same river and they have required so to the Ministry of Energy and Mining with a very similar timing. In this case, the winner will be the company offering more return to the government.

On the Paiton I project, the BMMG consortium was competing against the BNIE consortium. The risk these consortiums were facing is that there was a chance to loose the biding. The expenses incurred to participate in the process can be several million dollars, however the risk to the companies participating is restricted to the amounts invested on the preparation of the biding. The additional risk the sponsor phase on this phase is that the biding process sometimes is not fair. Lack of transparency, clarity, scope, and clear rules will add risk to the sponsor. On this project, the scope, evaluation criteria, and biding procedures were unclear. The BNIE consortiums was first invited to negotiate with the Government of Indonesia (GOI.) However, after 7 months the GOI announced they have reconsidered their decision and invited the BMMG consortium to negotiate. Forth months later, on September 1992, the contract was awarder to BMMG. This reconsideration was made after extensive debates at the minister level because they thought the BMMG bid was technological superior and offered a lower kWh price for the energy. It is also important to mention that the chairman of BHP, the local partner of the BMMG consortium, is the brother-in-law of Suharto's daughter. Suharto was the Indonesian president at that time and met several times with the chairman of BHP.

The biding risk can be mitigated by preparing a feasibility study, presenting well-crafted proposal, and having in the consortium a local partner with valuable network.

5.3.1.2 Credit Risk

The sponsors of both the Dabhol and Paiton I projects have creditworthiness and can provide additional funds required by the lenders. In contrast, the sponsor of Quitaracsa I is not financially strong, however, it can rely on a partner that can bring credit worthy and improve the project credit rating. The sponsor can use letters of credits as a mean to enhance its own credit.

5.3.1.3 Approval risk

All three projects faced approval risks. To reduce approval risk exposure companies will prepare a feasibility study, will try to build good working relationships

with the government and in some cases will incorporate in the consortium a local company that will help in the local networking.

On the Dabhol Project, there was an interest from the Indian Government to promote private participation on the power sector. S. Rajgopal, the Government of India Power Secretary visited Washington and encouraged the private sector to invest on the country. Enron had invited Rajgopal to Houston and then visited India. In their visit to India, Rajgopal acted as a guide during Enron's visit to Maharashtra and the MSEB. When Enron presented their proposal to the Foreign Investment Promotion Board, Rajgopal was again the guiding force. The sponsor prepared a feasibility study including economical and financial analysis that was used during the negotiations. Success on the negotiations resulted for Enron on having the opportunity to develop the project, and for Rajgopal to be promoted from Government of India Power Secretary to Government of India Cabinet Secretary. In addition to the strong relationship with Rajgopal, Enron have tried to build strong relationships with the GOM, paying courtesy and lobbing visits of several government officials and bureaucrats of India such as the Environmental Secretary, the Joint Secretary of Power, the Chairman of the MSEB, and the Chief Secretary of the Government of Maharashtra.

The Paiton I project was granted to BMMG after a biding process called by the GOI. The Government was trying to promote private participation on the power sector due to its rapid growth and its inability to keep pace the increasing power demand. The power sector was growing very fast because the country was experimenting very rapid expansion of its economy. The country situation can suggest large interest of the government to promote private investments in the sector. As a result the government should establish the regulatory and legal framework, and make a big effort to make real some power projects especially for the first movers. The Paiton I Project was the first Private Power Project in the country and the sponsor face the problem that there was not prior experience in laws and regulatory framework. The laws and regulatory framework was not fully developed and as a result the approval process took a long time and was very complicated. Several ministries had strong interest on power project development.

Resolutions from those ministries will have to pass several layers of bureaucracy and finally Suharto's participation before any agreement was achieved was mandatory. Having a local sponsor with very good political connections helped to mitigated this risk.

The Quitaracsa I project received all the approvals from different government agencies. However, this process took longer and in fact the sponsor faced several unjustified problems and delays from government agencies. The agencies were delaying without justification the Definitive Concession for the project. In addition, some requirements such as the Environmental Studies that was already approved were tried to be revised again by the MEM but the sponsors was successful to enforce the law and avoid additional procedures that were not justify.

5.3.1.4 Concession Risk

Sometimes there can be difficulty to differentiate the concession from the approvals because the concession is seen as an additional approval. However, there is a slightly difference between those risks.

The Quitaracsa project received all the legal approvals needed to receive the generation concession. In fact, according to the Peruvian law the sponsors have already the concession but it needed to go to trial to enforce it. However, due to political manipulation of the justice system, the sponsor has avoided this procedure because no positive result was expected from a trial that was manipulated by the government. The project's concession was only missing the Peruvian President signature.

Quitaracsa I was not the only hydroelectric project facing concessions restrictions. All hydroelectric projects in Peru were block by Fujimori's administration. One of the main reasons to block hydroelectric projects was the Camisea project.

The Camisea Project consists on the exploitation, transportation and distribution of the gas resources found in the Camisea Region in Peru. This gas field is the largest in South America and Fujimori was strongly committed to the project. The main market for the gas in Peru is the power sector. The government realized that hydroelectric power

plants were direct competitors for gas power plants. The government decided that the best way to create a growing market for the gas was to promote gas power plants and to block hydroelectric power plants. The Peruvian Government was trying to attract private investors to the project because in addition to the economic benefits that the project would bring to the country, it had also political implications such as an increase in the government's popularity in the case the government was successful attracting private investors.

In the cases of Dabhol and Paiton I the approval had as a result that the concession was granted; there was not a clear differentiation.

5.3.1.5 Technology Risk

This risk is not exclusive of the development phase. A project can face technology risk on the start up and operation phase also. On the development phase, technology risk can occur because the technology is not economically feasible or it was not a proven technology. The lenders will be reluctant to lend money to a project that will implement a technology not know and that will add additional risk to the project. This risk will be assumed by the sponsors and in particular the party that is in the best position to bear this risk is the supplier of the equipment / technology. The mechanism to be implemented can be in the form of technology performance guaranty, additional equity, or to use a well-proven technology provided by well-known suppliers.

The Dabhol Project, Paiton I, and Quitaracsa I projects all three have chosen well-known suppliers with proven technologies. In the case of Quitaracsa I, the contract to the supplier has not been granted. However, the three suppliers that have bided for the project are well-know suppliers and the technology offered has been successfully proven.

5.3.1.6 Environmental Risk

One of the requirements needed in most infrastructure project in order to receive the concession and be allowed to build and operate the plant is to perform environmental studies that will evaluate the impact of the project on its environment. Lenders know that environmental permits can delay the project so they would not commit funds to the project before this risk is mitigated. The sponsor will bear this risk.

The best mechanism to reduce this risk is to have a fully understanding of the environmental regulations and to perform an independent environmental study.

None of the sponsors of the project under analysis faced environmental risk during the development phase.

5.3.2 Design and Construction Phase

The sponsor has the concession, and he will have to put together a team that would design and build the facility. In some cases the contractor will be part of the SPC, but in others it will just compete in a biding process called by the sponsor. During this phase that can last several years, a contract or contracts will be signed for design and construction of the facility, equipment procurement, and any other preoperational costs. The number of contracts will depend on the delivery method chosen. On one side, one single party can take responsibility for the overall project under a Design-Build-Operate contract for example. On the other side, the project can be break in parts and design, construction, procurement, and operations can be responsibilities of different parties. Risk begins to increase as the construction phase started and more funds are needed. The loans raised in the capital markets are used to pay for the engineering and construction costs and the interest on debt started to accrue. No payment of principal or interest is due during this period.

Figure 5.6 shows how risk increase and decrease within the different phases of a project. During the design and construction phase, mostly designer, contractor, and supplier of equipment if there is one, assume risk. In addition, sponsors and construction

lender assume also risk. As was mentioned before, the type of financing available during this phase is most of the time short term financing that is often obtained from commercial banks. This type of financing is more expensive because banks require higher interest rates due to the related risk.

In a typical infrastructure project, change orders are the main source for project delay and cost overrun. Change orders are based on unexpected site conditions that were not considered in the initial schedule and budget, or changes required by the owner after the construction contract was signed. In addition, other sources of cost overrun can be price of materials increment due to inflation or exchange rate fluctuations, material shortages, or design changes due to legal requirements[11]. A strategy followed by sponsors is to use a turnkey contract. Under this type of contract, the price and schedule are fixed even before design started. The designer and contractor are assuming most of the risk in this phase. Turnkey contracts are more expensive because a premium should be given to designer and contractor for assuming most of the risk but are an effective hedging tool for sponsors.

[11] Hoffman, Scott L., "The Law and Business of International Project Finance: A Resource for Governments, Sponsors, Lenders, Lawyers, and Project Participants", Kluwer Law International.

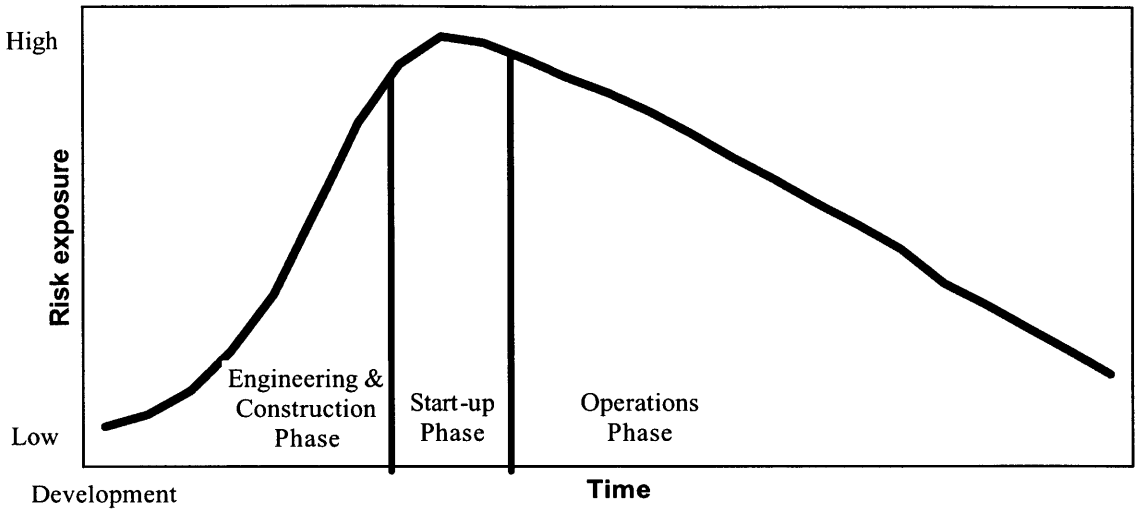

Figure 5.6[12]: Risk Exposure on Different Project Phases

As in the development phase, risk exposure during the design and construction phase can be exclusive of this phase or can happen on several project phases. Commercial risk and political risk that will occur only during the design and construction phase are site availability risk, design risk, raw material supply, construction risk that includes cost overruns and delays, and contractor's underperformance. Other risks can happen on several phases such as interest rate risk, inflation risk, currency risk, expropriation risk, and force majeure risk.

5.3.2.1 Site Availability risk

There is the chance that no convenient site is available for the project. Often the government will have to consent the use of the land by the SPC and a land use agreement will be the mechanism used to mitigate this risk.

[12] IFC, "Lessons of Experience: Financing Private Infrastructure", The World Bank and International Finance Corporation, Washington, September 1996.

Power plants location will depend on the market and the supply of fuel. The Dabhol Project was located on the Maharashtra State because it was the most attractive market for the sponsor. Enron chose the Dabhol Port because the project needed convenient port facilities due to the LNG fuel supply. Site availability was a real threat to this project. A large problem could have been not to have an appropriate area where port facilities can be built. However, this risk did not materialized in the Dabhol Project. DPC have entered into 99-year lease with the Maharashtra Industrial Development Corporation in 1993 on the project site.

The Paiton I project is part of the Paiton Complex, were eight generation units should be installed. The GOI through PLN developed and own units one and two (2x400MW.) The Paiton I Project is for the design, construction, and operation of units seven and eight. The site already existed and the sponsor faced no site availability risk.

Hydroelectric Power Plants in Peru are mainly built in the mountains to take advantage of high slope of the rivers that produce important level differences in very short distances. This difference in level, known as the height, is directly proportional to the capacity of the plant. To build a Hydroelectric Power Plant in Peru, it would be necessary to find a river with convenient hydroelectric potential[13]. As a result the project location is restricted to natural conditions. In addition, the land is in most of the cases property of the government so the sponsor needed to achieve an agreement with the Government to obtain the permits to use the land. Quitaracsa I Project does not face site availability problems. If the concession is granted, then the agreements included in the contract allow the sponsor to use the land in the project's area.

5.3.2.2 Design Risk

The design may not be acceptable due to omissions or bad design process. As a result, the project can face delays and lenders will require additional reviews or the

[13] Because of natural conditions, this is the type of hydroelectric power plants constructed in Peru. However, there are other plants on which a Dam originates the height. Normally on this type of power plants the flow of the river is considerable.

implementation of new design according with the project specifications, requirements, and good engineering practice. The best mechanism that sponsors can follow to manage this risk is by contracting expertise firms with extensive experience in similar projects.

DPC sponsors include the Bechtel Group and General Electric. Both firms have extensive experience in similar projects. Bechtel, a premier global contractor, will be responsible for the design of all major civil works. They have extensive experience in power plant projects. General Electric is also part of the construction team with responsibilities in the equipment design and supply. GE will design all the systems necessary to be built around the gas turbines procured to the project and needed for the good operation of the plants. Design and construction is normally integrated in a design-build contract that is also known as EPC contract in the case of power plants. The SPC is transferring the design risk to the construction consortium and the consortium will provide design warranty. Within the consortium, internal agreements will be made with risk-sharing purposes.

Similar to Dabhol Project, on the Paiton I Project DPC transferred the risk to the contractor consortium that was composed by Mitsui, Duke / Fluor, and Toyo. All those companies have vast experience on power generation projects. The contractor provided design warranty.

The sponsor of the Quitaracsa I project invited several companies to compete for the design, construction and supply of the equipment. No contract has been signed however, all the firms have experience on hydroelectric power plant projects and all are well-known global contractors or suppliers.

There is some risk that the sponsor can face because of the delivery strategy chosen. The sponsor had bided construction and procurement in separate packages. One package included all the civil works and the other package included the equipment supply and installment. It had happened in other hydroelectric project in Peru that the equipment supplier was reluctant to maintain the performance guarantee because the civil works as

the contractor had designed them generated changes on a couple of design parameters. The supplier used these parameters, provided by the sponsor, to design the equipment and define the performance. The argument was that the equipment will never operate at the design condition and as a result the performance could not be guarantee.

The sponsor can mitigate this risk by entering into a turnkey contract were the designer, contractor, and operator will work together as a team and will be responsible for any design, construction and operation problem.

5.3.2.3 Cost Overrun

As it was explained on subchapter 5.2, cost overrun can be a responsibility of the contractor or cannot be its responsibility. The contractor usually enters into a fixed-price certain date type of contract. Under this contract, the contractor will bear all the risk under its control except for changes in law that will be borne by the sponsor or power purchaser, insured events that are covered by the insurance company, force majeure risk that are borne by the sponsor, and subsurface conceal conditions that the sponsor will cover. To reduce risk under contractor control, the SPC will contract an experience contractor, with expertise in the type of project under development, and with creditworthiness.

The Dabhol and Paiton I projects contracted very experienced contractors with solid creditworthiness, and with extensive experience in gas and coal power plants. The Quitaracsa I project has not been awarder yet. However, the four contractors competing for the contract are major construction firms with extensive experience and solid reputation. These firms are Skanska from Swedish, Kvaerner an anglo-norwegian engineering and construction group, Odebrecht from Brazil, and Queiroz Galvao, from Brazil.

On the Dabhol projects, cost overruns occurred on both the first phase and the second phase. The first phase is already under operations, and the second phase is still under construction. During the construction of the first phase, the new government

elected on March 1995 canceled the project. The agreements with DPC were signed with the previous State Government, which was controlled by the Congress party. However, the Congress party lost the state elections against the SS-BJP coalition. Five month after the SS-BJP coalition took over the government it was announced that the Maharashtra State would cancel the project. This cancellation generated costs overruns that were not under the contractor's control and were a result of the project delay. The delay was related to the cancellation of the construction because the project was finally finished ahead of schedule. After the negotiation, Enron claimed a US $ 175 million cost overrun due to the cancellation, however the real cost overrun was finally estimated on US $ 28 million without considering US $ 37.2 million on development and standstill costs as it was reported on an Indian e-business paper[14]. Enron bore the cost overrun.

On the second phase of the project cost overruns have been estimated in US $ 92 million according to the Financial Express. The cost overrun was not under contractor's control. In fact they occur because of concealed subsurface conditions originated due to geo-technical problems, and because of contract variations. The problems occurred with the LNG contractors and an agreement was achieve between them and DPC. The cost overrun was financed using the project completion support provided by the shareholders.

Having Bechtel and General Electric as the main contractors, gave comfort to lenders and assures that experienced and well-known players in the industry are building the project reducing the exposure to construction risk.

On the Paiton I project PEC hedge the risk by using a turnkey contract with a fix-price certain delivery date. The sponsor also kept an insurance policy that covered the project against physical loss or damage to permanent and temporary work under construction, including materials and equipment. In addition, the sponsor committed US $ 300 million to be used in case of unexpected cost overruns. This additional equity was in the form of a stand-by financing guarantee. Another implicit guarantee was that PEC contracted the work with Mitsui, Duke / Fluor, and Toyo, all very strong and well know firms with vast experience in power projects.

[14] The article appeared on the Financial Express, the India's first e-business paper, on Wednesday, September 13, 2000. http://financialexpress.com

5.3.2.4 Delays

Delays can be the cause of cost overruns, inability to start collecting revenues, or both. Depending on what party was responsible for the delay is that the risk will be allocated.

To mitigate this risk, the SPC should use turnkey contracts with certain date completion agreement. In addition, they should contract construction and procurement with well-known and experienced contractors and suppliers with extensive experience on similar projects.

The Dabhol project was cancelled by the State of Maharashtra and construction was re started after several month. This delay caused cost overrun. However, the project was finished ahead of schedule. Under the PPA agreement, for any delay in the project delivery and dispatch, DPC will have to pay MSEB penalties of US $ 14,000 per day if delay happened in the first phase and US $ 36,000 per day if delay happened in the second phase. Those amounts are applicable for the first 180 delay days. After that, DPC will have to pay US $ 110,000 and US $ 250,000 per day thereafter respectively.

5.3.2.5 Supply Risk

The project is exposed to supply risk during the design and construction phase. The supply risk is related to the availability of materials for construction and equipment for plant operation.

During construction large amounts of materials and equipment for construction are needed. In addition, the plant equipment will be ordered at the beginning of this phase. The contractor will prepare a schedule based on their analysis of the market and availability of raw materials for the construction phase. Because of changes in the market, supply for some material or equipment may not be available at the time or in the quantities or quality needed for the project. The contractor will be then exposed to risk of delays and cost overruns. Supply for construction materials risk can be responsibility of the contractor or can be out of its control such as in case of social disturbance affecting

supply. In the first case, the contractor will bear the risk and in the second case the sponsor will do it.

Raw material availability is not a big problem on infrastructure projects. Most of the materials are commodities and in the case of the generation equipment, which is not a commodity there is a previous analysis of the supply sources and time constrains before the contractor commit to any time or schedule on their biding proposal or during negotiations with the government.

On the Dabhol and Paiton I projects, no problems were due to supply of materials during the construction process. In addition, the equipment suppliers were equity holders of the SPC.

On the Dabhol project GE was the equipment supplier for phases I and II and also held 10% equity on DPC.

On the Paiton I Project, GE held 12.5% equity on the PEC and was the supplier of the two steam turbine generators. Other suppliers were ABB_Flakt, Hitachi, and Cogelex.

The equipment suppliers will bear this risk guarantying delivery schedule and performance to the SPC through the contractor and will pay liquidate damages in case the equipment is not working on time or at the required performance.

5.3.2.6 Performance Risk

Performance risk can happen during the design and construction phase. The contractor's performance will keep construction prices on budget and schedule on time.

Performance on the construction phase will impact the project cost and schedule. To mitigate this risk, turnkey contract are used by SPC. Under a turnkey contract price and schedule will be fixed. Contractors will bear this risk. However in the case of contractor's default, performance bonds is the hedging tool used to protect the SPC and lenders. In this case the insurance company will take over the project and will be

responsible for its completion. In addition, if there are delays, the contractor or its insurer in case of default will pay for liquidate damages.

The Dabhol and Paiton I projects were contracted using a turnkey contract. This type of contract will transfer the construction performance risk to the contractor. In case of the Dabhol project, Enron was also acting as a Construction Manager.

The Quitaracsa I Project, the project was bided in two separate contracts. This strategy was followed to reduce the construction costs by not paying a premium to the contractor. However, it can add risk to the project. Performance can be assumed by the contractor, but due to the several parties involved in the project, the contractor can argue that its under performance is due to the inconvenience of having other contractors that are delaying its work. This situation happened in a hydroelectric project developed in Peru, and finally the sponsor was taking part of the performance risk. The sponsor of the Quitaracsa I plans to change its previous strategy and negotiate the construction and procurement into a turnkey contract.

5.3.2.7 Interest Rate Risk

Interest rate increase will raise the interest accrue during construction and as a result the total debt accrued during the construction phase will increase.

The mechanism used to reduce this risk is to have fix interest rates during construction. There is very high risk during the design and construction phase and the lenders to the project during this phase are mostly commercial banks lending at floating interest rates. Floating interest rates will expose the sponsor to interest rate risk. For this reason, mechanisms such as interest rates cap, or interest swap can be implemented to reduce interest risk exposure. Figure 5.3 shown on subchapter 5.2 describes how the interest rate swap works.

5.3.2.8 Inflation Risk

Inflation risk can jeopardize contractor's budget generating an increase of raw materials prices. If the contractor's contract is in local currency then it will face exposure to inflation risk. The SPC normally has most of the funds borrowed for the project on foreign currency so inflation will not affect it in this case. However, in some cases is possible to raise funds on local markets and often these funds' currency will be on local currency. The SPC can reduce their risk exposure in this case by using the local funds at the beginning of the project. The capital markets on developing countries are frequently small and as a result, the size of a loan on local currency will be small too.

Contractors can reduce their exposure to inflation by using indexation factors linked to the country's consumer price index (CPI).

5.3.2.9 Currency Risk

This risk arises when there is depreciation or appreciation of the local currency to the loan's currency. The mechanisms used to reduce currency risk exposure are indexation to exchange rate, tariff adjustment to include additional construction costs, borrow in local and foreign currency, match the revenues' currency with the loan currency, contract currency swaps, or establish an escrow account.

On the Dabhol Project, 23.6% of debt financing for the second phase was in Rupee, the Indian currency. However, the country did not suffer currency depreciation that could impact the expenses during the design and construction of both the first and second phase.

On the Paiton I project, the Indonesian Rupiah was strong. The exchange rate to US dollars had a strong position and was expected this condition to stay constant in the near future. However, the Asian crisis generated large devaluation and volatility of the Rupiah. The funds raised for the project were in US $ and the construction costs too. As a result, there was no negative impact on the local currency devaluation for the contractor and finally for the SPC.

The Quitaracsa I Project will borrow funds in US dollars. There is a very small chance that the Peruvian Nuevo Sol will appreciate to the US dollar. In addition, the exposure is to currency exchange risk is limited to three years, the construction phase duration. The SPC, contractor, and supplier will evaluate the country macroeconomic stability and will adopt the best strategy to reduce the currency risk.

5.3.2.10 Environmental Risk

The studies evaluating the environmental of the project are normally prepared during the development phase. These studies should propose the strategies to mitigate the environmental impact. The risk faced during this phase came from local groups and in some cases foreign environmental groups that oppose to the project. In addition, accidents such as oil spill in the construction area can also have environmental impact. The environmental risk can be borne by the sponsor or the contractor during this phase.

The Dabhol Project faced environmental risk in the form of Indian's protest to the project. There was peaceful protest from the habitants of Veldur, a fishing village near the project. The reason of the protest was the environmental impact of the power plant being built by Enron near Veldur. How Enron managed this risk is arguable and not very clear. On one side there is the position of Amnesty International accusing Enron of Human Rights violations and on the other side Enron denying those charges.

According to Amnesty International, the Indian police arrested arbitrarily several people on the city of Veldur because of their leading position in the protests against Enron and the Dabhol Power Plant.

Enron denied the accusation stating that there was no responsibility for the police acts. In fact the DPC announcement was that they did not employ, second, or subcontract police officers at any site.

However, Human Rights Watch (HRW) reported on January 1999 that Enron was directly paying police officers at the plant site. Police Sub-Inspector P.G. Satoshe was in charge of the operation and told HRW that DPC was paying the police salaries[15].

But Enron has also tried to implement social activities in the area of the project as a mean to achieve acceptance from the local habitants and to build good relations with the neighborhood. If the DPC has good relations with the neighbors, then the company is in a better position to limit or avoid protests.

The DPC is planning to export fruits and flower from the region. In fact, as part of its local environment preservation and promotion exercise, it has 400 acres of land around the project under cultivation. There is the chance to export several varieties of mangoes and local fruit in addition to floriculture products. The company is working closely with a local agricultural university to develop hybrid varieties of some local fruits and flower with high demand in the Gulf countries and in Europe. According to a company official, they are trying to change the people perception of the company, the project, and the development of the region. As the official said, "Initially, there were protests from environmentalists and human rights activists. The project turned controversial. Now, the good work done by the company for the community has brought about a sea change in the way the locals looks at us." The company has also invested in healthcare, education, culture, and recreation facilities for the neighborhood.

The Paiton I Project did not suffer from environmental protest due to the location of the plant and it impact on the environment, at least not in the magnitude of the Dabhol Project. There was no evidence of such risk after reviewing several reports. On the Paiton Complex, units one and two of the eight-units project were already operating. There is however some environmental problems not specific of the design and construction phase that will be discussed later.

[15] CorpWatch, "Enron in India: the Dabhol Disaster", July 20, 2000. http://corpwatch.org

5.3.2.11 Expropriation Risk

There is almost no risk of expropriation during the design and construction phase. The governments of India and Indonesia are trying to promote private investments on infrastructure projects and expropriation is the least thing they would do.

5.3.2.12 Change in Law Risk

The government can enact laws during the design and construction phase that can affect the project. Additional tax burden will increase the project cost. In addition, new regulations can require additional studies or work by the sponsor. To reduce impact on political risk, companies can get insurance from multilateral agencies such as the World Bank.

5.3.2.13 Breach of Contract Risk

There can be breach of contract among the different parties participating in the project such as the contractor, designer, supplier, government, utility, lender, and any other participant that has a contract to perform any activity during the design and construction phase. At the same time there are several mechanisms that protects the project and as a result the lenders and sponsors from breach of contract. The contractor, designer, or equipment supplier can be in default, but they will have to pay for liquidate damages and their insurance companies will have to finish the work. The case of government's breach of contract will be discussed when analyzing political risk.

None of the projects analyzed faced breach of contract problems during the design and construction phase.

5.3.2.14 Force Majeure Risk

An earthquake, fire, flood, strike are typical examples of force majeure risks. The project participants cannot control them and can be severely exposed to this risk category if it finally materialized. The SPC or any other participant can buy insurance for natural

disasters and some other cases of force majeure risk. The contractor will be insured to any natural disaster as a mean to reduce risk exposure.

No natural disasters have happened during the design and construction phase of the Dabhol and Paiton I projects.

In the case of the Paiton I project, in the event force majeure risk materialized and cost overrun or delays occur, then PEC and PLN should enter into good faith negotiations regarding tariff adjustment.

In the case of the Quitaracsa I project, if available, the sponsor should buy commercial insurance that will protect the project from any force majeure event. There would not be any adjustment to the tariff as in the Paiton I project. In addition, lenders will require insurance as a mean to protect the loan repayment.

5.3.3 Start-up Phase

A project is not completed after the engineering and construction ends. The facility will be inspected and the owner will verify that specifications and requirements were met. The firms responsible for design, construction and procurement of equipment will be responsible for the results of their work. One of the greatest risks within this phase is that the equipment under performs, which means that variables such as performance or output or both do not achieve the minimum requirements. This under performance increase the lender's risk because the project output will be less than expected and so do revenues, having a direct impact on debt payment. Other risks on this phase are that raw materials are ordered in projects that needed them for operation, such as fossil fueled on power plants. In addition, staff in charge of operations is completed. During this period the project starts to generate revenues that are used to amortize debt. The start-up phase signals the end of the construction phase and the beginning of the operational phase. To mitigate risk of underperformance, the SPC will require guarantees from the contracting consortium. Within the consortium, the equipment supplier is the

one that bears this risk. Using proven technologies will reduce the chance of having the equipment not performing according to the specifications requirements. In the case of underperformance, the project will not be able to conclude the construction phase after liquidate damages are paid to the SPC.

5.3.3.1 Technology Risk

Choosing none proven technology can have as a result that the project is not able to achieve the required performance.

The Dabhol and Paiton I project have both chose proven technologies and well-known suppliers to procure the equipment. Quitaracsa I Project is willing to mitigate this risk by selecting proven technology and well-known suppliers.

5.3.3.2 Supply Risk

The supply risk on this phase is limited to the availability of fuel to perform the equipment testing. Often the equipment supplier is responsible for the testing and their risk exposure will depend on the contracts signed with the SPC or the construction consortium. The quantities of fuel needed are small and the duration of the start up phase is short, so the risk exposure because of supply risk in very limited.

5.3.3.3 Performance Risk

This risk is directly related to the technology risk. If the equipment does not perform according to specifications, the construction consortium will have to pay liquidate damages to the SPC.

DPC will have 365-day grace period to achieve plant performance as specified in the project documents. If during the performance tests, the base load capacity or peaking capacity fails short of the nominal base load capacity or nominal peaking capacity then the DPC will have to pay liquidate damages to the MSEB. The amount of the penalty is

US $ 100 per KW calculated as the difference between the nominal base load capacity and the highest base load capacity achieved during the 365 testing period.

5.3.4 Operation Phase

The SPC is directly in charge of the operations. One of the sponsors can be the operator or it can be selected from a competitive process. If the project economic and financial assumptions demonstrate that were fairly similar to reality, then the revenues generated during the operation phase will be enough to pay operation expenses, service interest and debt, and generate expected return to equity investor. Risk should be reduced once time passes and debt payments reduce obligations from the SPC. Variables within this phase that can affect project financials are forecasted demand, changes on rates, operation expenses, inflation, foreign exchange rate, currency convertibility, supply risks, regulatory changes, political changes, uninsured losses, and management inefficiencies. The impact of operations in return on equity or debt service will depend on the period on which difficulties appear. If problems occur during the early stage of operation, then the impact to the project can be important. On the other hand, if the problems occur late, then the impact will be smaller.

Within the operation phase a major risk that can occur and that is exclusive of this phase is demand risk and output price risk. In addition other risk that can occur within this phase is equity resale risk.

5.3.4.1 Demand Risk

The economic and financial analyses for the project were prepared based on several assumptions. One of those assumptions was demand forecast. In several projects, demand forecast is overoptimistic, maybe due to good perspectives of the country at that moment or because some trends were not considered when preparing the forecast. Demand has a big impact on the project profitability and projects have demonstrated high sensitivity on demand variation. There are different approaches followed to deal with demand risk. On some projects, the government will directly assume demand risk or

indirectly through the state-own utility company. In other cases, demand risk is bear by the sponsor of the project. In fact, on the three projects under analysis different participant were bearing demand risk. On the Dabhol Project and Paiton I Project, demand risk was assumed by the state-own utilities. On the Quitaracsa I project, demand risk is on the sponsor side.

The DPC developing the Dabhol Project entered into a Power Purchase Agreement (PPA) with the State of Maharashtra on December 8, 1993. Under this PPA, demand risk was allocated on MSEB. The Board was required to purchase the Dabhol Project output once the plant started commercial production. The tariff structure was composed of two components, a capacity payment and an energy payment as it was described on subchapter 4.4. The initial agreement was for 20 years, having MSEB the option to extend the agreement for 5 to 10 more years. MSEB had to make the capacity payments once the plant was ready for commercial operation but irrespective of the dispatch. Capacity payment was intended to cover fix O&M cost, interest and principal on debt, tax payment, and expected return to investors. DPC transfer almost all the demand risk to MSEB. The only payments that were fixed to demand were the energy costs that should cover the variable operation costs.

The Paiton I Project has a similar tariff structure and risk transfer strategy if compared with the Dabhol project. PEC entered into a long-term PPA with the state-own utility company, PLN. The 30-years take-or-pay contract transferred all the demand risk to PLN. As in the Dabhol Project, PLN was enforced to pay for fixed capacity payments after the plant was ready for commercial operations. These payments were irrespective of dispatch, but depended on the plant's availability. The capacity payments included fix O&M costs, interest and principal repayment, tax payments, and the expected return to investors. Subchapter 4.4 explains more in detail the tariff structure agreed on this project.

The Quitaracsa I project is still far to deliver energy to the Peruvian grid, however as it was first conceived it will be a merchant plant, which means, will sell to the spot

market and will deliver the output depending on demand. The project has not achieved financial closure and demand risk will be a major concern to lenders. The sponsor realized this and is trying to achieve a long-term PPA with one of the private utility companies. If the sponsor does not succeed to have a long-term buyer for the project output, then it will face several problems to achieve financial closure. On the sponsor favor is that it would not be the first merchant plant in Peru developed by the private sector and financed in the international market. Aguaytia Power Plant, a 150 MW gas power plant developed by the private sectors dispatch their production on the spot market. The US $ 253 million project received US $ 60 million in funds from the Inter-American Development Bank and additional funds from other lenders. However, the sponsors of the project were six American companies with vast experience in power project and creditworthiness. The sponsors included Maple Gas Corporation, PanEnergy International Development Corporation, El Paso Energy Corporation, Illinova Generating Company, Scudder Latin American Power Fund, and the Power Markets Development Company. The actual regulatory framework favors delivery of hydroelectric power plants because of their low production cost. Under this assumption the sponsor assumed Quitaracsa I would deliver all the production. However, it is likely that lender will not be willing to assume the demand risk and will require more equity participation from the project sponsors.

5.3.4.2 Price Risk

Fuel power plants can be very sensible to price increases on fuel supply. In addition, all types of power plants will be very sensible to a reduction in the tariff.

Demand and price risk can jeopardize the project cash flow projections. In addition this risks are difficult to hedge. The best hedging tool is to have a purchaser of the project output that will agree to pay a fix price for it or at least will establish price variations clearly. This is the case of the PPA on the power industry.

On the Dabhol Project, the energy component of the tariff included the fuel cost. The price fluctuation on the fuel prices was passed to the MSEB that was exposed to this

risk. The sponsor successful reduce its exposure to fuel price volatility by transferring the risk to MSEB. In addition, the tariff guarantees the interest and principal payment, fix O&M, taxes payments and expected return to investments, so there was no risk on tariff to the sponsor.

The Paiton I project made similar arrangement as in the Dabhol Project. PEC managed fuel price fluctuations by negotiating the price with the fuel supplier every year. But PEC does not bear the price fluctuation risk because under the tariff structure, this fluctuation was passed totally to PLN, which was finally exposed to price volatility. In addition, as in the Dabhol Project, the tariff guarantees the interest and principal payment, fix O&M, taxes payments and expected return to investments, so there was no price risk to the sponsor.

On the Quitaracsa I Project there is risk for the output price. Decrease on energy prices will have an important effect on the project profitability and can affect debt payments. The sponsor needs to enter on a long-term PPA with a utility company to mitigate this risk. Otherwise, lenders will request additional equity contribution and as a result, will be hard to achieve the 70 / 30 debt equity ratio.

5.3.4.2 Technology Risk

During the testing period, the project can achieve the performance levels. However, during the operations performance can worsen and as a result can affect revenues and debt service. The sponsors of the projects under analysis reduced the risk by choosing well-proven technology.

Technology obsolesce can also be a threat for project profitability. This problem can arise when new technology is developed and as a result the companies implementing this new technology can reduce considerably the production cost. This cost reduction can materialize in the form of less fuel consumption, more efficiency of the equipments, and lower total cost of the equipment including shorter procurement period and faster installment. It is hard that new equipment will replace old equipment in a short period in

the case of power plants because of the capital investments required for this type of power plants. In addition, projects such as Dabhol and Paiton I have signed PPA with local utilities that will guarantee delivery and price of the output for the duration of the PPA.

5.3.4.3 Supply Risk

A project can be exposed to supply risk during the operational phases. This risk is related to the availability of raw materials for the operation of the plant that can be coal, gas, or any other type of fuel needed.

Supply during the operational phase is critical for fueled power plants. Fuel is a commodity, however, it is also critical for plant operations and frequently involve transportation from the areas were it is produced. SPC will enter in a long-term agreement with the fuel supplier to guarantee reliability of fuel supply. The agreement would guarantee quantities, quality but frequently no price can be fixed.

Fuel to be used on phase I of the Dabhol project was distillate oil to be sourced locally. However, on the long-term and after phase two was built the fuel was supposed to be LNG. Enron identified several Gulf countries as potential suppliers of LNG. However, the project was cancelled and after long negotiations fuel selection for phase I was changed to naphtha also sourced locally. In addition, the project capacity increased and phase II was no longer a decision of MSEB. Phase I will no longer switch from naphtha to LNG. However phase II will be constructed and LNG will be used as fuel. Enron entered into a 20-years contract with Oman LNG to supply 1.6 million tons per year and with Abu Dhabi Gas Liquefaction Company Ltd. (ADAGAS) to supply 0.5 million tons per year. Delivery was expected to start late 2001. The Government of India had no participation on LNG supply.

On the Paiton I project, fuel supply was obtained from reliable coal reserves in Tutupan are South Kalimantan in Indonesia. PEC entered into a 30-years Fuel Supply Agreement with BHP. Under this agreement, BHP will supply from 750,000 to 1,300,000

tons of coal quarterly and from 3 to 5.5 million tons annually. BHP will purchase the coal from Adaro, the coal mining company, which have the rights to mine the coal reserves in the Tutupan area. BHP entered into a long-term Coal Purchase Agreement. In addition, the GOI issued a coal letter support to PEC.

5.3.4.4 Performance Risk

Performance risk can happen on several project phases. During the operational phase the equipment performance will be critical in addition to the availability of skilled labor during the operation of the plant and management performance.

A major performance risk on project profitability is equipment performance. The supplier for the Dabhol project is GE. On the Paiton I Project, the suppliers are GE, ABB, Hitachi, and Cogelex. All these companies are well-known suppliers providing well-proven technologies but in addition to that the suppliers had provided guarantees for equipment performance.

Operational cost overrun is another important threat to the project and can be due to lack of experienced labor available or having bad operation's management. The risk mitigation arrangement recommended for that type of risk are to have experienced management teams, including performance incentive and penalties. Another recommendation is that equipment supplier and technical advisors should prepare local labor force. The result will be to have personnel trained to operate the plant and management team motivated to perform as good as possible.

The operators of the Dabhol and Paiton I projects are Enron Power Corporation on the first case and Mission through Mission O&M Indonesia on the second case. They have both extensive experience operating this type of projects and in addition they are the main equity holders of the SPCs. It is on their main interest to perform as good as possible. Any under performance will affect their return on equity.

In some cases, the lenders will look very close to the operator especially if they are the sponsors of the project. The reason is to make sure of good performance of the operator that will assure loans repayment. However, in this cases the sponsors are well

know companies with high reputation and there will be more confidence from the lenders.

On the Quitaracsa I Project the operator have not been selected. In fact, no candidates have been approached. Operation costs on hydroelectric power plants are much lower compared to fossil fueled power plants. In addition, there has been important improvement in automation of hydroelectric power plants projects. In some cases no operators will be on the plant unless some maintenance is needed. However, it is recommended the sponsor initiate negotiations with a possible operator of the plant. The natural operator of this power plant should be Egenor, the owner of Cañon del Pato, a 247 MW hydroelectric power plant, which power house distance to Quitaracsa I power house is less than half a mile. They have already an experienced operational team on the area.

5.3.4.5 Interest Rate Risk

During the operation phase, interest rate increase can raise the cost of debt. Several mechanism can be used to reduce this risk, such as using fix interest rates or in the case of floating interest rates, contracting interest rates cap, or interest swap. After the construction phase is finished and the project is operating according to specifications, it is possible to restructure the debt in order to reduce interest rate on the loan. The SPC can raise long-term debt with fix interest rate and with a longer maturity period.

5.3.4.6 Inflation Risk

Inflation risk can jeopardize operators budget. Inflation will generate an increase of raw materials prices and labor costs. If the operator's contract is in local currency then there it will face exposure to inflation risk.

Operators can reduce their exposure to inflation by using indexation factors linked to the country's consumer price index (CPI).

On the Paiton I project, some of the tariff components were linked to the consumer's price index. Components A and C had no inflationary compensation. The

component B was protected against inflation on both its foreign element and its local element. The mechanism used was to link the local part of the component to the Indonesian consumer price index and the foreign part of the component to he US consumer price index. In a similar way, component D was linked to the Indonesian CPI and to the US CPI

On the Dabhol project, the capacity payments seem to be fixed, however the payments are linked to price escalation and as a result the inflation risk was transfer to MSEB. Price escalation was included on the PPA for the second phase. It can be implied that also existed for the first phase.

5.3.4.7 Currency Risk

This risk arises when there is depreciation or appreciation of the local currency. The mechanisms used to reduce currency risk exposure during the operational phase are indexation to exchange rate, tariff adjustment to include additional costs, match the revenues' currency with the loan currency, contract currency swaps, or establish an escrow account.

India did not suffer currency depreciation. Depreciation can impact the debt service payments on of both the first and second phase because the revenues are collected in local currency but debt payment for most of the debt is in US dollars. The capacity payments for the Dabhol project are linked to exchange rate fluctuation. The exchange rate risk is transfer to the MSEB and finally to consumers.

On the Paiton I project, the Indonesian Rupiah was strong. The exchange rate to US dollars had a strong position and was expected that this condition will stay constant on the near future. However, the Asian crisis generated large devaluation and volatility of the Rupiah. The exchange rate risk was transfer by PEC to PLN using indexation factors to the Rupiah – US dollar exchange rate. The entire Component A of the tariff structure was protected. Fifty percent of the Component B was protected. This 50% corresponded

to the foreign part of the component. Sixty percent of the coal price was a foreign element of Component C and was also protected. Finally, as in the previous components, the foreign part of Component D was also protected. The total foreign portion of the tariff was protected against exchange risk.

The Quitaracsa I Project will borrow funds in US dollars. There is a very small chance that the Peruvian Nuevo Sol will appreciate to the US dollar. The SPC, contractor, and supplier will evaluate the country macroeconomic stability and will adopt the best strategy to reduce the currency risk.

5.3.4.8 Environmental Risk

Environmental risk within the operation phase can be due to contamination generated by the plant. If the projects comply environmental regulations, then this risk should not threat the project operation. Changes in environmental law requiring the project to adequate to the new norms can be a source of environmental risk during operations.

5.3.4.9 Breach of Contract Risk

Breach of contract can be within the commercial risk category or the political risk category. If the utility does not take the plant's output as established on the contracts then there is breach of contract within the commercial risk category. However, in most power projects, utilities are state-own and the decision to do not honor the contract can have more political connotations than commercial connotations. In general breach of contract risk can happen between all the parties that have contracts with the SPC such as the operator, the fuel supplier, and the output purchaser.

For the purchaser, buying the project output cannot be economic, or the contract can turn to be uneconomic because of increase in the input price. Other issues can be that the contract expires before the loan is paid off or the purchaser has not commit to take pre-established quantities. The mechanisms that can be implemented to reduce this risk are the use of take-or-pay or take-and pay contract.

5.3.4.10 Force Majeure Risk

On the Paiton I project, under the PPA contract, PLN will still have to meet its payment obligations even a force majeure events affects PEC. If PLN can not receive the electricity because of force majeure events or government actions, PEC will still receive capacity payments from PLN. In the case of a force majeure event related to coal supply, PLN has to make capacity payments.

5.3.4.11 Currency Convertibility Risk

On any of the three projects under analysis there was evidence that currency convertibility was a threat. Political risk insurance is available to mitigate convertibility risk.

On the Paiton I Project, currency convertibility risk was low. The Presidential Approval Notification Letter granted the PEC the right to convert local currency into foreign currency. In addition, GOI policy avoided since 1983 currency controls to Indonesian persons or companies.

5.3.4.12 Currency Transferability Risk

As on the convertibility risk, there was no evidence that this risk was a threat to the sponsors of the projects.

The Approval Notification Letter granted to PEC on the Paiton I Project gave the right to transfer and without limit foreign currency to another country.

5.3.4.13 Expropriation Risk

Expropriation risk is a political risk. It was very common during the 1960s and 1970s, however it is rare in this days. The SPC can insure the project to protect

against expropriation risk. Multilateral agencies such as MIGA will provide insurance to protect the SPC against the risk and in general against political risk.

5.3.4.14 Change in Law Risk

Political risk insurance would not cover the SPC in case the government change its commitment to privatization and this finally affect the investment environment in cases such as changes in taxation.

5.4 Improvements on Different Project Phases

Private development of infrastructure projects had produce benefits on consumers, governments, and investors. These benefits are generated form improvements in the different development phases of a project and are described as:

1. Construction and Operation Improvements:
2. Star-up and operational phase improvements:
3. Contractual arrangements, financial resources, high demand, government commitment, and privatizations:

1. Construction and operations improvements:

One of these factors is high competitiveness, and cost and time reduction on the engineering and construction phase of a project. Companies are adopting strategies such as innovative delivery methods for building new facilities. These strategies have demonstrated strong improvements in terms of cost and time when compared with public development. Projects were 3% under budget and 22% late on the expected period compared with the 10-23% cost overruns and 54-68% late on the expected period of

public projects[16]. In addition, the construction industry is participating as sponsors on many projects. More infrastructure projects are being developed by private sector and the strategy adopted by many firms in the industry is to be equity holders in the project and assure with this strategy some work during the development and construction period. Normally they hold a small percentage of the equity. Other factor is that the engineering, construction, suppliers, and operation companies are managing the risk they can better control. Delays, cost over runs, underperformance are responsibility of these parties. Any lose generated to the owner would have to be cover by them.

2. Star-up and operational phase improvements:

Risk management contractual arrangements reduce the delay and underperformance as it was described before. Private firms have more incentives to run their infrastructure projects more efficiently compared to governments. Private sector selects the best projects, not the best "Political" projects and they operate them searching from improvements on efficiency and return on their investments.

3. Contractual arrangements, financial resources, high demand, government commitment, and privatizations:

Contractual arrangements are a guarantee to all the parties involved in a project. Through these arrangements, risk management strategies are implemented and guarantees are given to all the players. Another reason is that private sector is participating more actively in project financing allowing more funds to be distributed in more projects. In addition new sources of funds are available due to participation of new lenders such as insurance companies and export credit agencies. There is an existing demand for basic services such as energy, water, or telecommunications in most of the cases. Governments

[16] IFC, Financing Private Infrastructure, Lessons From Experience, 1996 Pp. 25-26. Average cost and time overruns by sectors were 54% and 15% for power projects (309); 68% and 23% for telecoms (90 projects); 67% and 11% for transportation projects (573); and 64% and 10% for 188 water projects. Schedule overruns were calculated on the basis of actual completion versus that expected at IFC Board approval. In some cases there were delays in closing financing, rather then in physical implementation.

cannot afford to fund all projects needed to fulfill the demand. For this reason, they are forced to strongly commit to project financing and allow the private sector to participate in infrastructure development. A key aspect on project financing success is this commitment, which can allow projects to be funded even in countries perceived as risky. Finally, the privatization process forced governments to make the state-own companies economically viable. In most developing countries, these companies were used as "job-opportunity-for-friends" companies by current governments. For this reason, the companies were inefficient with high operational costs and bad customer service. Many of these companies were generating negative cash flows. The governments were finally providing the cash necessary to for the companies to keep operations. By privatizing, investments are promoted, efficiencies should be achieved, and real rates are charged to consumers, which means no subsidies. All this will avoid in many cases the expenses of the government on the company, and in addition they will receive some cash flow from the new owner.

Chapter 6 Case Study: Quitaracsa I Hydroelectric Power Plant

6.1 Introduction[1]

The Quitaracsa River is located 500 km North of Lima on the Department of Ancash, province of Huaylas, and district of Huallanca. S & Z "Consultores Asociados S.A." a local Engineering Consulting firm had develop the studies to exploit the hydroelectric potential of the Quitaracsa River. The company owns the water right granted by the government in 1997[2] and is in the process of obtaining the Definitive Concession that is the final approval needed in order to own the generation rights on the Quitaracsa River.

S & Z found an opportunity to expand their activities from pure engineering design and project management of infrastructure, to development of power plants in Peru. The company is looking for a partner to finance the project[3]. The new electricity law enacted in 1992, made possible this change in the company's focus. The objective of the law is to transfer to the private sector the government assets on electricity generation, transmission, and distribution. The government is willing to attract private investors to the power sector and commit them to invest on energy development in the short-term and long-term.

6.2 Country Background

Peru is located in Western South America and share borders in the North with Ecuador and Colombia, in the East with Brazil, South East with Bolivia, South with

[1] This case study was written as a basis for thesis discussion and not to illustrate effective or ineffective handling of a business situation.
[2] Granted by the government agency through Resolution N° 018-97-AACHS, year 1997.
[3] S & Z is a major local engineering firm with limited resources to finance the project by themselves. However, compared with international engineering companies, they are small. The partner S & Z is looking for should bring additional expertise, contribute with equity, and be financially strong.

Chile, and West with the Pacific Ocean. The total extension is 493,224 square miles[4]. In terms of size, it is the forth country in Latin America, after Brazil, Argentina, and Mexico. The Peruvian population is above 25 million and growing at 1.7% per annum. From those 25 million, 70% lives in urban areas and 30% in rural area. Around 53% is concentrated in the coastal region, 35% in the mountains or highland, and 12% in the jungle region. The coast is a narrow region between the Andes Mountains and the Pacific Ocean. It covers 13% of the territory and concentrates the industrial, commercial and agricultural activities of the country. Lima, the capital, is located in the middle of this area. More than 7 million people live in Lima and it concentrates the political and economic activity of the country. The Andes Mountains covers 37% of the territory. Most of the mining activities are developed in this area. Many cities are located on this region such as Cuzco, Arequipa and "Cerro de Pasco." This last one grew around a mining development and is located at an altitude of approximately 14,000 feet[5]. The jungle or rain forest, covers around 50% of the territory and is the less populated area of the country.

In the early 90s the Fujimori's government started structural changes in Peruvian economy. The country restructured its debt and re established debt payments to lenders such as IMF, World Bank and Paris Club. Peruvian government committed to follow radical changes on its economy. Those commitments were signed with IMF and World Bank, and they establish the country's economic goal for the following years. As part of the commitment, the country enters into and aggressive privatization process on the mining, electricity, telecommunications, banking, and fishing industry. The consequence of privatization was strong foreign investment in the industries mentioned above[6]. There was strong economic growth in the 1994-97 periods and inflation was under control. However, the privatization process decline, and external factors such as "El Niño" weather problem, the Asian financial crisis, and instability in the Brazilian market undercut growth. Nevertheless, GDP grew 3.8% on 1999 mainly because of price

[4] Approximately 1,285,216 square kilometers.
[5] 4,302 meters above see level.
[6] Foreign investments through privatization were possible due to new laws promoting private investment, elimination of government price controls on services such as electricity, water, telecommunications, etc., and in general, having the government as a promoter of private investments and responsible of creating the regulatory framework to make this happen.

recovery on commodities such as cooper and the recovery of the fishing industry affected by "El Niño." Growth in 2000 on GDP was 3.6% and was expected a 1.5% growth in 2001. Some of the main problems the Peruvian economy is facing are: high interest rate and a credit crunch; sluggish foreign investment; political and economical instability[7]; high levels of private and public debt; growth of poverty and unemployment; and depressed domestic demand. Some positive upcoming events are the opening in 2002 of Antamina[8], a cooper-zinc mine, and investment in the Camisea[9] project starting on 2002.

The privatization process followed by the Peruvian government slowed down in the late 90s. Prior to presidential election on April 2000[10], the government decided not to sell the assets that were kept on oil refinery, hydroelectric plants, and water companies. New elections will be held on April 8, 2001. In the mean time, there is a transition government with Valentin Paniagua as the president.

6.3 Peruvian Electric Sector

The Peruvian energy sector as on many developing countries was characterized by having the state as the only participant in the market. The market was vertical integrated, having the government as the owner of generation, transmission, and

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[7] Alberto Fujimori, the Peruvian ruler, started his third government period on July 28, 2000. Fujimori announced on September 2000 new election for 2001 and that he will step down as President on July 28th 2001. Videos showing Fujimori's advisor and chief of the Peruvian Intelligence Service, Vladimiro Montesinos bribing newly elected congressman forced Fujimori's announcement. On November 2000, Fujimori resigned from Japan. However, the congress did not accepted his resign and declared vacancy of the presidency. During the crisis, the first vice president resigned and as a result the second vice president was supposed to take the government. However, pressure from opposition forced the second vice president to resign due to corruption evidence and no guarantees of a fair transition. The congress, controlled by opposition forces after 10 years of Fujimori's party control, elected as its president Valentin Paniagua. He finally assumed the presidency and started to re establish democracy. New elections will be held on April 2001 and a new government will start on July 28, 2001.

[8] This US $ 2.2 billion dollars mining project will produce an important contribution to Peru's export earnings. Even with actual low prices for zinc and cooper, Antamina projected exports of US $ 800 million is significant for a small economy like the Peruvian.

[9] Camisea is the largest gas deposit in South America and total investment in the following two and a half years is expected to be around US $ 2.5 billion.

[10] The elections in Peru were characterized by the polarization of the population. On one side, those supporting Fujimori and on the other side those against him. In addition, there was no transparency and the process has been questioned by international agencies invited by the government and by Peruvian opposition. Alejandro Toledo, who was running against Fujimori, step down from the presidential race because of government manipulation.

distribution facilities. Two major companies, Electrolima and Electroperu were the state-own sector companies and were integrated vertically and horizontally. Structural economic changes promoted by the government in the early 90s were intended to change this situation. The government was willing to promote private participation on infrastructure development and on November 13, 1991 law 622 created the framework to promote private investment establishing juridical stability for private investors. On November 09, 1992 the government enacted the Electrical Concessions Law 25844. The intention of this law was to create the regulatory framework to structure the electrical sector. Two entities were created under this law, the Electricity Tariff Commission (CTE) and the "Economic Operation Committee of the System" (COES.) These two were responsible of the dispatch of the system. This law promoted privatization of state-owned assets[11] in the electrical sector. It also defined the rules for market entry of private sector and for pricing. Law 26876 was enacted in 1997 to avoid Monopoly and Oligopoly in the sector. The law limited vertical and horizontal integration of private companies in the sector. Companies participating in generation, transmission and distribution of electricity can own no more than 15% on any sector (Horizontal integration) and no more than 5% on any sector if vertical integrated[12]. Clearly the law intention is to avoid vertical integration and concentration on the market[13]. The government wanted competition.

The Ministry of Energy and Mining[14] (MEM), will guarantee the generation concessions[15]. Basically the MEM is in charge of the policy function and the CTE and

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[11] State-owned companies should be unbundled in generation, transmission, and distribution activities.

[12] A company can hold 10% in distribution for example, but no more that 5% on generation or transmission.

[13] Companies can get approval from INDECOPI if after buying shares or merger the percentages are violated. This was the case of Endesa-Spain (Endesa). This company competes in the generation market. Endesa acquire majority on Enersis from Chile, which is a major competitor in the generation sector in Chile and holds ownership in Peruvian generation sector. Endesa was violating the law because they owned more than 15% on the generation market with the acquisition of Enersis. The company claim the acquisition was before the Anti-monopoly law. INDECOPI finally allowed Endesa concentration in the Peruvian market. By the time INDECOPI was evaluating this case, the government was very interested on having Endesa as a major buyer of Camisea Gas and was trying to obtain Endesa's commitment to a take or pay contract. The gas should be used on the generation plants that were able to burn that fuel. The interest of the government was to make more attractive Camisea project for private investors. The government was in the process of granting concessions for field exploitations and distribution of the Camisea gas. The problem was that no gas consumption existed in Peru and they were trying to get clients to attract major energy companies to invest in the project.

[14] Ministerio de Energia y Minas

[15] Generation Concessions can be divided into Temporary Concession, and Definitive Concession. Temporary concessions allow a company or person to develop studies related to generation, transmission,

General Electricity Commission (DGE) of the regulatory activities. The DGE depends on the MEM and their role is to issue concessions, set standards, and undertake other regulatory functions. The purpose of the concessions is to promote private investments in the generation, transmission, and distribution of electricity. MEM role in the sector other than policy is planning of the sector and ultimately responsible for concessions.

Concessions are issued by DGE but are granted by MEM. Temporal concessions can be requested for a maximum period of two years and can be renewed for a similar period depending on the complexity of the project and additional studies needed. Within this period, all the technical studies needed for the project should be performed. In addition, economical and financial analysis, and environmental studies should be performed. A temporary concession guarantees a firm to develop the studies. In the case of a hydroelectric power plant, it protects the sponsor to maintain the rights on the hydroelectric potential of the river the sponsor is evaluating. During this period, the sponsor will prepare the entire requirement needed to obtain the definitive concession. The definitive concession allows the sponsor to use public property to build and operate power plant projects, in addition to transmission and distribution facilities if that was the nature of the concession.

The sponsor can lose the concession in case they do not continue with the studies required or if they do not follow the necessary procedures in order to have the facility finished and operating according to the schedule established on the Concession Contract. They can also lose the concession if without justification the facilities are not operating during 876 hours in a year. Another cause to lose the concession is if the facility is not operating according to the standards established by the "Economic Operation Committee of the North Central Interconnected System" (COES-SICN[16]) the agency that groups all the electric generators of the north central interconnected system. Some of the COES-

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and electrical substations that require temporary use of public property. For generation projects such as hydroelectric or thermal over 10 MW then the developer needs to request the concession. Definitive concessions are required when a company or person wants to develop generation, transmission, or distribution activities that will use public property. The sponsor will have the right to build and operate the facility and all related infrastructure.

[16] The Economic Operation Committee of the North-Central Interconnected System (COES -SICN) is a technical organism composed by members of the Generation and Transmission systems, which are interconnected to the North-Central System. Its main objective is to coordinate their operation at a minimum cost, guaranteeing security and quality of energy supply as well as the most efficient use of energy resources. (As defined on COES -SICN's web page: http://www.coes.org.pe/coes/default.htm)

SICN duties are: to plan the electric system operation; control operation programs and major maintenance of facilities; calculate electricity marginal cost on the short-term; calculate the firm capacity and firm energy of every generator according to regulations.

By 2000, the government had privatized several hydroelectric and thermal Power Plants[17]. One of the privatization requirements was that the new owners should expand the capacity through new investments. By year 2000, the privatized companies have expanded the energy offer in more than 500 MW. In addition, the government had added 180 MW[18] and is in the process of adding another 130 MW through the construction of Yuncan Hydroelectric Power Plant.

The Peruvian transmission grid is known as National Interconnected Electric System (SINAC[19]) Prior to October 2000, the system was divided into North-Center System (SICN[20]) and South System (SISUR[21].) However, after private investors finished the Mantaro-Socabaya transmission line[22], Peru was able to connect SICN and SISUR systems. The total capacity of the system is shown on Table 6.1 and the total production is shown on Table 6.2. Table 6.3 shows the incremental changes on production from 1999 to 2000. Figure 6.1 shows capacity demand for years 1999 and 2000.

System	Hydroelectric	Thermal	Total	%
SICN	2389	1525	3941	65%
SISUR	471	1658	2129	35%
Total	2869	3210	6070	100
%	47%	53%	100%	

Source: Peruvian Energy Tariffs Commission (CTE[23]) December 2000

Table 6.1: Total Generation Capacity (MW)

[17] The total capacity of the power plants privatized was 1236 MW.
[18] The government built 110 MW San Gaban Hydroelectric Power Plant and expanded Mollendo Thermal Power Plant in 70 MW.
[19] Sistema Electrico Interconectado Nacional
[20] Sistema Interconectado Centro-Norte
[21] Sistema Interconectado Sur
[22] 220 KV transmission line.
[23] "Comision de Tarifas de Energia" which was recently created and replaced the Electricity Tariffs Commission (CTE.) The new entity was responsible not only for the electricity sector, but also for the natural gas sector.

System	Hydroelectric	Thermal	Total	%
SICN	13992	763	14755	74%
SISUR	2181	2966	5147	26%
Total	16172	3729	19902	100%
%	81%	19%	100%	

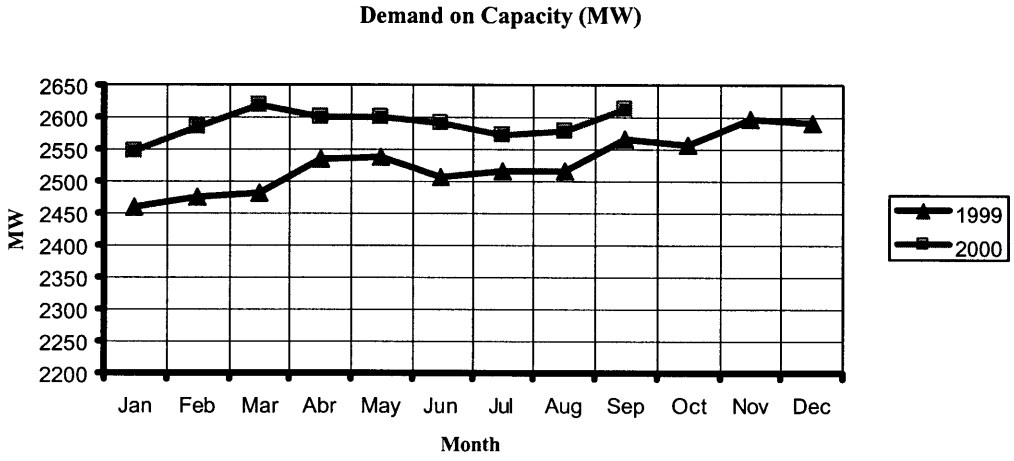
Source: CTE, November 2000

Table 6.2: Total System Production 2000 (GWh[24])

	Hydro	Thermal	Total
ENERGY ?	11.4%	-19.5%	4.7%

Source: CTE, December 2000 [25]

Table 6.3: Increment on Production 1999-2000 (GWh)



Source: CTE, December 2000.

Figure 6.1: Demand on Capacity (1999-2000)

The total capacity of the system is 6070 MW. While a total hydroelectric capacity of 2,869 MW correspond to 47% of the capacity of the system, total electricity

[24] GWh = Giga Watt Hour

[25] Only considered those companies reporting to the DGE. DGE is the National direction of Electricity.

production from hydroelectric sources of 16,172 GWh corresponds to 81% of the total production of the system. The main reason to explain this difference is that most of the energy is sold in the Spot market through COES. Under the existing regulations, the plants with less operation costs will sell their production first. Hydroelectric power plants use water as fuel so its fuel cost is zero. Because of this reason, hydroelectric plants are selling their production before thermal power plants. Thermal power plants are mostly used during peak hours and as a back up during dry years. In fact, year 1999 was dryer compared to year 2000 and for this reason, more water available in year 2000 generated that hydroelectric plants increased their production in 11.4% and thermal power plants production decreased 19.5%. The growth in production for year 2000 was of 4.7%.

Generation companies participate in a competitive market as they compete to sell their production to distribution companies and major consumers[26] in the deregulated market. Capacity that was not sold on the free market is sold on the spot market through COES. In this case, generators will dispatch base on their short-term marginal costs, on their production availability, and on system demand. The system is operated by the COES that is composed by generation and transmission companies, state and privately owned and dispatch is planned in hourly units. Generators will sell their production to the system based on economic performance, which means plants having lower production costs will dispatch first.

CTE is the government agency in charge of establishing the energy and capacity rates[27]. In addition, CTE will define the charges for using the principal and secondary transmission line systems. Figure 6.2 shows average energy tariff for Lima and Chimbote[28]. Figure 6.3 shows capacity prices on the same locations.

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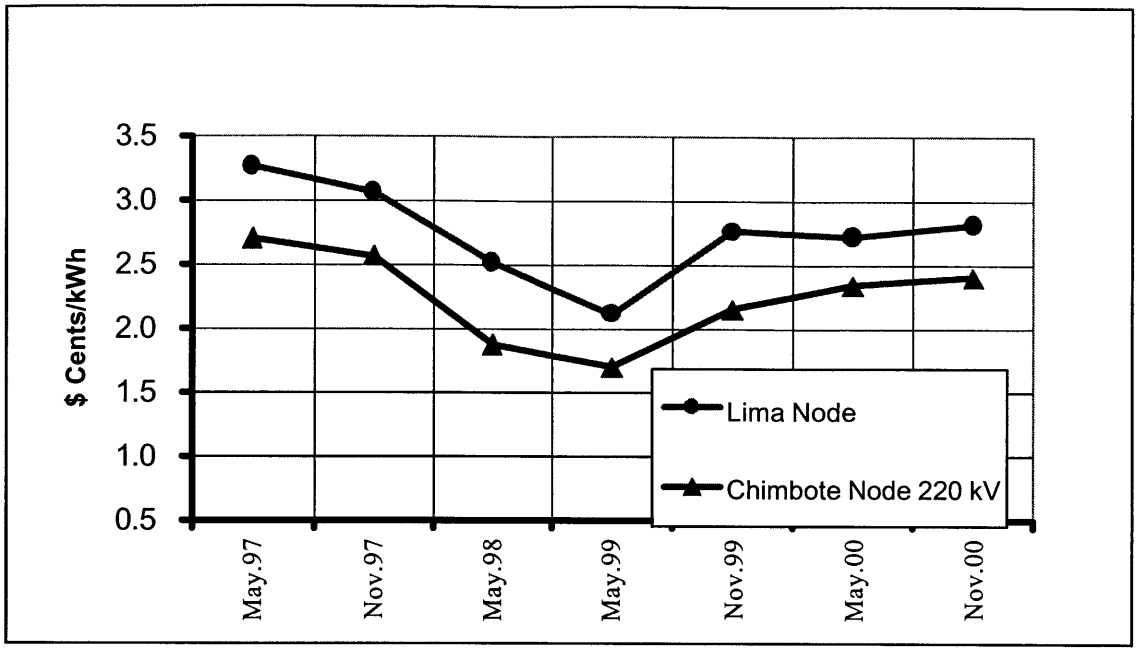
[26] Major consumers are those with demand greater than 1 MW. Generation and distribution companies can sell to these clients. On the other hand, distribution companies exclusively serve consumers with less than 1 MW demand.

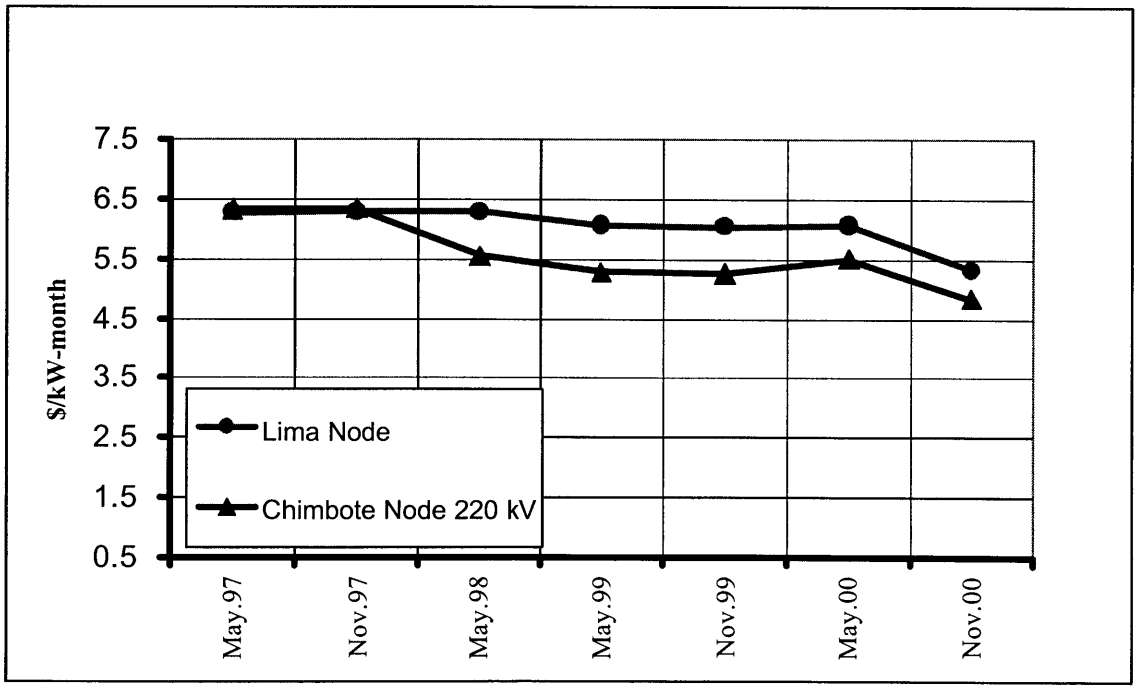
[27] Rates will depend on the region and are defined on electric substations (nodes.) COES will calculate them based on demand projections for the following 48 months period. In the calculation, COES consider factors such as expansion of the system, current conditions of fuel prices, reservoir levels, hydrology, and discount rate. The farthest the plant is from higher demand (in the case of Peru, from Lima), the lower the rates on energy and capacity. The rates are calculated two times every year, on May and November.

[28] Chimbote is a Peruvian city located 450 km north of Lima on the coast. Prices for the project are taken considering the node on this city because it is where Quitaracsa project will be connected to the electric grid. However, the government has just announced the construction of a new transmission line that will pass in front of the future power plant. A new exiting node will be less than half mile from the project.



Source: S & Z Consultores Asociados, S.A., "Quitaracsa I Hydroelectric Power Plant: Economical and Financial Study", Lima 2001

Figure 6.2: Average Tariff of Energy on Lima and Chimbote.



Source: S & Z Consultores Asociados, S.A., "Quitaracsa I Hydroelectric Power Plant: Economical and Financial Study", Lima 2001

Figure 6.3: Capacity Tariff on Lima and Chimbote.

6.4 Quitaracsa I Hydroelectric Power Plant[29]

The Quitaracsa River is located in Peru, 500 Km. North of Lima. S & Z developed studies to determine the hydroelectric potential of the river. According to those studies, a total height of 1,765 meters between Quitaracsa Town and the junction of the Quitaracsa River with the Santa River can be used for generation purposes. The company optimum plan is to develop this potential in two phases building two hydroelectric power plants, Quitaracsa I and II.

Quitaracsa I, a 115 MW power plant, is the development located down stream the river. The project was bided by S & Z in 1998 in two separated contracts. The first consists on civil works that include access roads, camps, intake works, tunnels, underground powerhouse and all the work that are normally performed by civil contractors. The contractor who wins this part will have a Design-Build contract. Financial contribution to the project was expected from the contractor. The second includes furnishing and installation of all equipment, such as gates, turbines, generators, switchyard, control systems, and all other necessary equipment for the correct operation of the plant.

The owner of the generation right, S & Z "Consultores Asociados" a Peruvian engineering consulting firm, prepared a conceptual design that was given to the bidders. The project had a very simple development scheme. A 20m high and 30m wide concrete dam, a 5km pressure tunnel in high quality rock, and an underground powerhouse. The main difficulty of the project was the access road to the intake works and the limited space available in the area where the powerhouse will be built. In addition, there is an existing powerhouse, Cañon del Pato, owned by a private company and located 400 m from the projected powerhouse. This complicates the construction works in this area and had created many problems to S & Z to obtain the Definitive Concession.

The sponsor had asked the bidders to suggest alternative solutions with the only restriction that the power and energy generated by the plant could not be less than the one defined on the bidding documents. In the different meetings and visits to the site with the contractors, the main questions were the access problem to the intake, the limited space

[29] S & Z Consultores Asociados S.A., "Quitaracsa I Hydroelectric Power Plant: Economic and Financial Studies of the project", Lima 2001.

for camps, and where all the material from the excavation should be disposed. The access road was the main concern. The intake works and the powerhouse are in both extremes of a spectacular canyon so narrow that is not possible to walk through it. In order to arrive to the intake area, is necessary to climb 2000 meters and then walk down 1500 meters. The sponsor had realized this problem and made additional studies, at the same time the bidders were preparing their proposals. The bidders approach the problem in very different ways and these approaches made an important difference in the bidding prices. Some bidders have maintained the access road considered in the conceptual designs. One of them suggested a cable way through the canyon, which was a very imaginative solution but very expensive. Another bidder considered an existing local road that is in very bad condition and then plans to construct more than 30 km of roads to arrive at the intake. The total length of this option was more than 100 km. For the other parts of the project, the contractors have presented some suggestions but they will wait until the negotiations with the sponsor to present all their improvements to the project. Finally, the additional studies performed by the sponsor suggested a much easier and cheaper way to access the intake through a 10 km new road with 1.5 to 3 km of tunnels.

The underground powerhouse is located downstream the river very close to the junction with the Santa River. In this area is also located Cañon del Pato Hydroelectric Power Plant. In fact both underground powerhouses will have one third of a mile distance between each other. This issue will add more complexity to the construction phase. In addition, to access the construction area it is necessary to use a bridge under control by the owners of Cañon del Pato, Egenor.

Five experienced contractors were invited to bid for the civil works. Two contractors were from Brazil, one from Sweden, one from Italy, and one from England-Norway. All five firms are large global contractors with experience on the country and hydroelectric projects. Only one of them did not presented an offer and none of them presented major suggestions or recommendations during the bidding process. Contractors were waiting for the negotiation to show their improvements. This requirement was supposed to be important when evaluating the proposals, however, it was not clear how these recommendations will affect the final decision of to whom should be granted the contract.

Four major suppliers of hydroelectric equipments were invited to bid. The underground powerhouse will allocate two Pelton turbines, each of them with a total output of 57.5 MW and design flow of 7.5 m^3/s. Suppliers were competing in parameters such as price and efficiency of the equipment.

S & Z had invested on the development phase preparing the feasibility and environmental studies, the biding documents, and the requirements needed to obtain the concession. They had also approached a US based financial group as their financial advisors. This company, Energy Capital Holding Company[30], (ECHCO) will help S & Z structure the project finance deal and access the capital markets to finance the project. ECHCO prepared a preliminary financial analysis on July 1998 were they recommended financing the project based on a 70-20-10 debt-equity proportion. The 70% corresponded to senior debt through an international bond offering, 20% subordinate debt or preferred shares through contractors and equipment suppliers, and 10% as equity contribution[31]. The proposed financial structure should be as is shown on Figure 6.4. According to ECHCO, the major concerns to be address in order to achieve a successful financial closure are:

1. Revenue forecast reliability. The main issue is if the lenders will accept forecasts. One recommendation was to study the availability and cost of risk management products that will insure revenue risk. The impact of Camisea on energy rates should be analyzed in detail.
2. Fixed cost price and schedule commitments must be secured.
3. Contractor financing offer must be evaluated
4. All the legal requirements should be fulfilled and permits should be obtained. The Generation Concession is necessary to start approaching investors.
5. The project needs to secure an insurance program.

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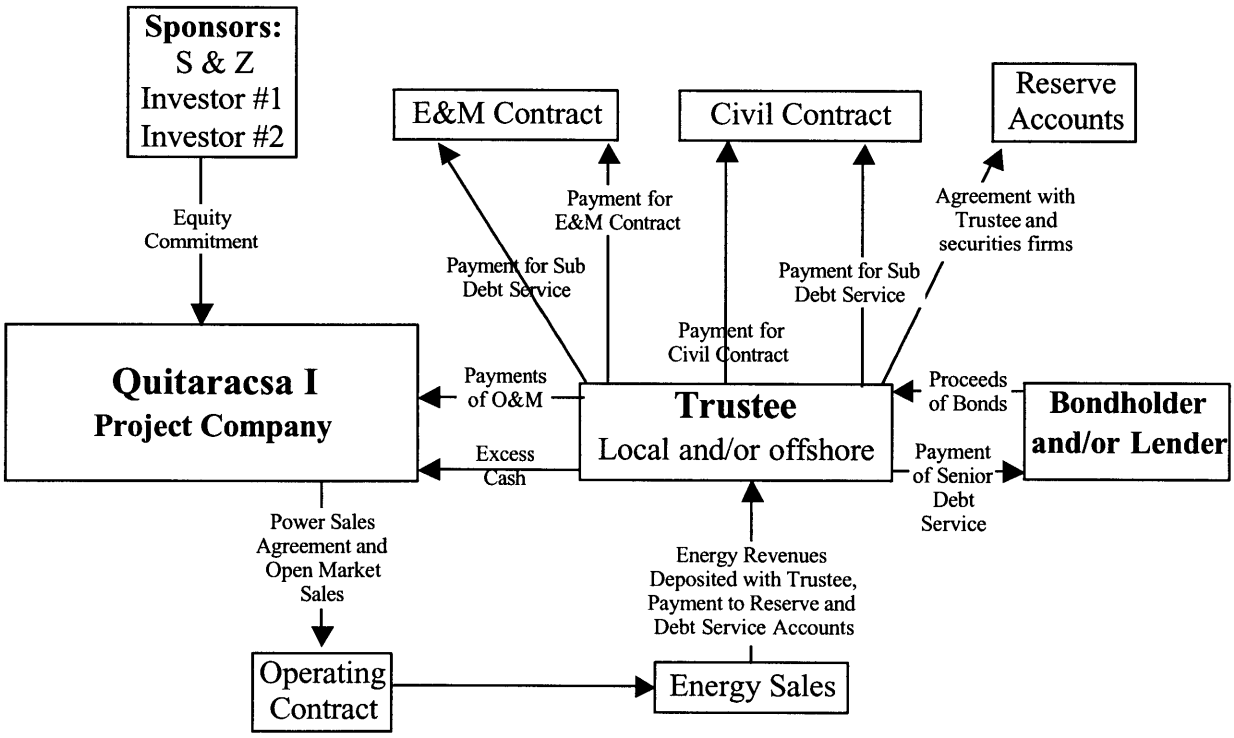
[30] This energy holding group is formed by the following companies: REM Capital Corporation (General & Financing Manager); Elsamprojekt A/S (Engineering and Development Manager, gas wind, bio mass, and solar energy); Banco Bandeirantes de Investimentos (Brazilian Depository and Project Agent Bank); Bank of Tokyo Mitsubishi Capital Corp. (Capital Markets Agent); Ballard Spahr & Ingersoll, LLP (Project Counsel); E&CO (Co-General Manager, Merchant Banking); Design Power (Engineering and Development Manager, Hydro, geothermal, and gas); Jardine Lloyd Thompson/Tri-City (Insurance Manager); Estudio Ortiz-de-Zevallos (Project Counsel, Peru); Pradini Advogados Associados S/C (Project Counsel, Brazil)

[31] Energy Capital holding Company (ECHCO), "QUITARACSA I: Preliminary Financial Analysis and Draft Financial Plan for Discussion with S & Z Consultores Asociados, S.A.", July 1998

6. At the time, no operation company was contacted.
7. A US $ 1.4 million equity contribution must be obtained to finish investments on the development phase.
8. Tax and duties analysis must be prepared.
9. Power Purchase Agreement must be secured.



Source: ECHCO, "Quitaracsa I: Preliminary Financial Analysis and Draft Financial Plan for Discussion with S & Z Consultores Asociados S.A., July 1998.

Figure 6.4:Quitaracsa I Financial Structure

Since the biddings were received on July 1998, S & Z was waiting the government to grant the Definitive Concession. According to the existing law, S & Z owns the generation rights since November 11, 1997. In fact the Concession Contract was sign with the MEM but Fujimori's did not signed it[32]. This was not legal, but the

[32] The President signature is a requirement on the Definitive Concession approval.

justice administration was controlled by the government and S & Z did not have other option rather than to wait. Two main reasons can explain Fujimori's attitude. The first reason was that Egenor was doing lobbies and at the same time pressured the government in order to get the rights over the Quitaracsa River. They claim that the Quitaracsa River water rights were obtained during the privatization process and they were trying to force the government to recognize this. However, it was clear that the Quitaracsa River water rights were not granted to Egenor when they bought the state-owned generation company. Quitaracsa is a highly profitable project for them and they are still willing to get the water rights from the river[33]. The second reason was the government interest on the Camisea Project. Camisea is the largest gas deposit in South America and the government was willing to attract private investors for its development. There is no gas consumption in Peru, however, the government was committed to create a market for the gas and gave important concessions to private investors especially after negotiation with a consortium of Shell and Mobil failed. Shell discovered this gas field in the 80s but country conditions were not attractive for development. In the 90s, the government invited Shell to continue with the studies on the gas field. Shell associated with Mobil continue with exploration and estimated a 9 to 13 trillion cubic feet (tcf) gas deposit and over 600 million barrels of concentrate. On July 1998, the consortium announced that would not continue with the project because negotiations with the government failed. The total investment on the project was estimated in US $ 2.6 billion and at that point it was a political necessity for Fujimori to continue with the project. The government invited the private sector to participate in a new biding process and negotiate with companies interested on the project. The concession was broken onto three parts field exploitation, transportation, and distribution. As a result of these negotiations, the hydroelectric concessions were block on 1999 and for five years after the congress approved a law blocking this type of power plants. However, the government lifts this restriction on December 2000 but gave MEM discretion to grant Definitive Concession.

Fujimori's government did not granted any hydroelectric Definitive Concession since 1998. The actual government granted on April 2001 the Definitive Concession to Cheves, a 525 MW power plant to be build on the northern part of Lima. The Quitaracsa

[33] The Peruvian Supreme Court solved the problem on the water right in favor of S & Z on April 9, 2000.

I Project was waiting the concession before Cheves, however, it seems that the size and strength of the two sponsor, a Norvegian company and a US company, and the pressure from Egenor are not allowing S & Z to obtain the Definitive Concession[34].

6.5 Cañon del Pato[35] - Egenor

During the privatization process, the two state-own electricity companies were unbundled and many of the newly created companies were privatized[36]. One of these companies was the generation company in the north of Peru, "Empresa de Genaracion Electrica Nor Peru S.A." (Egenor[37].) "Inversiones Dominion Peru S.A[38]" acquired 60% of the company on August 8, 1996. On June 1997, Chilgener[39], the second larger Chilean generating company achieved an agreement with Dominion Energy Inc to acquire 49% of their ownership on Egenor. On August 2, 1999 Dominion Resources agreed to sell all their portfolio of generation projects in Latin America to Duke Energy International (DEI) for US $ 405 million. On October 12, 1999 Gener S.A. transferred all their stocks to DEI. On October 13, 1999 the Peruvian Government offered to the market the 30% ownership they held in Egenor and all the stocks were bought by DEI. Duke Energy International Peru Holding N°2 LLC[40] now controls 100% of the company.

On 1996 S & Z approached Dominion to develop the Quitaracsa Project. By that time S & Z was developing the studies of the project and thought Egenor was the logical partner to them due to the proximity of the project to Cañon del Pato. They did not

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[34] Cheves is a project developed by Statcraft, a state-own Norway Company that build owns and operate hydroelectric plants on their country and foreign countries also and AES from US, another important player in the electricity sector. In contrast, S & Z is a local firm with limited resources and lobby capacity.
[35] Means The Duck's Canyon.
[36] The Peruvian Government retains control on Mantaro Complex, two hydroelectric power plants with a total capacity of 1,008 MW, and on EGASA and Machupichu, both generation companies in the south of the company. San Gaban (110 MW) finished on 2000 and Yuncan (130 MW) under construction, are state-own hydroelectric projects also. In addition, almost all transmission system is state own. Mantaro-Socabaya transmission line developed by the private sector under a BOT contract and some transmission lines in the south privatized on 1998 are privately held. The government also held 30% ownership in some regional distribution companies.
[37] EGENOR S.A.A. was constituted on November 27, 1996.
[38] Was a subsidiary 100% owned by US Dominion Energy Inc.
[39] On March 1998, the company changed their trade name to Gener S.A.
[40] This company is 100% owned by Duke Energy, US Company competing in the energy sector. Total revenues for 1999 were US $ 23,997 million and total assets US $ 33,409 million.

showed interest on the Quitaracsa project at least not to the project under S & Z development. However, they realized there was a lot of potential on this river so they tried to get the right on the Quitaracsa River[41]. Deadlines for their request were over and the right corresponded to S & Z. Egenor through Dominium and Gener had pressure the government and MEM to nullify S & Z rights in order to obtain the water rights and at the same time had contracted Acres, a design firm from New York, to develop the Quitaracsa Diversion Project. This project uses water from the Quitaracsa River to generate more energy and to get more capacity revenues[42] for Cañon del Pato Power Plant. It is not possible that Quitaracsa I and Quitaracsa Diversion exist at the same time; both project use the same water. S & Z had approached Egenor in the past few years without success. There was the possibility to build a smaller power plant in case of successful negotiations. The intake, and access to the intake area of the smaller power plant will be the same as were planned for Quitaracsa I. However the powerhouse will be move inside the canyon and upstream the intake of the diversion project. These changes will reduce the capacity of Quitaracsa I Power Plant in almost 50% to 63 MW and will increase the cost of energy per kilowatt generated making the project less attractive to private investors and more difficult to finance. S & Z required a fee so they can compensate the loss generated by changing projects. In addition, several optimizations can be made if the two projects are developed after a successful negotiation. It is not necessary to build two intakes both with enough storage capacity to meet peak demand. Only the Quitaracsa I intake can be build and the diversion project will only need simple an much less expensive diversion works. The new 84 km. transmission line needed for Quitaracsa I can be avoid if Egenor allows S & Z to use the new 220 kV transmission line

[41] According to Law 26844, if one company obtains a temporal or definitive concession for generation, another company can also request this concession but there is a deadline. In case two or more companies require a concession, then the concession will be given to the company that offers more benefits to the country: Investment, energy costs, environmental impact.

[42] Power plant capacity and real capacity recognized by the system are never the same for hydroelectric projects. Capacity calculations are made by CTE and are based on parameters such as hydrology and storage capacity near the intake (which means more flexibility to operate.) among others. Quitaracsa will allow Egenor to have more water available and regulated, and then the immediate effect is more capacity recognition.

this company is planning to build[43]. None of these issues had been negotiated in fact, negotiations were not positive between both companies.

6.6 Actual Situation

The actual situation is that the sponsor is still waiting the Peruvian Government to grant the generation concession so they can be able to raise fund from the capital market. The actual political crisis in the country can make more difficult the financial stage, however, there are still companies interested in the project.

According to the Peruvian Law, the Definitive Concession corresponds to S&Z since November 11, 1997. The Concession Contract was signed on May 18, 1998. The last step in this procedure is that the project's contract needs the sign of the Peruvian President. S & Z followed all the steps according to the Peruvian Law, however President Fujimori refuses to sign the contract[44].

The actual government had just granted a Definitive Concession to Cheves Project, but still nothing on Quitaracsa I. At this time there is a lot of uncertainty. A new government will start on July 28, 2001 and it is not clear what will they do.

1. Camisea is in the process of securing funds for its development and hydroelectric plants can reduce the market for the gas. It is not clear if the new government will impose a new moratorium to hydroelectric projects to favor Camisea.
2. Take or pay purchase contracts on the gas will result in a zero cost of fuel for the generators under COES actual regulations. However, it is expected that the variable costs of gas plants should be higher compared to hydro plants.

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[43] The Peruvian Government have just announced the construction of a new transmission line to favor mining development and to made more reliable energy supply. This transmission line will pass in front of Quitaracsa I and a new electric substation will be build. As a result, no 84 km transmission line will be needed allowing construction saving of around 10 million.

[44] It is not clear why Fujimori did not wanted to sign the contract. Pressure from other company willing to obtain the water from the Quitaracsa River can be one of the reasons. Fujimori left the government just after he was elected for a third period accused of corruption, and political manipulation. Legal actions against the government should have been the next logical step to be followed by the sponsor. No independency on justice administration gives almost any chance to the sponsor to succeed in a trial against the government.

3. The major generator on the country is private and more than 50% of their production came from hydroelectric power plants. They also own thermal plants that will be able to burn gas. However, they will be better off using their hydroelectric capacity before committing to burn gas on their plants.
4. The government had committed to buy an important amount of gas under a take or pay contract. This commitment was necessary to make feasible the development of Camisea. There is a real possibility that the government will develop a gas-fueled power plant to use this gas.
5. The actual recession had reduced growth in electricity demand. The system has an extra capacity of around 100%. There is one hydroelectric power plant under construction (Yuncan, 130 MW) and one under rehabilitation (Machupichu, 140 MW) In addition, the Definitive Concession to Cheves will allow their sponsors to build and operate the plant, which means extra 525 MW in five years.
6. Considering an annual growth of 4%, the capacity needs for the next five years will be 1100 MW or an average of 220 MW per year. However, it has to be considered that there is 100% overcapacity.
7. It is also uncertain if regulatory and institutional agencies can perform a neutral role on their duties on the sector's market or if they will suffer political intervention and pressures. Some worries appeared in this regard, after the government replaced the Electric Tariff Commission with the Energy Tariff Commission that will also have responsibilities on the natural gas sector.

Chapter 7: Conclusions

7.1 Project Evaluation

There is no best method to evaluate a project. The evaluation method will depend on the level of uncertainty that the project face. In many cases, a combination of discount cash flow analysis and sensitivity analysis would be enough to evaluate a project. In cases where uncertainty is high, the evaluator should use different methodologies such as decision analysis and options.

Decision analysis allows managers to evaluate a project including on the evaluation model the effect of actual decisions on future investments. It will also help managers to understand and structure complex projects evaluations. The probabilities of certain outcomes to happen are sometimes difficult to estimate especially when no previous records exist.

Choosing the wrong evaluation method can have as a result managers taking bad decisions. On Chapter 2, an economic analysis was performed for the Quitaracsa I Project and economic parameters such as the NPV, IRR, and B / C ratio were calculated. The NPV for the project was US $ 24,006,106. The calculation was made assuming that the project does not faced uncertainties. However, because the concession was still not granted, there is a chance that the project will never be built. In addition, the sponsor has different possibilities such as to keep the project as it was projected or sell the water right and reduce the project capacity. When adding these uncertainties to the evaluation using decision analysis, the NPV for the project was reduced in 28% to US $ 17,320,000. It is clear that the sponsor cannot move forward with the project because the concession was not granted. One of the reason why the concession was not granted is the existence of another company that is willing to use the water of the Quitaracsa River on one of their power plants. The sponsor has to consider the implications of not receiving the concession and negotiating with the other company on its analysis.

Decision analysis method uses the NPV method to calculate the present value of the several possible outcomes. One problem with decision analysis method is that normally all the different outcomes are discounted at the same discount rate. However, different alternatives will have different risk and as a result should be discounted using different discount rates.

Options are very valuable when the level of uncertainty is high. The NPV method will calculate the value of the project by predicting its revenues and expenses and discounting the project at the appropriate discount rate. This discount rate will include risk. However, NPV does not allow decision makers to react to changes in the assumption made when performing an evaluation using the NPV method. The option methodology allows managers to invest small quantities up front, see how things develop, and finally decide to abandon or move forward with the project depending on what happens in the future.

7.2 Project Finance

Infrastructure projects such as power plants are capital intense. They require large amount of funds to build the projects and long maturity period are needed for the loans to be paid back. The investment on power projects is sunk, which means that the lender will not be able to recover the loan through selling the project assets. The loan will be recover from the project's cash flow.

Private participation on infrastructure projects is growing and the evidence is that it will keep growing. Developing countries are allowing more private investments on infrastructure projects because of the need of development, and the lack of funds to finance the projects needed. Infrastructure projects are of vital importance to a country's development and lack of infrastructure will erode a country's competitiveness, possibilities of development, and increase on its GDP.

It is fundamental to attract private investors the political commitment, a stable regulatory framework, competition, and clarity and transparency in the transactions. A concession can be granted to a private investor and the government can back this investor

giving them a strong support. However, if the transaction was not transparent and in fact there were irregularities generating justifiable criticism to it, then it is highly probable that changes in government will alter its initial commitment to the project and previous agreements can be review and in some cases rejected by the new administration. This was the case of the Dabhol and Paiton I project, were there was no transparency and there were also signs of corruption.

On the Dabhol Project, the SS-BJP coalition won the elections on the State of Maharashtra[1] and they cancelled the project arguing lack of transparency during the negotiation process and questioned the final agreement between Enron and MSEB. The local press and the opposition had criticized the project during and after negotiations. In this case the new government canceled the project because it was harmful for the state and there was a perception of corruption[2]. However negotiation between the government and Enron were held after a few months and a new agreement was achieved. The new agreement was also criticized because it was too generous for the investor and still harmful for the country. Under these circumstances, renegotiation of the contract has not reduced the political risk on the project.

On the Paiton I Project, the authoritarian government of Suharto was backing the project. Government's power suppressed any criticism to the project and the government did not allow any controversy of the deal. There were several evidences about corruption on this project. The member and friends of Suharto's family had received stakes on the project without payment. The supply contract was awarded to BHP, a company with no previous experience on the coal business but with family relations with Suharto and the Ministry of Energy that was later Ministry of Economic Affairs. After Suharto step down from the government, claims to the project restarted. Negah Sudja, a former head of research at PLN commented to the Asian Wall Street Journal: "Everybody knew it was nepotism, but we could not do anything about it." According to PLN staff, they did not want and could not afford the plant, but they had no power to challenge the project because the president backed it. In addition, the president of PLN commented: "The power companies dictated terms to us because they had Indonesia's first family behind

[1] They replaced the Congress party.
[2] An Enron spokesperson denied that any kickbacks were paid.

them. Resisting them was like suicide." The Indonesian National Audit Commission estimated that corruption increased the cost of the Paiton I Project by US $600 to US $1,000 million dollars.

Large corporations investing in developing countries such as India, Indonesia, and Peru are risk takers. Investments for projects such as Dabhol and Paiton I are large and not only the sponsors are investing on the projects. In fact, debt financing in the first case is around 70% of the total budget and 76% in the second case. The following discussion will cover the role of the lenders, the sponsors, and why corruptions seems to be one of the "parties" facilitating the deals.

There is a lot of arguing about corruption signs and irregularities on the Dabhol and Paiton I projects. On the first project, the conditions accepted by the Government of Maharashtra were harmful for the State and finally its population. On the second project, it was evident the participation of the president and the president's family on the project development.

It seems sometimes that there is not a clear line to differentiate what a country need as infrastructure and what should be paid for that infrastructure. But the problem is not only related to the projects, the companies and the politicians. Unfortunately, corruption is a common practice on many developing countries and corruption is possible because the system and the legal framework facilitate it. Creating a legal framework reliable to private investors is the first step to reduce irregularities, questioning and in some cases corruption. This legal framework should be clear and should promote competition, transparency, and clarity on the process to grant infrastructure projects. The government is the one to define what are their needs and what strategy to follow to satisfy those needs. They should identify the projects and clearly define the scope so the private sector knows exactly what the government is looking for. When calling for a bidding, the government should define the competition rules as clear and transparent as possible and the process itself has to be clear and transparent. As clearer and open is a process, there is less chance of irregularities and corruption. In addition, government commitment to private sector development of infrastructure projects is a key aspect. Summarizing, government commitment, legal and regulatory framework in place, competition, clarity

and transparency, market attractiveness, and demand are all key aspects to promote private sector participation on infrastructure projects.

A competition is not always possible. On some cases such as high-risk country, or small project with urgency to be implemented or limited knowledge of the market, direct negotiated projects can be the best way to proceed. However, this will not mean that the process has to be secret; the process has to be transparent.

The companies developing Dabhol and Paiton I entered risky markets where the rules were not really clear and where uncertainty was a big issue. It was out of the scope of the thesis and the analysis to deeply analyze and explain why these companies had adopted so risky position. However, an obvious explanation to their strategy can be that these companies have been risk takers by nature and entering this market were a large opportunity. They believe they were able to manage the risk. There is one consideration that has to be taken into account when analyzing the risk they face and the theoretic long-term nature of their investments. This consideration has to do with the independent valuation of the projects. The costs claimed by the sponsors were far more expensive from what should have been the real costs. By inflating the costs, the sponsors can be collecting some part of the investment up-front and as a result reducing their exposure and risk. If their paid back period is eight years for example, then inflating costs will directly affect the real paid back period reducing it maybe to four. If this is the case, then this strategy is equivalent to having the sponsor committing less equity and exposing the lenders to more risk.

It is arguable the benefits of government's commitment on projects such as Dabhol and Paiton I. On the short –term, without doubt it was positive for the project, but in the long-term it is not positive. The problem is not the government commitment because as it was stated before, commitment is a key aspect to attract the private sector. The problem is the nature of that commitment, which means many irregularities, lack of transparency and clarity, and lack of competition that generated criticism and negative reactions to the projects. The sponsors faced no problems before the governments supporting them were on control. However, once a new government replaced them, the projects entered into trouble. The new governments were not in favor of the projects

because of all the irregularities during the process not because they did not wanted private investments.

The Quitaracsa I project is quite different from the previous tow projects. In this case there was political interference and the sponsor did not had the power to fig this risk. Fujimori's government blocked all hydroelectric developments not only the Quitaracsa I project because of the Camisea gas project. Before blocking hydroelectric development, he granted the concession for two power plants to be built by the company that is now the major private power producer in the country. At that time, Quitaracsa I was only waiting for Fujimori's signature as the other two projects but he did not signed it. One of those two projects was already under construction because the sponsor had the financial resources to fund the construction and the concession was imminent because they fulfill all the law requirements to get it as was the case of Quitaracsa I. Fujimori step down almost six month ago and the new government released the concessions for hydroelectric projects. In fact they already granted the concession to two hydroelectric projects, which were developed later than Quitaracsa I. One of these projects, the one that received the first concession after the release of hydro plants development, is sponsored by two large companies, one from Europe and one from US. They have made extensive lobbying and have appear several times on the Peruvian press.

Power plants provide electricity that is a basic service. The country population is very sensible to increases in the tariff they pay for this service and for this reason these projects are highly exposed to political risk. Governments will grant many benefits to investors in order to attract them. This is especially true on developing countries were needs for capitals to develop infrastructure projects are high and the governments are not able to finance the projects. However, after the private sector invested in the country and the perceived risk on the country decreases, then governments tend to change their position and try to renegotiate contracts or in some cases just making changes on the playing rules. In addition is very common on developing countries that after a new party take over the government some changes can be expected on regulations, laws, or even contracts with developers. As it will be described later, corruption finally affects the projects. The Dabhol and Paiton I project phased several problems from new

governments because there was no transparency and clarity on the deals but there were suggestions of corruption and kickbacks.

Peru can be a good example of changes on the playing rules because the perception of less risk by the government[3]. New election will be held in a month and one of the parties running for government has announced reduction in the electricity tariff. On the actual regulations methodology, the tariff is calculated through the cash flow for a reference type of power plant as it was explained on Chapter 6. This cash flow was discounted at a 12% discount rate. The argument from this party is that the discount rate of 12% is very high and was defined to include the risk of terrorism within the country. However, because terrorism is no longer a threat, then the discount rate can be reduced to 10% and as a result the tariff will decrease. The offer to reduce the tariff is mainly political rather than technical. Population is very sensible to services such as electricity, water, and transportation. Governments controlling tariff was a common practice in Peru in the past. In fact the party that now is making this announcements was controlling the government in the period 1985-1990 and their government subsidized the tariff on those basic services.

[3] There is the possibility that the political risk materialized if the party making the announcements wins the elections.

APENDIX 1

8.1 Financial Analysis

After the sponsors had performed the technical and economical studies for the project it will have to make a decision. This decision can be to move forward with the project in case it is attractive, to wait after some uncertainties are clarify making the project feasible, or to reject the project because it is not attractive. Once the sponsor decided to move forward then two of the most important things they should do is to prepare the financial analysis and to perform a risk management analysis. The first one will be covered on this Chapter and the second one will be discussed on Chapter 5.

There are several important considerations that have to be taken into account when preparing a financial analysis. As in the economic analysis shown in Chapter 2, a cash flow will be prepared and would have to be discounted with the appropriate discount rate. Choosing the appropriate discount rate is very important and not an easy task.

The discount rate will be used to discount the Net Income obtained from the income statement and to discount the free cash flow obtained from the statement of cash flow.

As it was mentioned on Chapter 2, the analysis that is prepared is based on forecasts and represents what the decision maker believes reality would be. It only shows one scenario. However, it is normal to expect changes on the forecasts, which means that there is a certain level of uncertainty. To deal with this uncertainty, a sensitivity analysis is frequently performed to evaluate how the project profitability will vary depending on the changes in different project variables such as costs, rates, and any other that can affect profitability and feasibility of the project.

8.1.1 Discount Rate

Chapter 2 covered project evaluation methods under certainty. It was also explain that to discount a project to actual dollars the discount rate for the project should be used. It is not the purpose of this thesis to explain the theory of discount rate and how it has to be calculated. However, it is important to make some distinctions and to clarify in some extent some concepts that are in many cases not clear for decision makers. Using the wrong discount rate can drive the decision maker to bad decision. The question then is how to calculate the right discount rate for the project.

The first important concept that has to be clarified is that there is no one single rate that can be apply to all the projects. The discount rate has a direct relation with risk, which means that when a company will discount two projects, the project facing higher risk would have a higher discount rate than a project with lower risk. For instance, a corporation competing in several industries should have a discount rate for each business units and not a "corporate discount rate." It is very important to use the appropriate discount rate. Discounting a low risk project with a high discount rate can make the decision maker to reject a good project. On the other hand, discounting a high risk project with a low discount rate can have as a result that the decision maker can accept a high risk project fro which investors will normally require a higher discount rate due to higher risk.

For project financing, these rules also apply. The project should be discounted at the project's discount rate, not at the sponsor's corporate rate. However, the rates can or cannot be the same. The project's discount rate will depend on the debt-equity ratio and on the risk relative to the project. There is no single methodology but several that can be use depending on the company.

Many corporations use the Cost of Capital, that is the required rate of return demanded by the investors on the securities issued by the company, to discount their projects. The Cost of Capital is usually treated as the Weighted Average Cost of Capital—WACC that depends on the debt-equity ratio, the tax rate, the cost of equity, and the cost of rate.

$$WACC = re(E/V) + rd(1-ta)(D/V)$$

re: Return on equity

rd: Return on debt

E: Equity

D: Debt

V: Firm Value = E + D

ta: Taxes

The Return on Equity represents the expected return of the stock of the company. The evaluation of this rate considered the effect of risk. The model used to calculate the return on equity is known as the Capital Asset Pricing Model (CAPM) [1],

$$re^2 = rf + \beta(rm - rf)$$

re: return on equity

rf : Risk free rate of return

rm: Market rate of return

β: Risk factor[3]

The calculation of the WACC presents some difficulty when dealing with projects on developing countries. Debt, equity, taxes, and even the return on debt can be determined without complications. However, the return on equity or cost of equity is not easy to calculate and companies follow different approaches to do so.

How would Enron calculate betas in India, or Mission in Indonesia, or S & Z in Peru is not really clear. Some companies will estimate the beta based on their global

[1] To review the theory about WACC and CAPM see Brealey, Richard A., Myers, Stewart A., "Principles of Corporate Finance", Sixth Edition, McGraw-Hill, 2000

[2] The return on equity is affected by the risk related to the project. If a company is investing in a foreign country for example, a way to do it is to add a primium to the company's re that reflects the additional risk.

[3] Beta is defines as the sensitivity of a security to market movements.

portfolio, and some based only on the specific country risk. Some companies in the US for example will calculate the WACC of a similar project for the US and then add the spread of the developing country debt as the additional risk. The conclusion is that there is no one single way to calculate the discount rate and that will mostly depend on the company developing the project.

8.1.2 Income Statement

The income statement will show how profitable the project will be over the years. The two basic components are the revenues and expenses generated from the project. On Chapter 2 Table 2.3 an economic analysis was made and showed. The income statement will be based on that economic analysis but will incorporate financial implications on the statement. The income statement will simulate the operations of the project for a certain period of time and will include all the expenses that will have to be done.

8.1.2.1 Revenues

The revenues of the project will be generated when the project starts to sell the output. In the case of a power plant it will depend on the tariff structure.

Phase I of the Dabhol Project incorporated a tariff structure composed of two major components, capacity payments and energy payments.

The capacity payments were determined per kilowatt-hour of base load capacity that DPC have to define through tests and declare to be available every year. MSEB would make capacity payments based on the established base load capacity and irrespective of output deliveries. This capacity payment showed two fixed costs. The first fixed cost consisted on the necessary funds to cover operations and maintenance (O&M) of the plant, in addition to interest and debt principal payments, taxes payment, and the established return to investors. O&M and capital costs were paid in local currency, the rupee, and in dollars. MSEB was assuming the exchange rate risk to cover dollar payments. The dollar component of O&M was linked to US inflation rate and the rupee component was linked to the Indian inflation rate. In addition, the dollar part of the

interest and principal payment, taxes payments, and return to investors has an increase factor of 4% per year[4].

The energy component was based on the real dispatch of the power plant. This component includes the O&M variable costs, fuel charges, and fuel management fees. As in the capacity component, it was also composed of rupees and dollars payments. Both currencies were linked to the inflation rate of their respective countries as in the capacity component.

The Paiton I project tariff is composed of four different components, two capacity components and two energy components. PLN has to make the capacity payments to the SPC independent of the dispatch of the plant but subject to the plant availability. In contrast, PLN will pay the energy component depending on the real dispatch of the plant.

The two capacity components are Component A and Component B. The first one provides the funds to cover debt service requirements, Indonesian taxes, and the return on equity to sponsors. This capacity charge changed during the 30 years of the PPA being the higher the first six years, then decreasing 2.5% the following six years and finally decreasing 48.1% the last 18 years. This component is protected in US dollars against exchange rate fluctuation by indexation factors. However, there is no escalation due to inflation. Component B provides funds to pay for the fix operation and maintenance costs. The fix costs are not dependent on the plant's dispatch. This component is composed of two costs that are called the local element and the foreign element. They both have the same contribution to Component B and are protected against inflation by index factors liked to consumer price index of Indonesia and US.

The two energy components are called Components C and Component D. Component C is the fuel component calculated form the price of the Primary Supply Coal and would be renegotiated every year. The portion of this component that corresponds to foreign currency, 60% of coal price, is protected against exchange rate fluctuations. Component D corresponds to the variable operation and maintenance costs such as spare parts, chemicals, and other. This variable cost is composed of a local element that consist

[4] Harvard Business School, "Enron Development Corporation: The Dabhol Power Project in Maharashtra, India (A)", Case Study, July 6, 1998.

of 75% of the total and a foreign element that is 25% of the total. The local and foreign elements are protected against inflation.

On the case of the Quitaracsa I Hydroelectric Power Plant, the tariff structure is composed of two components, a capacity component and an energy component.

The capacity component in the case of the spot market has to be paid irrespective of dispatch on but depending on plant availability. However, in this case the component is not calculated base on debt service, Peruvian taxes, and return on equity to investors. The Energy Tariff Commission (CTE), a government agency will make the calculation for this component. This calculation is based on the cost of a power plant used as reference and includes operation and maintenance costs. For May 2001 the referential power plant was a 122 MW Turbo Gas (TG) fueled with Diesel 2. In case the Quitaracsa project arrange to sell the power to a private utility, then the capacity payment will be negotiated with the power purchaser.

In the case of the energy component, the CTE will forecast the marginal costs for a 48-month horizon. The model used by this government agency will simulate dispatch of the system based on the actual dispatch rules. The model forecast supply and demand and will also incorporate power plants under construction or any plant that can start operation with that time period. The CTE will perform monthly simulations. The energy tariff will be calculated as the present value of the total income divided by the present value of the total energy dispatched in the 48-month horizon. This means that the energy tariff is the average marginal cost forecasted for the following 48 months. The CTE will calculate the tariffs twice in a year, on May and November. These rules apply to the energy sold on the spot market. However, if the company sells the energy to a private company, then the tariff will be negotiated.

8.1.2.2 Expenses

Expenses will represent all the payment that the SPC will have to honor. Figure 8.1 shows the Income Statement and Cash Flow statement for the Quitaracsa I Hydroelectric Power Plant. The intention to present those statements is to show how

these statements are prepared and to clarify the concepts. No financial analysis will be prepared for the Dabhol and Paiton I projects.

1. Operating Expenses

This are the O&M costs that includes all the costs necessary to operate and maintain the plant, such as labor, spare parts, office supplies, insurance expenses, and all other expenses that have to be incurred during operations, such as payments to the CTE, COES, water fees, and transmission lines fee in the case of Quitaracsa I.

2. Operating Income

It is also known as Earning Before Interest Tax and Depreciation (EBITD), is calculated as the difference between the revenues minus the operating expenses.

3. Depreciation

It is the portion of the investment that can be deducted from the taxable income[5] and will depend on each country's accounting rules.

For the Quitaracsa project, depreciation expenses are calculated based on the total expenses for civil works and electromechanical supply and works. The civil cost expenses will be depreciated using straight-line depreciation on a period of 33 years. The electromechanical supply and works will be depreciated using the same technique, but depreciating the equipment on 5 years. No salvage value is considered on both cases.

4. Net Operating Income

It is also known as Earnings Before Interest and Tax (EBIT) and is calculated after subtracting depreciation from the operating income.

5. Interest Expense

These are the interest that the SPC has to pay to the project's lenders. Interest will start to be paid after the project starts operation and revenues are collected but starts to

[5] Brealey, Richard A., Myers, Stewart A., "Principles of Corporate Finance", Sixth Edition, McGraw-Hill, 2000, pp1064

accrue since the loan is provided. The mechanism used is to match expenses with funds requirements. The lender will provide the funds, as they are needed. Depending on the loan term agreement, interests will be paid on a yearly bases or maybe twice in a year. The SPC will pay interest on the total amount borrowed plus the interest accumulated during the construction period. Debt service is broken into two parts, interest payment and principal payment. Normally on the early years of operation interests are higher than principal. However, once time passes and the SPC is amortizing the principal, then principal will be a higher payment compared to interest payments.

On the income statement shown, many assumptions have been made to calculate interest expenses. Interests will be paid on senior and subordinate debt normally with different interest rates and maturity. To simplify, a 12% interest rate was considered in the model. Another consideration is that the funds are provided as they are needed and interests will start accruing since the lenders start to provide funds.

6. Net Income Before Tax

It is also known as Earnings Before Tax (EBT) and is calculated subtracting the interest expenses from the net operating income.

7. Work Profit participation

In the case of Peruvian legislation, companies have to share profits with the workers. This sharing corresponds to 5% of the net income before tax

8. Income Tax

It is calculated by multiplying all the remaining income times the corresponding tax rate. It is out of the scope of the thesis to explain all issues related to tax treatment. However, as a general overview, tax treatment will depend on every country's tax legislation. The sponsors in many cases will hire a consultant expert in taxes because some value can be obtained due to tax benefits. In some countries such as US and Peru for example negative incomes can be accrued and use as tax benefit on the future when net income is positive. However, there is a limit on the number of years that can be accrued. For the financial analysis shown on Figure 8.1, losses can be accrued for a maximum of 5 years.

9. Net Income

It is the profit, calculated after subtracting all the expenses from the revenues. If it is negative then is a net loss.

8.1.3 Statement of Cash Flow

This statement reflects the activity of the cash account of the SPC over the period of analysis. The statement of cash flow shows the transactions entered into by the SPC and that increase in some cases the cash account but in other cases decrease the account. The statement will show how much cash is available at the end of certain period. In the case under analysis, the cash available or Free Cash Flow (FCF) is the amount available after paying all expenses, including principal, interest, fees, and taxes. The FCF is available for the equity holder of the SPC.

Income Statement

YEAR	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenues														
Energy	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2	12361.2
Power	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5	8054.5
Total revenue	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**	**20415.7**
Operating Expenses	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0
EBITD	20414.1	20414.1	20414.1	20414.0	20414.0	20414.0	20413.9	20413.9	20413.9	20413.8	20413.8	20413.8	20413.7	20413.7
Depreciation	18493.3	18493.3	18493.3	18493.3	18493.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3
EBIT	1920.8	1920.8	1920.7	1920.7	1920.7	19180.6	19180.6	19180.6	19180.5	19180.5	19180.5	19180.4	19180.4	19180.3
Interest	10341.7	9944.3	9511.0	9038.8	8524.1	7963.0	7351.5	6684.9	5958.3	5166.3	4303.1	3362.1	2336.5	1218.6
EBT	-8420.9	-8023.5	-7590.3	-7118.1	-6603.4	11217.6	11829.1	12495.7	13222.2	14014.2	14877.4	15818.3	16843.9	17961.8
Workers porfir part.						560.9	591.5	624.8	661.1	700.7	743.9	790.9	842.2	898.1
Income tax						0.0	0.0	0.0	1206.0	3994.0	4240.1	4508.2	4800.5	5119.1
NET INCOME	**-8420.9**	**-8023.5**	**-7590.3**	**-7118.1**	**-6603.4**	**10656.7**	**11237.7**	**11870.9**	**11355.1**	**9319.4**	**9893.5**	**10519.2**	**11201.2**	**11944.6**

Statement of Cash Flow

Net Income	-8420.9	-8023.5	-7590.3	-7118.1	-6603.4	10656.7	11237.7	11870.9	11355.1	9319.4	9893.5	10519.2	11201.2	11944.6
Add Depreciation	18493.3	18493.3	18493.3	18493.3	18493.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3	1233.3
Add VAT rec	5000.0	5000.0	4500.0	500.0										
Less Pric. Repay	4416.3	4813.8	5247.0	5719.2	6233.9	6795.0	7406.6	8073.1	8799.7	9591.7	10455.0	11395.9	12421.5	13539.5
FREE CASH FLOW	**10656.1**	**10656.1**	**10156.1**	**6156.0**	**5656.0**	**5095.1**	**5064.5**	**5031.1**	**3788.7**	**961.1**	**671.9**	**356.6**	**13.0**	**-361.5**

Figure 8.1: Quitaracsa Hydroelectric Power Plant Income Statement and Cash Flow Statement

8.1.4 Sensitivity Analysis

It was discussed on Chapter 2 that the economic analysis was made using numbers that represents what the decision maker expects to be reality. However, in reality, there is the chance that some of the assumptions may change. The project can be very sensible to revenues and to costs. The Dabhol and Paiton I power project have PPA signed with state-own utilities so in theory there should not be volatility on the revenues. However, there is some risk that will be discussed on Chapter 5 and will address issues such as governments renegotiating project agreements. In contrast, Quitaracsa I Hydroelectric Power Plant does not have a PPA. They had conversations with a private utility. However there is no contract signed, which means any unexpected change on rates or dispatch rules may affect the project profitability. The other major uncertainty that was brought into the analysis to illustrate the necessity to perform sensitivity analysis is cost overrun. The contractor can sign a turnkey contract with the sponsor, however, there are some costs overruns that are not under the contractor's control and have to be honored by the SPC such as concealed surface conditions. The sponsor or its financial advisor will perform the sensitivity analysis and will use it as a tool to identify major risks that can jeopardize project's profitability.

7.2 Financial Structure[6]

It is also known as Project Structure and is very important because it will show the participant's relationships and also the flow of debt, equity and project revenues. Starting with the Single Purpose Company all the relationships with the project's participants will be analyzed, risk analysis will be performed, and finally will create the base to define the contractual agreement necessary for a successful financial structure. Depending on the project complexity, the country, the risk, and the type of project, the structure can be more complex or not. The financial structure basically shows the relationships and contractual agreements among project participants. It will show the

[6] Which is different from financing structure

flow of money and responsibility and will be composed by a series of contractual agreements each of them detailing the role, responsibilities, and benefits relative to the project. Figure 8.2 shows the financial structure for the Paiton I generation Project and Figure 8.3 shows the proposed financial structure for the Quitaracsa I Hydroelectric Power Plant.

The structure for the Dabhol project is similar to the one showed on Figure 8.2, there are obvious differences in the project participants and in some relations but in essence are very similar.

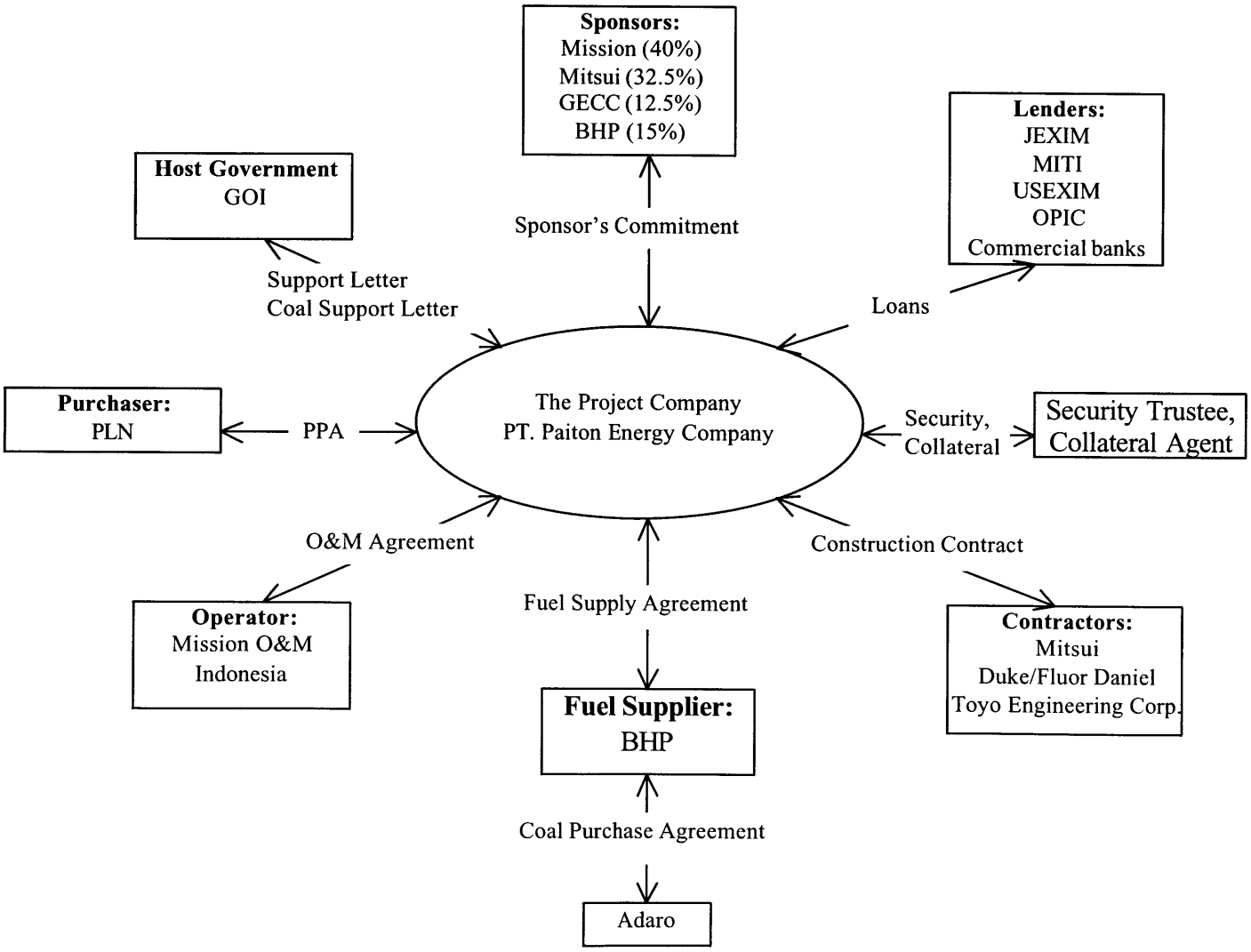

Figure 8.2: Financial Structure Paiton I Power Generation Project

The main difference with financial structure of the Quitaracsa I Hydroelectric Power Plant is the existence of a trustee in the Quitaracsa I Project that will collect all the funds and revenues and then distribute them depending on the contractual agreements. The trustee will pay the contractor and supplier during construction. It will also receive the project's revenues from the output purchaser and will first pay for operation expenses. Second the trustee will service debt to lenders. Third it will make deposits to the reserve account and only if some cash remains then it will distribute the remaining funds to the equity holders of the SPC. The reserve account is an especial account normally required by lender to the project. This account is used to save funds to be used in case unexpected events will difficult debt service. If some of this events happens, the project will be able to service debt for a certain period of time depending on the amount of the account saved. The amount saved on the reserve account will depend on the project and the sponsor, but it can range from six months to one year or in some cases maybe more. This funds will gain interest for the sponsors and will be turned back to them after all the debt is service or under the conditions defined on the contracts if different.

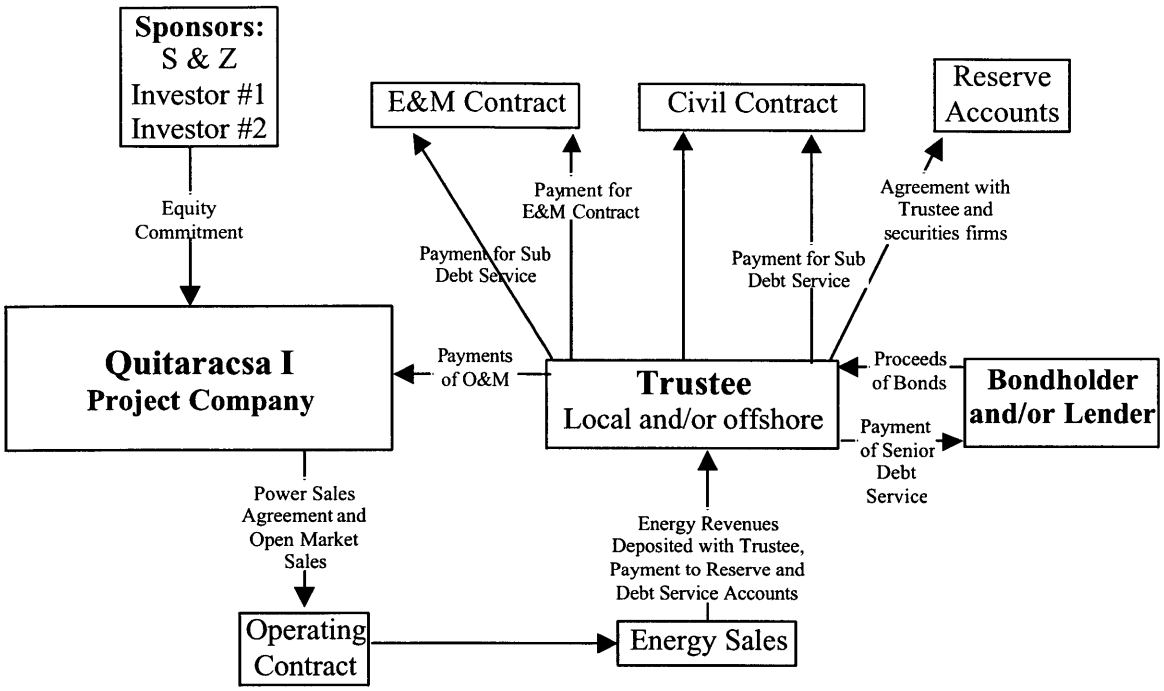

Figure 8.3: Financial Structure Quitaracsa I Hydroelectric Power Plant

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