46

# PUBLIC-PRIVATE PARTNERSHIPS FOR THE RECONSTRUCTION OF LEBANON: AN APPLICATION TO POWER GENERATION

by

**Nagi A. Hamiyeh**
Bachelor of Science in Civil Engineering
University of Texas, Austin (1993)

**Rachid A. Mikati**
Bachelor of Science in Civil Engineering
Massachusetts Institute of Technology (1993)

Submitted to the Department of
Civil and Environmental Engineering in Partial Fulfillment of
the Requirements for the
Degree of

**Master of Science in Civil and Environmental Engineering**

at the

**Massachusetts Institute of Technology**

May 1994



Signature of Authors _____
Department of Civil and Environmental Engineering
May 12, 1994

Certified by _____
Professor Fred Moavenzadeh
Thesis Supervisor
Director, Henry L. Pierce Laboratory

Accepted by _____
Professor Joseph M. Sussman
Departmental Committee on Graduate Studies

# PUBLIC-PRIVATE PARTNERSHIPS FOR THE RECONSTRUCTION OF LEBANON: AN APPLICATION TO POWER GENERATION

by

**Nagi A. Hamiyeh**
Bachelor of Science in Civil Engineering
University of Texas, Austin (1993)

**Rachid A. Mikati**
Bachelor of Science in Civil Engineering
Massachusetts Institute of Technology (1993)

Submitted to the Department of Civil and Environmental Engineering
in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Civil and Environmental Engineering

May 1994

## ABSTRACT

Lebanon currently enjoys a period of limited stability after seventeen years of civil war. The war had its toll on the country's infrastructure and left most of it in rubbles. The government is trying to initiate a reconstruction scheme and to attract loans to rebuild the infrastructure. The objective of this thesis is to describe a public-private partnership for the power generation sector of Lebanon's infrastructure. Such a scheme will shift the debt burden to the private sector and allow the influx of international capital and expertise to the country.

The first chapter briefly describes the current economy in Lebanon. The next chapter lists all the possible public-private schemes and explains each of them. The chapter also explains the basic characteristics of a Build-Operate-Transfer (BOT) scheme and its exact structure. The third chapter analyses the lessons learned from past BOT power generation projects in developing countries and the main issues that need to be considered for successfully completing such a project. Chapter IV is an overview of Lebanon's electric power sector and the problems that Electricite du Liban (EDL), Lebanon's electric power authority, is facing. The chapter forecasts the future demand for power in the country and concludes that EDL will have difficulty meeting the future demand if it is not assisted by the private sector. The last chapter of the thesis describes the steps that need to be taken in order to successfully undertake a BOT project in the power generation sector in Lebanon. The chapter will concentrate on financing, procurement, legal agreements, government concessions and incentives, technology transfer, and marketing. The chapter relies on information about Lebanon's socioeconomic environment and on lessons learned from other BOT projects in developing countries. The thesis concludes that government participation and cooperation, both before and during the project operation, is essential in order to attract investors and ensure that the project is completed successfully.

Thesis Supervisor: Professor Fred Moavenzadeh
Director, Henry L. Pierce Laboratory

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

*To Our Parents*

# INTRODUCTION

After 17 years of civil war, Lebanon currently enjoys a period of limited stability. Amidst its deteriorated infrastructure, the country is trying to regain its once prestigious status in the Middle East. Previously known as the "Switzerland" of the Middle East, Lebanon was severely set back and most of its infrastructure reduced to rubble during the war. After the Taif agreement and hopes of future stability, foreign capital is starting to enter the country to help implement its ambitious reconstruction plans.

This thesis will analyze the issues related to the reconstruction of the power generation sector of Lebanon. This sector is crucial to Lebanon's growth and to the restoration of its pre-war status as the financial center of the Middle East. The country needs to expand its power generation capacity in order to satisfy its present and rapidly increasing demand for power.

The electric power sector is an essential factor in the development of the Lebanese economy. This is due to the fact that power availability is essential for growth. All strategies for land development face the issue of the availability of power production and distribution facilities[1]. Electric power is needed in other infrastructures such as

telecommunications and water supply. This fact makes power availability a prerequisite for the repair and operation of those sectors.

The government faces a set of alternatives for the financing of this expansion. At one extreme, the government can simply rely on foreign aid (and debt) for financing. On the other hand, the government can choose another extreme and allow the full privatization of this sector, therefore ridding itself of the financial burdens associated with this expansion.

Reliance on foreign aid has the following disadvantages. It reduces the borrowing power of the government and deprives it of funds that can be allocated to other priority aid. It also keeps the management of this sector in the hands of the government authorities, which reduces the efficiency of management, and slows the decision-making process. Conversely, the Lebanese economy is not yet ready for full scale privatization and the public sector is not dominant enough to regulate such a process. Also, the Lebanese authorities will not give up control of such an indispensable sector of the infrastructure.

One viable solution for financing the power sector is to allow a public-private partnership to undertake the needed expansion. Under such a scheme, an international consortium would ally itself with an operations and maintenance (O&M) contractor to build a power generation plant and operate it for a definite period of time. At the end of that period, the project cashflows should have repaid the private sector for its investment

and the ownership of the plant would be transferred to the Lebanese authorities. Such a scheme is known as a Build-Operate-Transfer (BOT) arrangement which is intended to draw the best of the public and private sectors.

The first chapter of this thesis will briefly describe the current post-war economy of Lebanon. This chapter will also provide the reader with a background on the issues faced by the Lebanese government regarding the future economic growth of the country. The chapter will also describe the future capital markets in the country and their roles in economic growth and project financing.

The second chapter will present the basic characteristics of a generic BOT project and describe the legal and financial arrangements. It will also focus on the major players involved in such a scheme and the security package needed in every BOT project.

The third chapter will describe the arrangement and results of real projects that have taken place in other developing countries. It will give a broad overview of the different infrastructure financing methods and will focus on the general objectives of this type of financing. It will also describe the general issues faced in these previous projects. Finally, the chapter ends with a real case study of the Hub River Private Power Project in Pakistan and the lessons learned from it.

The fourth chapter deals with the electric power sector in Lebanon. It will describe the demand pattern of electricity in the country and forecast future demand. It will also show the state of Lebanon's electric power authority, its generation capabilities, the damage it incurred during the war, and the problems (financial and managerial) it is currently facing.

The last chapter will propose a solution to the expansion of Lebanon's power generation capacity based on a BOT project. It will describe the following aspects of such projects in Lebanon:

- Financial analysis of the viability of the project
- Sources and arrangement of financing
- Procurement
- Construction and operation
- Power tariff structure
- Risk coverage
- Government incentives needed to promote such projects
- Technology transfer
- Marketing such projects to international lenders

Privatization has become an economic buzzword in a very short period of time. Since its emergence ten years ago it has become a priority in the government policies of

many industrialized and developing countries. In the case of Lebanon, money raised through public-private partnership to finance infrastructure efforts can alleviate the government's budget deficit. Therefore, these savings can be channeled into social services such as education, health and job creation. The potential benefits can be:

- Expanded capacity: Additional resources such as human resources, including giving the country personnel and experience in order to run such projects in the future.
- Increased efficiency: Through better management, better technology, better services, especially greater options open to consumers and finally greater competition.

One clear advantage in the public-private partnership is that no borrowing on the part of the government is involved, which would shift the debt burden from the government to the private sector, since the loans are made without government guarantee to the private party. This scheme will attract domestic and foreign entrepreneurial capital in the form of debt and equity, which will lead to the improvement and expansion of infrastructural facilities vital to the economic development of the country.

One of the objectives of this thesis is to clarify all the issues involved in public-private partnerships and to apply them to the case of Lebanon. One of the goals of the authors is to explain the difficulties of undertaking a BOT project in Lebanon, and to suggest solutions that might facilitate the process. The authors hope that the Lebanese Authorities would use the thesis as a guideline for undertaking BOT projects.

Since there are many uncertainties in the current political and economic climate in Lebanon, the thesis will have a limited scope. There are many political factors that influence decisions, even if they have no economic justification. Such factors are too complicated and broad to be taken into full consideration in this thesis, and therefore the authors will assume a relatively stable economical and political outlook for Lebanon.

Information for this thesis was gathered from diverse sources. Although Lebanon's reconstruction is a topic that has not been extensively written about, the authors managed to obtain a substantial amount of helpful information. Besides using the obvious sources such as library books and previous theses, information was obtained from several government ministries, the World Bank, international privatization consulting agencies, Lebanon's Council for Development and Reconstruction and some personal interviews with government officials. Although the reliability of some of this information might be questionable, the authors agree that it is accurate enough to serve the qualitative purposes of this thesis.

**Reference:**

1. "Rebuilding The Residential Structure of Lebanon" MIT-AUB Joint Research Project on Housing, MIT 1992.

# I. LEBANON

This section is intended to provide the reader with a background on Lebanon's economy in 1993. The section will also describe the upcoming capital markets in Lebanon, since this issue will be significant in financing the public-private partnership project. This section will not deal with historical events or touch on the many aspects of Lebanon's social environment. The war in Lebanon had many negative effects on the country and these are too complicated to be described in this thesis. The authors wrote this chapter for the sole purpose of depicting Lebanon's current economy, which is used as background information for applying the power generation case to the country.

## A. *Economy in 1993*

The seventeen years of war have severely affected Lebanon's economy. Most industries have been critically impeded and, as a result, the country suffers many social and economic problems. Lebanon's infrastructure was severely damaged and this was one of the many factors that resulted in the hindrance of the economy. The Lebanese pound plunged severely and caused the bankruptcy of many individuals and institutions. Other economic problems include very low wages compared to the soaring consumer prices. Lebanon remains economically disadvantaged compared to its neighbors (Appendix I contains relevant statistics about Lebanon). Despite these developments, the economy is slowly picking up. In 1993, economic indicators were positive: the Lebanese pound was steady, consumer prices were not as highly inflated and foreign capital was starting to flow into the country[1].

The government is trying to boost the service industry which, traditionally, constitutes Lebanon's comparative advantage. The government is also trying to reduce its local debt and decrease the trade deficit (Appendix I). The budget deficit for 1993 was 42%, a high figure but favorable compared to 50% in 1992[1]. Due to the government's lack of funds, the private sector's investment is encouraged, given that Lebanese Diaspora controls large amounts of capital holdings around the world, and that Gulf Arab investors have a shown strong interest in investing in Lebanon.

The Council for Development and Reconstruction unveiled a $10 billion ten year plan for economic recovery. The plan might expose Lebanon to high levels of foreign indebtedness (34% of GDP in 1994), but is still lower than most developing counties[1]. Foreign aid increased in 1993 and a substantial amount of emergency aid was promised. The aid comes mostly from neighboring Arab countries.

Lebanon signed four economic agreements with Syria[1]. The first aimed at achieving socioeconomic complimentarity and recommended freedom of transport of goods, persons and capital. The second increased cooperation between the two countries on health-related issues. The third facilitated transportation of vehicles between the two countries, and the last agreement included a cooperation in agricultural policies. These agreements will boost the economies of both countries and will help in Lebanon's recovery.

Nineteen ninety-three was a turning point for the Lebanese economy. Even though it is still weak, signs of recovery are finally surfacing. The economic indicators are positive, and the following events demonstrate a promising economic future for the country[2]:

- Income Tax Law was reformed; it now provides an encouraging ground for both local and foreign investment.
- The successful floating of $650 million of shares of SOLIDERE (the real estate company responsible for rehabilitating the Central Business District of Beirut). The

40% oversubscription confirmed that both Lebanese nationals and Arab investors are willing to channel money into Lebanon. The flotation of share will also encourage the prompt the opening of the Beirut Stock Exchange.

- The Beirut Stock Exchange is due to begin operating in October, 1994. It will be a vehicle for promoting foreign investment in Lebanon.
- Real National Income increased by 6% (highest increase in the Middle East).
- The consolidated balance sheet of commercial banks increased from $7.9 billion to $10.99 billion.
- $1.0 billion surplus in balance of payments account.
- Exchange rate of the Lebanese pound against the US dollar improved from LL 1838 in December, 1992 to LL 1711 by the end of 1993.
- Capital base of commercial banks increased by more than 100%.
- Construction permits increased significantly.

The above events are some examples of the positive economic outlook at the end of 1993. We can conclude that Lebanon's economy is weak but shows signs of recovery, especially if the private sector contributes to that process. Some of the ways to facilitate economic recovery are to reform the financial systems and to allow channels for both domestic and foreign investment in the country.

### *B. Future of Capital Markets in Lebanon*

Lebanon is currently trying to fund its reconstruction efforts. Since the government is finding it difficult to secure loans, other means of raising capital must be found. Capital markets offer a valid alternative since they will attract international capital which could partially fund Lebanon's reconstruction. Once capital markets are opened up to international investors, many individuals and institutions interested in the high returns offered by emerging markets will invest in Lebanon. In addition, international investors would be more encouraged to invest in a country that has a developed capital market rather than give loans to individuals or governments. Through the use of government bonds, country funds or Eurobonds that are traded in both Lebanon's and other markets, the government of Lebanon will gain the confidence of international investors and hence their capital. Before the war, financial services contributed to over 40% of Lebanon's GNP. Restoring these services will boost Lebanon's economy and help finance the reconstruction.

Capital markets in Lebanon can be used as a vehicle for privatization. A stock exchange can be used to allow the public to buy shares in the government owned companies such as utility companies. The public's buying of shares will lessen the debt on the government and allow the public to share the risks of projects. The government can also borrow from the public by issuing bonds instead of having to rely on international aid. SOLIDERE, the company rebuilding the Central Business District of Beirut, was sold as

shares and was able to raise $1.5bn through the public's participation[3]. The government would have encountered difficulty raising this amount of money in a short period of time.

Another use of capital markets would be to help in redistributing wealth in Lebanon. Unfortunately, the war left a large gap between the social classes and almost wiped out the middle class. Today a small group of individuals control most of the wealth in the country, while the rest of the population suffers from high price inflation and low wages. Most Lebanese citizens living abroad and people of Lebanese origin have accumulated substantial amounts of holdings and are ready to invest them in Lebanon. Capital markets will encourage investment and allow the flow of capital into the country to be efficient. In addition, it will allow the lower income class to share the profits of entrepreneurial businesses. They can slowly channel their savings into stocks and bonds and eventually participate in owning large businesses. In the absence of capital markets, the lower income groups will not get a chance to participate in owning business since the wealthier owners will not want to share ownership. Finally, shared ownership of businesses will promote efficiency, since management will be supervised by shareholders and will have to seek their interest rather than the interest of a sole owner.

There are four capital markets currently being developed in Lebanon: the foreign exchange market, money markets, the corporate and government debt market and the Beirut Stock Exchange[4]. The foreign exchange market was the largest in the region before 1974. It was not only a domestic market, but also dealt on an international basis. During

the war, other money market centers such as Bahrain and Cyprus replaced Lebanon. Nevertheless, Lebanon can quickly regain its role as a regional and international foreign exchange market in the near future.

The monetary authorities in Lebanon are in the process of developing a "Beirut Dollar Market[4]." These actions recognize the dollarization of the Lebanese economy and allow banks and institutions to clear foreign currency payments and to hold deposits in foreign currency at the Central Bank. In the future, the Beirut Dollar Market can act as an important circuit for both international and local funds and can direct them toward productive activities as the market develops. It will be a contributor in generating financial resources for the corporate sector.

The corporate government and debt market will increase the type and maturities of securities offered by the government and extend the coverage by the public as well as creating an active secondary market[4]. The government introduced a swap market, which allows banks to substitute securities in the government debt market. In the future, banks can engage in such activities without central bank intervention. The government will be able to issue many types of financial instrument to the potential Lebanese, Arab and foreign investors. These securities include reconstruction bonds, savings bonds, and longer dated instruments. Once the government debt is liquid and international, corporate debt can be developed. Many sectors of the infrastructure can benefit from the availability of

medium and long-term financial resources. This will reduce the debt issued by the Treasury and restore financial discipline to the corporations and institutions.

The Beirut Stock Exchange was active before the war. Even though it had a relatively small capitalization, it included forty companies. Now it is dormant, since the war imposed difficulties on the assessment of the value of companies, on communication and on political and economic risk assessment[4]. The potential size of the market is large relative to the current economic condition of Lebanon. SOLIDERE, the company undertaking the reconstruction of the Beirut central Business District has a capitalization of about $2.3 billion. SOLIDERE's shares will form the backbone for the revival of the Beirut Stock Exchange. Other private companies, financial institutions and industries can be listed on the BSE, which would raise its capitalization to over $3 billion. This figure is reasonable for an emerging capital market, compared to other emerging markets such as Jordan and Colombia.

The BSE should allow cross-listing of company shares from exchanges in the region. Many neighboring countries are expected to start privatization schemes and Lebanon could be used as a gateway to invest in these emerging markets. In the future, Syria, Iraq and the Gulf countries have great potential but most do not have the necessary infrastructure to sell their companies' shares. Lebanon, once it restores its status as financial center of the Middle East, could be the first step for foreign investors who need to access these markets. These companies could be listed in US Dollars and internationally

quoted. This would enable Middle Eastern companies to be listed in both their national currency and in US dollars in the BSE[4]. In the future, the role of Lebanon will be reversed: in the past Lebanon was the financial center enabling Middle Eastern countries to channel their money out of the Middle East to foreign markets. Tomorrow, Lebanon will enable foreign investors to channel their money to emerging Middle Eastern markets.

## C. *Chapter References*


1. Economist Intelligence Unit, Lebanon: Country Report, 4th Quarter, 1993.
2. Iskandar, Marwan "The Lebanese Economy, 1993" Banque De La Méditerranée, March 1994.
3. SOLIDERE information package, published by SOLIDERE, 1993.
4. Saidi, Nasser "Capital Markets, Economic Stabilization and the Reconstruction of Lebanon: 1993 and Beyond" Speech given in New York City, October 1, 1993.

# II. A GENERIC BOT PACKAGE

## A. *Introduction*

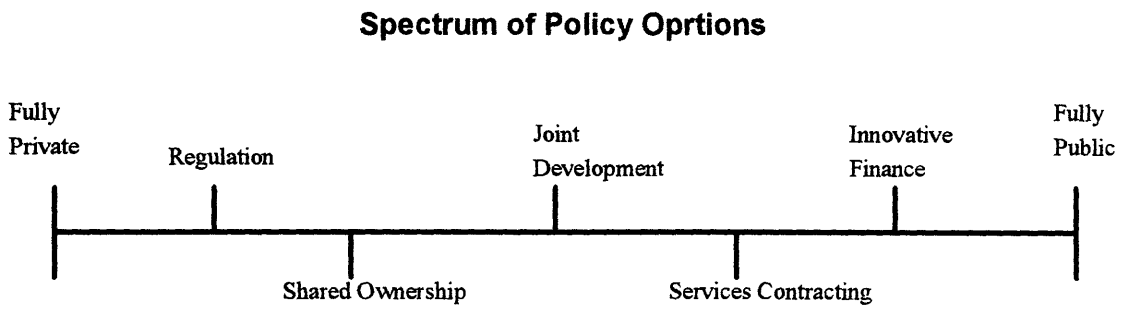
In the post-World War II era, most infrastructure projects around the world were built and financed by the government itself, or under the supervision of a government agency.

However, several trends were developed in the seventies to find an alternative way to finance those big projects for the following reasons:

First, the need for infrastructure continued to grow with continuous population and economic expansion. Second, the debt crisis which was haunting Third World countries, decreased the borrowing capacity of the developing countries in order to finance infrastructure projects. Third, recession in the Middle East during the Eighties left major international construction companies without big contracts, therefore facing a major downturn in their business. Finally, throughout the Eighties, a number of government and international lending agencies found vested interest in promoting and developing the private sector as well as privatizing the traditional public sectors. Figure 1 shows the spectrum of policy options.

**Figure 1: Spectrum of Policy Options.**

Source: Reference number 7.



A new way of financing big projects was to follow the old financial arrangement of "concessions" used in Nineteenth century France. Formerly, "concessions" were widely used in developing infrastructure: the government conceded ownership of the land and the right to operate it to a private company. A well known concession is the Suez Canal in Egypt. The "concession" concept was merged with a modern financing technique of non-recourse project financing which was perfected in the late sixties and seventies mainly in the area of oil and gas exploration. In such a financing arrangement[1], a lender provides funds for a project without a collateral and relies on the project staying solvent to recoup its investment. In the United States and other developed countries, similar project financing occurred in the seventies to promote infrastructure projects, such as power plants, airports and toll roads. The result is what we now refer to as "BOT project."

The "BOT" term was first conceived by the Turkish Prime Minister Turgut Ozal in the early eighties, designating "Build-Operate-Transfer."

There are different models of BOT type projects:

- BOT Build, Operate and Transfer.
- BOO Build, Operate and Own.
- BT Build and Transfer.
- BOOT Build , Own, Operate and Transfer.
- BRT Build, Rent and Transfer.
- BOOST Build, Own, Operate, Subsidize and Transfer.
- ROO Rehabilitate, Operate and Own.

- ROT Rehabilitate, Operate and Transfer.
- LDO Lease, Develop and Operate.

** For more details on the structure of some of these models, refer to Chapter III.

Although several kinds of BOT type projects exist, some common characteristics apply to all of them[2]:

- In each approach, one or more sponsors from the private sector are authorized to create a "project company," to build, operate, lease, or rehabilitate a public facility.
- The project company, following each approach, should follow strict government regulations and specifications.
- In each approach, the project company should have a high debt:equity ratio , usually 8:2. The equity financing is usually procured by the parent company, while the debt financing is usually raised from the commercial banks or multi-national agencies.

In each approach, the project agreement should incorporate a security package. This package should include all the probable risks that may affect the project cash flow.

**Criteria for BOT type Projects:**

For a project to be implemented as a BOT-type project, it has to meet two basic criteria:

- **The project is profitable as structured.** Private contractors will only participate in a project which guarantees to pay off the capital costs involved, and which provides them with a reasonable rate of return.

- **The project has a dependable revenue stream**. This gives a comparable advantage to BOT projects over all other project financing arrangements: In a BOT project, revenue streams are ensured through credit enhancements while in entrepreneurial projects, there is never any assurance whether there will be any demand for one's product.

For example[1], the government will usually guarantee that a highway BOT will always carry a certain level of traffic, or that a power plant BOT will require the utility to buy a certain amount of the plant's electricity output.

Once these two conditional criteria are met, the project is only potentially candidate for implementation under BOT style arrangement. To guarantee such an implementation, the legal, economic, and political environments of the country in question must be considered. This chapter will focus on the BOT approach of infrastructure projects in developing countries. Thus, it will not discuss several types of privately owned projects built with non-recourse financing in various sectors.

## *B. Basic characteristics of BOT projects*

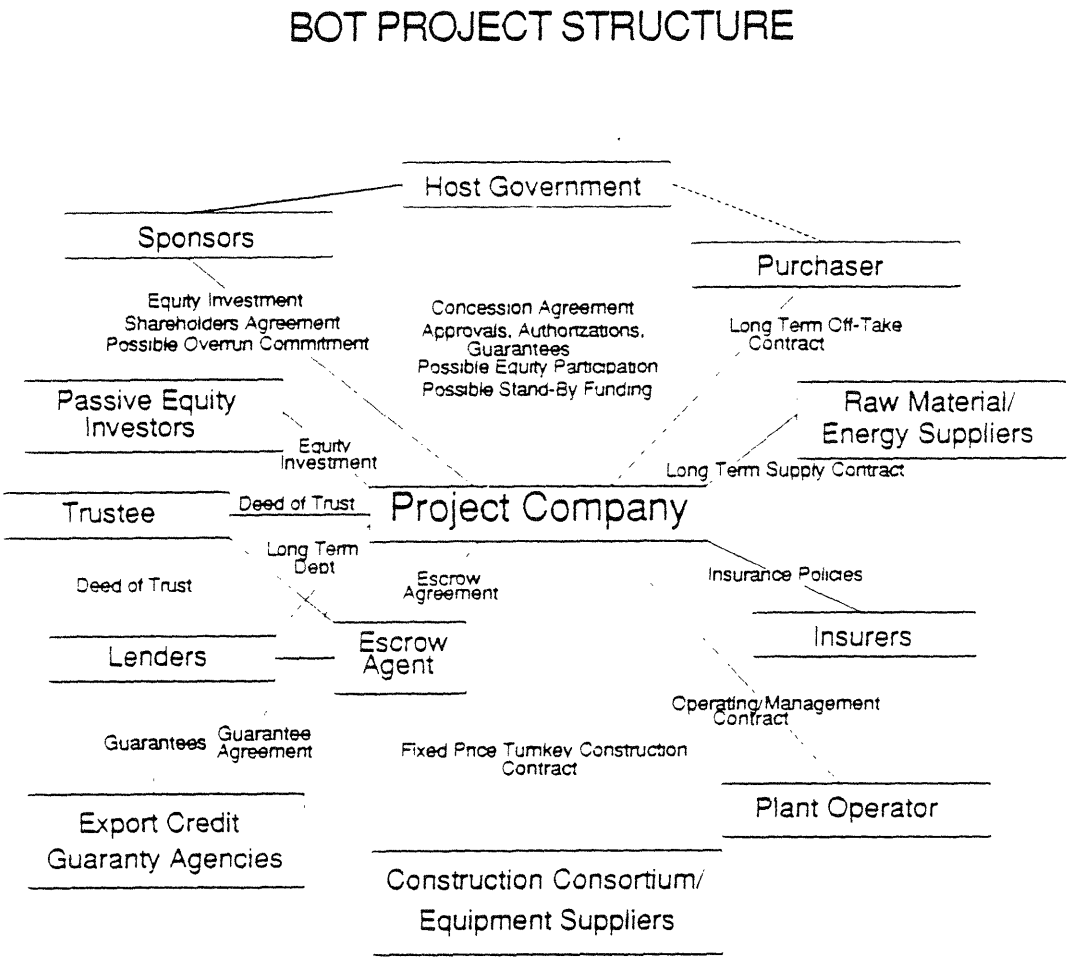
Even though all BOT type projects vary according to their specific environments, they all share a fundamental generic structure which includes the following basic characteristics: (refer to Figure 2)

### 1. Host Government

The host government is by far the most powerful player in this game. In order for a BOT project to occur, the host government should be fully committed to accept the project and to support it. The host government's role will start by authorizing the project through specific legislation, followed by supporting the project financially (which is an essential ingredient for the development and implementation of a BOT project). Finally, it remains the ultimate client or purchaser of the project. In conclusion, as for developing countries, BOT-type projects can't be realized in a purely private sector venture, without the direct interference of the host government or one of its agencies.

**Figure 2: BOT Project Structure.**

Source: Reference Number 2



### 2. Sponsors; Project Company

The second most important player in a successful BOT project is a financially strong, experienced and capable sponsor or group of sponsors who will form the Project Company. The Project Company is usually a consortium including an international engineering and construction firm, a heavy equipment supplier as well as a separate firm responsible for operating and maintaining the facility throughout the life of the concession. The communication within the consortium tends to be difficult at some critical phases of the project. As a result, it is highly advisable for the project company to be formed at an early stage in order to avoid later delays due to negotiations among the different interest groups within the consortium, along with the multilateral lending agency, investment bankers or host government.

An equity participation by the host government is sometimes viewed as unnecessary since the inclusion of the host government among the shareholders might add an analogous bureaucratic interference . This interference leads to the mismanagement of the project-- the very thing which privatization wishes to avoid.

### 3. Financial Viability

Equity investors and potential lenders should be convinced of the financial viability of a BOT project over its intended life; the project should have a certain source of revenue to cover the principle and interest payments on the project debt. It is very likely that equity investors as well as lenders show no enthusiasm about using experimental "state of

the art" technology in the project since they are committing substantial sums of money and are supposed to bear the risk.

### 4. Local Partners

It is highly recommended for project companies to have a local partner to provide the needed logistical support during the development phase. The local partner should be a strong, well connected, private entrepreneur, who understands well the local working environment. Such a partner can help the project company deal with the government, agencies, local subcontractors, and suppliers of raw material.

### 5. Construction Consortium

The core of the BOT project consists of a large building job. In order to assure the lenders and the equity investors that the project will be built on time, at the cost agreed on, the construction company as well as the heavy equipment supplier, should be of a proven reliability, expertise, and financial strength[2].

Other basic characteristics of any BOT-type project are its financing, security to lenders, and transfer to host government. These characteristics will be thoroughly studied later on in this chapter.

### C. *Financial Evaluation of BOT-type Projects*

The purpose of this section is to examine the attractiveness of a project to the private sector, and to determine if a project would be economically beneficial to the country.

BOT projects are financially evaluated by investors using several tools. In the pre-feasibility stage, two measurements are used: the financial internal rate of return (FIRR), which indicates whether a project can be financed, and the economic internal rate of return (EIRR) which indicates a project's net economic benefit to the country. From the investors' point of view, the internal rate of return on equity (IRRe) is an adequate indicator of the attractiveness of a project to the private sector[2].

Two financial techniques are used to calculate IRR: "obtaining future net cash flow streams and using discounting cash flow methodology to arrive at an estimate of the present value of these net cash flow streams[2]."

IRR, FIRR, and EIRR are not always valid tools to examine the attractiveness of a project. The assumption behind these financial measurements is that one can always forecast the project's future cash flow. Unfortunately, there are many variables which develop over the life of the project. These variables can alter the rate of return. Among these variables, are the cost overruns, delays in construction, inflation, foreign-exchange fluctuations and force majeure.

### *D. Financing BOT-type Projects*

A generic BOT project is usually financed with a combination of equity provided by the project company, and debt provided by the lenders, which usually are commercial banks, international financial institutions and multilateral lending agencies.

Since most BOT projects fall within the infrastructure sector of the economy, these projects tend to have four main distinguishing financing characteristics which will dictate the type of capital needed for financing any of these projects[2]:

1) **"Lumpy"** Most projects require irregular infusions of capital over the construction phase. This phase may vary from three to five years according to the size of the project.

2) **High front-end costs.** The BOT project will require a large initial capital infusion.

3) **Long time Horizon.** The life of the project varies usually from ten to thirty years.

4) **Highly leveraged.** The ratio of equity to debt seems to fall most often within the range of 10% to 30%. Some Debt/Equity ratios for major BOT projects undertaken are:

Navotas Power plant (Philippines): 75/25

Eurotunnel: 80/20

Hab River (Pakistan): 85/15

North-South Expressway (Malaysia): 90/10

Antrim Power Station (Northern Ireland): 82/18

Skytrain (Thailand): 80/20

As we noticed from the above examples, the debt to equity ratio might vary between 10 to 30%. This fluctuation is due to the impact of several issues specific to each individual project. As a senior consultant at an international privatization group noted:" It is possible to do projects with a 10% equity in some countries, although this low level would require a whole web of contractual agreements for allocating the risks. But in other parts of the world, equities have to be at least 25 to 30% of the total project cost for a BOT project to be feasible. In the case of the Hopewell project (in the Philippines), Hopewell's equity amounted to 24.4% of the total project cost[3]."

A generic financing package for a BOT project has four different sources of finance to raise capital:

- Domestic Equity
- Foreign Equity
- Domestic Debt
- Foreign Debt

Each of these sources should be examined separately.

### 1. Domestic Equity

Raising domestic equity in developing countries is not always an easy task. Generally LDCs (Less developed countries) financial markets tend to be underdeveloped. There are usually two basic reasons behind that phenomenon[3]. On the supply side, there is an insufficient number of high grade securities, due to the fact that many corporations have been reluctant to list their stocks on the market. On the demand side, there is a limited participation from the investors side involved in the stock market due to a lack of knowledge of the financial tools, and a general fear of financial assets.

An example is the case of Lebanon, where a lot of companies do not want to go public for a variety of reasons. Families and businessmen have the tradition of retaining the control of their companies to themselves, fearing that they would lose management control once they go public. Apart from that reason, there is a prevailing belief among family-owned companies to earn all the potential profit they can make, without necessarily sharing it with outsiders. These facts are common to most LDCs.

There are four potential sources of domestic equity in LDCs that could be able to finance BOT projects[2]. Since these are the only sources available, they will tend to demand a significantly high rate of return. These sources are:

- Local Sponsor
- Local Joint Venture Partner
- Venture Capital Funds
- Local Mutual Funds

*Local Sponsor*

In LDCs, over the last decades, most of all infrastructure projects have been undertaken by government contractors and not bid out to the private contractors. Thus, not many private contractors have the necessary experience nor the size to handle a BOT infrastructure project on their own. They tend to ally themselves to foreign contractors through a joint venture.

*Local Joint Venture Partner*

Most foreign sponsors prefer to have a local partner. The local partner will have a better understanding of the country's regulations, and will have an easier access to the government. The local partner can also act as a protection shield for the foreign sponsor. In the case of political unrest, it is less likely for a government to nationalize a project

company which is partly owned by a local. Thus, the actual presence of a local partner can reduce the country's risk.

*Venture Capital Fund*

There are two known venture capital funds in LDCs. Family-owned venture funds which, usually invest in family businesses, and are of no use to BOT projects. The second type of fund is the institutional venture capital fund which purpose is to re-invest capital given by their investors or shareholders. A famous example would be the Shearson-Lehman fund which is very active in Argentina, India, and the Philippines.

*Local Mutual Funds*

Private placement of capital through local mutual funds is always an option in LDCs. For example, in Lebanon, a brand new local mutual fund has been designed under the supervision of *Fidelity Investments* . It seems that it attracted already a decent amount of capital.

### 2. Foreign Equity

There are usually five sources of foreign equity available to finance BOT projects in LDCs[2]:

- Foreign Sponsor
- Foreign Joint-Venture Partner
- Debt-Equity Swap
- Foreign Venture Capital Fund
- Private Sector Windows

*Foreign Sponsor*

Since that infrastructure projects are highly specialized by nature, they usually appeal to sponsors experienced enough in that particular field, in order for them to be credible among lending agencies.

*Foreign Joint-Venture Partner*

As was mentioned before, the inclusion of a domestic sponsor would lower the country risk associated with the project. Because of the benefits associated with having a local partner, many of the expected BOT projects will be carried out under a foreign-local joint-venture.

*Debt-Equity Swap*

Specifically with the advent of the Latin American debt crisis, new forms of external debt reduction are beginning to gain credibility and acceptance on the international terrain. Perhaps the most innovative financing practice used to reduce LDCs` debt to international lenders is the "debt-equity swap".

The debt-equity swap used to purchase an SOE (State owned enterprise) would involve the following steps[4]:

• A foreign company is possibly interested in acquiring a certain public enterprise, which will be privatized in the near future.

• The national investment institution that controls the public enterprise has outstanding $ loans from international commercial banks, and wants to convert them to avoid the foreign exchange required to pay interest on them. In turn, the banks want to get rid of the debt for fear that the loan will never be collected.

• As a result, the foreign company acquires the debt (in dollars) at a discount from the international bank; the higher the level of country risk, the larger the discount.

• After it got the debt certificates, the foreign company is in a position to negotiate with the LDC's central bank, in order to convert the certificates to local currency instruments. The next step will consist of negotiating with the government agency which owns the SOE, in order to use the local currency acquired to purchase all or part of the equity in the SOE.

• The consequences of the debt-equity swap transaction will lead to the reduction of the LDC external debt; in addition to that, the foreign investor would have acquired a company at a low price; finally, the government agency involved in this transaction would have successfully transferred one of its holdings to the private sector.

Several Latin American countries have experienced debt-equity swaps, but the most experienced country by far remains Chili where legislation has been passed to promote and regulate this activity.

*Foreign Venture Capital Funds*

There are several institutional venture capital funds which are potential candidates for investing in BOT projects. The problem associated with this type of equity investment is that the fund is very adverse to the country risk. Since each investor in this fund is willing to accept a different level of risk, the guidelines of the capital venture fund should accommodate the most risk adverse of the investors.

*Private Sector Windows*

The International Finance Corporation of the World Bank can play a tremendous role in a project's equity financing. Another influenceable private sector window is the

Asian Development Bank which already assumed equity and debt investments in Asian LDCs BOT projects.

### 3. Domestic Debt

There are four sources of domestic debt available to finance BOT projects:

- Commercial Banks
- Institutions
- National Development Banks
- Commercial Paper

*Commercial Banks*

Commercial banks' loans are usually short-termed with a high interest rate. In this case they will be of little use to BOT projects which require payback periods of 15 to 20 years.

*Institutions*

There are two types of domestic institutions which provide debt financing to BOT projects: insurance companies and pension funds. The only obstacle in financing a BOT project with such funds, is that they usually require a proven record of potential profits and dividends.

*National Development Banks*

These national banks offer a comparable advantage in debt financing. Their loans are long-term, usually five to fifteen years (depending on the bank, and the nature of the project) at competitive interest rates.

In order to gain access to these loans, the project company should convince the Development Bank that its project meets the prequalification criteria of the sources of finance set by the World Bank.

*Commercial Paper*

So far only blue chip companies were able to issue commercial paper. Therefore financing BOT projects through commercial paper will be of a very limited scope.

### 4. Foreign Debt

According to the World Bank, there are three sources of foreign debt available to finance large BOT projects:

- Foreign Commercial Banks
- Export Credit Agencies
- Private Sector Windows

*Foreign Commercial Banks*

Commercial Banks have been reluctant to lend LDCs with high country risk. They have only been willing to lend to the private sector with a guarantee from an export credit agency.

*Export Credit Agencies*

A guarantee from an export Credit Agency allows a bank to lend to a developing country with coverage for sovereign risk. This risk is assumed by the agency for the sole purpose of promoting its country's exports. However only projects including a high foreign content are able to systematically address this funding source.

*Private Sector Windows*

The comparable advantage of the private sector windows, as stated in an earlier section of this chapter, is that they offer long-term loans with low interest rates. Another advantage of having the IFC (for example) as a creditor in a project, is that it directly adds credibility to the project, and may entice other banks to get involved in the financing procedure. The private sector windows seldom occupy a dominant position, limiting their intervention to 15% to 25% of the project cost.

In conclusion, it appears that the proportion between foreign currency and local currency as well as the proportion between debt and equity are all dictated by the nature of the project and the country involved. For example:" A power plant project, with the need for expensive foreign source heavy equipment and perhaps a greater need for foreign expert services will require a very large part of the investment in foreign currency. A toll road project, on the other hand, particularly if the local economy is capable of providing much of the steel, cement, and other materials to be used, will require much less foreign currency financing[1]."

## *E. The Security Package*

BOT projects face several identifiable risks due to the nature of the project. These risks might be of a political or economical nature, and might affect tremendously the projected cash flow of the project. For this reason, financiers would not pour money in a project for the sole fact that it has a strong projected cash flow. They have to have assurances that these risks are carefully detected and covered through guarantees (in this case, credit enhancements), and that each party (referring to the sponsors and the government) will agree to inject money into the project to offset the money lost due to the occurrence of that particular event[1]. The legal package that includes the contracts of what risks are covered by who, is referred to as the security package. It is an essential "ingredient" of every BOT-type project.

The risks may be divided into three distinct categories, depending upon when in the life of the project they occur. The risks are pre-commissioning risks, post-commissioning risks, and finally project lifetime risks.

### 1. Pre-commissioning Period Risks

Pre-commissioning risks are the risks that may occur before that the project becomes operational. These risks include the possibility that the project will be aborted by the shareholders, the risks of late start-up, cost overruns and delays arising from force majeure, damage encountered on site, and bankruptcy of shareholders and suppliers. There is also the risk that government regulations, related to customs, procurement and construction work force regulation will increase construction costs or provoke delays. The

major pre-commissioning risks, however are capital cost risk and the construction delay risk.

### 2. Post-commissioning Period Risks

These risks emerge once the project becomes operational. In this category, risks are usually output shortfall due to physical damage, strikes or general operational reasons; output shortfall due to inadequate fuel supply; inflation and operating costs above forecast levels; and again government actions such as change in import restrictions, tax regime, or safety and environmental legislation which effects the viability of the project. The most significant post-commissioning risks are the operating risks, along with the technical risks specific to the project.

### 3. Project Lifetime Risks

This third set of risks consists of the risks to which the project is exposed throughout the project life. These risks include foreign exchange risk, increased interest rates, nationalization and expropriation, and delays of the date of commissioning. Particularly relevant in developing countries, are the currency convertibility risks, general political risks, and finally the risk that shareholders will not fulfill their joint venture responsibilities.

### 4. Risk Allocation

As seen above, the risks involved in a BOT project are numerous and diverse. Therefore, it will be very useful for the public as well as for the private sector to allocate these risks; the following risks are the most common ones to occur[1]:

*Force Majeure*

This type of risk is usually not insurable at all; commercial lenders as well as export credit agencies will normally be reluctant to take force majeure risks in a BOT context, and will seek for the support of one or more of the parties involved. On the other hand, equity investors may assume the force majeure risks for themselves but normally will not be willing to protect the lenders against this risk[2]; they will do so(assume the risk for themselves), if offered considerably more upside potential than 16% to 18% return. The lenders, therefore, would require a sort of guarantee from the government, providing them, with some coverage for uninsurable force majeure risks.

*Inflation and Foreign Exchange Risks*

Both lenders and equity investors to a project in a developing country will insist on implementing a mechanism to protect themselves against inflation and foreign exchange risks. These investors are convinced that such risks are beyond their controlling web, and that the host government should offer a sort of protection in order to prevent the occurrence of such events. In a typical BOT project, the potential rewards to the investors are never great enough to compensate for taking inflation or foreign exchange risks[2].

Local investors would only require protection against inflation. On the other hand, the foreign investors would require a protection against both inflation and foreign exchange risks. Specifically when the revenues of the project are derived in local currency they would want assurances such as (a) currency will be legally converted into hard currency, (b) and that sufficient hard currency will be available to permit that conversion, (c) and finally that the conversion can be made when the investment is made[2].

Inflation risk, according to the World Bank, is usually covered by the long term off-take contract (in the case of a power plant), or the agreement with the host government as to minimum revenues to be collected from the public (in the case of toll roads or ports) will normally provide for periodic adjustments in the price of the goods or services produced by the project based on some relevant index of local inflation. The host government is also expected to guarantee convertibility, the availability of sufficient foreign exchange and the exchange rate[2].

*Sovereign Guarantee*

Host governments who, in most cases do not guarantee the loans made to the project company, will be expected to provide sovereign guarantees for some aspects of the project. For example, when a government utility undertakes the long term supply of fuel or energy to the project, the government itself is required to guarantee the utility's performance; moreover, the basic agreement between the host government and the project company will usually contain numerous obligations for the host government to undertake[1].

*Protection from Competition*

The project company normally expects assurances from the host government on protecting the BOT project against any outside competition. For instance, in the case of a toll road, the sponsors would require assurances that no other parallel road will be built during the life of the project.

*Completion Risk*

In every BOT project there is a risk that the project would not end on time, for the price stated. This is why such projects are often supplemented by performance bonds. As a consequence, the cost of the whole project is increased (to include a risk factor) in order to compensate the contractor for taking such a risk.

*Performance and Operating Risks*

Some warranties would be included in the security package concerning the performance of the project. These guarantees are provided by the construction company, as for the actual building of the facility; in addition, the operating company will guarantee the performance of the project during the post-completion phase.

*Cash Flow Risk*

Commercial insurance is available in the London market to cover cash flow risk in BOT projects. However, the cost of this insurance will become part of the overall cost of the project. In the case of a power project, this would be reflected in the higher cost of power provided to the government in the off-take agreement[2]. Therefore, a government might find it more beneficial to assume this risk itself, rather than allowing a project company to be reimbursed for the cost of a commercial insurance.

*Political Risk*

This is the risk that any governmental change of policy would adversely impact profitability. Usually, both foreign commercial lenders and foreign equity investors would seek political risk insurance from their own export agencies or from such sources as the World Bank.

There are several other risks involved in a BOT project, which would not be covered in this chapter. These risks include technological, development, market, and finally legal risk.

In conclusion, the importance of the so called "security package" is that it depicts the various risks involved in a BOT project, by assigning their coverage to one of the parties. The following parties are expected to cover the following risks:

- **Force Majeure:** Host government
- **Inflation Risk:** Lenders and equity investors
- **Foreign Exchange Risk:** Host government
- **Sovereign Guarantees:** Host government
- **Protection from Competition:** Host government
- **Completion Risk:** Project sponsor & construction consortium
- **Performance and Operating Risk:** Construction contractors & equipment suppliers
- **Cash Flow:** Project company
- **Political Risk:** Foreign commercial lenders & foreign equity investors

## F. Chapter References


1. The Coordinating Council of Philippines Assistance Programs: *Introduction to BOT-type Projects.* The World Bank, Washington D.C.

2. Augenblick Mark, Custer Scott, and Ma'ani-Bruss Sovaida: *The Build, Own and Transfer approach to Infrastructure Projects in Developing Countries.* The World Bank, Washington D.C., August 1989.

3. Price Waterhouse: *Private Power Projects and Capital Market Development.* Price Waterhouse, Washington D.C., 1991.

4. Arthur Young International: *Financing Privatization under Limited Capital Conditions.* Arthur Young International, November 1986.

5. Citibank: *Development and Financing of Private Electric Power Projects in Asia.* Citibank, 1990.

6. World Bank: *Private Sector Participation in Power through BOOT schemes.* The World Bank, 1990.

7. Cao, Andrew: *Privatization of State Owned Enterprises, A Framework for Impact Analysis.* International Privatization Group, Price Waterhouse, August 1992.

# III. LESSONS LEARNED FROM BOT-TYPE PROJECTS

## A. *Trends & Developments: Statistics on Privatization*

Privatization, a relatively new word in the development terminology, means different things to different people. This is evidenced by the variety of terms that have already been used to describe the privatization process[1] : "peopolization" in Sri-Lanka, "popular capitalism" in Chile and the all encompassing "private sector development" in some other countries. In general terms, the word privatization depicts either the transfer of ownership or management of SOEs (State-owned enterprises) to the private sector, or the dilution of public ownership via increases in private financing of new projects[2]. It is the latter concept of privatization that is the subject of interest of this thesis.

The eighties marked the age of privatization. According to *Privatization International*, the total proceeds of divested SOEs worldwide in 1988 were approximately $29.5 billion. This figure went down to $24.7 billion in 1989 and to $25.3 billion in 1990. Due to the abrogation of centrally-planned economic systems in Eastern Europe and the former Soviet Union, privatization became an even more strategic development technique. Consequently, the total proceeds of privatization reached $53.2 billion in 1991. In 1992, a similar result was evidenced, with worldwide privatization transactions of over $53 billion in total value[3].

Privatization implementation varies among different regions and countries. While some countries have taken the initiative to adopt this means of development, other preferred to wait and benefit from the experience of the "avant-guardistes". Mexico and Chile can be clearly denominated as the precursors of privatization, and were the first to realize positive results from their privatization programs, and their success served to stimulate other countries such as Argentina and Brazil. In Mexico, around 200 public sales of loss-making SOEs have raised $17 billion or approximately 7% of the country's GDP (Gross Domestic Product). This process has allowed the government to turn around the 8% budget deficit in 1981 to a surplus and bring inflation below 20%[4]. Similar results occurred in Chile.

Despite the positive results of Mexico's and Chile's privatization programs, some countries still fear the political consequences of privatization as well as the labor displacement issue involved in the implementation of such a process. For these reasons, many countries have started their privatization programs under the form of private financing of infrastructure projects rather than outright sales of existing SOEs[1]. This method minimizes the risk of labor displacement while enhancing the supply of much-needed infrastructure services, such as water, electricity, telecommunications or waste removal. The latest data available regarding the financing of major infrastructure projects by private capital indicates that $36.6 billion were assigned to such projects in 1993.

Before we focus on the different Infrastructure Project Financing methods, and the general issues involved in the process, it will be relevant to discuss the most popular privatization objectives to date.

## *B. Objectives of Privatization*

Governments privatize state-owned enterprises (SOEs) for numerous reasons, the most important ones often being the reduction in the budget deficit, improvement in efficiency, and revenue generation. There are also secondary objectives, which are often a by-product of the privatization technique adopted[6] (such as dispersion of share ownership, development of capital markets, etc.). Some of these objectives, may and often do, conflict with each other; attempts to accomplish numerous aims can result in a failure to achieve any. Governments involved in the privatization process should do their best to balance conflicting objectives.

In the next section, we will review today's most popular privatization objectives and determine their impact on the selection of privatization techniques.

### 1. Improving efficiency

In common usage, "efficiency" is not a very precise concept. For economists, however, efficiency has a fairly exact meaning and is measured in a fairly precise way, namely, by the amount of output that is derived from a given input. "Efficiency is therefore increased if output rises without an increase in inputs" (Reference Number 1). It is hoped that transferring ownership from the government to the private sector will improve production efficiency, i.e. managers in private enterprises will obtain more output than managers in public enterprises

from given inputs of capital, labor, and intermediate materials. According to the World Bank (1992), improving SOE performance is one of the most sought-after objectives of privatization.

A word of caution is necessary, however. The desired post-privatization efficiency will be reached only if the managers of the enterprise are provided with incentives differing from those they experienced when the government was the owner. Management will behave differently and will have incentives to maximize the firm's profits under the following conditions: if the market in which they are operating is competitive, if their pay is linked to their performance, and if the capital market is fully functioning, thus pricing the company's shares and/or, via the threat of bankruptcy (with no hope intervention from the government) or takeover, thus imposing discipline on the firm and its managers[7]. Transferring ownership alone without a change in the working environment will have little impact on overall productivity and efficiency.

Besides affecting management, privatization can also increase the productivity of the employees. In the public sector, where security of employment is guaranteed, there is a tendency for employees and management to be less concerned with their performance and responsibilities. In the private sector, inefficient employees can be dismissed; this threat of dismissal leads to an increase in efficiency. The inability to dismiss employees in public corporations also increases militancy, which leads to labor market imperfections[7].

## 2. Reducing Government Borrowing and Expenditures

Government indebtedness, including the debt of its public corporations, has been growing at a very rapid pace in most developing countries and in some industrialized countries. Required future investments in infrastructure could further accelerate this trend unless alternative sources of funding are found.

Undoubtedly, it is important to continue to enable public corporations to increase and improve the essential services they provide. The question is how to fund such expansion and improvement projects without further adding to national fiscal crises. Privatization of selected public corporations through the injection of new equity capital, rather than an addition to the country's debt burden, could provide the alternative source of funds, which could be key to more dynamic, and more soundly financed, economic and social development in the years ahead. A good example of the potential of privatization can be seen in the recent sale of Telmex, the national Mexican telephone company. In 1990, the Mexican government, faced with the daunting task of modernizing its archaic telephone system, opted to privatize Telmex via a combination of private and public sale. 20% of the company was sold to qualified and experienced international operators for $1.76 billion, while the rest of the shares were floated on international stock markets for another five billion dollars[8]. The new operators committed to invest $10 billion over the next five years, a sum the government could not have expended. This privatization resulted in technology transfer in the telecommunication area, investments in the nation's infrastructure, and large revenues to the government.

Loss-making public enterprises, which require continuous subsidies and investments, make good candidates for privatization. Their divestment can substantially reduce the annual fiscal deficit incurred by governments[8].

### 3. Reducing Political Intervention

By divesting its shares in a company, the government will no longer interfere in the daily management of the enterprise, which should result in an increase in economic efficiency and managerial performance. Privatization will also reduce the government's conflict between running the business and the desire to use state enterprises as a way of collecting taxes or enforcing anti-inflationary price controls.

Finally, the privatization process will free up the government officials and let them concentrate on their main task: governing the country. This will be quite beneficial since there is a limited number of skilled officials carrying out a tremendous variety of tasks in most developing countries. A Mexican official, who sat on the board of 300 companies (and thus had to attend 300 board meetings per year), welcomed privatization as a measure to liberate the government's resources and allow it to focus more on its social tasks[7].

## 4. Broadening Domestic Equity Ownership and Capital Market Development

Privatization is an opportunity to redistribute assets and broaden ownership without taking assets away from someone else. It enables a larger number of citizens to have an opportunity to participate in and enjoy the benefits derived from the growth of the enterprise. This broadened ownership results also in the high probability of new owners causing greater management focus on results and less bureaucratic emphasis on process. Indeed, these individual shareholders represent an independent and concerned monitoring process over the performance of enterprises which the government can never fully duplicate.

Privatization can also help develop capital markets (and vice versa). Numerous countries including Chile, France, Jamaica, Japan, Nigeria and the UK, increased considerably the number of shareholders and total market capitalization as a result of privatization. Table 1 highlights the number of new shareholders created by privatization as well as the proceeds from sale as a percentage of stock market capitalization.

**Table 1: New Shareholders Created by Privatization.**

| Country | Proceeds of Sales Through Stock Exchange ($US millions) | Proceeds as a % of Stock Market Capitalization | Number of New Shareholders |
|---|---|---|---|
| Canada | 812.0 | 0.4% | N/A. |
| Chile (since 1985) | 893.5 | 9.3% | 63,316 |
| France | 5,148.1 | 3.0% | 5,000,000 |
| Jamaica | 120.8 | 12.6% | 30,000 |
| Japan | 76,500.0 | 1.7% | 1,670,000 |
| Nigeria | 27.0 | 2.0% | 400,000 |
| Trinidad & Tobago | 6.8 | 2.5% | N/A. |
| Tunisia | 8.6 | N/A. | N/A. |
| United Kingdom | 51,720.5 | 6.0% | 7,400,000 |

Source: The World Bank, "Privatization: The Lessons of Experience", April 1992.

As these figures demonstrate, privatization contributed tremendously at developing the capital markets of these countries. In the UK alone, over 7 million shareholders were created during the privatization wave (1979-1989). Similarly, in France, over 5 million shareholders were created over two years only. In Jamaica, the sale of three companies alone boosted market capitalization by 12%[9].

### 5. Attracting Foreign Capital and Expertise

The infrastructure investment and development needs in most developing countries are still substantial, particularly for power, telecommunication, transportation, and water. Privatization offers the opportunity to bring in new foreign capital and expertise, without adding to indebtedness. Foreign equity investments can also build relationships, provide access to new technology and provide management and technical skills and training[10]. The privatization of Telmex, the Mexican telephone company (mentioned above), which has brought so far $6.76 billion in revenues and new technologies, is a good example.

### 6. Changing the Structure of Property Rights

A change in ownership can affect the structure of property rights and thereby overcome existing bureaucratic failures. While, in effect, every taxpayer/voter is currently a shareholder in the public enterprise sector, an explicit shareholding may induce those voters who hold shares to take a greater interest in the performance of public enterprises. Since their financial return is directly linked to the performance of the firm, they will no doubt put more pressure on the management and might even fire them in case of bad performance[9].

Privatization will also allow people to choose the levels of their holding (if any) in the industrial assets concerned, rather than being "forced shareholders" in the public enterprises.

### 7. Reducing Trade Union power

It is believed that privatization can sometimes reduce the leverage of trade unions in the privatized enterprises, leading possibly to increased efficiency in the use of labor and less pressure towards wage-inflation[9].

### 8. Increasing Competition and Consumer Welfare

Privatization coupled with appropriate liberalization and deregulation measures, can create, increase or enhance competition. Competition in turn will impose pressures on industry through the availability of alternative sources of supply of consumption goods and the alternative uses of capital resources. This should lead to a reduction in prices, improved services and goods, and accordingly, higher consumer welfare[9].

### 9. Retrenchment of the Public Sector

During the 1960s and 1970s, governments have diversified into numerous unrelated and non-strategic areas such as hotels, tourism, manufacturing, etc. As the size of the public sector grew, its administrative and financial burden became increasingly heavy. Privatization is seen by many as a solution for controlling this growth and bringing the size of the public sector back to manageable proportions[7].

In addition, the activities of many SOEs originally designed to play a catalytic role in the development of the economy, no longer needs to be undertaken by the government which otherwise might increasingly interfere with the private sector. Therefore, the government will sell these companies or at least divest the non-strategic segments of these enterprises.

### 10. Increasing Political Support

Most of the above objectives are aimed at increasing consumer welfare, which in turn leads to increased votes and popularity for the government. Privatization therefore can be considered as a policy of capturing votes.

As mentioned earlier, some of the above objectives could conflict with each other. For example, reducing the size of the public sector and/or maximizing the revenues to the government may not be compatible with the goal of efficiency if it involves transferring monopoly power from the public to the private sector without increasing competition. When several objectives conflict with each other, the government will have to select the over-riding objective(s) that best fit with its priorities and shape its privatization program accordingly.

The methods chosen to implement a privatization program are likely to vary according to the order of priority set by the government. Due to the scope of our thesis, and since we are using all these general issues in order to find a suitable way of financing the infrastructure in Lebanon, only the public-private partnership methods will be discussed.

## C. *Overview of Infrastructure Project Financing Methods*

A new form of privatization has recently become popular: public-private partnerships. In an increasing number of countries around the world, the public and private sectors have joined together to overcome funding constraints and create necessary new infrastructure projects. Although the balance of public and private responsibilities varies among projects, public-private partnerships have one central strength: they draw on the best of each sector to fulfill infrastructure needs which neither sector alone could provide.

Since no borrowing on the part of the government or government agency is involved, public-private partnerships shift the debt burden from the government to the private sector. The government, in this manner, conserves its limited resources for other social infrastructure needs such as health, education, flood control and drainage. By attracting domestic and foreign private entrepreneurial energy and capital (both debt and equity), the scheme contributes to the expansion and improvement of much needed infrastructural facilities which otherwise would not have come onstream and whose absence would constrain economic development of the country[1]. Furthermore, as part of the privatization the private sector is likely to provide sound management, speedy implementation and operational efficiency including the adoption of innovative design features[8].

Public-private partnerships in infrastructure involve a wide array of public-private relationships with variables degrees of public and private responsibility[1]. Important factors include nature of the developer's organization, source of initiative, who operates the facility, ownership (including duration), financing sources, and type of revenues. The most popular forms of public-private partnerships are presented below.

### 1. Build-Operate-Transfer (BOT)

According to the World Bank, a Build-Operate-and-Transfer scheme can be defined as a contractual arrangement whereby the contractor undertakes the construction, including financing, of a given infrastructure facility, and the operation and maintenance thereof. The contractor operates the facility over a fixed term during which it is allowed to charge facility users appropriate fees, rentals, and charges sufficient to enable the contractor to recover its operating and maintenance expenses and its investment in the project plus a reasonable rate of return. The contractor transfers the facility to the government agency concerned at the end of the fixed term. Depending on the time of the transfer, the performance of the sponsor and the remaining economic life of the project, the government may opt to extend the sponsor's operation of the project to some future period in time[5]. Worldwide examples of BOTs include the Hopewell Power plant in the Philippines, the Pakistan Hub River power plant, and the Malaysia Saba water supply.

One major reason for the transfer feature has been the concern many governments have regarding private ownership and control of sensitive or strategic economic activities such as telecommunications, transportation and infrastructure, resulting in a hesitancy to allow total privatization.

The main advantage of the BOT scheme is that it is supposed to provide significant "additionality." When a government has neither the budgetary resources nor the borrowing capacity to finance an infrastructure project as a public sector project, the BOT formula offers the possibility of realizing a project which would otherwise not be built. Financing "additionality" is provided in the form of the sponsor's equity investment, as well as passive equity and subordinated debt[1]. In some cases, commercial banks may be willing to lend to a BOT project with a specifically tailored security package where they might not be willing to make new loans to the government itself. Ideal candidates for BOT schemes are in the sectors of telecommunication, power, transportation, and water.

### 2. Build-Own-Operate (BOO)

The BOO method is used when the infrastructure facility is brand new rather than existing, requiring financing for construction such as the Bangkok Hopewell Rail, the Mexican toll road or the French MUSE tunnel[9]. The sponsoring consortium which finances the project takes care of the construction and operations of the facilities as

owners without worrying about transferring back the facilities to the host country government. One major reason why the transfer is not considered by the government as necessary is because it is not under political pressure to own the facilities. In general, countries which are truly committed to private sector development and liberalization tend to prefer this method over the BOT scheme.

### 3. Build-Transfer-Operate (BTO)

For governments which are not committed to privatization, a derivative of BOT called Build-Transfer-Operate (BTO) is used. Examples include the German and Hungary toll roads and the Poland Modlin airport. With this method, there is no private ownership and the operation resembles a franchise arrangement rather than a BOT[9]. BTO often has public participation in funding and it is not unusual for the government to pay for maintenance of the facilities. This method is preferred to the BOT when limiting legal risk such as tort liability is a major concern, as it is generally more difficult to sue the government than it is to sue a private concern[1].

## 4. Buy-Build-Operate (BBO) and Derivative Methods[10]

In projects involving existing facilities, the sponsoring consortium can purchase the assets from the government, expand capacity and then operate. This method, referred to as Buy-Build-Operate (BBO), is used for by governments that are committed to privatization and wish to expand the capacity of existing operations. Examples include the Philippines light rail system, the Pakistan and Mexican telephone operations and the Dublin, Ireland beltway.

A derivative of BBO is the Lease-Develop-Operate (LDO) method. This method is similar to BBO except that full privatization is avoided through the government's retention of ownership rights. Under this arrangement the government receives cash flows as specified by the lease agreement and existing facilities are financed by the lessee. The Toronto airport terminal, the Atlantic City International airport and the Kuala Lumpur/Kauntan road are examples of LDOs.

Another derivative method allows the government to retain ownership of existing facilities while the private sector financed expansion is owned by the sponsor. This method is called Add-Own-Operate (AOO). Examples of AOO include an addition of a fuel facility on an airport site which belongs to the government. This method is also used if the government's objective is, for example, to maintain the existing labor force while increasing the service supply and creating competition (thereby increasing efficiency)

within the state-owned facility. A third derivative is called Contract-Add-Operate (CAO) and is used in those cases where ownership is not allowed even for the private sector financed expansion. These methods are popular in waste processing plant expansion projects.

These are the major privatization techniques currently being used around the world. Several combinations of the above methods exist as well. The choice of a particular method will ultimately be dictated by 1) the objectives being sought by the government, 2) the financial condition and record of performance of the enterprise, 3) the legal organizational form of the SOE, 4) the sector of activity of the SOE, 5) the ability to mobilize private sector resources, 6) the degree of development and sophistication of the capital market, and 7) the political and economic constraints facing the government[9]. According to the World Bank, no generalization can be made as to the relative weight of these elements in choosing how to privatize. Every country faces special economic and political conditions which will have a unique impact on its privatization program.

## *D. General Issues to be Considered in BOT-type Projects*

While preparing and evaluating a BOT-type project, it is essential to thoroughly study the various aspects involved in every stage of the process, starting from the initial planning of the project to the actual implementation stage. The reason is that BOT-type projects are very difficult to apply, and they usually encompass several variables which affect the final outcome. Numerous lessons have been learned regarding all stages of this type of projects.

BOT projects are increasing in dollar size, and they include now a larger number of participants. Banks worldwide are reducing their lending in general, and this has a negative effect on the availability of funds for higher-risk project financing[1]. The shrinking market has resulted in new pressures on project development and financiers.

### 1. General Characteristics of Successful Projects[5]

- The local economy does not have the public funds allocated for capital projects, i.e. there must be a strong need for private capital.
- The project must serve a pressing public need.
- The top levels of the public sector must feel that the private sector would be able to perform the capital projects and manage the risks more efficiently and effectively.

- The sponsoring agency should not be a competitor.
- The private developer must provide value added and possess irreproachable technical expertise to design, build and operate the project.
- The awarded contractors / suppliers must be willing to get involved in turnkey design / construction contracts with firm prices and completion terms and conditions.
- The project should be considered financeable on a limited-recourse basis. Non recourse financiers need assurances that a project will be completed within budget and on time.
- The project is able to collect substantial user fees and has the potential for non-user revenues.
- A single agency should negotiate the binding agreement.
- The government should provide some backup credit support, this is usually provided by multilateral development or export credit agencies.
- The technical, economic and commercial elements of a BOT-type project should be closely integrated and coordinated. Clear communication between the project participants at all stages of the project is necessary when working out financing arrangements, especially when relying on syndicated financing.
- Personality traits of key individuals / managers involved in the BOT stages must not be overlooked. Different personality types are needed at different stages of the project. Due to the involvement of international participants, cultural difficulties will be encountered, and adequate management of cultural issues by the project coordinator / manager is needed at these times to avoid jeopardizing the project.

## 2. General Problems Encountered

- The lack of availability of credible project developers and equity investors with experience in packaging these projects.
- Competence of governments to provide the necessary level of cooperation, integration and support for such projects.
- Formulation of workable corporate and financial structures. These projects are extremely complex as they involve risk allocation and sharing arrangements.
- High Development Costs: Expensive consultants and advisors / lawyers.
- Conflict of Interests (i.e. between the needs of the project and expected financial return of suppliers / contractors).

## *E. General Lessons Learned*[1]

The most common lesson learned throughout the execution of the numerous BOT-type projects is that trust among the different project participants is a must. The untrusting relationship between the private and public sector yields to misunderstandings about the real incentive of each party, and these doubts usually amplify when negotiating the sharing of risks[1]. The public and private negotiators should consider themselves as partners instead of antagonists, since they have mutual interests, mainly the success of the project in question. Misunderstandings do not profit to any of the parties, since they slow the process of negotiations, and lead to the costly interference of "low value-added" advisors, lawyers and arbitrators.

### 1. Negotiating Issues

1. Acceptance of Loss of Control:

At the early stages of a BOT-type project, the government gets troubled by the perceived loss of control to the private sector. The government must discern the trade-off involved in this process and abide to it.

2. Acceptance of Public Sector Regulations:

The private sector must acknowledge that the government does not operate as a private entity, and that it is difficult to the latter to commission one person to negotiate freely on its behalf and virtually accept any reasonable setting advanced by the private sector.

3. Allocation of Responsibilities to a Single Person:

The appointment of responsibilities to a single individual is paramount to the timing involved in the execution of the project. Failure to assign a single authority to negotiate on behalf of each party can cause a paralysis in the negotiations.

4. Need for Flexibility:

While negotiating a BOT-type project, flexibility is necessary for both the private and the public participants.

5. Components of a Negotiating Team:

Governments are always at a disadvantage while negotiating with the private sector, since they lack the expertise of the latter. It is to the government's benefit to recruit expert advisors such as investment bankers, lawyers and environmental specialists for the negotiation stage.

## 2. Packaging Issues

One main cause of failure for BOT projects is a shortage of "packaging skills". In other words, if the basic criteria of the scheme are not reasonable to all the participants, the project is condemned to fail. Important issues to consider under packaging are:

1. Project Company:

The sponsoring company should approach the project based on the fact that it owns stakes in this project, instead of acting as a financial or technical consultancy.

2. Timing:

Lengthy negotiations can ruin a project, being able to coordinate the required resources in order to head off this problem is mandatory. All projects, regardless of their dollar value, require the same amount of effort and negotiations to reach an agreement.

3. Private Sector Experience:

There is a very limited understanding and knowledge on the practical approaches used to create the complex public-private partnership. BOT projects are usually managed by private sector managers with little or no experience with the method.

4. Public Sector Experience:

The public sector is relatively slow in developing a project and implementing it, mainly because of the size of the public sector and the numerous interests involved in the project. "The public sector has limited experience in the preparation and execution of large infrastructure projects under the time and cost and profit conditions typically encountered by the private sector" (Reference Number 5).

5. Selection Process:

The task of awarding a project should be assigned to an unbiased and independent expert who should base his judgment on a competitive basis evaluation of the bidders. Suspected favoritism would enhance the "losers" to delay the negotiations.

6. Provisions:

These partnerships should include exit provisions for weakly performing partners, as well as entry provisions for new participants.

## 3. Political Issues

1. Objectives and Constraints:

The host government should clarify its objectives and constraints, specifically the financial ones. There must be adequate government funds and guarantees available for the project and accordingly political will to employ the private sector's capabilities for the project. In addition, there must be a pressing need for the project which has been perceived for years by government officials. The roles and attitudes of the major "players" in the scheme, such as the government, the equity investors, and lending agencies, are crucial for a BOT-type project to work. Finally, there must be a clear commitment by the government to support this type of project.

2. Political Risk:

International institutional investors are only attracted by countries with low political risk. Political stability of a country insures the investors that the project would be completed on schedule, without changes in the local laws and regulations.

3. Policy Framework:

The establishment of legislation on issues regarding foreign investment and regulation of public utilities, is a prerequisite to the implementation of a BOT project. The earlier in the process that the legislation is initiated, the higher the potential to attract investors to the project.

## 4. Project Risks

It must be understood by all parties that BOT-type projects include several risks (discussed earlier in the previous chapter), and that these risks should be shouldered by the parties who are most able to assume them. Before the creation of a project's financial structure, the project should be subjected to intensive risk analysis and the contractual documents should incorporate mitigants to make the risks manageable for the lenders[5].

Among the risks involved in a BOT scheme, are inflation and foreign exchange risk, project / commercial risk, and political and country risk. At this time, the reader is referred to the last section of the previous chapter, which consists of an analysis of the security package of a BOT-type project.

Taking into account the above-mentioned lessons learned and risks involved, we next examine a BOT project carried out in Pakistan, and another one undertaken in Malaysia.

## *F. Case Study: The Hub River Private Power Project of Pakistan*

Over the past few years, the power generation market has seen the rapid growth of private power generation facilities in the US and overseas. By combining project financing techniques with long term power sales agreements, private companies have developed a new segment in the power industry, namely BOT, and BOO. Having gained momentum and experience in first world order countries like the US and Canada, these techniques have started to be applied to power plants in developing nations.

The Hub River Power Project has been referred to by John Blackton, the Pakistan director of USAID, as the "make or break" test for these types of projects in the developing world. The Hub River scheme is the largest project by far of its kind ever undertaken or even considered. Originally, the power station was designed to provide 500 MW, at an approximate cost of $900million. At that time, the Government of Pakistan received two admissible proposals which it combined. The consequent output was 1,200MW to be provided from an oil-fired station at Hub Chowki, 50km west of Karachi, costing roughly $1.88billion.

Although this project originated as a BOT-type project, through the negotiations phase, its structure changed to a BOO scheme which will sell its output to the state-owned Water and Power Development Authority (WAPDA). The BOO decision was made when

the consortium decided that a BOT project was deemed contrary to privatization, a primary objective of the Pakistani government at this juncture[9].

*Arrangement of the Consortium*

The participants in the Hub River Power Project were Saudi, Pakistani, Japanese, European and US companies. The main sponsor of the project was Xenel International Energy of Saudi Arabia. Other sponsors included Mitsui & Co. of Japan and Hawker Siddely Power of Great Britain. Price Waterhouse acted as the financial advisor to the Government of Pakistan.

The makeup of the consortium has drastically changed as of December 1989, when the original consortium dissolved and withdrew its offer. In May of 1991, the new (current) consortium formed and submitted its formal offer[9].

*Project Financing*

HUBCO, the project company, was to provide 20% of the total financing as equity capital from both foreign and local shareholders. The remaining 80% was to be borrowed from the PSA's. The private sector ended up supplying US$380 million of equity for the scheme and $1.5 billion of loans (That amount included a substantial quantity of foreign borrowings).

The debt/equity ratio is constituted as follows[10]:

- Equity:

  7.2% $136 million by the project company - HUBCO

  5.3% $100 million raised through the public sale of convertible bonds.

  7.7% $144 million from other overseas investors (CDC).

- Debt:

  70% $1,313 Foreign Debt (ECAs, PSEDF, ECO [WB], CDC, and other).

  10% $188 from local banks.

- Total Financing:

  100% $1.88 billion

The project financing was structured in a way that money is supplied by the commercial lenders against the revenue stream of the project rather than against the balance sheet of the Government of Pakistan.

*Lessons Learned[10]:*

**1. Establish Strict Proposal Criteria and Ensure Compliance**

As noted previously, the original project was priced approximately $900 million. However, upon receipt of two acceptable proposals(from two different companies), the

evaluating committee decided to combine the two offers resulting in over double the original wattage, from 500MW to 1,200MW.

In addition, various contractual documents could have been prepared, although not in their final form, prior to project development, such as the Fuel Supply Agreement and the Power purchase Agreement. Such documents must identify and establish policies and operating issues needed for a BOT-type project.

### 2. Keep Project Size Manageable

The total project cost rose from $900 million originally to the extreme figure of $1.8 billion due to delays in the initiation of construction and fluctuations in exchange rates. The final cost of the project ($1.8 billion) is considered to be a colossal figure for a first time project and therefore more difficult to arrange the various required financing schemes. According to a senior consultant at Price Waterhouse, in July 1991, a contingency provision of $200 million to cover cost overruns was added to the project cost, an obvious disadvantage of extending the project life.

### 3. Reduce Negotiations Stage

One key lesson implied from this project is that the negotiations phase should be reduced to a minimum. Given the large number of participants involved in the BOT process from start to finish, the negotiations will, de facto, be a trying process. Negotiations for the Hub River project were drawn out and difficult for the sole reason

that the Government of Pakistan did not commission one single authority to represent the government. In addition to that, on both the public and the private sector sides , those involved in the negotiations did not have "carte blanche" responsibility to commit their respective parties to all agreements. One way to avoid these difficulties is by appointing one predominant negotiator who is given the trust and power of his party/company, in order to make the critical decisions.

In addition, according to the World Bank, the various government agencies and other vested interests should be informed of the projects purpose, goals and objectives which might impact upon their activities up front. However, at the negotiations stage those interest groups should regroup and form one cohesive entity ready to represent the government.

Due to the high complexity of BOT-type projects, both the public and the private sectors should be aware, at the proposal development stage, of the legal elements involved in such a project. Additional ways to reduce the negotiations phase to a minimum is to identify the policies regarding relevant legislation, foreign investment issues, and legal issues before the commencement of the project.

### 4. Maintain Close Relationship with the Government

The passing of the Sharia Law of Pakistan by the Muslim Court, as a supreme law, could have directly affected the Hub River project, knowing that this ruling prohibits

interest. As a consequence, Western bankers showed concern as they felt the potential threat on the project returns Fortunately, the relationship of the sponsors with the Pakistani Government was strong enough in order to ensure that the project must be constructed and operated under the terms of the contract signed. In order to prevent unnecessary impasses caused by the result of the ruling, the World Bank intervened in association with the GOP (Government of Pakistan) and switched the governing law to English.

According to Price Waterhouse, the financial advisor to the GOP, evidence of the strong relationship which HUBCO has with the government, and the importance of that relationship, is demonstrated through the numerous risks which the GOP was willing to assume to make this project succeed. The GOP has accepted responsibility for the performance of the utility to whom HUBCO will sell its power generated, the Water and Power Development Authority (WAPDA).

Since Pakistan is rated weakly in terms of its credit-worthiness on International markets, some additional guarantees and commitments were required from the GOP and other governmental agencies. The resultant security package, governing law, developed into four sets of documents for HUBCO. They are:

**Government of Pakistan:**

- Implementation Agreement
- Power Purchase Agreement

- Fuel Supply Agreement

**Lenders:**

- Senior Loans
- Subordinated Loans
- Intercreditor Arrangements

Trust/Deed

**HUBCO:**

- Construction Contract
- Operation and Maintenance Agreement

**Constitutional:**

- Articles, Memoranda
- Registration Statements
- Shareholders Agreements

### 5. Minimize Political Risk

The major challenge faced in financing private power in a developing country is to minimize the political risk allowing banks to concentrate on the commercial risk of the project itself. Lessons learned from the Hub River Project concluded that the principal risks under this project were political in nature, rather than technological or market

related, and hence the involvement of development agencies was essential to spread this developing country risk.

In order to bring in additional financing, the World Bank developed the Expanded Cofinancing Operation (ECO). According to a responsible in the World Bank, ECO was developed to get the project off the ground by attracting private financing through its involvement in committing equity and substantial guarantees to other investors and lenders.

A good incentive by the Pakistani Government to attract foreign capital ready for investment, was to offer the lenders an insurance on foreign exchange risk. This insurance, offered at an extremely competitive rate (3%) was designed to last the entire life of the loans. In addition, the GOP has agreed to guarantee the performance of its agencies, the Water and Development Authority (WAPDA), the State Oil Company, and the State Bank of Pakistan.

## G. Chapter References


1. Price Waterhouse: *Private Power Projects and Capital Market Development.* Price Waterhouse, Washington D.C., 1991.

2. Augenblick M, Custer S, and Ma'ani-Bruss S: *The Build, Own and Transfer approach to Infrastructure Projects in Developing Countries.* The World Bank, Washington D.C., 1991.

3. Privatization International: *Privatization Yearbook 1992.* London, 1992.

4. Financial Times: *Mexico- An Envied Program.* April 6, 1992.

5. Solh K, Senior Consultant, International Privatization Group, Price Waterhouse: *Interview on January 29th, 1994.* Price Waterhouse, Washington D.C.

6. Hartley K., and Parker D.: *Privatization, a Conceptual Framework.* Privatization and Economic Efficiency, 1991.

7. Aharoni Y.: *On Measuring the Success of Privatization.* Privatization and Control of State-Owned Enterprises, World Bank, Washington D.C., 1991.

8. Berg E., and Shirley M.: *Divestiture in Developing Countries.* World Bank Discussion Papers #11, Washington D.C.

9. World Bank: *Privatization: The Lessons of Experience.* Country Economics Department, April 1992.

10. Bouin O., and Michalet Ch.: *Rebalancing the Public and Private Sectors: Developing Country Experience.* OCDE, Paris, 1991.

# IV. THE ELECTRIC POWER SECTOR IN LEBANON

The electric power sector has been severely damaged during the war. Since most of the other infrastructure sectors depend on it, its prompt repair is crucial to the development of Lebanon. This chapter will describe the activities and problems of the Electricite du Liban (EDL), Lebanon's electricity authority and will describe a suggested solution to the quick rehabilitation of this sector.

## A. *Historical Background*

The Electricite du Liban was established in 1954 when the Lebanese government acquired the Franco-Belgian electric company providing electricity to Beirut[1]. Its establishment was a result of a legislative decree restricting the production, transmission and distribution of electricity in Lebanon to one independent government controlled entity. The decree also requested the transfer of all publicly and privately invested electrical establishments to EDL. All franchises and rights given to private enterprises were automatically transferred to EDL once their licenses expired[2]. EDL is considered a financially and managerially independent public establishment responsible for public services. Although it has commercial and industrial characteristics, it is under the authority of the Ministry of Hydraulic and Electric Resources. The latter approves EDL's management, development plans, budgets, tariffs, loans, etc. By 1983 EDL had 3,000 employees and was regarded as a model government institution. It was profitable and financed its own expansion[2].

### *B. Organizational Structure of EDL[2]*

The organization chart of EDL is typical of public corporations in Lebanon. Executive power is entrusted in an administrative council which consists of seven members (one of which is president). The duties of this council include planning, legislation and supervising execution. The administrative acts through the general director, which heads the two different units of the EDL. The general director sometimes delegates authorities to regional managers responsible for certain provinces.

The EDL consists of two main units, technical and administrative, each of which is divided into several departments. The technical unit consists of nine services:

- Production: produces energy from EDL plants and buys needed energy from other plants.
- Transmission and Cooperation: transmits power produced through stations to become suitable for consumption and transforms high tension voltage to medium voltage.
- Distribution: distributes current through overhead and underground cables.
- Studies and Design: designs plants, networks and stations, and conducts topographical studies.
- Consumer Service: links lines to subscribers and installs meters.
- Measurement and Protection: repairs meters and transformers.
- Common Works: maintains machines, trucks and buildings.
- Works Service: handles civil engineering works of the EDL.

- Computer Center: handles accounting, issues customer receipts, schedules salaries and preserves technical information for statistical uses.

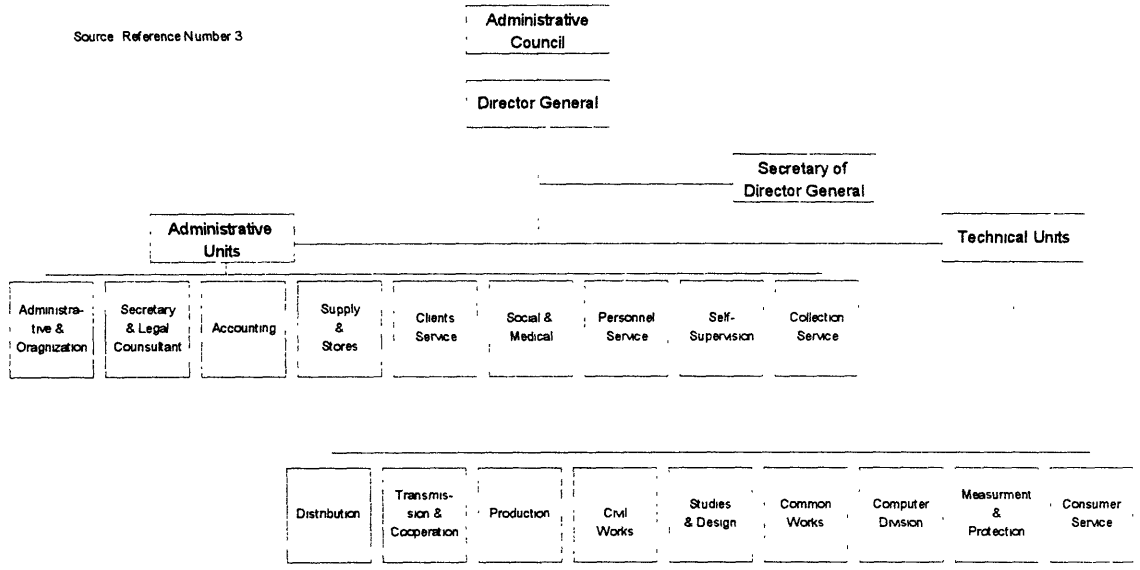
The administrative unit encompasses the corporation's infrastructure and the support needed for the technical unit to operate. This unit also consists of nine services:

- Administrative and Organization: evaluates programs, organizes jobs and vacancies, coordinates between different services, sets purchasing specifications and supervises procurement.
- Secretary and Legal Consultants: handles legal work with subscribers and maintains correspondence and archives.
- Accounting service: sets budgets, salaries and subscriber dues.
- Supply and Stores: stores cables, wires and other electrical equipment as well as office supplies.
- Clients Service: organizes subscriptions, detects thefts and breakdowns, controls client consumption and settles disputes with subscribers.
- Social and Medical Service: maintains medical files and provides employees and their families with medical care.
- Personnel Service: handles employment, vacations and promotions. Also prepares entrance exams with the Civil Service Board.
- Collection Service: responsible for collecting payments due.
- Self-Supervision Service: supervises the heads of services and workers.

The Diwan or Secretary of Director General acts as a link between the general director and administrative council. Figure 3 shows the organization chart of EDL.

The organization of EDL is very bureaucratic. The abundance of units increases the separation between them and reduces flexibility and interdepartmental interaction. This organizational weakness results in some of the problems mentioned in the following sections.

**Figure 3: Organization Chart of EDL.**



## C. *Demand For Electricity in Lebanon*

This section will describe the past and expected future demand of electricity in Lebanon. Based on the future demand forecasts, the requirements of new electric generation and distribution systems will be considered.

Since electricity can not be efficiently stored in large quantities, it must be produced on demand. The demand varies significantly during the course of the day. There are two peak hours per day. These are periods of maximum load and they vary slightly from month to month. Table 2 shows the peak hours of Beirut's electricity demand.

**Table 2: Daily Peak Hours, as defined by EDL.**

| Month | Morning Peak Hours | Evening Peak Hours |
|---|---|---|
| January | 9:00 a.m. to 1:00 p.m. | 5:00 p.m. to 9:00 p.m. |
| February | 9:00 a.m. to 1:00 p.m. | 5:15 p.m. to 9:15 p.m. |
| March | 9:00 a.m. to 1:00 p.m. | 5:30 p.m. to 9:30 p.m. |
| April | 9:00 a.m. to 1:00 p.m. | 6:00 p.m. to 10:00 p.m. |
| May | 9:00 a.m. to 1:00 p.m. | 6:30 p.m. to 10:30 p.m. |
| June | 9:00 a.m. to 1:00 p.m. | 6:45 p.m. to 10:45 p.m. |
| July | 9:00 a.m. to 1:00 p.m. | 7:00 p.m. to 11:00 p.m. |
| August | 9:00 a.m. to 1:00 p.m. | 7:00 p.m. to 11:00 p.m. |
| September | 9:00 a.m. to 1:00 p.m. | 6:00 p.m. to 10:00 p.m. |
| October | 9:00 a.m. to 1:00 p.m. | 5:00 p.m. to 9:00 p.m. |
| November | 9:00 a.m. to 1:00 p.m. | 4:45 p.m. to 8:45 p.m. |
| December | 9:00 a.m. to 1:00 p.m. | 4:30 p.m. to 8:30 p.m. |

Source: Reference number 2.

These times are defined by the EDL. These hours are important to note since the capacity of the electric power network must be able to generate electricity at a rate large enough to serve the peak periods. Currently, the price of electricity is the same during the peak hours and the off-peak hours. This is due to EDL's use of old meters which only read the total quantity of electricity provided. In developed countries, digital meters are available. These meters note the amount of electricity consumed during peak and off-peak hours. The use of such meters enables the utility company to raise the cost of electricity during the peak hours.

### 1. Demand Determinants

There are many determinants to demand. These include wealth, level of industrialization, population growth, rate of increase of population served and electricity consumed per capita[2]. Only the three most important factors will be considered for the sake of simplicity. These are population size, economic growth and the rate at which electricity is sold.

Population is one of the main factors affecting demand of electricity. A future population forecast for Lebanon will enable the prediction of the future demand for power. One important point to consider is that while Lebanon had a somewhat constant population between 1974 and 1988, the demand for electricity increased significantly during that period, as can be shown in Table 3.

**Table 3: Population Vs Energy Consumed in Lebanon.**

| Year | Population (x 1,000,000) | Energy Consumed (MW-h) |
|---|---|---|
| 1974 | 2.73 | 1678 |
| 1975 | 2.77 | 1554 |
| 1976 | 2.77 | 858 |
| 1977 | 2.76 | 1525 |
| 1978 | 2.73 | 1687 |
| 1979 | 2.70 | 1884 |
| 1980 | 2.67 | 2327 |
| 1981 | 2.65 | 2596 |
| 1982 | 2.64 | 2492 |
| 1983 | 2.64 | 2825 |
| 1984 | 2.64 | 2715 |
| 1985 | 2.67 | 3220 |
| 1986 | 2.71 | 3628 |
| 1987 | 2.76 | 3937 |
| 1988 | 2.76 | 4076 |

Source: Reference number 2.

Economic growth is another important factor affecting demand. Economic growth increases wealth and industry, which both increase the demand for electric power. During the war in Lebanon, the demand for electricity increased significantly even though the GDP decreased[2]. Table 4 shows that even though he GDP was affected in 1975-1982, the energy consumed still increased steadily.

**Table 4: GDP Vs Energy Consumed in Lebanon.**

| Year | GDP in Lebanese Pounds Million LL (1974 prices) | Energy (MW-h) |
|---|---|---|
| 1970 | 6131 | 984 |
| 1971 | 6669 | 1112 |
| 1972 | 7495 | 1276 |
| 1973 | 7920 | 1496 |
| 1974 | 8137 | 1678 |
| 1975 | 6750 | 1554 |
| 1976 | 3376 | 858 |
| 1977 | 4827 | 1525 |
| 1978 | 4698 | 1687 |
| 1979 | 4828 | 1884 |
| 1980 | 4900 | 2327 |
| 1981 | 4923 | 2596 |
| 1982 | 3082 | 2492 |

Source: Reference number 2.

The tariff of electricity is the third factor affecting demand for electricity. Even though the rates for electricity have increased significantly in Lebanon, the demand for electricity has been increasing steadily. Albeit, the real value of the Lebanese Pound also decreased significantly during that period, making the tariff increases less significant[2]. Table 5 shows the years in which the rates for electricity have increased versus consumption. This proves that the demand for electricity is inelastic to price increases.

**Table 5: Years of Power Tariff Increase and Energy Consumed.**

| Year | Tariff Increase | Energy (MW-h) |
|---|---|---|
| 1964 | Tariff Increased | 530 |
| 1965 | - | 587 |
| 1966 | - | 667 |
| 1967 | - | 707 |
| 1968 | - | 813 |
| 1969 | - | 902 |
| 1970 | - | 984 |
| 1971 | - | 1111 |
| 1972 | - | 1276 |
| 1973 | Tariff Increased | 1496 |
| 1974 | - | 1678 |
| 1975 | - | 1554 |
| 1976 | - | 858 |
| 1977 | - | 1525 |
| 1978 | - | 1687 |
| 1979 | - | 1884 |
| 1980 | Tariff Increased | 2327 |
| 1981 | Tariff Increased | 2596 |
| 1982 | Tariff Increased Twice | 2492 |
| 1983 | - | 2825 |
| 1984 | - | 2715 |
| 1985 | - | 3219 |
| 1986 | - | 3628 |
| 1987 | - | 3937 |
| 1988 | Tariff Increased Twice | 4076 |

Source: Reference number 2.

## 2. Future Demand Forecasts

The urgent need for expansion of the electric power sector is emphasized by the high expected future demand for electricity. Although there are no exact predictions of future demand for power in Lebanon, there are some estimates which are not

quantitatively accurate but which point out the high future demand. At this point it is important to note that it is difficult to predict demand of electricity in Lebanon for several reasons[3]: First, the past production of EDL in the 1980s does not reflect demand, since the production was not satisfying the demand. One must keep in mind that exact demand is more than production, since the power was rationed during that period. This fact is proven by the widespread use of private generators both on the household and industrial levels. Second, since the electricity bills have not been collected for many years, future demand could be altered when the bills will be collected and more realistic prices set. Third, it is uncertain how quickly Lebanon's economy will recover in the coming years.

The MIT-AUB joint research estimate the yearly rate of growth of electricity demand in Lebanon to be 14%[1]. Another model assumes steady linear demand and concludes that the demand of energy will increase according to the following equations[2]:

$$E = 163T + 140$$

$$P = 97T + 45$$

where E is energy demand, P is power and T is unit of time. These equations were derived from Table 6.

These equations imply that for every unit increase in time, the power demand will increase by 145 MW and the energy will increase by 303 MW-h.

**Table 6: Energy and Power Consumed Vs Time.**

| Year | Energy (MW-h) | Power (MW) |
|---|---|---|
| 1964 | 530 | - |
| 1965 | 587 | - |
| 1966 | 667 | - |
| 1967 | 707 | - |
| 1968 | 813 | - |
| 1969 | 902 | - |
| 1970 | 984 | 213 |
| 1971 | 1111 | 244 |
| 1972 | 1276 | 280 |
| 1973 | 1496 | 295 |
| 1974 | 1678 | 341 |
| 1975 | 1554 | 340 |
| 1976 | 858 | 253 |
| 1977 | 1525 | 312 |
| 1978 | 1687 | 335 |
| 1979 | 1884 | 380 |
| 1980 | 2327 | 450 |
| 1981 | 2596 | 510 |
| 1982 | 2492 | 570 |
| 1983 | 2825 | 655 |
| 1984 | 2715 | 695 |
| 1985 | 3219 | 720 |
| 1986 | 3628 | 750 |
| 1987 | 3937 | 825 |
| 1988 | 4076 | 950 |
| 1989 | - | 1100 |
| 1990 | - | 1200 |

Source: Reference number 2.

Three scenarios for demand will be considered in this section[3]: Historical trend (low growth) scenario, MIT-AUB research program (medium growth) scenario and EDL's 1990 prediction (high growth) scenario.

The historical trend scenario linearly projects the historical growth of demand for electricity in Lebanon. The scenario might be possible if the situation in Lebanon remains unchanged. The scenario envisions the peak demand to increase at a constant rate of about 34.8 MW per year[3].

The MIT-AUB forecast projects an 11% growth in demand for electricity between 1992 and 1995 due to population influx and industry rebuilding, a 9% growth between 1995 and 2002 as population remains steady and industry grows, and a 7% growth between 2002 and 2006 as industry growth stabilizes. The base load used is 1110 MW in 1992[3].

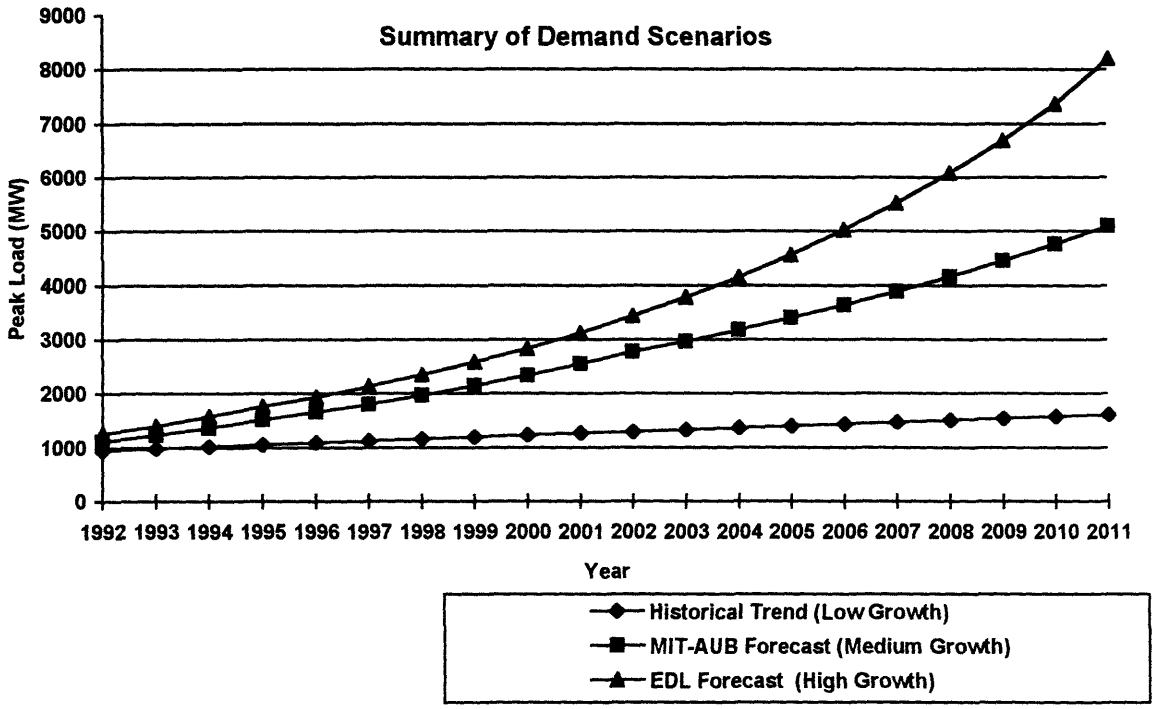
EDL's prediction for future electricity demand is based on a report written by EDL's production director, Lucien Letayef. EDL estimates the demand growth to be 12% from 1990 to 1995 and 10% between 1995 and 2000. The 1990 base demand is estimated to be 1000 MW. These estimates are based on the historical growth since 1965, which varied between 8% and 15% per year. Table 7 shows the numerical results of these scenarios.

**Table 7: Peak Load for Demand Scenarios (MW).**

| YEAR | Historical Trend (Low Growth) | MIT-AUB Forecast (Medium Growth) | EDL Forecast (High Growth) |
|---|---|---|---|
| 1992 | 949.8 | 1110.0 | 1254.4 |
| 1993 | 984.6 | 1232.1 | 1404.9 |
| 1994 | 1019.4 | 1367.6 | 1573.5 |
| 1995 | 1054.2 | 1518.0 | 1762.3 |
| 1996 | 1089.0 | 1654.7 | 1938.5 |
| 1997 | 1123.8 | 1803.6 | 2132.4 |
| 1998 | 1158.6 | 1965.9 | 2345.6 |
| 1999 | 1193.4 | 2142.8 | 2580.2 |
| 2000 | 1228.2 | 2335.7 | 2838.2 |
| 2001 | 1263.0 | 2545.9 | 3122.1 |
| 2002 | 1297.8 | 2775.0 | 3434.3 |
| 2003 | 1332.6 | 2969.3 | 3777.7 |
| 2004 | 1367.4 | 3177.2 | 4155.5 |
| 2005 | 1402.2 | 3399.6 | 4571.0 |
| 2006 | 1437.0 | 3637.5 | 5028.1 |
| 2007 | 1471.8 | 3892.2 | 5530.9 |
| 2008 | 1506.6 | 4164.6 | 6084.0 |
| 2009 | 1541.4 | 4456.1 | 6692.4 |
| 2010 | 1576.2 | 4768.1 | 7361.7 |
| 2011 | 1611.0 | 5101.8 | 8097.9 |

Source: Reference number 3.

**Figure 4: Graph of Three Demand Scenarios for Electricity in Lebanon.**




Source: Reference number 2.

Assuming that the linear historical trend is conservative for future forecasts, we can disregard it. Both the MIT-AUB forecast and the EDL forecast agree that the demand for power in Lebanon will multiply at least fivefold. Such a quick rise in demand for power will need to be satisfied by large investments in power generation equipment and some transmission and distribution equipment. Since EDL is already facing difficulties in satisfying the current 1,000 MW demand, it can be assumed that EDL will need assistance in supplying the anticipated 5,000 MW or 8,000 MW demand.

## *D. EDL's Production Capabilities*

EDL depends on gas oil, steam and hydroelectric energy to generate electricity. In October 1993, the network's total installed capacity was about 1500 MW. The distribution of this generating capacity is divided as follows[4]:

- Gas oil power plants: 166 MW.
- Steam power plants: 1058 MW.
- Hydroelectric power plants: 282 MW.

However, due to the many problems mentioned in the next section, the total capacity that can be achieved by the network is 1200 MW. In 1991 the network was providing only 811 MW of energy[1].

### 1. Gas Oil Turbines[4]

Due to the old age of EDL's gas oil turbines and lack of maintenance, these can produce only 50 MW of energy, out of a total of 156. Table 8 lists the individual turbines and their expected capacity after the system's rehabilitation.

**Table 8: Installed, Present and Expected Capacity of Gas Oil Turbines.**

| Turbines | Installed Capacity (MW) | Present Capacity (MW) | Expected Capacity After Rehabilitation |
|---|---|---|---|
| Westinghouse | 30 | 28 | 28 |
| Westinghouse | 30 | - | 28 |
| Westinghouse | 30 | - | 28 |
| Westinghouse | 30 | - | 28 |
| AEG | 23 | 22 | 22 |
| AEG | 23 | - | 22 |
| **TOTAL** | **166** | **50** | **156** |

Source: Reference number 4.

Only 30% of the Gas Oil turbines' capacity is currently being used. After rehabilitation, 94% of the initially installed capacity could be exploited. About 6% of the capacity will be lost due to the age and poor maintenance of the turbines.

### 2. Steam Power Plants[4]

Most of Lebanon's electricity is produced by steam power plants. Most of these plants are located at Zouk and Jieh. Similar to the case of gas oil turbines, the capacity of the steam turbines is also greatly reduced due to the lack of spare parts and poor maintenance. Table 9 shows the installed, present and expected capacities after rehabilitation.

**Table 9: Installed, Present and Expected Capacity after Rehabilitation of Steam Turbines.**

| Turbine | Installed Capacity (MW) | Present Capacity (MW) | Expected Capacity after Rehabilitation |
|---|---|---|---|
| Zouk Ansaldo GIE | 145 | 130 | 145 |
| Zouk Ansaldo GIE | 145 | 130 | 145 |
| Zouk Ansaldo GIE | 145 | - | 145 |
| Zouk Alsthom | 172 | 172 | 172 |
| Jieh Toshiba | 62 | - | 55 |
| Jieh Toshiba | 62 | 35 | 55 |
| Jieh ABB | 69 | - | 60 |
| Jieh ABB | 69 | 45 | 65 |
| Jieh ABB | 69 | - | 65 |
| Kadisha 1 | 25 | 17 | 17 |
| Kadisha 2 | 25 | 13 | 13 |
| Kadisha 3 | 70 | - | 70 |
| **TOTAL** | **1058** | **542** | **1007** |

Source: Reference number 4.

Only about 50% of the installed capacity is currently being used. Once rehabilitated, the steam turbines will use 95% of the original installed capacity. 5% of the installed capacity will be lost due to the damage and maintenance patterns.

### 3. Hydroelectric Power Plants[4]

The main hydroelectric power plants are established on the Litani River. These can not operate all year round due to the seasonal drop in the water levels. Table 10 shows the capacity of the main hydroelectric turbines.

**Table 10: Capacity of Main Hydroelectric Turbines.**

| Turbine | Capacity (MW) |
|---|---|
| Awali | 102 |
| Joun | 48 |
| Markaba | 34 |
| Ibrahim | 32 |
| Safa | 13 |
| Bared | 17 |
| Other | 36 |
| **TOTAL** | **282** |

Source: Reference number 4.

Other hydraulic plants are situated around the country. They do not have water storage facilities and therefore their operation is dependent upon the flow of the rivers.

### 4. Transmission[4]

EDL transmits power through and integrated 150-60 KV network connected to the Syrian grid at Anjar in the East and Deir Nebouh in the North. Figure 5 shows the location of the network in Lebanon.

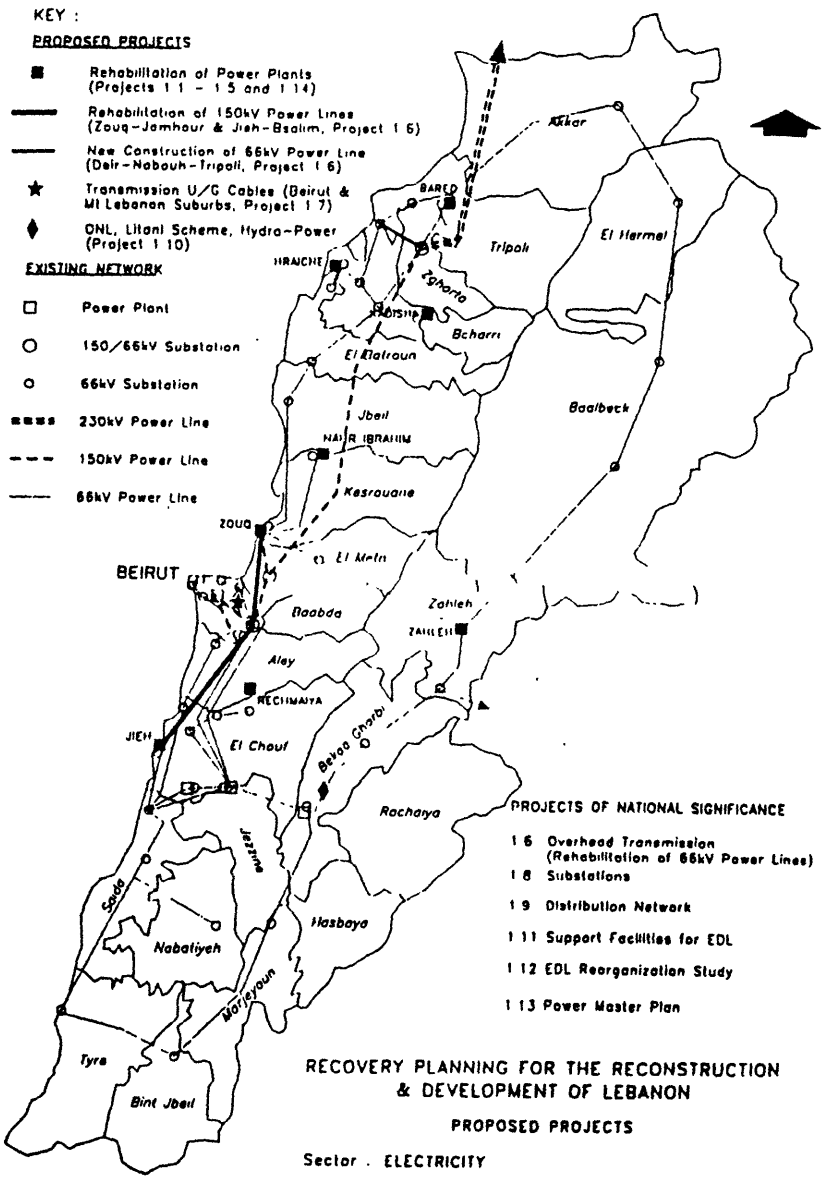
### 5. Distribution[4]

The distribution occurs at four medium voltage levels: 33, 15, 11 and 5.5 KV. The 11 KV lines supply the city of Beirut and the 15 KV lines supply the rural areas of the country. The 5.5 KV lines exist in the older parts of the grid. The medium voltage

substations are numerous and their lines span many miles. They provide electricity at 110/190 V and 220/380 V.

**Figure 5: Map of Electrical Power Transmission and Distribution Infrastructure in Lebanon.**

Source: Iskandar, Marwan "The Lebanese Economy in 1993" Banque De La Méditeranée, March 1994.



## *E. Problems in EDL*

The existing network suffers several problems that hinder EDL's performance. The results of these problems is the financial decline of EDL and the inefficiency in its service. These problems include:

### 1. War-related Damages[2]

The network suffered large amounts of damage as a consequence of the civil war. Power plants, transmission cables and fuel tanks have been partially and sometimes completely destroyed. Other damages include direct hits to transformation stations, tens of thousands of poles destroyed, miles of cables cut, trucks seized and equipment stolen. The damages between the 1975-1985 period amounted to approximately 104m US Dollars. Table 11 shows a yearly estimate of the damages inflicted on the network. These damages resulted in a drastic reduction of EDL's capacity to produce and distribute electricity. The electric power sector of the infrastructure suffered substantially because much of its equipment (Transmission cables, transformers .. etc.) is exposed. This results in damage due to local fighting, which in turn prevents accessibility and repair. Another consequence of the war is the isolation of some parts of the network. Once the distribution pattern was segmented, the distribution efficiency is greatly reduced and caused and unbalance in the allocation of power resources. The network lost its continuity and forced EDL to ration power[1].

**Table 11: Damages to EDL's Network.**

| Year | Damages (million LL) | Damages (million US $) |
|---|---|---|
| 1975-1976 | 85 | 32.7 |
| 1982 | 242 | 51.2 |
| 1983 | 56 | 12.4 |
| 1984 | 40 | 6.1 |
| 1985 | 30 | 1.8 |

Source: Reference number 2.

### 2. Lost Revenues[2]

During the war, few of the bills issued by the EDL were collected. This is due to many causes, namely: lack of government control and authority, deteriorating security and military situations, lack of organizational and managerial control in the public sector, high cost of living, devaluation of the Lebanese Pound and increasing internal emigration. These factors resulted in the inaccuracy of reading subscriber consumption, slackness in delivering the information in the central database, and consequently issuing bills that do not reflect the amount of power consumed. The non-existent mail system requires EDL to send employees to subscribers in order to collect bills. The bills are seldom collected and the amount collected was a fraction of EDL's expenses. Although bills collection was improved in the early 1990s, the amount of money collected corresponded to less than 10% of the cost of energy produced. Table 12 shows the amount of uncollected bills that decreased the revenue of EDL.

**Table 12: Amount of EDL's Uncollected Revenues.**

| Year | Uncollected Bills (million LL) | Uncollected Bills (million US $) |
|---|---|---|
| 1974 | 66.1 | 28.5 |
| 1975 | 95.2 | 41.6 |
| 1976 | 154.2 | 53.0 |
| 1977 | 178.0 | 58.0 |
| 1978 | 207.4 | 70.0 |
| 1979 | 227.4 | 70.2 |
| 1980 | 315.8 | 91.9 |
| 1981 | 417.0 | 96.8 |
| 1982 | 584.0 | 123.5 |
| 1983 | 688.5 | 152.3 |
| 1984 | 741.8 | 114.0 |
| 1985 | 823.0 | 50.1 |
| 1986 | 741.8 | 19.3 |
| 1987 | 1,000.0 | 4.4 |

Source: Reference number 2.

### 3. Theft[2]

Even though every electrical utility company suffers the "free riders" phenomenon, that amount does not usually exceed 5% in developed countries. In Lebanon the number of illegal consumers has reached critical levels during the war. They are an important factor in the increase of demand for electricity since they do not use electricity conservatively (since they do not pay for it). The excess consumption results in power shortages and rationing. Although energy theft is a phenomenon associated with the consumers who do not own meters, many subscribers connect lines to the network without passing through the meters. This allows them to use more power than the meter would allow and not pay for it. Each year, a larger percentage of EDL's production is consumed illegally and hence deprives EDL from its much needed revenues. Table 13 depicts the extent of energy theft

in Lebanon. The authorities have not been able to control energy theft due to an absence of government control. EDL resorted to ineffective media campaigns. In the period ranging from 1975 to 1986, EDL estimates that 8,354 million KW-h have been stolen, an equivalent of 32% of the total generated energy in that period.

**Table 13: Stolen Power in Lebanon.**

| Year | Power Generated (MW-h) | Power Stolen (MW-h) | % Stolen |
|---|---|---|---|
| 1974 | 1580 | - | 0 |
| 1975 | 1550 | 179 | 11.55 |
| 1976 | 858 | 136 | 15.85 |
| 1977 | 1495 | 196 | 13.11 |
| 1978 | 1649 | 261 | 15.83 |
| 1979 | 1665 | 461 | 27.69 |
| 1980 | 2180 | 325 | 14.91 |
| 1981 | 2464 | 588 | 23.86 |
| 1982 | 2273 | 783 | 34.45 |
| 1983 | 2635 | 1032 | 39.17 |
| 1984 | 2497 | 1120 | 44.85 |
| 1985 | 3036 | 1563 | 51.48 |
| 1986 | 3474 | 1710 | 49.22 |
| **TOTAL** | **25779** | **8354** | **32.41** |

Source: Reference number 2.

### 4. Internal Problems[2]

EDL suffers many production problems, as a result of which the performance of the company has declined severely. These problems can be grouped into two categories, technical problems and personnel problems. The technical problems are a result of delays

in the maintenance and upgrading of the power grid and are due to the difficult situation during the hostilities. Maintenance problems led to further deficiencies in production and hindered EDL from meeting the increasing demand for power.

Since the beginning of the war, the generators of EDL have not been properly maintained. The attitude of the maintenance staff was "don't fix it until it breaks," instead of proactive maintenance. This attitude resulted in maintenance taking place only after a breakdown, which reduced the capacity and lifetime of the generating equipment. Moreover, EDL never had (for financial reasons) reserve generators. The latter are used to temporarily replace generators when they were being maintained or when they broke down. As a result, EDL rationed power in case a generator broke down or was being maintained.

Transmission cables and transformation stations also needed continuous maintenance. Maintaining such equipment was difficult since few technicians were willing to perform this task amongst the hostilities. Also, many areas were under the control of militias and EDL had little access to them. The neglect of such equipment resulted in its deteriorated condition, sabotage and theft.

Another factor that affected the prompt repair of EDL's equipment is the lack of spare parts. EDL seldom kept an inventory of often needed spare parts. Once a problem arised with the equipment, the purchasing department ordered spare parts from overseas.

These parts took several weeks to arrive to EDL, and production would be disrupted until the parts were replaced.

One last factor that hindered production was the availability of fuel for the generators. The production of local refineries did not meet the needs of the EDL and hence fuel was imported from neighboring countries. This resulted in higher costs of fuel and delays in delivery. The unreliability of fuel supplies, whose transportation was slowed by the war, also affected the performance of EDL. Moreover, the quality of the fuel obtained is not always satisfactory, and that contributed to shortening the lifetime of the equipment and making its maintenance more difficult.

EDL also faces problems with its personnel. Due to political reasons, EDL has not appointed any full-time employee for 10 years. Personnel needs were filled by hiring temporary employees. Many employees left their positions due to immigration, early retirement or other better-paid jobs. This left much work to be done by few qualified personnel, which substituted quality to meet everyday requirements. The personnel problem can be summarized by the following list:

- Lack of qualified personnel since EDL could not afford them.
- Some employees use their jobs for personal profit.
- Salaries were low compared to qualifications.
- The seniority concept resulted in unqualified employees in key positions.
- The lack of incentive results in the carelessness of personnel.

- Employee morale was low due to unfavorable factors such as favoritism and sectarianism.
- Many employees do not report to work or do not perform their jobs.

The organization structure of EDL is complex and bureaucratic. Restructuring is needed in order to achieve flexibility and increase the morale of personnel. Job descriptions and responsibilities must be clearly stated and applied. Unqualified employees must be replaced with qualified ones which must be appointed in key positions.

### 5. Financial Situation[2]

Before the war EDL was a financially sound and independent institution. New projects were financed by the excess profits incurred from the high revenues of selling power. Today, EDL is financially dependent upon the government and it constantly seeks funding from Arab and international funds for its projects. These changes are a result of the extensive war-related damages to its equipment, power theft, increase in operating costs, etc.

EDL's sources of revenue are installation fees and power charges. The revenue is collected in Lebanese Pounds. The devaluation of the Lebanese Pound drastically decreased the real revenues of EDL:

- Wages have multiplied around 50 times between 1974 and 1991.

- The revenues collected in Lebanese Pounds do not cover the salaries of employees, let alone other costs.
- The payments for equipment and spare parts is made in foreign currency.

The rapid increase in the cost of fuel, equipment and spare parts as well as covering for the equipment damages due to the war forced EDL to increase its power charges on several occasions (see Table 5). The deficits of EDL since 1975 are depicted in Table 14.

**Table 14: EDL's Profits/Losses.**

| Year | Profit (Loss) LL | Profit (Loss) US $ |
|---|---|---|
| 1975 | 17,493,085 | 7,639,085 |
| 1976 | (14,858,148) | (5,105,893) |
| 1977 | 4,622,764 | 1,505,786 |
| 1978 | (5,781,148) | (1,953,090) |
| 1979 | (18,270,583) | (5,639,066) |
| 1980 | (45,976,522) | (13,365,268) |
| 1981 | (101,709,109) | (23,598,401) |
| 1982 | (385,352,302) | (81,469,831) |
| 1983 | (318,342,726) | (70,429,807) |
| 1984 | (929,317,070) | (142,752,238) |
| 1985 | (1,300,000,000) | (79,171,742) |

Source: Reference number 2.

Due to many economical and political reasons, the Ministry of Hydraulic and Electrical Resources did not allow EDL to increase the power charges to keep up with increasing costs and the devaluation of the Lebanese Pound. In 1987 EDL was allowed to increase its rates, however, by that time the US Dollar was worth LL 225 (45 times its value in 1982). In 1992 the tariff was increased once again, but the revenues of EDL still do not cover its costs.

The rapid increase in fuel and gas prices in the late 1970s and early 1980s added to the costs of EDL and increased the gap between the high costs and low revenues. The Lebanese government decided to cover some of EDL's deficits by paying some of its energy bills, which constitute the largest portion of the deficit. However, when the government was burdened by its own loans in the late 1980s, it froze all subsidies to EDL except for loans for fuel and spare parts.

The devaluation of the Lebanese currency and hence the decrease in real revenue of the EDL also added to EDL's budget deficit. EDL had borrowed considerable amounts of money in foreign currency at relatively high interest rates to finance its projects and expansion in the early 1980s. In order to preserve its creditworthiness and the credibility of the Lebanese government, EDL borrowed locally (from the Lebanese Treasury and Banque du Liban) in order to repay its foreign loans. Consequently, EDL is incapable of paying its loans and fell deeper in debt.

EDL's total debt in 1991 was 273 million US Dollars and 37 billion Lebanese Pounds. The debt can be broken down into:

1. $ 38m in foreign loans
2. $ 20m in debt to foreign contractors
3. Local debt:
    - $ 90m and LL 1.08 billion debt to Banque du Liban

- $ 125m and LL 150m debt to Council for Development and Reconstruction
- LL 35.15 billion in Treasury Bills

4. Other debt includes unpaid fuel bills, which are covered by the government.

EDL's financial situation is very critical. Due to the depressed economic condition today, it is difficult for EDL to increase its tariffs to cover its debt. Consequently, it is also difficult for EDL to borrow money to finance its much needed capacity expansion. The next section will propose a solution to expanding EDL's capacity and quality of service without having to borrow large sums of money to finance these improvements.

### *F. Tariff Structure*[3]

One of the major causes of EDL's financial problems is the effects of low tariffs. In 1982, EDL increased its tariffs to LL 0.375/KWh, equivalent to $0.095/KWh. This tariff was designed to allow EDL to balance its expenditures by 1983. Unfortunately the war events and the devaluation of the Lebanese Pound prevented it from reaching this goal. The currency depreciation caused the tariff per KWh to decrease from an equivalent of $0.095 in 1982 to $0.005 in 1989. After it was increased in 1991, it reached $0.03/KWh in 1992, still much below the cost of production.

The current tariff is based on the category of consumers. For large consumers such as factories, peak pricing is applied at two periods. At other times, a flat rate applies: LL 45/KWh for 100 KWh or less and LL55/KWh for any consumption above 100 KWh. These rates were designed using an average system cost approach based on current exchange rates and historical costs. Currently, other tariff structures are being proposed, since the current structure is not meeting EDL's objectives. The objectives that a new tariff structure should try to meet are:

1. "The efficient allocation of national economic resources and the economically efficient utilization of electric energy.
2. The satisfaction of conditions of fairness and equity including the allocation of costs among consumers based on their consumption and its effects on the system

performance, the stabilization of prices, the transparency of bill calculations and the provision of a minimum level of service for low-income consumers.

3. The raising of sufficient revenues to pay all costs of operations and capital.
4. The satisfaction of all political, social, economical objectives of the government."

Simultaneously satisfying all of these objectives is difficult and a good tariff structure is one that can meet a large part of them. EDL needs to find a structure unique to the objectives of the Lebanese Government. The government currently needs to recover the debts of EDL and meet the new challenges of recovery and income redistribution.

## G. Substitutes

The frequent electric power rationing in Lebanon encouraged the public to find substitutes to the Government's electric network. In the early eighties, when the reduction in EDL's service was still acceptable, private generators were used by a limited number of institutions, such as hospitals and factories[1]. Most other subscribers kept relying on the EDL's services. However, in the late eighties the government could only provide an average of 6 hours of electricity per day. This pushed the private sector to react promptly and begin using private generators. The use of these generators is widespread in Lebanon. The smaller portable models are used by small stores and houses while the larger ones supply buildings and factories with electricity. Most consumers rely on generators as a "backup" whenever they do not get power.

Even though private generators seem convenient, there is a significant disadvantage to the public's reliance on them. Generators are fuel or diesel operated and contribute significantly to the rising problem of air pollution in Beirut. Many buildings and most shops in the downtown area rely on generators. These run about 5 to 12 hours per day and their smoke is released untreated. Another disadvantage is the noise pollution they cause. Even though the larger generators are strategically located in basements, they can still be heard several meters away. Finally, the generators are expensive to operate and maintain. The cost of EDL's electricity is a fraction of the cost of privately generated electricity. The widespread use of these generators despite their operating costs is an

encouraging indicator that the prices of EDL's electricity could be raised in order to raise its quality and reliability of service.

## *H. Emergency Plan*[5]

In 1991, the Council for Development and Reconstruction (CDR) commissioned International Bechtel and Dar Al-Handassah Consultants to undertake studies for the recovery planning of Lebanon. The report advised on 14 "priority" projects for the electric power sector. According to the report, these projects are part of a national emergency recovery program that would be implemented to rebuild Lebanon's infrastructure. The CDR is supervising the implementation of these projects. The projects are due to be completed by the end of 1994. Table 15 briefly describes these projects.

**Table 15: Priority Projects for The Electric Power Sector.**

| Project Number | Project Title | Funding Requirements ($) | Implementation Time (Months) |
|---|---|---|---|
| 1.1 | Rehabilitation of Zouk Power Plant | 25,000,000 | 12 - 15 |
| 1.2 | Rehabilitation of Jieh Power Plant | 18,500,000 | 12 - 15 |
| 1.3 | Rehabilitation of Hraiche Power Plant | 8,000,000 | 12 |
| 1.4 | Installation of Unit 6 at Hraiche Power Plant | 45,000,000 | 18 - 24 |
| 1.5 | Rachmaya Hydroelectric Plant | 1,500,000 | 6 - 8 |
| 1.6 | Overhead Transmission | 8,000,000 | 8 - 12 |
| 1.7 | Underground Transmission Cables | 5,000,000 | 12 |
| 1.8 | Substations | 30,000,000 | 12 - 15 |
| 1.9 | Medium and Low Voltage Networks | 50,000,000 | 12 - 24 |
| 1.10 | Hydro - Power on the Litani River | 6,000,000 | 15 |
| 1.11 | Support Facilities for EDL | 16,000,000 | 15 - 24 |
| 1.12 | EDL Reorganization Study | Included in agreement with Electricite de France | 2 - 3 |
| 1.13 | Power Master Plan | same as above | 6 - 8 |
| 1.14 | Rehabilitation of other Hydroelectric Power Plants | 7,000,000 | 12 - 15 |

Source: Reference Number 5

## *I. Need for Privatization*

The issue of privatization has been suggested several times in Lebanon but never seriously considered. Currently the government is undertaking most of the reconstruction efforts without allowing the private sector to participate. However, in light of the many problems EDL is facing and the need to satisfy the large future demand of electricity, privatization seems to be an option[1].

EDL currently encounters problems on all levels: infrastructural, financial, technical and managerial. The government is not able to assure EDL acceptable working conditions. EDL's privatization could have the following advantages:

- Speed in decision-making. The private sector can quickly provide personnel that are technically and managerially qualified in order to modernize EDL's management. The private sector can also make changes and enforce them. Currently EDL is bound by the laws and bureaucracy associated with government agencies.
- Money lenders could be more encouraged to give loans to the private sector if the latter has proof of reliable experience. Lenders are skeptical of the government's abilities in providing the required management.
- The profit incurred by the private sector could finance more investments and operations. The private sector will have a vested interest in improving management, efficiency and modernization.

- In Lebanon, consumers tend to respect and support the performance of the private sector while they remain suspicious of the government.
- The private sector can assure proper financing for operations. The government has a limited reconstruction budget and will have difficulty raising the capital necessary for future expansions. The previous section concluded that in 20 years Lebanon will require about five times its current generating capacity.
- By allowing the private sector to participate, the government will concentrate its efforts on governing rather than on managing corporations.
- If a public private partnership is allowed, the government will inherit, at the end of the project period, a well-managed corporation capable of sustaining itself.

There are three components of EDL that can be privatized. The first is production, where the private sector can undertake turnkey projects and sell the output to the government. Little exploitation can be achieved since the producer is limited by contracts to sell to the government at preagreed prices. Transmission could also be privatized. The private enterprise can undertake the management of the transmission equipment and assure efficient dispatching of power between the producer and the distributing substations. The private contractor can optimize the management and the use of the equipment in order to achieve this at the lowest possible cost. The contractor will also properly maintain the equipment in order to optimize transmission.

Finally, distribution can be privatized. Lebanon consists of many autonomous regions each with its own demographic character. Creating several autonomous distribution companies which will optimize bills collecting and have a vested interest in stopping theft of energy. The contractor will assure efficient collection of bills in the shortest time possible. The companies can compete in efficiency of service and customer satisfaction.

One often used point against privatization is the private sector's potential abuse of monopolies. Consequently abuse can be minimized if the state ensures that:

- All the declared expenses are reasonable and justified.
- The cost of the produced energy must be strictly justified.
- All developments and access to electric power must be fairly distributed around the Lebanese territory (even to the small villages).
- Continuity in production and distribution of current are assured.
- The government must be able to intervene to extend its control and enforce agreements. Also, the state must be able to intervene in case the contractor abuses a monopoly.
- Profit that is reinvested in electric service is not taxed.

There are many other issues that could be debated if privatization is to materialize. One such issue is the fate of the 3500 personnel currently employed by EDL. The next section will describe a suggested public-private partnership that, in the opinion of the

authors, will solve some of EDL's problems and still enable the government to keep in control of the electric power sector.

## *J. Chapter References.*

1. "Rebuilding The Residential Structure of Lebanon" MIT-AUB Joint Research Project on Housing, MIT 1992.

2. Kombargi, Racha "Estimation of Electricite du Liban Production Function" American University of Beirut Master's Thesis, May 1992.

3. "Reconstruction of The Lebanese Electric Power System" MIT-AUB Collaborative Research Program, February 1993.

4. El-Irani, Atef Ibrahim "Power Systems Planning with Uncertainty: Application to Lebanon" American University of Beirut Master's Thesis, October 1992.

5. "Recovery Planning for The Reconstruction of Lebanon" Phase I Summary Report, Volume 4 Projected Profiles, Council for Development and Reconstruction, Republic of Lebanon, Beirut, May 1992.

# V. BOT Framework for Lebanon's Electric Power Sector

The previous chapter demonstrated the problems that the current electric power sector is facing in Lebanon, and demonstrated the high expected demand for power in the next twenty years. This chapter will describe how a successful BOT project can be implemented in Lebanon. The chapter will start with a description of the project and an evaluation of it. It will then describe several crucial aspects of it. Each of these aspects will be depicted in detail in a separate section. Afterwards, a summary of the security package will be described, including the responsibilities of each of the various parties involved. By using information about Lebanon and lessons learned from experience in other countries, the conditions each party must adopt will be described in order to achieve the best results in Lebanon. Such a project could be a prelude for a series of BOT projects that will follow. Public-private partnerships will facilitate a quick recovery for Lebanon, even though the government has limited financial resources from which to draw.

## *A. Project Overview*

### 1. Need for BOT Project

The forecasts of the future demand for electricity in Lebanon conclude that by year 2012 the demand will reach between 5,000 MW and 8,000 MW[1]. EDL's current capacity is about 1,000 MW[2], which is not enough to meet the present demand, let alone the rapidly growing future demand. EDL is facing many problems in managing the generation and transmission of the current supply. Due to its various financial, managerial and infrastructural problems, we can assume that EDL will not be able to efficiently manage the heavy generation expansion needed to satisfy future demand. Based on this assumption, we can suggest that foreign capital and expertise help in this expansion.

Since many countries such as Mexico, Argentina and Chile are privatizing state enterprises in order to alleviate their governments of the financial and managerial burden public enterprises carry, one might suggest that EDL follow the same process. However, the socioeconomic climate in Lebanon is not yet ready to accept full-scale privatization. The government is purposely bureaucratized in order to allow all the minorities a share in the decision-making process. Removing government control will reduce the full representation of all the minorities in the decision-making process of a strategic sector of

the infrastructure. Based on this assumption, we can conclude that full scale privatization is not yet an option in Lebanon.

The optimum solution for such a case is to allow a public-private partnership in the generation of electric power. Based on a BOT contract, a private investor can undertake the financing, construction, maintenance and operation of a power generation plant for a certain period of time. The output of such a plant can be sold to EDL at a pre-agreed upon tariff. At the end of the concession period, the ownership of the plant will be transferred to the Lebanese government. Such a solution will ensure that EDL remains in control of its 1,000 MW generating capacity and the transmission of all power in Lebanon. EDL can use all the funds allocated to it by the Council for Development and Reconstruction (CDR) to repair the transmission network, rehabilitate its power plants, invest in bills collection, control the theft of power, change its organizational structure and recruit qualified personnel. The BOT contractor will undertake the needed expansion of the power generation by building a plant and selling power only to EDL. The government will remain in control of the electric power sector by controlling the transmission and distribution of power.

Such projects have been undertaken in other developing countries such as Turkey and Pakistan. For example, the Government of Pakistan wishes to increase the country's generating capacity but does not have the expertise or the finance to undertake such a project[3]. Using a BOT scheme for the Hub River project, the capacity of the country can

be increased by 1,200 MW (refer to Chapter 3). The operation and financing is provided by the project sponsor, and the Pakistani Government is the client for all of the generated power. The project value was $1.8 billion and the government could not have secured loans to unilaterally finance such a project. Other positive externalities of such projects include the transfer of foreign technology and expertise to the developing country.

## 2. Project Proposal

The government should use a modestly-sized project to have a first-time experience with BOT projects. If the experience is successful, then the rest of the capacity expansion should be considered on a BOT basis. For the purpose of the thesis, we can assume that the power generation plant to be built will have a capacity in the order of 500 MW. Such a large plant will require international expertise in the construction and operations phase. Its high cost, up to $600 million (depending on the technology used), will also require international financing. We can assume that the Council for Development and Reconstruction will not allocate such a high amount of money to the electric power sector, and therefore a BOT-type project is needed.

The government must approve of a suitable location of the plant. EDL, the client of the project, must purchase a daily requirement of power from the plant. The sponsors must setup a project company, which will manage the project and coordinate the various parties involved. The project company will be responsible for the construction, financing,

output and performance of the plant. The government's sole responsibility is to purchase the output of the plant via EDL and provide some guarantees and incentives that would attract investors to Lebanon to undertake such a project. The revenues of the plant will enable the project company to repay its debt and generate some profit for the shareholders. After a predetermined period (about 10-20 years), the project company should have repaid its debt and equity, and will transfer the plant ownership to the government (at no fee).

The success of such a project in Lebanon will depend on many factors. Each of these factors will be discussed in the following sections. Based on information about Lebanon and lessons learned from other BOT projects in developing countries, a framework will be established to suit Lebanon's needs.

### 3. BOO Vs. BOT[4]

Since Build-Operate-Own (BOO) and Build-Operate-Transfer (BOT) are becoming increasingly popular financing techniques for infrastructure projects, either could be considered for financing the Lebanese Power Generation Project. The two major issues regarding the application of one of these schemes over the other are the financial implications behind these techniques, and the political standpoint of the local government and its commitment to full privatization. This section will only depict the financial determinants of selection between BOO and BOT.

We ought to consider two main frameworks in the decision-making process: the conceptual framework and the negotiation framework.

## 1. The Conceptual Framework

BOO and BOT, two capital budgeting processes, should be well understood by the government as well as the sponsoring consortium in order to facilitate the negotiation process. Several lessons learned pointed out that the most common cause of lengthy negotiation was attributed to the lack of understanding of the financial implications of each (negotiation) option, by the government on one hand, and the project consortium on the other (refer to the Hub River case in Chapter 3).

The following equation depicts the relationship between the initial investment and the stream of future cash flows until the end of the life of the project:

$$IO = \Sigma[ACFt / (1+IRR^*)^t] + TVn / (1+IRR^*)^n$$

Where: IO = Initial Outlay / Investment,

ACF = Annual Cash Flows,

T = Number of years of project's economic life (without transfer),

IRR* = Target Internal Rate of Return representing minimum acceptable hurdle rate,

TV = Transfer Value, which equals the sum of all foregone cash flows after the transfer at year n,

and n = The year the transfer takes place if the project is a BOT-type project.

The acceptability of the project is determined by its internal rate of return, defined as the discount rate equating the present value of all future cash flows (ACFt), including the transfer value at time n (TVn), to the initial investment. Since BOO does not involve transfer of the plant at the end of the predetermined period, the transfer value belongs to the project company and is included in the target IRR calculation (as shown in the formula).

Since a BOT project requires the transfer of the plant at some point (n), the transfer value should be excluded from the IRR calculation. Therefore the cash flows which result after the transfer year will not belong to the project company but to the government instead. Thus, these cash flows represent the opportunity cost for the consortium. In order to maintain the same rate of return, the initial investment must be reduced by the amount shown below:

$$IO - [TVn / (1+IRR^*)^n] = \Sigma[ACFt / (1+IRR^*)^t]$$

The sooner the transfer takes place, the larger is the transfer value, knowing that the sponsor will have to sacrifice more ACFs, and the lower the initial outlay becomes to maintain the target IRR*. Smaller initial outlay implies a reduction in capacity of the plant, or in the cost of the project. Usually neither option is acceptable to the government because of the need for a certain size and technology. The only option left to maintain the

target IRR* is to increase the annual cash flows. From the project company standpoint, the annual cash flows (ACFt) can be increased by inflating the tariff and/or by decreasing some of the costs.

The major issue being advanced against BOT in favor of BOO is the fact that with BOT, the sponsors tend to rely on strict measures to cut costs, such as lower maintenance, (which reflects a sub-optimal maintenance schedule in order to maintain its target IRR*). The outcome of such a poor maintenance schedule is that at the transfer point, the plant is in a poor shape and the government will have to spend a great deal of money to rehabilitate it, which adds to the total actual costs of the facility. This explains why BOT costs more than BOO to the government in the final analysis.

A second argument against BOT is the lack of commitment of the sponsor to the investment, specifically in the case where the operation period is short (10 years instead of 30 years). This lack of commitment results in less attention to issues such as training and human resource development. As a consequence, there are fewer possible opportunities for personnel improvements than there would be under a BOO option. This lack of commitment would also lower the operating cost and therefore increase the ACF and IRR.

## 2. The Negotiation Framework

A. The Abandonment Framework:

At this stage, we can conclude that from the financial standpoint BOO appears to be the preferred method. However, for the case of Lebanon, the government has political constraints and therefore prefers BOT. Then, the basic financial foundation behind decision making should be the indifference principle between various options of transfer timing. From the sponsor's perspective, a transfer at no cost can be acceptable if it is considered an abandonment case in the capital budgeting process where there is no salvage value. Such abandonment can be viewed by the sponsors as a cost saving move which would make the net present value (NPV) positive, and therefore more acceptable. The Government of Lebanon must be aware of these intricacies in order to come up with a negotiable proposal and execute it effectively.

In the case of Lebanon, since BOT is imperative, one option the government can propose (based on the abandonment concept), which may be acceptable to the sponsors, is to make the transfer at a cost which equals the estimated salvage value. This transaction should be coupled with the option to renew the concession, given that everything is satisfactory to both parties by the time of the transfer.

The abandonment framework for negotiation would allow the initial investment to be acceptable to the government, which would result in time saved during negotiations since there are fewer items to negotiate. Without transfer cost, the sponsor would have to require many other concessions, which will be discussed in the following section.

B. The Concessionary Framework:

In the case of a BOT project, if abandonment is not an option, then concessions ought to be made. As indicated earlier, the targeted IRR is maintained by increasing the annual cash flows. These cash flows can be increased by altering the tariff and/or the cost involved in the process.

The items which are often highlighted during the negotiation phase have been maintenance, training and human resource development costs. Due to the aging of the equipment and the increase in maintenance needed to assure satisfactory production, the repair and maintenance costs normally increase with the project life.

Another cost item which should be thoroughly negotiated is the training and human resource development cost. Examples of training include maintenance training, monitoring equipment training, engineering training for construction supervision, administration training and project management. The training must be emphasized in Lebanon in order to allow transfer of both technical and managerial expertise.

Both BOT and BOO are new financing techniques for infrastructure project development. Both are still relatively new and tend to be less understood in developing countries, where differences between the two concepts are not easily discerned, and where the application of capital budgeting techniques has not reached an appropriate level. Consequently, the negotiation phase of BOT/BOO is usually lengthy, resulting in cost increases and, in some cases, the abandonment of the project. In order to increase the speed and success of such negotiations in Lebanon, it is suggested that priorities be set. These priorities must be concurrent with the overall government recovery strategy and must suit the socioeconomic situation of the country. As the government is not yet dedicated to full privatization schemes, a BOT process is more suitable for the immediate future. Finally, it is suggested that, in order to speed up the negotiation process, financial analysis must be used to determine the exact impacts of the concession. In this case, the negotiation would become more factual and the implications of negative political interventions more predictable, and thus more easily controlled.

## *B. Financial Analysis*

This section focuses on an initial analysis of the Lebanese Power Generation Project based on general assumptions provided by the World Bank. Such analyses must always be conducted before such projects in order to identify the viability and the details of every item in the cash flow. These analyses will determine the attractiveness of the project to debt lenders, equity investors and multilateral agencies. Furthermore, sensitivity analyses will predict the project cash flow under potentially changing conditions.

### 1. Financial Requirements of the Lenders[5]

In evaluating the project for the purposes of limited recourse financing, lenders will need to be assured that the project is viable under justifiable assumptions and after appropriate sensitivity analyses of the cashflows. The project needs to generate sufficient revenues to meet its cash costs (including debt services), and maintaining a margin to cover negative conditions. Two measures are used to assess the adequacy of projected cashflows. These measures are the debt service ratio and the coverage ratio. The debt ratio is defined as the annual cash flow available for debt service divided by the value of the debt service. The coverage ratio is the NPV of cash flows incurred during operation life divided by the outstanding loan.

If the value of the coverage ratio is equal to one, then the debt could be repaid if the future cash flow matches its projected value. However, this leaves the project with no margin for errors. A coverage ratio of less than one means that the debt could not be repaid with the given cash flows. A coverage ratio in excess of one provides room for variations from the cash flows projections. We suggest that in the case of Lebanon, since this project will be a pioneer in BOT financing, it is highly advisable that the coverage ratio be well above one in order to leave room for experience curve effects and the unpredictability of the economic environment.

## 2. Financial Requirements of Equity Investors[5]

In addition to the lenders' concerns, the equity investors' concern will be the adequacy of project financial returns. Equity investors use the following criteria to evaluate project attractiveness:

1. IRR on equity investment
2. Payback period
3. Risks to net cash flows

In the case of Lebanon, investors will look for a short payback period (3-5 years from project startup). This is due to the current political instability of the region. Investors will also review the sensitivity of cash flows to the variations in pricing, capital expenditures, production rates etc.

### 3. Sensitivity Analysis

A sensitivity analysis of such a project will depend on how the risks are shared, and this can only be determined once advanced negotiations start taking place. Sensitivity analyses are usually undertaken for:

1. Project capital cost
2. Selling price of power
3. Cost of fuel
4. Construction delay
5. Production volume
6. Operating costs
7. Effect of inflation
8. Combinations of the above

The projected value of any of the factors mentioned above must be altered unfavorably, and the viability of the project should be reassessed. If the project cash flow can still absorb these risks, then the project will be more attractive to all lenders and investors.

## 4. Project Viability

In order to better understand the general attractiveness of the project, the following questions must be raised[6]:

**Revenue Stream:**

*1. Can a specific revenue stream be identified, assured and written into a binding contract? (i.e. Does a market exist for the product or service?) If the revenue can not be contractually assured, is it predictable over a reasonably long period?*

The BOT plant will sell all of its output to EDL. The power tariff will be negotiated ahead of time. The contract will either bind EDL to a minimum monthly amount of power or will pay for the underusage of the plant (refer to Power Tariff section). Since the electricity demand in Lebanon is much higher than the current supply, it is expected that EDL will purchase all of the plant's capacity.

*2. Are the revenues coming from a creditworthy source? If not, can the performance of the revenue source be secured?*

Even though the power purchaser, EDL, had financial difficulties during the war, the Government of Lebanon would have to guarantee EDL's payments. It is also assumed that EDL will improve the problem of bills collection and power theft. Therefore EDL's financial situation would be ameliorated once it concentrates on transmission and distribution.

*3. How is the revenue stream structured to accommodate inflation, increasing project expenses ...etc.?*

It is assumed that inflation prone components of the power tariff will be indexed according to an international independent agency's publications. However, the operations and maintenance contractor will guarantee unforeseen project variable expenses.

**Operating Expenses:**

*1. How well can project operating expenses be forecasted? Are project operations and expenses low-risk? Can operating expenses be insured?*

Since it is suggested that the technology used in the plant be proven and reliable, its operating expenses should be easily forecasted. An experienced contractor would already be familiar with causes of increased costs and would know how to forecast accurately. Nevertheless, the O&M contractor should guarantee the operations costs. It is also assumed that the O&M contractor would be insured.

*2. Who will take the risk of increasing operating expenses?*

The O&M contractor will assume all the risk for an increase in the operating expenses, in exclusion of fuel. Fuel is an important issue and is depicted in detail in the "fuel agreement" section.

**Technical**

*Will the facility have a value remaining at the end of the franchise period which can be transferred back to the government or will it be obsolete or have outlived its life?*

Since the project is undertaken on a BOT basis, it should be transferable. The concession period should be shorter than the life of the plant. The Lebanese Government needs to make sure that it is a viable "transfer."

**Financing**

*1. What kind of financing would be required to amortize the cost of the project and provide a reasonable and competitive return to the equity investor?*

The project is defined on a limited-recourse financing, relying on the project cash flows and risks. A thorough financial analysis is assumed to have taken place.

*2. Can the debt market provide the funds for financing the project? Is the project too large? Can it be broken into smaller segments or done in stages?*

The local debt market is not large enough to absorb such a project, however, the international debt market could close the gap, especially if the World Bank assists in financing the project. The project is financially large compared to the other projects currently taking place in Lebanon. It is possible to break the project into smaller parts, however, the country needs a project of this size in order to meet the large unsatisfied demand.

*3. What kind of security would have to be given by the project company and/or its shareholders during the construction and operations period to obtain the financing required?*

The performance bond and the cost overrun insurance are the responsibility of the contractor. In typical case scenarios, the international contractors approach the host government along with their export agencies, which insure their performance.

**Objectives**

*What are the objectives of the government in pursuing this project?*

*a. Scarce country funds (local and foreign)*
*b. Technology transfer*
*c. Creation of new jobs, country investment*
*d. Promote competition*

The Lebanese Government is constrained by its borrowing capacity. Thus, it is to its advantage to enter into a partnership with a reliable sponsor. This sponsor should bring a level of technology and management skills, which ought to be transferred to EDL at the end of the concession. This project will help create new jobs, a positive externality. However, the nature of the project is to assist EDL in supplying the needed electricity and not compete with it. The plant will only be allowed to sell power to EDL.

**Regulatory**

*What kind of performance will be required by the private sector developer?*

The private sector developer will be required to build a plant according to the agreed specifications. The penalty will be amortized by a performance bond and the quality will be assured by an independent quality consultant.

### C. *Project Financing*

BOT projects can be considered a variant of limited-recourse financing. The limited recourse financing is based on the fact that project risks and cash flows, in which guarantees given from project owners, are limited. The potential benefits of such a type of financing include freeing potential borrowing capacity of the government, sharing project risks, and bringing private sector efficiency and commercial discipline to the power development process.

As we mentioned in previous sections of this thesis, BOT financing schemes require a detailed risk analysis in order to assess whether all the risks will be satisfactorily covered: First, the economic analysis is used to demonstrate acceptable rates of return to the government and the project; and second, financial analysis is used to demonstrate adequate cash flows (refer to Chapter 2 of this thesis). It is thus a complex process which involves the reconciliation, within a defined time period and at an acceptable overall cost, of the conflicting variables, and the requirements in order to meet the objectives of lenders, governments, investors, contractors, suppliers of raw materials, and finally, purchasers of output.

The benefits of limited recourse financing have a price. The BOT structure of a project will incur some costs otherwise not present in government bids. These are the costs of financing, insurance and time spent on negotiation. However these costs are

recuperated by the efficient management of the private sector. Some drawbacks of limited recourse financing projects include lengthy projects' development process[7]. Nevertheless, tighter construction and planning under private sponsorship can reduce the delay in development. The private sector is constrained in its ability to allocate funds and operate without external review. The government will also be constrained in its ability to change the business environment for the project in question[7].

In the 1970s and early 1980s, such an infrastructure project would have been done entirely in the public sector, with the involvement of the World Bank and other bilateral institutions, and probably export credits guarantees by suppliers' governments as well. Nowadays, in the present financial environment, at least half the resources might be leveraged from sources outside of the country.

The following are the steps which, once integrated effectively, represent the development of a viable BOT project[7]. The first step consists of the clarification of the host government's objectives and constraints, including financial constraints. This stage includes preliminary evaluation studies. The principal operating partner should be identified and initial negotiations completed on technical, commercial and financial issues. The second step involves the developing of contractual arrangements. Other equity investors must be identified. At this time, detailed engineering studies are completed, a financing strategy is planned, and lenders and contractors secured. Finally, the rest of the

documents describing the contract and the loans are completed. This process usually takes about two to three years.

Financing such a project will require the involvement of a substantial number of parties. The financing can be arranged in multiple ways, using a portfolio of many available financial instruments. Since such a project has not yet been undertaken in Lebanon, it is difficult to predict its financial structure. In the following sections, the authors will try to depict a financial structure and sources of finance that match the economical environment of Lebanon. Such a structure will be devised on the likely available sources of finance, and on norms acceptable to the business community, banks and Government of Lebanon.

### 1. Equity[8]

The equity of a project represents the initial capital put forward in order to attract senior forms of capital. As compared to debt lenders, equity lenders are the last to be repaid from the profits generated by the cash flow. In addition, in case the project is not successful and its assets liquidated, the equity lenders are given the last priority in the distribution of the proceeds. The advantages of equity include the relatively high profits they generate if the project is successful. On the other hand, debt lenders get a fixed return on their investments regardless of the cashflow's performance.

There are two main reasons for requiring a certain level of equity in a project. The first is that senior debt lenders use equity as safety margin, should the project not perform as well as predicted. Once equity is available, the debt lenders will be more comfortable with investing in the project. The other reason is that a significant portion of equity is provided by the host government and the project sponsor. These two parties are the most critical players for the success of the project. The financial involvement (through equity investments) of these two parties will assure the lenders of their commitment, since they have a vested interest in the prevailing performance of the project.

For this case in Lebanon, the project's equity percentage ought to be high. This is due to several reasons:

- Lebanon is viewed as a high risk country due to its political instability. The debt lenders are unwilling to finance a highly leveraged project in a risky country. A high equity percentage leaves enough safety margin for unpredictable events.
- It will increase the involvement of the Lebanese government. The involved parties fear the passiveness of the highly bureaucratized local government. A large financial involvement of the government in the equity investment will invoke its attention and will encourage it to facilitate the execution of the project. Nevertheless, it is undesirable that the government be too involved in such a project since it will reduce the efficiency of the private sector by limiting its freedom; this will contradict the basis of the BOT principle.

- It will increase the involvement of the project sponsor. The sponsor will have a higher interest in the project, which goes beyond construction, and management fees.

The sources of equity for such a project in Lebanon are limited. On the international scope, the foreign sponsor is the main supplier of equity. Sometimes he can be accompanied by a foreign joint venture partner and a private sector window. The private sector window, such as the International Finance Corporation of the World Bank, will demonstrate its approval of the project by investing in equity. Such a move will encourage other foreign investors to consider Lebanon as a prospective ground for future investments.

On the local level, the Government of Lebanon should be the main equity provider. Some local equity can be provided by a local joint venture partner and mutual funds. The local partner will probably be financially restrained due to its size (Lebanese firms tend to be small); therefore, he will have a nominal share in overall equity. The local mutual funds could be a good source of private Lebanese funds. However, the strength of mutual funds will depend on the future of capital and money markets in Lebanon. The initial success of Beirut's private real estate company, SOLIDERE, demonstrates the willingness of the public to participate in the reconstruction of Lebanon. Also, mutual funds will be a gateway for the Lebanese Diaspora to invest locally. The issue of a preferred stock for the proposed BOT plant will be an incentive for the Lebanese public to participate in equity financing.

Other components of the financial package, such as subordinated loans, can be used to increase the percentage of equity while maintaining a fixed income structure.

### 2. Subordinated Loans[8]

Subordinated loans are fixed-rate, long-term and unsecured loans. They are used to increase the percentage of equity since they can be considered part of equity. This is due to the fact that subordinated loans are used to secure senior debt. They can be used to finance initial costs such as construction. Once subordinated loans are secured and are able to cover a certain portion of costs, the senior debt lenders would be more reassured. The advantages of subordinated loans are numerous:

1. They return a steady income, which does not depend on the performance of the company.
2. If the performance of the company is satisfactory, the subordinated loans can be converted, for a premium, to equity.
3. There is a larger market for subordinated loans than for risk equity.
4. Subordinated loans allow an investor to bypass Anti-Trust Laws if he wishes to buy the majority of the project.

Such loans can be obtained from local commercial banks in Lebanon. The latter are not usually willing to invest in projects for a long term, and would invest in subordinated

loans which can later be converted to equity and sold. They can be used by the local authorities to promote the project and encourage senior lenders to provide long-term debt.

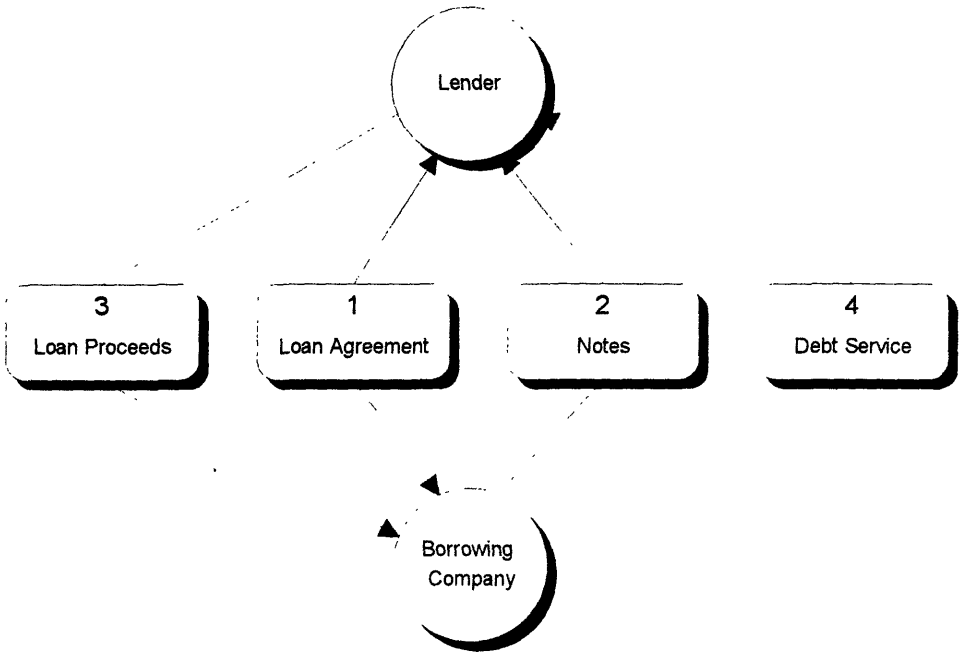
A subordinated loan is considered to be a median between equity and senior debt. In terms of priority payments, it is considered senior to equity capital and junior to senior debt.

### 3. Senior Debt[8]

Senior debt usually constitutes more than 50% of the total financing of infrastructure projects. These debts are not subordinated and their service is given the first priority in distributing the operating profits of the project. Debts come in two forms, secured and unsecured. Unsecured debt is backed by the general credit of the borrower and is not guaranteed by a third party. Figure 6 depicts the relationship between the lender and the borrower in an unsecured debt obligation. The process starts by a loan agreement between the two parties. The lender secures the debt amount to the borrower. Consequently, the borrower pays the debt service periodically to the lender.

**Figure 6: Unsecured Debt Obligation.**

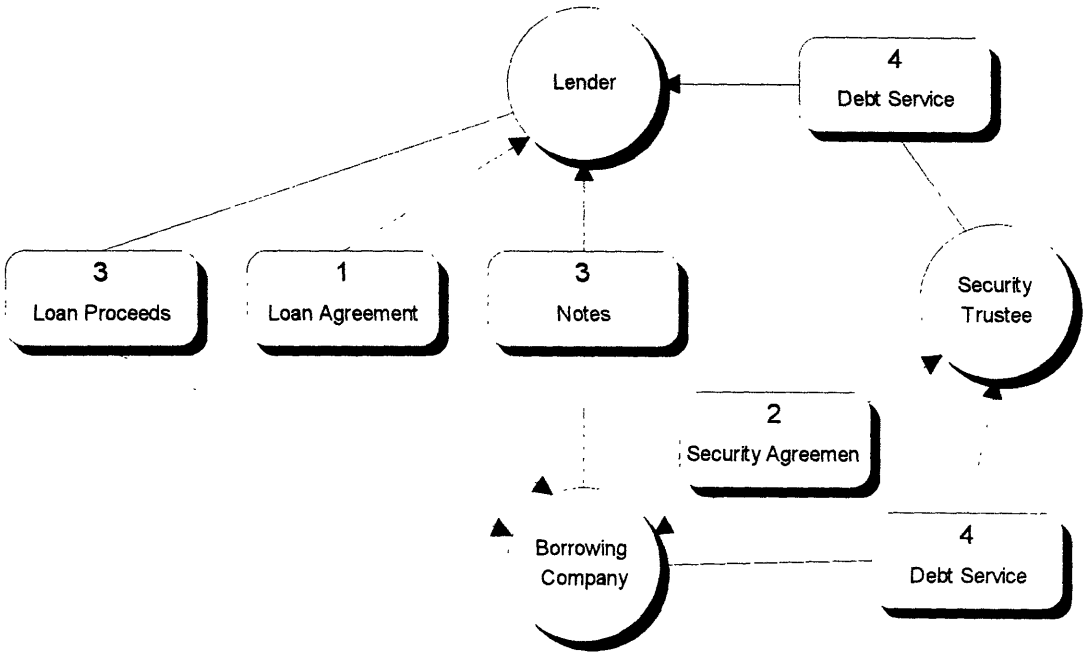
Source: Reference Number 8.




Secured debt involves the guarantee of a third party often referred to as a security trustee. Figure 7 shows the relationship between the three involved parties. After the loan agreement is reached between the lender and the borrower, a security agreement is reached between the borrower and a security trustee. The latter takes the debt service from the borrower and delivers it to the lender.

**Figure 7: Secured Debt Obligation.**

Source: Reference Number 8




Before financing such a BOT project, senior lenders would have some of the following concerns:

1. The project's total financing must be secured before the final agreements are complete. The lenders do not want to risk leaving some financing unsecured, since new financing sources might impose different conditions and could threaten the overall performance of the project.
2. All senior lenders must be equal in ranking. If a problem arises, no senior lender should be given preference over others.

3. The senior loan agreements should include cross-default clauses. This is to prevent the default on one loan to trigger defaults on the rest of the loans.
4. All payments to senior lenders must be proportional to the ratio of their initial loan on the project.
5. If the project underperforms, and decisions have to be made as to the future outlook of the venture or the capital structure will have to be changed, the senior lenders have to agree by majority vote on the course of action to take.

For the Lebanese power generation plant, there are numerous sources of senior debt:

- Foreign Commercial Banks. These banks have been reluctant to lend Lebanon since it is an LDC with a high country risk. They are willing to lend to the private sector with a guarantee from an export credit agency.
- Export Credit Agencies. The sponsor's country of origin should be willing to provide debt to the project if it can promote its exports in Lebanon. Export credit agencies have some advantages that apply to the power generation case of Lebanon:
    1. Debt is available at a fixed rate of interest.
    2. That rate is lower than rates offered by commercial banks.
    3. The loan period is usually longer than the one offered by commercial banks.
    4. Increased protection against the Lebanese government expropriation of the facility, since a foreign government is involved.

Nevertheless, export financing has its disadvantages:

1. Long waiting periods before obtaining approval.
2. The equipment available from the same country providing export finance might not be optimal for the project.

- Private Sector Windows. These should provide the project with around 20% of the total cost. Their involvement encompasses many advantages. They offer low interest loans for longer terms. They also add to the credibility of the project.
- Arab Funds. Other Arab countries, especially the Gulf countries, have historically provided financing to projects in Lebanon. These take the form of "soft loans" which are very low interest loans that are sometimes forgiven. The sources for these loans include the Kuwait Fund, Saudi Fund and the Arab Monetary Fund. These Arab sources of debt have renewed their interest in investing in Lebanon. This has been demonstrated with the oversubscription of SOLIDERE by $300 million. The excess funds were to be returned to the Gulf investors. Instead, they can be re-invested in Lebanon. An option would be to use the money as debt for the BOT plant. Appendix II shows some of the available financing through such sources.
- Local Commercial Banks. The Government of Lebanon can guarantee loans from local commercial banks. These loans would otherwise have high interest rates, and be provided on short term basis.
- The Government of Lebanon can use some of its reconstruction funds to provide subordinated loans for the project. The availability of subordinated loans will encourage international senior debt.

## 4. Financial Structure

Although such a project in Lebanon could have a multitude of different financial arrangements, the authors will depict some likely ranges of investment of each involved lender. There are many factors that can influence the debt-equity ratio for such a project. Among these factors are the market expectations, the risks involved, the government incentives and cooperation, the future state of the economy and the past experience of lenders in Lebanon. The authors suggest an equity percentage no less than 25% of the total financing. The basis for such an estimate is the lessons learned from the other power generation plants in developing countries. Table 16 shows the likely contributions of each equity lender for the power plant in Lebanon. Table 17 shows the likely contributions of each debt lender.

**Table 16: Possible Equity Contributions.**

| Type of Loan | Source | Probable Range |
|---|---|---|
| Equity | Project Sponsor | 10% - 15% |
| | Public Sale of Securities (Mutual Funds, Convertible Bonds, Stocks etc.) | 0% - 10% |
| | Private Sector Windows (IFC, MIGA, World Bank etc.) | 5% - 10% |
| | Government of Lebanon | 5% - 10% |
| | | |
| **TOTAL** | | **25% - 30%** |

**Table 17: Possible Debt Contributions.**

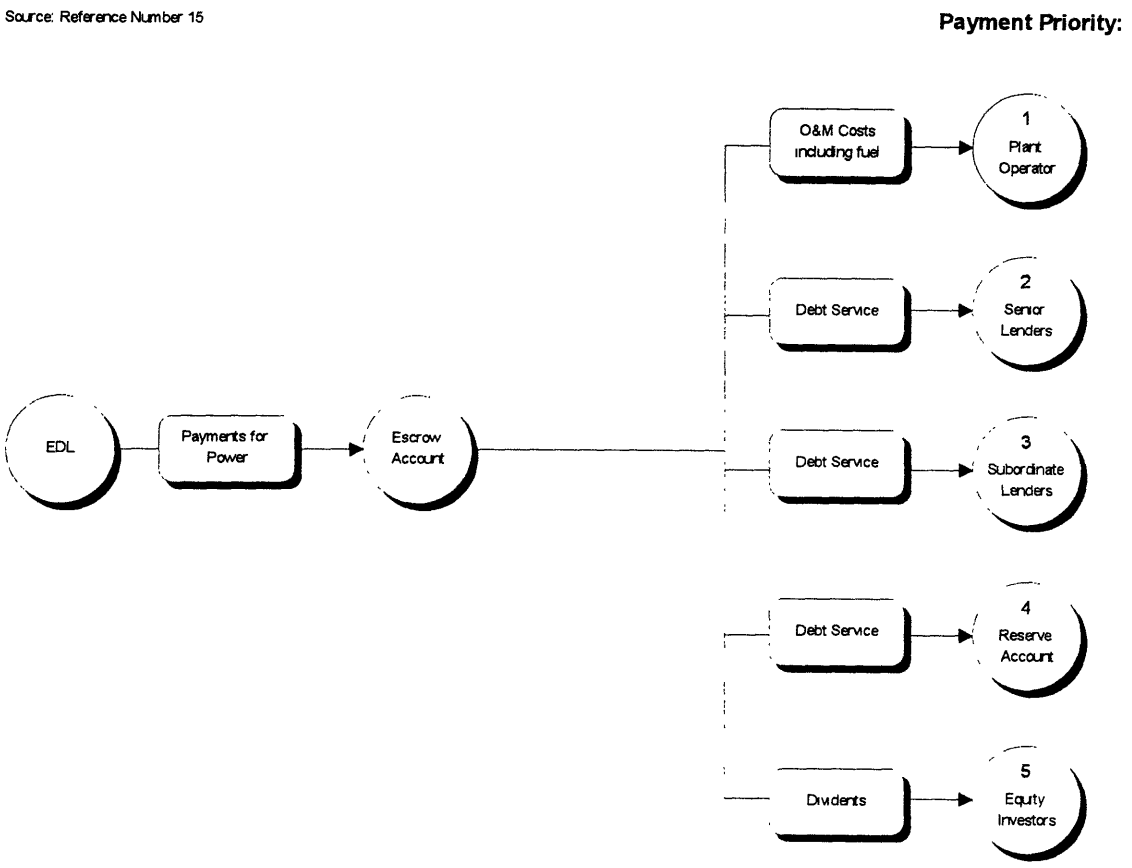
| Type of Loan | Source | Probable Range |
|---|---|---|
| Debt | Arab Funds | 25% - 40% |
| | Private Sector Windows (IFC, MIGA, World Bank etc.) | 5% - 15% |
| | Export Credit Agencies | 5% - 10% |
| | Local Commercial Banks | 0% - 10% |
| | Government of Lebanon | 5% - 15% |
| | | |
| **TOTAL** | | **70% - 75%** |

### 5. Escrow Account[9]

The Escrow Account is considered an indispensable guarantee needed in every BOT-type project. It is usually required by the lenders and investors to insure the proper management of the project's cashflow. An Escrow Account consists of an off-shore account managed by an escrow agent. All the project revenues are immediately transferred to the Escrow Account. The latter will control the collection, management and disbursement of the project's revenues into several other accounts, namely, the operator, senior lenders, subordinated loans, reserve account and finally, the investors. The highest priority is given to the operator to cover the O&M costs (including fuel). The second priority is given to service the debt of the senior lenders. The third priority is to serve other debt. The left-over cash will be repatriated to the investors in form of dividends. Figure 8 depicts this process.

**Figure 8: Escrow Account Cash Flow.**

Source: Reference Number 15




The role of the escrow agent is to hold project security on behalf of all lenders. It presents the Lebanese pound equivalent in debt reserve to the Central Bank of Lebanon for conversion to debt service currencies. The Escrow Account will also monitor the insurance package and authorize disbursement from the insurance account. The agent's role should become effective at financial close and should remain enforced until all lenders are repaid.

Such an account is necessary for the power generation project in Lebanon. This is due to the potential disputes that might occur over the life of the concession. The lenders will feel assured if the funds are managed in a Western country by trusted bankers.

### 6. Reserve Account[10]

The Reserve Account is a part of the sponsor's capital. Its purpose is to repay the operating charges and the debt service if the revenues from the operations are not enough to do so. The balance of this account is set by the lenders at the time of the financial close. During the operation phase excess cash is used to meet the required balance in the reserve account; and meeting the account's minimum balance is given a priority over the distribution of dividends.

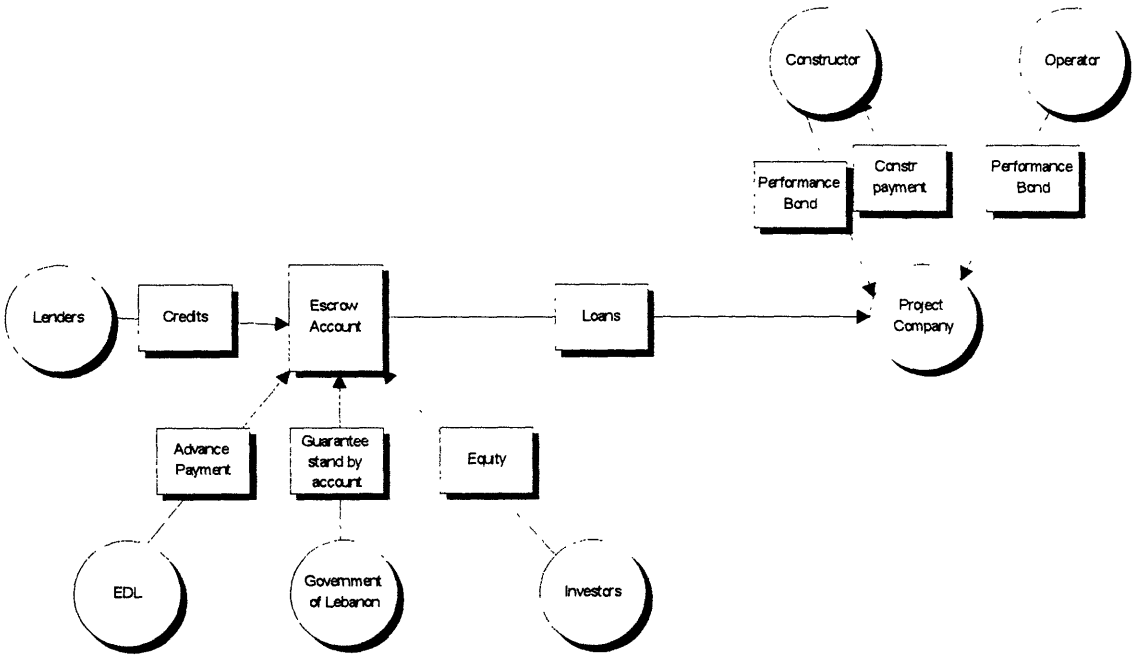
### 7. Stand-By Credit Facility[10]

The stand-by credit facility is a loan set aside for the payment of unforecasted costs the project might require. Since the initial loans do not cover the extra costs, the stand-by credit facility is used if the reserve account does not hold the required cash. This credit facility is usually provided by the debt lenders.

## 8. Cash Flows

The project's cash flows will differ between the construction and the operation phases. In the construction phase, the initial source of capital is equity. Once the equity is exhausted, the debt is used to finance the rest of the construction. This flux of capital flows via the Escrow Account to the project company. Figure 9 portrays the cash flow during construction.

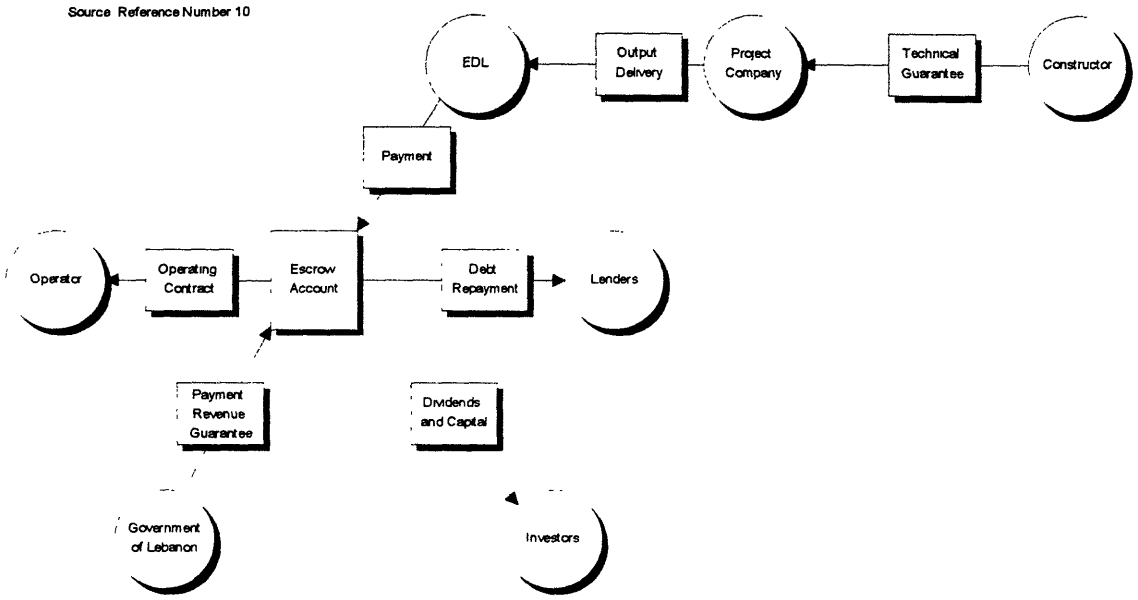
**Figure 9: Project Cash Flows During Construction of Plant.**




During the operation phase, the source of capital is EDL, the sole purchaser of the product. The capital stream flows into the Escrow Account which then redistribute it to

the concerned parties. (the reader is referred to Figure 8). Figure 10 delineates the cash flow during the operation phase.

**Figure 10: Cash Flows During Operation of Plant.**




## 9. Legal Framework[11]

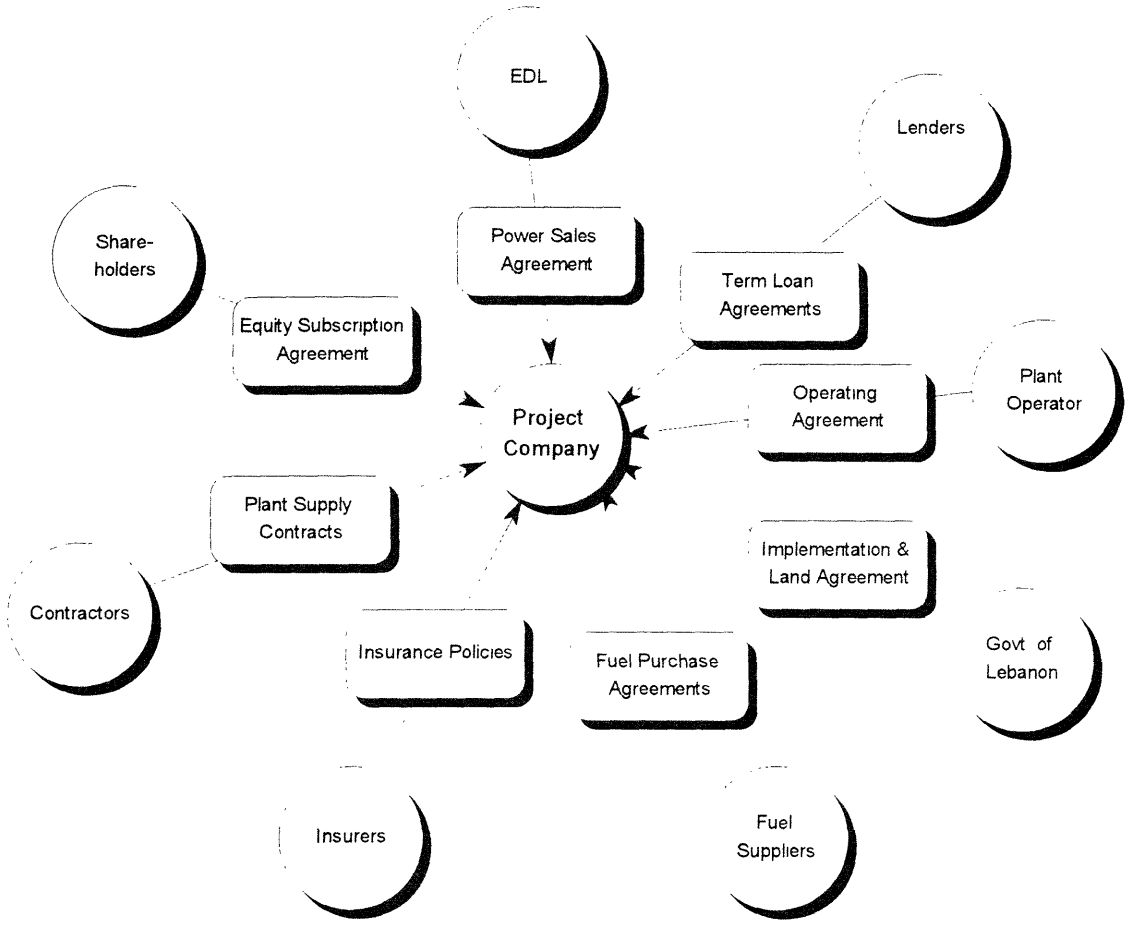
The following provisions set the legal ground required for the implementation of the BOT Power Plant in Lebanon.

1. A Protocol between the Lebanese government and the project sponsor should establish the main agreements between the parties.

2. An implementation agreement between the project sponsor, the O&M contractor, and the Ministry of Hydraulic and Electrical Resources, will be the covenant agreed upon for the construction and operation of the project.
3. An Energy Purchase Agreement between EDL and the project company.
4. A construction contract between the project company and the construction consortium.
5. A Subordinated Loan Agreement between the project company and the Government of Lebanon which ought to be represented by its Central Bank.
6. An Escrow Agreement between EDL, the project company, the investors and the escrow agent. The latter should be a reputed international bank.

Figure 11 depicts the contractual structure needed for a BOT project in Lebanon.

**Figure 11: Contractual Structure of BOT Project in Lebanon.**



### *D. Procurement Issues*

Negotiating a BOT contract is a complex, time consuming and costly procedure to both the host government and the interested sponsor. Sponsors would be willing to spend years and large amounts of money only if the process is orderly and the chances for success, and thus the recovery of the investments, are predictable. In order to attract private sponsors to develop proposals for projects in Lebanon, the Lebanese Government should start by commissioning a study on the prospective project. This was already done in 1992 when the Council for Development and Reconstruction (CDR) hired two renowned international consultants to plan the emergency reconstruction for Lebanon's recovery. Such feasibility studies will demonstrate the seriousness of the Lebanese Government in starting a series of BOT-type projects. Usually governments either accept one unsolicited proposal or start a competitive bid process.

Unsolicited proposals by only one sponsor, seem to be attractive to the host government since they are a short cut around the lengthy negotiations and comparisons between different sponsors. However, this approach is inadvisable to Lebanon's case, since it could be politically dangerous and economically unwise to accept a proposal from a single source without evaluating competitive alternatives. If an unsolicited proposal is imperative, the Lebanese Government should, as a rule of thumb, use EDL to evaluate the cost and competitiveness of the proposal[12]. The reason behind this is EDL's experience in

the construction of such projects which are undertaken on a competitive basis. Nevertheless, some form of competitive selection should be adopted, even if only on the proposal level, is highly preferable.

If the Lebanese Government is willing to accept unsolicited proposals, the following steps must be taken[3]:

1. The government should subject all applications to a processing fee; this fee should be in the order of $5,000.
2. If the proposal is found to be technically and financially viable, a Letter of Interest should be issued to the sponsors of the project. Within a predetermined period of the receipt of this letter (six weeks?), the applicant should be requested to furnish a performance guarantee. The latter can be a form of a bank guarantee from a local bank or a reputed international bank, valid for one year (or more). The amount of this guarantee must be specified to a certain number of US Dollars (a fraction of the project's costs?). If the guarantee is not furnished on time, the Letter of Interest will expire.
3. Once the performance guarantee is accepted, a Letter of Support will be issued to the sponsors.
4. The guarantee will be cashed if the sponsor is not able to achieve financial close within a certain period (one year?) of the issuance of the Letter of Support.

Such a scheme will encourage applications only from very serious and financially viable sponsors, without wasting the efforts the Lebanese Government in trying to negotiate with technically or financially underqualified sponsors.

The preferred procedure for awarding BOT projects should be similar to that for awarding public construction projects. The host government should start by identifying the project it wishes to undertake on a BOT basis and should define the expected standard of the product[12]. The next step consists of providing a list of incentives and government support to the awarded sponsors[12]. This list should include the power tariff calculation method, the required debt-equity ratio, host government debt or equity financing available. At this point, the Government of Lebanon should receive preliminary proposals from interested sponsors. The most suitable sponsor should then be selected on the basis of criteria that are of importance to the Lebanese Government. These criteria could include price, experience, length of concession period, and other benefits such as technology transfer etc.. Then, the complex and detailed negotiations will proceed to the finalizing of financing and other agreements amongst the involved parties.

Since the host government has a vested interest in getting a low price, it is tempted not to preserve the integrity of the competitive bidding process[12]. The government might continue to shop initial bids until it is certain it has achieved the best possible price for the project in question. However, the government could fall into the trap of allowing retenders and therefore lose its credibility. This could lead to very high initial bids on subsequent

projects because the bidders would know that they will be given a chance to lower their prices later on in the process. Also, some sponsors will no longer seek participation in a bidding process that would lack credibility. Unfortunately, the Government of Lebanon has historically engaged in bid cancellation, over-extended negotiations and retenders. The government would have to prove its seriousness in order to attract international contenders to the project, since, at the present, some multinational firms do not view Lebanon as a priority area to work in[13].

## *E. Construction of Plant*

During the proposal phase of the project, the sponsors will seek a construction consortium to undertake the construction of the plant. The construction consortium will include many parties usually under the responsibility of the general contractor. These parties are design contractors, foundation contractors, electromechanical contractors, generation equipment suppliers and civil contractors. A generation plant usually includes the generation equipment, fuel supply tanks, office and control space, and living quarters for staff.

### 1. Choice of Technology

There are several power generation technologies. Some of these include hydroelectric, gas powered and coal powered technologies. Before the negotiations, the Ministry of Hydraulic and Electrical Resources must identify the technologies that are clearly not feasible or needed in Lebanon. Hydroelectric power, for example, is not a suitable option due to the lack of unexploited river locations in Lebanon. Also, hydroelectric projects require longer payback periods than other technologies, and finding lenders for a such long term could be difficult.

Another very important factor influencing the choice of technology must be the reliability of that technology. The technology chosen must not be "new" or emerging. The Government of Lebanon should not experiment with such an important sector of the infrastructure. The technology proposed must be proven to be reliable and successfully implemented on other projects in the past. Also, the lenders will be skeptical of a project involving a new technology.

The Lebanese authorities negotiating the contract should stress environmentally sound technologies. If an environmentally damaging technology is implemented, it could leave the government with a large clean-up cost after the life of the project. By then, the contractors would have transferred the plant to the government and would not be liable for the effects of such pollution. Although the Ministry of Environment in Lebanon is not yet enforcing environmental protection, such a project must not be overlooked since its effects will only be apparent years after its transfer to the Lebanese Authorities. One good way to ensure that a technology is environmentally safe, is to have the World Bank or UNDP approve the contractor's proposal.

Another criterion important to the choice of technology for the project is the life of the plant after its transfer to the Government of Lebanon. It is useless to undertake a BOT project if the plant will have outlived its life by the end of the concession period. The Lebanese authorities must make sure that the transfer at the end of the project life is a viable one.

One important lesson learned from projects in countries similar to Lebanon is that the government should not give specific project specifications. The contractor/designer must have the flexibility to optimize the technology and scope of the project to make sure that he undertakes projects that he is experienced in. If the specifications are set in a strict way, the contractor might build a plant that he is inexperienced in building. The contractor is more likely to be informed of the ideal technology and project scope than the government. The Lebanese Authorities should negotiate standards of the output of the plant and not the capital costs. All the design and cost intricacies should be left to the project company. This will allow the contractor to use his expertise to propose a lower-cost, more efficient design.

### 2. Choice of Construction Consortium

When the Council for Development and Reconstruction announced the tender for the Beirut International Airport, many multinational construction consortia bid for the project. This proves that if a BOT project for a power plant were to be offered, the most experienced multinationals would be interested in undertaking it. The Lebanese authorities would have a variety of contractors to choose from. At this point it is important to prequalify only the syndicate of contractors that satisfy the following conditions:

- The consortium is willing to undertake the construction on a turnkey basis. This condition will leave both the design and implementation risk to the contractor and

allow conflicts to be more easily resolved (since any underperformance in the construction phase can be blamed on the consortium). The turnkey contract will have a fixed price, fixed completion date, and agreed-upon quality, with the construction consortium taking the time and cost overrun risks.

- All the members of the consortium have successfully completed a plant using the same technology. It is important to emphasize that all the involved parties (design team, contractor and equipment supplier) have worked together on a previous project involving the same technology that they propose. This point is crucial since the Lebanese Authorities should not take the risk of allowing parties to work together on a first time basis. If they do not agree on specifications or do not work efficiently together the risk of construction not being completed successfully and ontime will increase drastically.
- The consortium is large and financially sound enough to undertake such a project.
- The consortium is willing to take the construction risks and provide a performance bond whose value is approximately equal to 10% of the value of the contract.

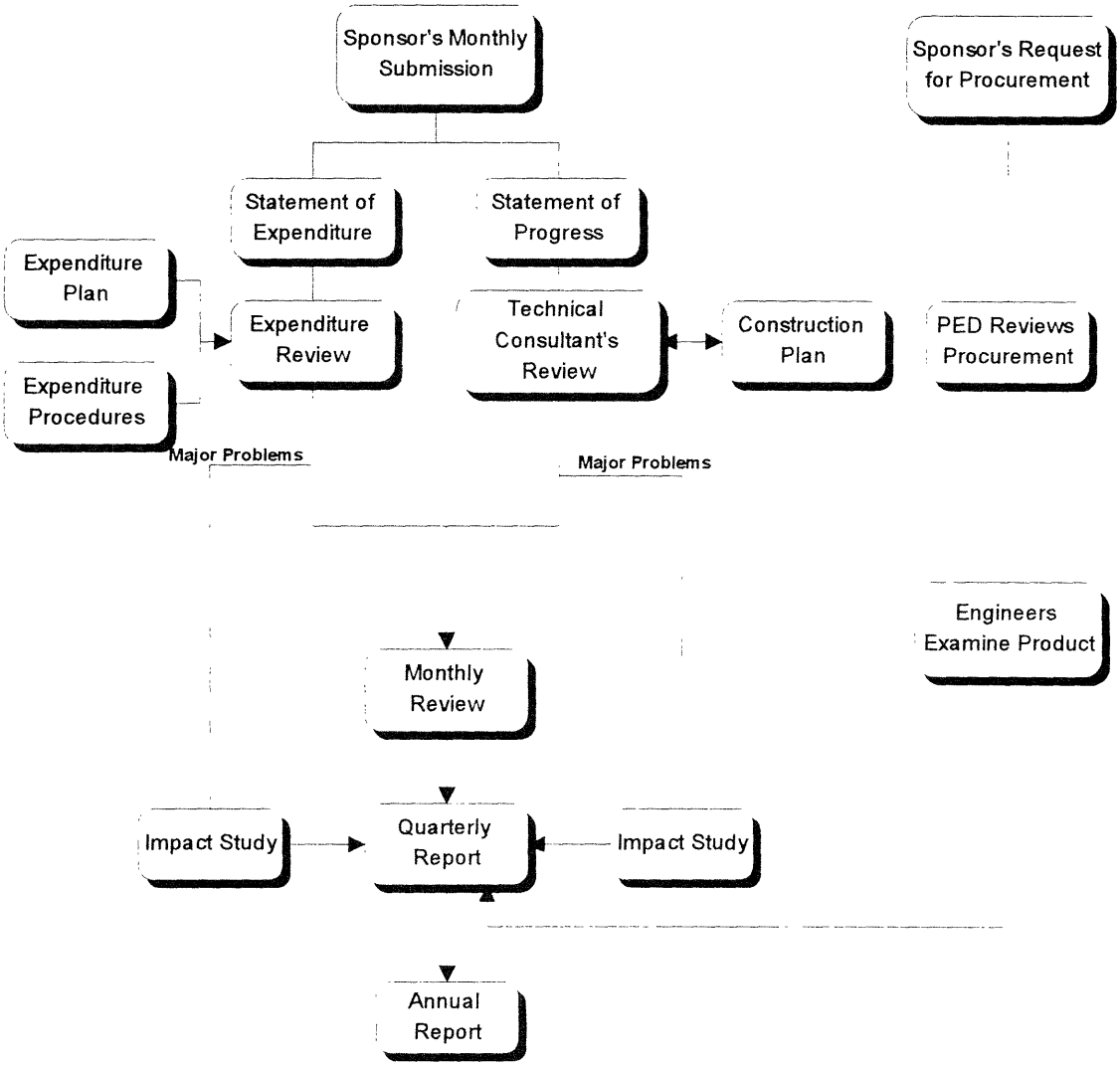
The construction consortium should provide financing and a large amount of equity. Based on the different proposals and packages offered by the different contractors, the Lebanese Government will choose one which optimizes cost, transfer period and output.

### 3. Monitoring and Supervision

Once the construction begins, the project company must appoint a team of engineers to supervise the construction of the plant. Another alternative would be to hire an international consultant to monitor the construction process. The contractor must submit specific data on the status of the project on a monthly basis. The project supervisor can then compare the statement of progress to the statement of expenditure. All the data can be entered into a monthly report that is submitted to the project company and the Government of Lebanon. If major problems occur, an impact study can be conducted and alteration can be undertaken[9]. Figure 12 depicts the project supervision process.

**Figure 12: Project Supervision Process.**

Source: Reference number 9



### *F. Operations and Maintenance*

One of the most difficult tasks in a BOT project, is to assure the proper operation of the plant. This is due to the important effect the operations have on the return of the project. In the case of non-satisfactory operations, the project will not yield the desired revenues or will not sustain acceptable operating costs. Either outcome will result in financial inadequacy, and the project could be considered a failure. Another aspect that increases the difficulty of this task is the amount of time (the project's life) over which the operator's performance will have to be sustained.

Since the operations and maintenance contractor is one of the most significant members of the project company, the sponsors must be very careful in their selection process. It is imperative that the O&M contractor have a similar experience in power generation BOT projects and preferably ones with similar output to that proposed in Lebanon. The O&M contractor must also have experience with the same type of power generation equipment. It is also preferable that the O&M contractor be experienced with projects in the Middle Eastern area.

The responsibility of the O&M includes[9]:

1. Planning of the procurement of raw material such as fuel.
2. Proper maintenance of the equipment and timely purchase of spare parts.

3. Setting up an organizational structure comprised of qualified personnel and their training.
4. Clear communication with EDL to determine the needed daily amount of power.
5. Reporting to the project sponsors on the exact performance of the plant. Predicting difficulties before their occurrence.
6. Optimizing and fine tuning the equipment in order to assure maximum efficiency.

The performance of the O&M contractor should be guaranteed by a performance bond. The performance bond should allow the sponsoring company to have another operator in case the original operator fails. The contractor must be a large corporation and have enough financial leverage to deal with a temporary deficiency in its cashflow. This is particularly relevant in the case of Lebanon, since EDL might have delays in issuing payments.

### G. *Fuel Agreement*

Since the power plant will burn fuel to generate electricity, the price of fuel is one of the main variable costs. A fluctuation in the price of fuel (or gas depending on the type of plant) could considerably affect the costs, and therefore profitability, of the project. One of the main concerns of the project company is to secure itself against the fluctuations in the costs of fuel.

The project company faces three alternatives for contracting the price of fuel. The first alternative involves securing a fixed long-term agreement with a fuel supplier. This would hedge the risk of fuel cost fluctuations and the project's cash flow will be more predictable for the life of the project. Such a contract could be obtained at a high premium from an international supplier and could cause the project company to pay a high, but fixed, price for the fuel. A similar contract could be negotiated with Lebanon's Ministry of Hydraulic and Electrical Resources, where the ministry would provide fuel at a fixed price (even if subsidized) to the contractor. The Lebanese Government could use this as an incentive to increase the attractiveness of such a project by decreasing one aspect of the many risks involved. Unfortunately, due to the many fluctuations in the price of fuel in the past years, few suppliers are willing to commit to a long-term contract. This is especially true at the time this thesis was written, when fuel is at its lowest price in many years.

Another alternative would be to allow the project company to sell the power it produces at a price proportional to the fluctuations in the price of fuel. The tariff would have two components, one covering fixed costs of the project company and the other covering variable operating costs. The second component would include the price of fuel and would vary with the fluctuations in the price of the former. Such an agreement would reduce the risks of the project company since it will protect its revenues from fuel price risk. However, such a scheme will make the project less attractive to the client, EDL, since EDL would not be able to predict the tariff of power that it buys externally. Nevertheless, EDL could then transfer this rise in costs to the consumers. These would view that fluctuations in the price of fuel as affecting their lifestyle, and would not have the option to purchase electricity at a subsidized tariff.

The last alternative would be to allow the project company to import fuel at international prices without paying taxes or duties. At the same time EDL would purchase electricity at a fixed cost throughout the life of the project. This alternative would force the project sponsors to take a risk with the price of fuel. This would, of course, make the project less attractive to international investors, but would secure EDL a predictable cash flow.

The second alternative seems most reasonable to be adopted. The cost of electricity is always dependent on fuel costs and EDL should pay for it accordingly. If EDL was producing the electricity and the fuel costs increased, then it would either be

transferred to the consumer or would have to be subsidized. Since EDL is buying it at prices concurrent to what it would cost EDL to produce it, it should purchase it at a fair price.

The fuel agreement is one of the major issues in a BOT project in the power sector. Since the Government of Lebanon is not in a strong bargaining position against international contractors, it would have to lessen the risks involved in the project. This would conclude that EDL would have to purchase power at a tariff that is dependent on the price of fuel.

### *H. Power Tariff Agreement*

The power tariff agreement is one of the most important components of the security package. Since the sole product of the plant is power, the amount of revenues will depend on the tariff of the power sold to EDL. If properly negotiated, the agreement could significantly reduce some of the project's risks, therefore comforting the lenders.

There are two suitable alternatives for Lebanon's case. The first is a "take or pay" agreement. Under such an agreement, EDL will be obligated to pay for a minimum amount of daily power, whether it uses it or not. If EDL buys more than this minimum amount, then it would have to pay for it in full. From the project company's point of view, the value of the minimum daily amount will be critical. If this value does not yield the predicted revenues then the project is risky, since EDL is not legally obligated to buy more than that amount. On the other hand, if that minimum value is high enough to generate the desired cash flow, then this agreement would be risk-free and favorable to the project company. Usually, in such agreements, the purchaser would have to forewarn the producer of the amount of power needed. That forewarning period is agreed in the contract documents. Should the project company be unable to deliver the desired amount of power, then it would owe EDL the amount of cost of the power.

The other alternative would be to split the power tariff into two components[3]: Energy price (EP), and capacity purchase price (CPP). The energy price comprises the

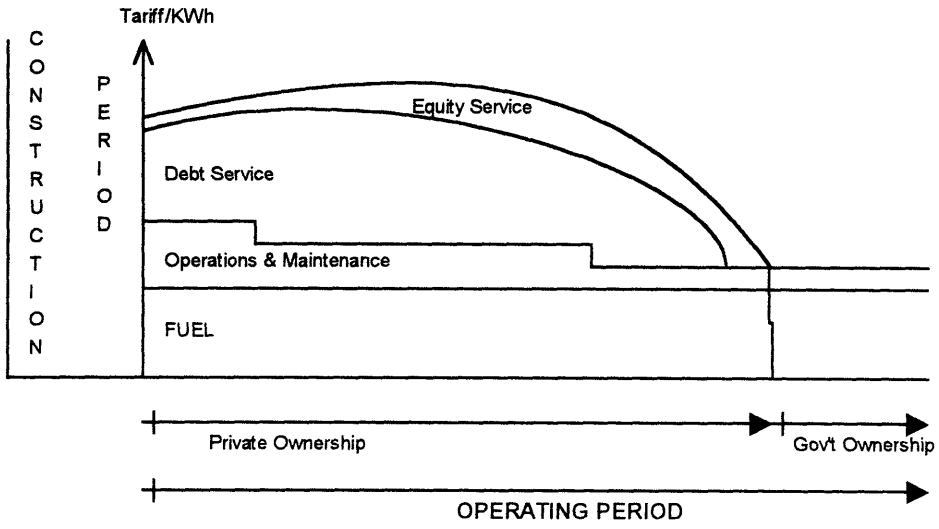
fuel components and a variable operations & maintenance component. The energy price would be the variable component of the total power tariff and would vary proportionally with the amount of MWh sold to EDL.

The CPP is also split into two components[3]: Escalable component (EC) and non-escalable component (NEC). The EC includes the fixed operations and maintenance costs, the insurance costs, the administrative costs and the return on equity etc.. The magnitude of this component is fixed in the contract, and it is only adjustable against change proposed in the energy price by the investors. Once determined at the time of financial close, this base figure will remain unchanged during the life of the project. This amount could be indexed if changes in base costs occur. The NEC component covers the debt servicing charges including payment of principal, interest and other fees to the lender. Once adjusted at the time of financial close, this component would not be indexed.

Using this second alternative in the agreement, implies that EDL would have to pay the CPP on a monthly basis regardless of the amount of energy it purchases from the BOT plant. The energy price would be the marginal charge beyond the CPP and this charge would be proportional to the amount of energy sold to EDL[3]. It is important to note, at this point, that the energy price would decrease per megawatt-hour if a large amount of power is sold to EDL. This is due to economies of scale. Figure 13 depicts a typical power tariff structure.

**Figure 13: Power Tariff Structure.**

Source: Reference Number 8.




The advantage of this method is that the sponsoring company is safe from cash flow risks related to revenues since its expenses would be covered even if EDL's demand decreases. This contract is advisable if EDL plans to buy large amounts of power from the plant and if the Government of Lebanon is willing to provide attractive opportunities to foreign investment.

Another premium would have to be added to the rate of every MWh. This premium is the foreign exchange risk insurance and it is payable either to the Central Bank of Lebanon, or to the International Foreign Exchange Risk Insurer. This amount is about 5% of the tariff per MWh[3].

If the involved parties decide to index the energy price, then the fuel cost will be indexed on the basis of changes in fuel prices maintaining the agreed heat rate (thermal efficiency)[3]. Also, the variable operation and maintenance cost should be indexed against exchange rate variations between the Lebanese pound and hard currency and inflation rate of the country where the spare parts would be imported from. Moreover, the indexation should apply prospectively on a pre-agreed periodic basis (semi-annually?).

Using information taken from similar power generation projects undertaken in developing countries, a break-up of the percentage of each component of the bulk power tariff is shown in Table 18. These numbers are by no means exact but can be used by the reader as a rough guide to the weight of each component in the overall cost of one KWh.

**Table 18: Break-up of the Bulk Power Tariff.**

| **Energy Price** | **Percentage of Bulk Power Tariff** |
|---|---|
| Fuel | 31% |
| Variable O&M | 1.5% |
| | |
| **Capacity Price** | |
| Escalable Component | 19% |
| Non-Escalable Component | 42.5% |
| Foreign Exchange Risk Insurance | 6% |
| | |
| **TOTAL** | **100 %** |

Source: Reference number 3.

## *I. Risk Coverage and Insurance*

Before such a project is undertaken in a developing country such as Lebanon, a thorough analysis of all the risks involved is imperative. During such an analysis, all the risks must be stated, their likelihood predicted and their coverage defined. Risk coverage will inflate the price of a project, and the extent of this inflation is proportional to the participation of the private sector. An early identification of risks and responsible parties for these risks will save time later on, if a problem materializes.

The following is a list of relevant risks to this BOT power generation project in Lebanon[7]:

**Monetary Risk.** *Monetary risk considers circumstances in which the host country can not permit transfer of funds for debt service because of its own economic problems.*

*Likelihood in Lebanon:* Low. This is due to the free market economy of Lebanon. The government of Lebanon does not control the flow of money in or out of the country. As an additional assurance, the contract should include a guarantee by the government that there will be no restriction on the inflow or outflow of money, whether in local or foreign currency. Given Lebanon's history as a banking center of the Middle East, this policy is not likely to change.

**Political Risk.** *This is the risk that any governmental change of policy would adversely impact profitability.*

*Likelihood in Lebanon:* Medium. The government of Lebanon is currently under much of the social and economical pressures associated with postwar reconstruction. There are many issues being debated on the future policies of the government. Due to the bureaucratic nature of the parliament and to the external political pressures imposed on the decision-making process, some policies are likely to change. However, the Government should provide a guarantee that the new policies that negatively affect the project will not be applied to that specific BOT project. In addition to the government's guarantee, both foreign commercial lenders and foreign equity investors could seek political risk insurance from their own export agencies or from multilateral agencies such as the World Bank.

**Foreign Exchange Risk.** *This is the risk that the currency in which the revenues are incurred (Lebanese Pounds in this case) depreciates compared to a hard currency. This is unfavorable since the lenders and investors are interested in real gains. Also, spare parts and fuel, which are imported, would increase and thus increase the operating costs of the plant.*

*Likelihood in Lebanon:* High. This is due to the history of the value of the Lebanese Pound. During the war, the pound plunged and has not substantially recovered since. Even though the currency has been stable for the past two years, there is no assurance of this in the future. The unstable political environment leaves many doubts on the future economic conditions. As an incentive to the investors, the Central bank of Lebanon should consider

providing the project company with a foreign exchange risk insurance. The current premium rates of this insurance should be included in the power tariff. The insurance should have a value of approximately 5% of the bulk power of tariff.

**Inflation Risk.** *This risk includes the adverse effects of inflation on the costs (mostly variable) of the project.*

*Likelihood in Lebanon:* Medium. One of the effects of the war was an inflated economy. Although the country did not experience hyperinflation, the risk of moderate inflation is present. This is especially true if the recovery will bring about a large influx of money from the Lebanese Diaspora and other investors. One solution for this risk is to periodically index the tariff of power. EDL must purchase power at a rate which includes components that could be indexed according to pre-agreed formulae and indexes.

**Availability of Permits and Licenses.** *This risk includes the probability of timely obtaining the permits and licenses for the construction and operation of the plant.*

*Likelihood in Lebanon:* Low. The government should be willing to provide the permits before the finalization of the contract. Otherwise, the delay in obtaining the required permits should be paid for by the government.

**Risk of Competition.** *This risk will materialize if the host government will allow a competitor to the project. The output sold will be lessened and might not be enough to generate the desired cash flows.*

*Likelihood in Lebanon:* Low. The government should assure the sponsor that no other generation plant will be built until all of the capacity of the BOT plant is used and more supply is needed. i.e. if the total demand is 2000 MW and EDL can only supply 1000 MW and the BOT plant can only supply 500 MW, then it makes sense to add another power generation project. However, if the plant is not reaching its total capacity, then the government should not allow any more power generation projects. Most likely, the government will have to commission other projects since the demand will increase rapidly in the future. Also, since the government will provide some of the debt and equity to the plant, it will have a vested interest to keep the cash flow safe.

**Operating Performance Risks.** *This is the risk that operating costs will prove to be higher than expected or that unpredictable events will increase costs, such as launch failure or payload failure.*

*Likelihood in Lebanon:* Medium. This depends on the performance and expertise of the operations and maintenance contractor. Unless this is due to factors beyond the O&M contractor's control, the risk is covered by the performance bond of the contractor. The security package would include some warranties concerning the general performance of the project. These guarantees are provided by the equipment supplier and operating company.

**Market Risk.** *This is the risk that the product of the plant will not have a substantially large market, or the market will be more price sensitive than expected.*

*Likelihood in Lebanon:* Low. This risk is very low in Lebanon given the constant power shortages and the extremely high demand. As for the price of the power, this will be fixed by a long-term contract. The government must guarantee EDL's credit for purchase of power.

**Development Risk.** *This risk includes construction cost and time overruns.*

*Likelihood in Lebanon:* Medium. This risk will be undertaken by the contractor and will be guaranteed by the performance bond.

**Technological Risk.** *This is the risk that technologies critical to project success either will not be developed, will require greater than expected spending, or will be patented by a potential competitor.*

*Likelihood in Lebanon:* Low. This is due to the choice of a suitable technology. One of the conditions is that the technology should not be "new" or under experiment. The sponsor will be able to accurately predict the requirements of a technology it has already tried.

**Completion Risk.** *This is the risk that the project will not end on time, for the price stated.*

*Likelihood in Lebanon:* Medium. Similar to other developing countries, construction costs and timing are difficult to predict due to the lack of information and unexpected delays. However, the consortium undertaking the plant's construction must include an experienced

local contractor, who would help accurately predict delays and cost overruns. This risk is guaranteed by the performance bond of the contractor. As a consequence, the cost of the project is increased in order to compensate the contractor for taking such a risk.

**Enforceability of Contracts Risk.** *This risk includes the enforceability of the power purchase agreements and the fuel agreements. Sometimes the parties involved might be unreliable and not live up to contract obligations in a timely fashion.*

*Likelihood in Lebanon:* Medium. The power will be purchased by EDL. EDL is currently facing financial difficulties and its credit for payments is questionable. One solution to this problem is to have the Lebanese Government guarantee EDL's payments. If EDL is unable to comply with its financial obligations, then the Government will pay the sponsor for the energy produced.

**Price of Raw Materials and Fuel Risk.** *This risk comprises the escalation of the prices of fuel and other necessary raw materials needed for the production of power.*

*Likelihood in Lebanon:* Medium. For this project, fuel is by far the most important raw material. Through a long-term fuel agreement, the project sponsor can assure that its price will be predictable. Another alternative would be to index the power tariff to reflect increases in the prices of fuel.

**Cash Flow Risk.** *The risk of the cash flow deviating from predicted values.*

*Likelihood in Lebanon:* Low. The experienced sponsors would have thoroughly predicted the cash flow. If satisfactory amounts of power are purchased and if the equipment sustains the predicted efficiency, then cash flow problems are probably due to the mismanagement of the O&M contractor. The latter is backed by a performance bond. Cash flow problems could be insured, if this comforts the lenders. The Lebanese government can guarantee the cash flow as an incentive to attract foreign investment.

**Force Majeure Risk.** *This is the type of risk which results from events beyond the control of any of the parties to the project financing. These events include various kinds of insurable casualty losses, such as fire, flood and earthquake and non-casualty losses from such causes as war, civil disturbance, strikes, lockouts, nuclear explosion, expropriation and political interference.*

*Likelihood in Lebanon:* Varies. History has proven that natural disasters have a low likelihood of occurring in Lebanon. The risk from such events is low. On the other hand, war, civil disturbance and political interference are more probable. This type of risk is usually not insurable at all, especially viewing Lebanon's track record. Commercial lenders as well as export credit agencies will normally be reluctant to take force majeure risks in a BOT context and will seek for the support of one or more of the parties involved. The lenders' objective might be to shift the various force majeure risks to the sponsor, or to the sponsor's suppliers and purchasers through contractual obligations or insurance protection.

## *J. Government Concessions and Incentives*

Lebanon's current economic condition is not encouraging for foreign firms to invest on a long-term basis. Due to the length of the concession period, the foreign contractor is skeptical of the long-term stability of a country which just came out of a civil war. The current economic situation in Lebanon is not very promising and a foreign contractor will need many incentives to invest in Lebanon. The country is approached by many general contractors ready to undertake the relatively short-term risks of construction, but fewer firms are willing to undertake the financing of a BOT project.

There is a wide variety of incentives the government can provide. The amount of available incentives provided is dependent on how much the government is willing to sacrifice in revenues and take risks. The more the government shares the risks of a project and forgives taxes, the more willing the foreign contractor to participate in BOT projects. The government of Lebanon can learn from other countries, such as Pakistan and Turkey, which were successful in attracting foreign investment through the use of many financial and legal incentives. Although it might not be reasonable to compare countries with different socioeconomic structures, other countries have used many incentives that are applicable to Lebanon in 1994.

The first and most important incentive the Government of Lebanon could provide is an internationally competitive rate for the purchase of electric power[3]. The more

competitive the rate is, the shorter the concession period, and therefore the less risk the contractor will take. When the overall risk is lower, the contractor is more willing to invest. Furthermore, a competitive rate will leave the cash flow some financial buffer, in case the project is not as profitable as expected.

The next incentive on the part of the Lebanese Government should be on the project specifications[3]. The government should set standards of output expected and clarify the incentives it is willing to give. The government should not be specific on the design of the plant, type of fuel used, construction method or management method. The contractor should have the freedom to choose the design, and technology, provided it meets output expected and environmental standards. Usually the contractor will optimize the design - equipment combination and find the most synergetic combination. Also, the government must not impose on designers to use specific type of equipment or restrict the choice of contractors. The project should be undertaken on a turnkey basis, with the sponsor choosing all the members of the consortium. Such practices will lower the cost of the project and allow the contractor to draw on his experience. The government agency is less likely to be as experienced as the construction consortium. Moreover, the government should have the design approved by an international consultant or a multilateral agency in order to assure its validity and suitability, especially in environmental matters, for Lebanon.

The Lebanese Government should use some of the reconstruction funds to set up an energy fund that targets BOT projects[3]. This fund must provide financing for part of the debt and the equity for the project. The government involvement will not only encourage the investor by providing financial support, but also assure him that the government has a stake in the project and will ensure its proper operation.

Other financing incentives include a permission for the BOT power generation company to issue corporate bonds and shares to be sold in Lebanon[3]. These can be traded in the Beirut Stock Exchange, and the public will be allowed to participate in the project's financing. The public cooperation will reduce any nationalization risks and comfort the international lenders. Such permission to issue shares and bonds would be more desirable if accompanied by a permission to foreign banks to underwrite the issue of shares and bonds by the BOT sponsor. The sale of the stocks and bonds could be more encouraged if an independent rating agency would be allowed to evaluate them and advise the public of the risks and profitability of investing in the project.

Fiscal incentives are important in such BOT projects[3]. The Lebanese Ministry of Finance should exempt the project from corporate income tax. The import of plant and equipment should be allowed without the payment of customs duties, sales tax, import fee and other surcharges. The equity and dividends should have guaranteed repatriation, and must be free of income or capital gains tax. The Central Bank of Lebanon should provide foreign exchange risk insurance for an acceptable fee.

The Government of Lebanon should provide guarantees for EDL's performance in the power purchase agreement. Also, it should guarantee the performance of the fuel supplier if the latter is a local enterprise. Other very attractive incentives include protection against specific force majeure risks. Some expected incentives include government protection against certain taxes and duties and an insurance of the convertibility of the Lebanese Pound.

One important factor that could reduce the time spent on negotiations is to reduce the number of government agencies the sponsors will have to interact with[3]. For such a project, the BOT contractor would have to interact with EDL, the Ministry of Hydraulic and Electrical Resources, and the agency responsible for negotiating the project. The government could facilitate negotiations by providing a one window operation. All the parties that the sponsor is supposed to interact with can send representatives to a common agency. This newly created agency will represent all interaction on the part of the Lebanese Government and Authorities. The contractor will have to negotiate with only one Government agency instead of several, and therefore reduce the negotiation time - and money.

Since one of the main hurdles for foreign investors is the lack of clarity of the host country's incentives and expectations, few investors end up spending time and money searching for information or starting negotiations from scratch. The Government of

Lebanon must put together a package that will highlight the exact government requirements and incentives for such projects. Once published, the investors will understand the incentives offered in Lebanon for BOT projects and will have a basis on which to start negotiations (see Marketing BOT Projects section).

## *K. Technology Transfer*

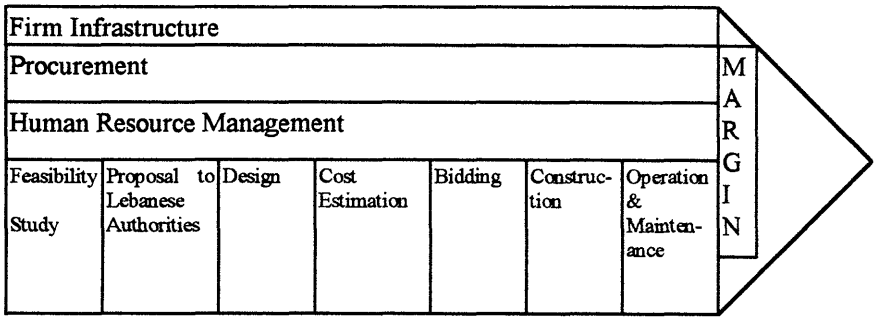
The construction and operation of the BOT plant in Lebanon can have a positive externality: Technology Transfer. The foreign contractors will bring about a level of technical and management expertise that is not available in Lebanon. Through involving Lebanese engineers in the plant construction and maintenance, the government can take advantage of the presence of foreign expertise in Lebanon to achieve the transfer of skills to the Lebanese workforce.

In such a project, transfer of technology can occur with select value-added-activities. The value chain of such a project comprises the following activities:

1. Feasibility study
2. Proposal to the Lebanese Authorities
3. Design
4. Cost Estimation
5. Bidding
6. Construction
7. Operation and maintenance

Figure 14 shows the value chain of the project in Lebanon. Some of the above value added activities include skills that can be transferred to the Lebanese engineers. The activities are: Feasibility study, design, cost estimation, construction, operations and maintenance. The following paragraphs will depict how the Lebanese government and the project company can facilitate technology transfer in each of the abovementioned activities.

**Figure 14: Value Chain of The Power Generation Project.**




In the feasibility study phase, the sponsor will assess the need for a plant, its cost, revenues and potential cash flows. Based on the results of this study, the sponsor will determine if such a project is attractive or not. There is potential for transfer of technology in this phase. Usually, similar studies are undertaken by EDL before building new plants and transmission networks. EDL staff could benefit from assisting the foreign planner and learning from his expertise and efficiency. The Government of Lebanon should request the presence of EDL planning engineers in the feasibility study for the new plant. The engineers can learn and enhance EDL's planning.

The design phase includes the design of the plant, the fuel supply tanks, the equipment and the physical facility. The department of civil works in EDL could benefit from assisting the international designer in this process. In the future, EDL's design capabilities could be improved. The Government of Lebanon should request the presence of several EDL engineers during this phase. If this is enforced over several generations of BOT projects, the department of civil works at EDL could reach world standards.

Moreover, EDL would be more qualified in setting Terms Of Reference for future public bid projects after improving its design department.

The construction phase is one in which the local engineers can benefit substantially from the presence of international contractors. By encouraging joint ventures between the foreign and local contractors, the latter could learn both technical and project management skills needed to undertake such large projects. Also, local subcontractors could benefit from interacting with international construction firms. The equipment supplier can also train EDL staff in the installation of the generation equipment.

The operations and maintenance contractor could play a very important role in technology transfer. The Lebanese Authorities must impose a condition on the O&M contractor that he periodically train EDL staff. Every year the O&M contractor should invite several EDL O&M engineers and train them for a certain period. By the end of the concession period, most O&M staff at EDL would have experienced this training. The result of this is the significant improvement in EDL's performance in power generation.

Another method to approach this technology transfer in the O&M is for the Lebanese Government to impose employment conditions on the operations contractor. If the O&M contractor is forced to maintain a certain percentage of the plant's staff to be Lebanese, then technology transfer is bound to occur. The government can also require the contractor to transfer all the O&M to Lebanese staff several years before the end of

the concession period. This requirement will force the O&M contractor to train its Lebanese employees since he will be responsible for their performance during the last few years of the concession period. After the transfer, the government will keep all the staff and ensure that the performance of the plant will not change once the O&M contractor's contract ends.

The government must take advantage of the positive externality of technology transfer and turn the BOT project into a BOOTT (Build-Own-Operate-Train-Transfer). The process will be much more systematic and better enforced if the Lebanese Government sets up an agency to monitor, negotiate and encourage technology transfer.

## L. *Transfer of Plant Ownership to Ministry of Hydraulic and Electrical Resources*

A typical BOT project requires that ownership be transferred to the host government at the end of the concession period. The transfer includes the ownership of land, plant and equipment. In some BOT agreements, the land remains owned by the government and leased to the sponsor.

At the end of the concession period, the Lebanese Government will have two alternatives with the ownership of the plant[12]. The first would be adding the plant to EDL's assets, and allowing the latter to manage it. The other alternative would be to lease the plant to the project company if the latter is interested in undertaking the management for a longer period than the originally planned concession. The transfer will not require any payment from either the government or the project company unless otherwise specified in the agreement. In some cases, the equity investors require some financial compensations from the host government at the time of the transfer. This is especially true if the plant is still in a good running condition and if the equity investors did not profit as much as they originally planned. It is advisable that at the time of transfer the Government of Lebanon offers a bonus to the project company if the plant is well maintained and returned in a good condition.

The plant should be inspected either by EDL's specialized staff or by an international consultant at the time of the transfer in order to accurately assess the condition of the plant. The sponsor is required to hand over the plant to EDL completely maintained and ready in every respect for continuous operation at the normal production rate. The contractor shall submit all technical instructions, operations and maintenance manuals, as built drawings, and the full list of all spare parts required for operating the plant for its remaining lifetime[14].

In case the cash flow of the project deviates from its predicted value, the transfer period could be changed to accommodate for that deviation. If the plant repays its debt ahead of time, the transfer period could be made earlier. On the other hand, if the revenues are less than expected for reasons beyond the control of the sponsors, the transfer period could be delayed to compensate for the deficit. Such flexibility on the part of the government could be a good incentive for international contractors to invest in Lebanon.

## *M. Marketing BOT Projects in Lebanon*[15]

The concept of BOT financing is relatively new to the Middle Eastern region. It has been widely undertaken in Turkey under Ozal's regime, and is one of the vehicles the country used to finance its infrastructure. However, Arab countries have not yet implemented BOT on a large scale. This is due to several factors: Some Arab countries (such as the Gulf countries) did not need financial assistance from the private sector and others were politically unstable and could not attract foreign investments.

Lebanon's reconstruction gives both its government and foreign investors an opportunity to start using limited recourse financing in this country. Consequently, the government should start promoting the concept to both the Lebanese public and to the potential investors. Such marketing will communicate the benefits of BOT type projects and initiate the interest of the foreign investors and the political support of the Lebanese business community, the governmental agencies and regulators.

The next paragraphs will describe the steps the Government of Lebanon should follow in order to market the BOT implementation of this specific power generation plant and future infrastructure projects. There are two target audiences for this marketing: the local audience and the international audience. The local audience consists of local lenders such as commercial banks, wealthy individuals (which are prospective investors) and

financing institutions. Once briefed on the advantages of BOT projects, the latter will be more willing to participate in financing such projects. EDL must also be included in the local audience in order to promote its cooperation with the generation plant. The international audience includes the potential sponsors, contractors and lending agencies which will bring both money and expertise, two factors on which the project is dependent.

In order to promote the project locally, the marketing campaign should focus on educating the audience of the benefits of a BOT project. The following points should be communicated:

- BOT arrangements rely on the synergy between the partnership of public and private sectors. The public sector is called on selecting what infrastructure projects are most needed while the private sector is relied upon for building the facility and operating it.
- BOT arrangements are beneficial to the government, the public and the project company. The advantage of using a private contractor over a public one is that the former is more efficient and more skilled. This gain in efficiency is shared between the project company, in terms of profit, and the public, in terms of better quality facilities.
- BOT arrangements free some of the government's crucial resources since the main investment is made by the non-government sector. Therefore, the government will have more available resources to channel into different priorities such as education and reduction of poverty.

- One of the most critical aspects of a BOT project in Lebanon is the "T" (transfer). After a certain duration the government will inherit an infrastructure project at no cost. In this case, it consists of a technologically advanced plant and its trained staff.
- The procurement process will be fair to all the contractors interested in bidding for the project. All contractors should be guaranteed a fair evaluation of their bid.
- There is a shortage of power in Lebanon. The BOT project will help alleviate this problem. This approach is mainly aimed at the general public which is ailing from the power shortage problem. This fact will assure the potential investors of the demand for the plant's product.

As for the foreign investors, the marketing campaign should be able to explain why this specific project should be undertaken as a BOT and not through the public sector. They must be assured of the seriousness of the Lebanese Government's commitment to the project and of the long-term stability of the country. One important point to note is that the Government of Lebanon will be competing with other governments in tying to lure investors to come to Lebanon. The investors must be assured of the predictability of events in the country, especially ones that would negatively affect the project's cash flow. Finally, they must believe that the government is entirely committed to the project and will guarantee some of the country risks.

There are a number of different elements that a marketing campaign should incorporate in order to effectively promote the project internationally. When conducting

its marketing campaign, the Government of Lebanon should consider the following constituents:

- **Investor Search.** The campaign must approach potential investors, preferably ones which previously participated in energy BOT projects in developing countries. These investors will most likely fulfill the prequalification standards for the project.
- **Advertisements.** The campaign must place advertisements in international newspapers, trade journals and investment publications. There must be an efficient follow up to these advertisements. The campaign must have informative literature on the project in case more detailed information is requested.
- **Information Packet.** Such a package must be compiled and ready to send to the requesters of information. The package should include the specifications of the facility to be franchised, a description of incentives provided by the Government of Lebanon and the name of a contact person one can call to obtain more information.
- **Delegation Tour.** The Council of Development and Reconstruction should invite the prospective investors to Lebanon. These must be greeted by prominent government officials who will accompany them to the proposed site and persuade them that Lebanon is politically stable, and serious about rebuilding its economy. The event can be covered by the media in order to show the strong government support to the project.
- **Project Briefings.** The Government Authorities must have information sessions open to the public. These sessions should be regularly scheduled to answer questions investors might have, and any concerns the general public may have.

- **Contact Person.** Since the Lebanese Government tends to be bureaucratic, it is essential to assign a single authority/individual for the dissemination of information on the project. It would then be the individual's responsibility to collect all the relevant information on the project in order to accurately answer questions raised.

## *N. Chapter References*


1. "Reconstruction of The Lebanese Electric Power System" MIT-AUB Collaborative Research Program, Cambridge , MA, February 1993.

2. "Rebuilding The Residential Structure of Lebanon" MIT-AUB Joint Research Project on Housing, MIT 1992.

3. Interview with Mr. A.H. Mikati, Resident Engineer, Electromechanical Dept., ACC Construction. April 20, 1994.

4. Cao, Andrew D "Financial Determinants of Selection Between BOO Vs BOT" International Privatization Group, Price Waterhouse, Washington DC, 1992.

5. "Public - Private Partnerships in Infrastructure" Transportation and Utilities Finance Group, Price Waterhouse, Washington DC, 1990.

6. Rudo, Diane "Project Evaluation / General Questions and Issues" Price Waterhouse, Washington DC, 1992.

7. Solh, Karim "New Generation Through BOOT and BOO Contracts" unpublished.

8. Nevitt, Peter K. Project Financing Euromoney Publications, London, 1989.

9. Cao, Andrew "BOO and BOT Approaches to Privatization" International Privatization Group, Price Waterhouse, Washington DC .

10. Selwan, Fadi "BOT Model for Construction Projects; Issues and Applications to Turkey and France" MIT Thesis, 1990.

11. Lecat, Jean-Jacques "An Overview of BOT Projects Proposed in Turkey" International Department, Bureau Francis Lefebre, 1990.

12. Augenblick, Mark & Custer, Scott "The BOT Approach to Infrastructure Projects in Developing Countries" The World Bank, 1990.

13. Interview with Rafael Del Pino, CEO, Ferrovial Group, March 1994.

14. Contract Written Between a Contractor and the Government of the United Arab Emirates, 1993.

15. "Seminar on BOT and BOO Projects" The Coordinating Council of Philippine Assistance Programs.

# CONCLUSION

This thesis describes the general framework for BOT-type projects and attempts to personalize this process to the case of Lebanon. BOT-type projects have been implemented in many developing countries with different economic structures, ranging from Pakistan to Turkey. The results of such ventures have sometimes been successful and at other times less desirable. If implemented carefully, BOT projects will yield desirable cashflows and generously repay all the involved investors. Such positive results will enhance the interest of lenders in future projects in that country. On the other hand, an unsuccessful project could not only be financially deficient, but would also discourage potential investors from getting involved in projects in that country. The lessons learned from past projects are well documented and should be carefully reviewed by the host government before it attempts to negotiate legal and financial schemes for prospective projects.

Since no project of this nature has been undertaken in Lebanon, the government is inexperienced in such negotiations. Lebanon differs significantly from the other developing countries studied (Turkey, Pakistan, and the Philippines) for the following reasons. The first major difference is that Lebanon has just come out of a long and destructive civil war. The second difference is Lebanon's severe currency devaluation in the mid 1980s and the

constant fluctuation of the value of the local currency. Thirdly, Lebanon remains politically weak compared to its stronger neighbors. Finally, until the time this thesis was written, the Lebanese Government had not publicly announced its willingness to adopt privatization schemes for the reconstruction of its infrastructure. All these differences are hurdles to the success of a public-private partnership in that country.

The thesis sheds light on the issues that need to be debated before such a project can be implemented in Lebanon. Even though such a project appears to be viable in theory, the authors are certain that it would require a great effort in order to be successfully implemented in a country with a similar socioeconomic structure and history as Lebanon. Although BOT projects have many advantages, they do not present a perfect solution for developing countries. The advantages of BOT projects are[1]:

- **Additionality.** BOT projects are ideal in cases where the host government has neither the finance nor the borrowing capacity to undertake an infrastructure project. Additional financing is provided by the international lenders participating in the project. Governments which promote BOT projects use additionality as the main reason for their interest.
- **Credibility**. Since the private sector is usually more qualified than the public sector in evaluating whether and how a particular project should be built, lenders are more willing to take on the risk associated with a BOT project. The BOT approach saves developing countries from non-viable projects which might otherwise be carried out as public sector projects.

- **Efficiency.** The private sector is usually more efficient than the public sector, especially in developing countries.
- **Benchmarking.** The private sector project can be used to measure the efficiency of similar public sector projects in the host country.
- **Technology Transfer.** BOT projects should include training programs which transfer technical and managerial skills to the local staff. Although technology transfer could occur without a BOT project, the latter facilitates the process.

Nevertheless, BOT projects have the following disadvantages[1]:

- **Complication.** BOT projects involve highly complicated negotiations. The time and money spent on finalizing agreements involve a high opportunity cost.
- **Financial Constraints.** Commercial lenders and export credit agencies are sometimes limited by the country risks, even if the BOT approach is used.
- **Cost.** A public sector project, if implemented efficiently, will cost the host government less than the overall cost of a BOT project. This is due to the time saved on negotiations and the money saved from risk covering and guarantees.

While Lebanon is currently not a desirable country in which to undertake BOT projects, serious government participation can make the country more attractive to investors. The lessons learned from other countries suggest that government participation is crucial in both the negotiation and implementation stages. If the Lebanese Government actively markets BOT projects, and offers a package of incentives to show its commitment

to public-private partnerships, Lebanon will become substantially more attractive to international lenders. The government must insure the success of the first BOT project implemented in that country since such positive results will trigger a new generation of BOT projects that could rebuild a significant portion of the country's infrastructure.

This thesis constitutes the first step in understanding the issues needed to implement BOT in Lebanon. If the government desires to promote such schemes in the country, a more quantitative report must be produced to prove the viability of the project, given the incentives the Lebanese Authorities are willing to provide the international investors with. Further research should explore the viability of BOT projects applied to other sectors of Lebanon's infrastructure.

Given the limited information used to write this thesis, the authors feel that no concrete conclusions can be drawn from the Lebanese Power Generation case. Nevertheless, the qualitative nature of this thesis could serve to introduce the notion of public-private partnership to the Government of Lebanon. The authors hope that this work would be taken into consideration by the authorities involved in planning the reconstruction of Lebanon.

**Reference:**

1. Augenblick, M. and Custer, S. "The BOT Approach to Infrastructure Projects in Developing Countries" The World Bank, 1990.

# BIBLIOGRAPHY

"A Guide to Public-Private Partnerships in Infrastructure: Bridging the Gap Between Infrastructure Needs and Public Resources" Price Waterhouse, 1993.

"Private Sector Development and Privatization Activities" Cofinancing and Financial Advisory Services, The World Bank, March 1993.

"Public - Private Partnerships in Infrastructure" Transportation and Utilities Finance Group, Price Waterhouse, Washington DC, 1990.

"Rebuilding The Residential Structure of Lebanon" MIT-AUB Joint Research Project on Housing, MIT 1992.

"Reconstruction of The Lebanese Electric Power System" MIT-AUB Collaborative Research Program, February 1993.

"Recovery Planning for The Reconstruction of Lebanon" Phase I Summary Report, Volume 4 Projected Profiles, Council for Development and Reconstruction, Republic of Lebanon, Beirut, May 1992.

"Seminar on BOT and BOO Projects" The Coordinating Council of Philippine Assistance Programs.

Aharoni Y.: *On Measuring the Success of Privatization.* Privatization and Control of State-Owned Enterprises, World Bank, Washington D.C., 1991.

Alexander, Myrna and Corti, Carlos "Argentina's Privatization Program" Private Sector Development and Privatization Group, Cofinancing and Financial Advisory Service, The World Bank, August 1993.

Arthur Young International: *Financing Privatization under Limited Capital Conditions.* Arthur Young International, November 1986.

Augenblick, Mark & Custer, Scott "The BOT Approach to Infrastructure Projects in Developing Countries" The World Bank, 1990.

Berg E., and Shirley M.: *Divestiture in Developing Countries.* World Bank Discussion Papers #11, Washington D.C.

Bouin O., and Michalet Ch.: *Rebalancing the Public and Private Sectors: Developing Country Experience.* OCDE, Paris, 1991.

Boustany, Sami "Privatization and its Role in the Reconstruction of Lebanon" MIT Thesis, May 1992.

Cao, Andrew "BOO and BOT Approaches to Privatization" International Privatization Group, Price Waterhouse, Washington DC .

Cao, Andrew D "Financial Determinants of Selection Between BOO Vs BOT" International Privatization Group, Price Waterhouse, Washington DC, 1992.

Cao, Andrew: *Privatization of State Owned Enterprises, A Framework for Impact Analysis.* International Privatization Group, Price Waterhouse, August 1992.

Citibank: *Development and Financing of Private Electric Power Projects in Asia.* Citibank, 1990.

Dykes, William "Project Financing and Construction in the 1990s" Citicorp International Limited, January 1992.

Economist Intelligence Unit, Lebanon: Country Report, 4th Quarter, 1993.

El-Irani, Atef Ibrahim "Power Systems Planning with Uncertainty: Application to Lebanon" American University of Beirut Master's Thesis, October 1992.

Ferrigno Joseph "The Successful Packaging of BOT Projects" World Bank Seminar, April 1990.

Financial Times: *Mexico- An Envied Program.* April 6, 1992.

Harmeling, Suzan and Froot, Kenneth "La Nationale and the Huites Dam Project" Harvard Business School Case, June 1993.

Harrell, Edgar and Solh, Karim "The Impact of Privatization on Foreign Investment and Technology Transfer in Latin America" Price Waterhouse, January 1993.

Hartley K., and Parker D.: *Privatization, a Conceptual Framework.* Privatization and Economic Efficiency, 1991.

Im, Soo , Jalali, Robert and Saghir, Jamal "Privatization in the Republics of the Former Soviet Union" Private Sector Development Group, Legal Dept., Private Sector Development and Privatization Group, The World Bank, June 1993.

Iskandar, Marwan "The Lebanese Economy, 1993" Banque De La Méditerranée, March 1994.

Jinich, Roberto "Financing Infrastructure Development in Mexico Through Public Private Partnerships: The Huites Hydroelectric Dam" MIT Thesis, February 1994.

Kombargi, Racha "Estimation of Electricite du Liban Production Function" American University of Beirut Master's Thesis, May 1992.

Lecat, Jean-Jacques "An Overview of BOT Projects Proposed in Turkey" International Department, Bureau Francis Lefebre, 1990.

Majdalani, Fadi "Financing the Reconstruction of Lebanon" MIT Thesis, February 1988.
Mathrani, R. "Issues in Developing BOOT Projects in LDCs" World Bank Seminar, April 1990.

Nevitt, Peter K. Project Financing Euromoney Publications, London, 1989.
Pfefferman Guy, Madarassy Andrea "Trends in Private Investment in Developing Countries 1993" International Finance Corporation.

Phillips, Robert "The Questions Which Need to be Asked to Identify Viability" McKenna & Co., London.

Price Waterhouse: *Private Power Projects and Capital Market Development.* Price Waterhouse, Washington D.C., 1991.

Privatization International: *Privatization Yearbook 1992.* London, 1992.
Ragette Friedrich "Beirut of Tomorrow, Planning for Reconstruction" American Uniuversity of Beirut, 1983.

Rudo, Diane "Project Evaluation / General Questions and Issues" Price Waterhouse, Washington DC, 1992.

Saidi, Nasser "Capital Markets, Economic Stabilization and the Reconstruction of Lebanon: 1993 and Beyond" Speech given in New York City, October 1, 1993.

Saidi, Nasser "The Economic Reconstruction of Lebanon" unpublished, 1993.

Selwan, Fadi "BOT Model for Construction Projects; Issues and Applications to Turkey and France" MIT Thesis, 1990.

Solh K, Senior Consultant, International Privatization Group, Price Waterhouse: *Interview on January 29th, 1994.* Price Waterhouse, Washington D.C.

Solh, Karim "New Generation Through BOOT and BOO Contracts" unpublished.
SOLIDERE information package, published by SOLIDERE, 1993.

The Coordinating Council of Philippines Assistance Programs: *Introduction to BOT-type Projects.* The World Bank, Washington D.C.

World Bank: *Private Sector Participation in Power through BOOT schemes.* The World Bank, 1990.

World Bank: *Privatization: The Lessons of Experience.* Country Economics Department, April 1992.

# APPENDIX I

## Relevant Facts About Lebanon

Source: Boustani, Sami "Privatization and Its Role in the Reconstruction of Lebanon" MIT Thesis 1992.

Lebanon Facts and Figures

---

Area: 10,452 Square Kilometers (4,015 Square Miles)

Population: 2,655,000 in 1990

Capital and Largest City: Beirut

Other Major Cities: Tripoli, Saida, Tyr, Zahleh, and Baalbeck.

Population of Beirut Metropolitan Area: 1,250,000 million in 1990

Political System: Democratic, Parliamentary

Economic System: Liberal, "Laissez-faire"

National Currency: Lebanese Pound (L.L.)

Gross Domestic Product (GDP): 1990: U.S.$ 2.137 billion
1991: About U.S. 2.80 billion

Exchange Rate on April 15, 1992: 1410 L.L. for one U.S. dollar

Boundaries: North and East: Syria
West: Mediterranean Sea
South: Israel

Principal Activities: Commerce, Banking, and Services

Languages: Arabic, French, and English

Major Universities:
- American University of Beirut (AUB)
- "Université Saint-Joseph" (USJ)
- "Université Libanaise" (UL)

---

Source: Economist Intelligence Unit *Lebanon, Fourth Quarter 1993* London 1993

# Economic structure

*Latest available figures*

| Economic indicators | 1988 | 1989 | 1990 | 1991 | 1992[a] |
|---|---|---|---|---|---|
| GDP at current prices[a] $ m | 3 274 | 2 606 | 2,558 | 2,941 | 3,165 |
| Consumer price inflation % | 150 | 50 | 115 | 33 | 130 |
| Population m | 2 66 | 2 67 | 2 70 | 2 74 | 2 70 |
| Exports fob $ m | 629 | 485 | 494 | 539 | 560 |
| Imports cif $ m | 2,366 | 2,235 | 2,525 | 3,743 | 4,203 |
| Reserves excl gold $ m | 978 | 938 | 660 | 1,276 | 1,496[b] |
| Total external debt $ bn | 1 1 | 1 2 | 2 0 | 1 9 | 2 0 |
| Exchange rate (av) L£ $ | 409 2 | 496 7 | 695 1 | 928 2 | 1,713 0[b] |

October 4, 1993 L£1,711 $1

| Origins of gross domestic product 1987 | % of total | Components of gross domestic product 1987 | % of total |
|---|---|---|---|
| Agriculture | 8 7 | Government consumption | 5 7 |
| Energy & water | 0 8 | Private consumption | 96 5 |
| Manufacturing | 14 7 | Gross capital formation | 16 0 |
| Construction | 4 8 | Net exports of goods & services | -18 2 |
| Financial services | 8 7 | **GDP at market prices** | **100.0** |
| Non-financial services | 22 9 | | |
| Commerce | 34 2 | | |
| Administration | 5 2 | | |
| **GDP at market prices** | **100.0** | | |

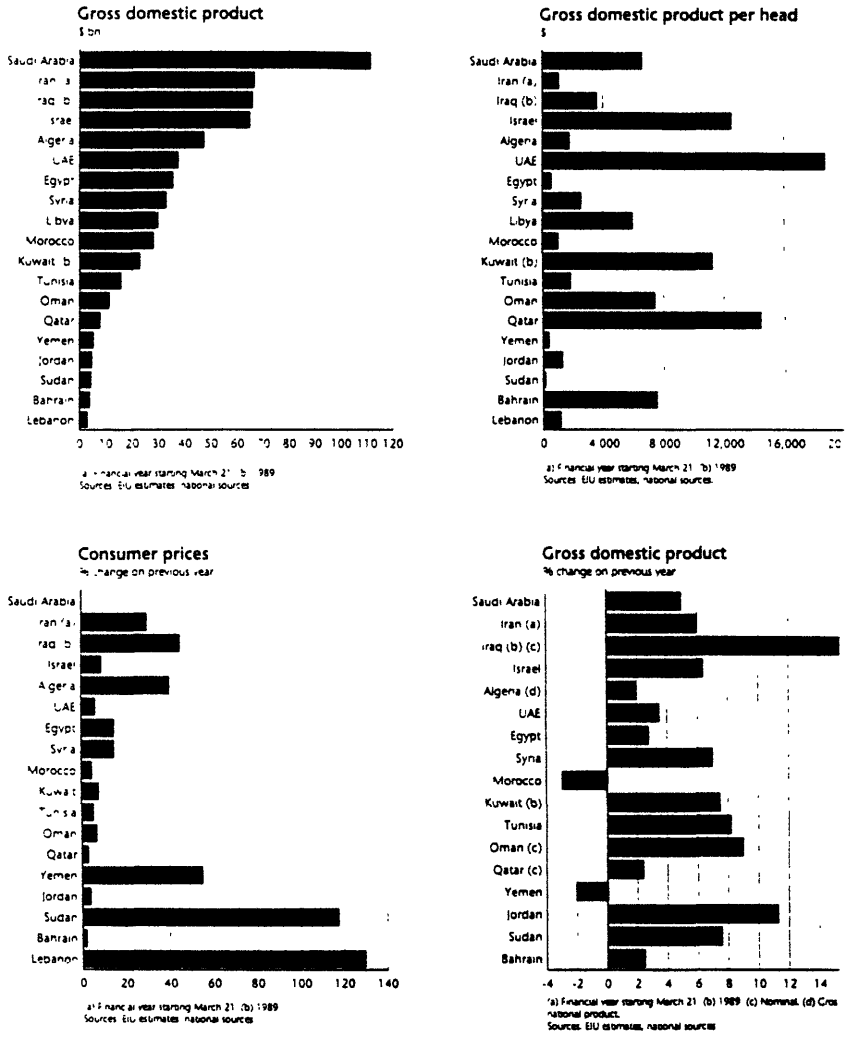
| Principal exports 1992[c] | $ m | Principal imports 1982 | $ m |
|---|---|---|---|
| Clothing | 110 | Consumer goods | 1,331 |
| Metals & metal products | 64 | Machinery & transport equipment | 1,165 |
| Food products | 55 | Petroleum products | 665 |
| **Total incl others** | **510** | **Total incl others** | **3,327** |

| Main destinations of exports 1991 | % of total | Main origins of imports 1991 | % of total |
|---|---|---|---|
| Saudi Arabia | 21 8 | Italy | 13 6 |
| UAE | 10 6 | Syria | 11 4 |
| Switzerland | 8 0 | USA | 8 1 |
| Jordan | 7 2 | France | 8 1 |
| France | 5 2 | Germany[d] | 6 7 |

[a] EIU estimates [b] End-December national figure [c] National source. [d] Includes former East Germany.

Source: Economist Intelligence Unit *Lebanon, Fourth Quarter 1993* London 1993.

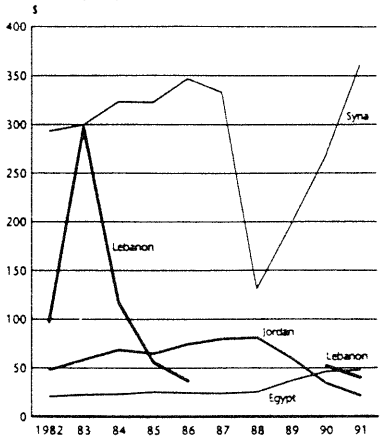
**The Middle East and North Africa in 1992**



Source: Economist Intelligence Unit *Lebanon, Fourth Quarter 1993* London 1993

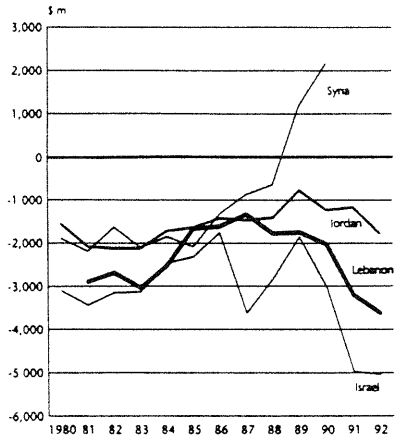
**Lebanon: comparative economic indicators**

Military expenditure per head



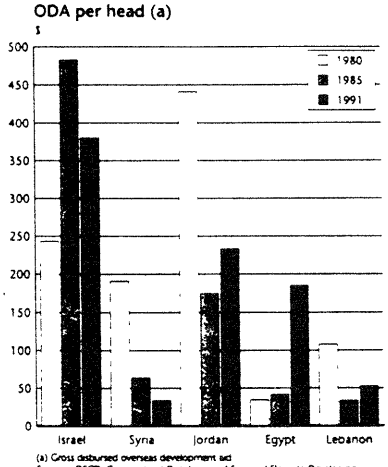

Sources: SIPRI Armament and Disarmament Yearbook, UN, Monthly Bulletin of Statistics

Merchandise trade balance



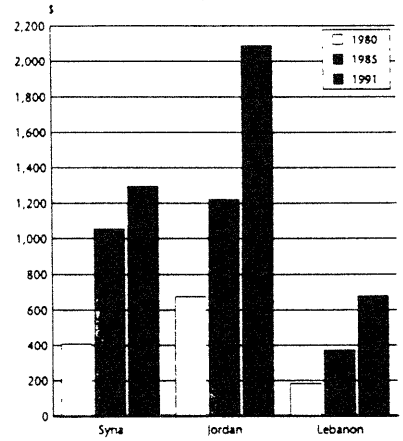

Sources: IMF International Financial Statistics; IMF Direction of Trade Statistics.

ODA per head (a)




(a) Gross disbursed overseas development aid
Sources: OECD Geographical Distribution of Financial Flows to Developing Countries, UN, Monthly Bulletin of Statistics

Total external debt per head




Sources: World Bank, World Debt Tables, UN, Monthly Bulletin of Statistics.

# APPENDIX II

## Available Foreign Financing in Lebanon

Source: Iskandar, Marwan "The Lebanese Economy in 1993" Banque de La Méditeranée, March 1994

($ million)

| Sector | AFESD | SFD | KFAED | ADFAED | IDB | IBRD | CEC/EIB | France | Italy | Others | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electricity | 73.7 | - | 31.2 | - | - | 35.0 | 50.5 | 19.7 | 261.8 | - | 471.9 |
| Waste Water | - | - | - | - | - | 16.2 | 3.6 | - | 9.0 | 0.7 | 29.5 |
| Solid Waste | - | - | - | - | - | 30.0 | - | - | 23.6 | - | 53.6 |
| Telecom-munications | - | - | 34.5 | - | 12.6 | - | - | 7.6 | 32.0 | - | 86.7 |
| Transport | - | 64.5 | - | - | - | - | 50.5 | 0.8 | 25.3 | 1.8 | 142.9 |
| Water Supply | - | - | 16.7 | - | - | 43.8 | 14.4 | 26.4 | 14.0 | 0.6 | 115.9 |
| Education | - | 21.7 | 6.3 | - | 13.3 | 15.0 | 9.0 | 1.6 | 5.7 | 17.5 | 90.1 |
| Public Health | - | 33.1 | - | - | 10.7 | - | - | - | 8.7 | 19.2 | 71.7 |
| Housing/ Resettlement. | 26.8 | 4.8 | - | 25.0 | - | 25.0 | - | - | - | 5.3 | 86.9 |
| Agriculture/ Irrigation | - | - | - | - | - | - | - | - | 5.5 | 20.6 | 26.1 |
| Industry | - | - | - | - | - | - | - | - | - | - | - |
| Oil and Gas | - | - | - | - | 0.3 | - | - | 0.3 | - | - | 0.6 |
| Services and Tourism | - | - | - | - | - | - | - | - | - | - | - |
| Government Bldgs. | - | 5.9 | - | 5.0 | - | - | - | - | - | 2.9 | 13.8 |
| Management and Implem. | - | - | - | - | - | 10.5 | 43.5 | - | 2.9 | 2.8 | 59.7 |
| **Allocated Funds** | 100.5 | 130.0 | 88.7 | 30.0 | 36.9 | 175.5 | 171.5 | 56.4 | 388.5 | 71.4 | 1249.4 |
| **Unallocated Funds** | - | 100.0 | 25.0 | - | - | - | 95.1 | - | 5.0 | 26.6 | 251.7 |
| **Total Funds** | **100.5** | **230.0** | **113.7** | **30.0** | **36.9** | **175.5** | **266.6** | **56.4** | **393.5** | **98** | **1501.1** |

**Legend:**

***AFESD**: Arab Fund for Economic and Social Development.*
***SFD**: Saudi Fund for Development.*
***KFAED**: Kuwait Fund for Arab Economic Development.*
***ADFAED**: Abu-Dhabi Fund for Arab Economic Development.*
***IDB**: Islamic Development Bank.*
***IBRD**: International Bank for Reconstruction and Development (World Bank).*
***CEC/EIB:** Commission of the European Community/European Investment Bank.*
***Others** include: UN; UNDP; FAO; IFAD; OPECF; Belgium; Germany; Japan; Oman; Qatar; Syria; USA.*