BOT schemes as financial model of hydro power projects

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There is a worldwide trend for governments to encourage involvement of the private sector in power generation and transmission projects. Due to the long realization period, high investment, Hydro Power Projects, especially in most developing countries, face two major problems: unavailable technological know-how and financial resources. Traditional methods of project development, funding, management and operation do not fully alleviate these problems. Build-operate-transfer schemes are the latest methods adopted in the developing infrastructure projects. This paper outlines the project financing through BOT schemes and briefly focuses on the factors particularly relevant to Hydro Power Projects.

Introduction

One of the main ideas behind the BOT-approach is to bring private capital into construction of infrastructure like power plant. The foreign company or the operating company runs the scheme for a stipulated periods and then, at some point in the future transfers the facilities to the public sector of the host nation.

The application of BOT Schemes to Hydro Power Projects has been limited, because many of theseprojects have been large scale for construction and private financing is not well suited to projects which take many years to complete. But in the last years, some schemes - special financing models for HPP-projects requiring advanced technology and high capital investment - have been developed within the private sector, in some cases with treasury guarantees to secure the financing. One example for an existing BOT Scheme of HPP - Project is the Birecik Project in the Republic of Turkey, which will be explained later on.

A further observation is that BOT schemes are enormously complex in terms of the negotiations and the arrangements that have to be reached by all parties. So what is also necessary, if you are a party of a BOT - scheme, that you have good lawyers for negotiating sophisticated contracts of enormous complexity.

As my colleague, Mr. Rudolf Huepfl will present you tomorrow in his lecture, the investment for the HPP Freudenau, which is located about sixty kilometers upstream on the Danube from the City of Bratislava near Vienna, amounts to about 1.5 billion dollars. A main part of this investment is necessary for the measurements of environmental protection. Which means, that HPP project financing is not only to bring in capital for production of electric energy, but also to raise funds for reducing the environmental impact associated with such projects.

1 WHAT IS A BOT SCHEME

In general, *The principal features of these build operate projects are:*

- the project investments are planned, financed, constructed directly or indirectly by the consortium (often a private consortium and normally acting through a „project company");
- they usually involve private sector participation;
- It is limited-recourse-financing, based only on the project risks and project cash flow. The recourse to project owner is limited;
- The projects are operated and maintained by the consortium for a stipulated periods, under a concession or franchise, granted by the host government;
- The investment will be repaid by the sale of the products, the facilities are build for;
- There are normally guarantee of revenue generating either through agreed tariff formulae and long-term purchase agreements;
- at the end of the concession or franchise period, the facilities will be transferred to the host government, which itself then becomes responsible for the project's operation

The concept of build-operate scheme have come to be widely used for a whole family of methods of private financing for public infrastructure projects.

The main types of build-operate schemes are:

- ***BOT*** (Build-Operate-Transfer), where the facility is transferred to the host government after a certain period;
- ***BOO*** (Build-operate-own), where the facility is owned by the consortium;
- ***BOOM*** (Build-operate-own and maintain), where the maintenance function and responsibility is added;
- ***BOTT*** (Build-Operate-Transfer-Training),
- ***ROT*** (Rehabilitate-Operate-Transfer), where an existing facility is refurbished, operated and transferred. This is becoming a popular concept for modification and upgrading of an old power station for many countries (e.g. Philippines, Malaysia)
- ***ROL*** (Rehabilitate-Operate-Leasing) in this case, an existing facility is refurbished, operated an leased from the consortium for the cooperation period for operation and maintenance.

2 THE STRUCTURE OF BOT SCHEMES

Traditionally, projects are executed by a consortium made of different parties, who have varying interests in the projects. The four traditional participants are: ***the owner***, ***consultant***, ***constructor*** and ***financier***. The parties of consortium may not necessarily be distinct, but could merge into one another.

Private Power Projects can present substantial risks and involve a great deal of careful development. A comprehensive contractual framework has to be developed defining the obligations of all parties during construction and operation. The important agreements for a BOT project are:

- Engineering Procurement Construction Contract (EPC) with contractor
- Power Purchase Agreement (PPA) with utilities
- Fuel Supply Agreement (FSA) with fuel supplier in case of a thermal power plant
- Operation and Maintenance Contract (O&M) with plant operators
- Land Purchase Contract with local /municipal government
- Loan Agreement with Banking Consortia
- Implementation Agreement
- Insurance Contract, and others

In Appendix 1 below shows the elements, generally included in the BOT project structure, but the role of the participants and the relationships among them vary from project to project.

3 PROJECT IMPLEMENTATION OF BOT SCHEMES

All project have a life cycle comprising three distinct phases:

- The Project Development Phase, during which activities such as feasibility, design an preparation of tender documents take place.
- The Project Implementation Phase or construction phase, during which the HPP is built and commissioned
- The Project Operation Phase, during which the HPP is utilized for the production of electric energy

During ***The Project Development Phase***, activities such as market study, feasibility, design, environmental impact assessment (EIA) and preparation of tender documents take place. A quick method for the project initiator to evaluate the BOT project, is using a flow charts for the selection of project, especially of potential BOT project in developing country (see 2nd).

After having worked through the project evaluation flow charts, the necessary steps required to ***implement the BOT project*** should be carried out. These are:

- **Government legislation,** which means that the host government commits to supporting, in the context of the project e.g. compulsory acquisition of land, or relocation of local inhabitants. There is no chance to realize such a project, if it does not have the full and committed support of the government of the state in which it is taking place. The extent of governmental support is, of course, a matter which lenders will wish to consider carefully before committing themselves to providing the finance required for the project.
- **Concession,** provides regulatory framework and guarantees, which gives the sponsoring consortium the right to build and the right to charge. The concession agreement is the heart of any BOT-scheme and it is the agreement, which really characterizes a scheme as a BOT. Essentially it allows the sponsors to undertake the project and concedes certain rights to them, e.g. land use rights. In this agreement, there is generally speaking, determine the right to built the plant and the right to sell the electric energy.
- **Construction contract,** which may consist of design contract, E&M contract and civil works contract, in term of Hydro Power Project, should ensure that the contractors comply with the ground conditions, the repayment procedures and the liabilities for damages to be imposed on the contractor in the event of delay or in the event that specific performance requirement are not met. The equipment suppliers will operate as a subcontractor to the contractor during construction phase. There are also BOT-schemes in discussion, where, design and construction companies as well as equipment suppliers are member of the consortium.
- **Project finance**, BOT schemes financing are usually made of 75 % debt and 25 % equity. The traditional **sources of finance** for HPP-Project are export credits, the medium-term loan syndicated by a group of commercial banks of different countries or debt and equity issues on the capital markets. The export credits are normally long term and guaranteed by their government of the state, from which goods and services are provided to the project.

  The lend will look primarily at the **debt service ration** to ensure that the project is able to withstand the risks involved. By contrast, the investors will be interested in the **IRR** (internal rate of return) offered by the project. The minimum acceptable rate will depend mainly on the project type and location, and on the risk sharing arrangements and the investor's opportunity cost of capital.

  According to my experience on projects in China, due to runaway inflation, foreign exchange restrictions, and strict Government control of electricity prices, it make investment in China's energy sector a risk that few companies are willing to take for less the a 20% IRR.

  BOT financing requires a combination of detailed risk analysis; economic analysis - to demonstrate rate of return of the project; and financial analysis - to demonstrate adequate cash flows. It is a very complex process, and need a separate workshop to discuss all financial problems in connection with financing

BOT-Schemes, so I have to reduce my comments only on certain problems an risks involved in BOT-schemes, which I will try to explain later on.

- **Operating contract** will normally require the operator to run and maintain the project in conformity with any obligations, the host government has imposed in the concession agreement. Apart from these requirements, the operating period should also be an important element in operation contract. Due to the long realization period, the project sponsors will need a appreciate operating period, which is long enough for them to recover the cost and to achieve an acceptable return.

4 SWOT ANALYSIS OF BOT SCHEMES

A brief strengths, weaknesses, opportunities and threats (SWOT) analysis is undertaken below for BOT-schemes:

Strengths- the build-operate schemes

- Promote direct foreign investment into developing countries.
- Reduce the pressures on government in terms of both financing infrastructure projects and recurrent expenditure generated by projects.
- Improve the national debt burden and interest payment obligations.
- Increase the commitment from contractors and financiers alike towards the successful operation of projects.
- Require that the project evaluation are undertaken with increased intensity and strictness.
- Reduce the chances of and the application of inappropriate technology.

Weaknesses-the build-operate schemes

- Are not applicable to all kinds of infrastructure projects.
- Usually require high pricing and tariff structures for returns to be attractive or obtained; thus possibly distorting the existing local pricing structures
- Due to devaluation and currency convertibility, revenues normally have to be generated in hard convertible currencies.
- Usually involve the provision of guarantees and extensive legal agreements as a prerequisite for investment, which may increase the project costs

Opportunities-the build-operate schemes

- Act as a vehicle for introducing new technologies rapidly and successfully into developing countries.
- Provide a good basis for technology transfer and training of local staff.
- Create an opening for private sector participation and also the development and use of emerging markets to fund projects.
- Create an incentive for additional capital inflows into a country and reduce capital flight.

Threats-to build-operate schemes

- For BOT schemes, the threat of the facility being run down at the transfer stage of the scheme exists.
- If the schemes are not structured properly, natural resources in developing countries could be wastefully utilized and depleted by the project promoters.
- Political instability and the threat of nationalization sometimes exists and makes investors cautious about entering into any long-term arrangements on build-operate schemes.

5 THE PROBLEMS AND RISKS INVOLVED IN BOT-SCHEMES

BOT financing required a detailed risk analysis. For both the host government and the private parties, it is important that risk allocation has been carefully considered before the project package is put together. The risks related to the BOT Schemes may be divided into:

- **Political risks** are among others, a change in taxation conditions, changes in requirements for native involvement, and imposition by the host government of exchange controls. The risk that Government may use actions of this sort to influence a project will increase construction costs or cause delays. That leads the private investors often to require high rate of return.
- **Construction risks** are often associated with the feasibility of the project. It have to be considered, which technology is behind the project, which local infrastructure is existent, because no projects are isolated from the environment, in which it is situated. One common difficulty with HPP is that sites cannot be located according to choice, many sites are located in isolated areas far from the population they are intended to serve. In this case there is the need for an efficient and effective transmission network. The risks of time overruns beyond the scheduled period of completion is also part of the risks during construction period.
- **Economic risks** in BOT project are usually arising from the economic instability of the project circumstances. The most significant risks in this category are e.g economic depression in host country, inflation rate above forecast level, bankruptcy of shareholders and suppliers, which effects the viability of the project.
- **Currency and Foreign Exchange risks,** the currency, in which loans are made available to cover construction cost or other expenditure may be different from the currency which the project generates. In the case of a HPP, revenues are most likely to be in local currency.

  An important general issue for BOT project is how the sponsors protect themselves from exchange rate devaluation and from the currency convertibility risks. If the currency differs, the project company and the lenders are running an exposure to currency movements, in addition, government agreement on the amounts and terms under which local currency can be converted to foreign exchange will also be of importance to the lenders.

- **Revenue risk,** when the project is completed, the production should be able to bring the project company sufficient income to meet the debt obligation and to provide the sponsors with a return on their investment. There are many factors which may effects revenue shortfall, among them the price and offtake risks, which may be in form of lower offtake than desired; power prices below forecasts level; changes in fuel supply price, transportation cost and labor cost.
- **Operating risks,**. which means, despite completion of the construction, originally planned the project does not operate, due to the lack of competent labor force, of spare parts, or general absence of routine maintenance and so on. One way to minimize the operating risk from breakdown of the plant is to provide for special completion test, so that the plant meets the specification for which it was designed. An experienced operator to run the plant is also essential, the duties of the operator will be set out in the O&M-Agreement (Operation and Maintenance Agreement).

In Appendix 3, a list of risks and possible solutions is summerized.

In a HPP-scheme, there are a lot of risks additionally to the above mentioned risks, e.g.

- long realization period
- high capital investment required
- sites cannot be located according to choice
- need for effective and efficient transmission network
- land use rights and relocation of local inhabitants
- high environmental sensitivity
- variability of hydrology and uncertainty about energy output
- wide range of technical complexity due to the need of high technical efficiency leads to technical risk of operation and maintaining

The long realization period required for HPP projects means on the one hand, that the HPP project will combine the full range of risks, and on the other hand, that the project company will need a long franchise period for the investment pay-back and for the achievement of an acceptable return. The low cost of oil and gas and the high investment required, make large HPP less attractive. But as you can see later in clause 8, if the parties make the long-term plan and obtain parallel co-financing through a numbers of commercial bank, as it was done at the Birecik project, they can also be successful with BOT schemes in Hydro Power Project.

6 THE VIEWPOINT OF CONSULTANTS AND ENGINEERS IN A BOT-SCHEME

Allocating risk and creating of financial structure take considerable time and planning. It is important for both public and private participants, to have appropriate financial and technical consultants.

Take my company as an example, Verbundplan was founded in 1959 as a subsidiary of Austrian largest utility - the „Verbund". Nowadays, Verbundplan consists of 6 special engineering and consulting companies and has about 500 engineers, economists and other specialist in 25 different fields. This large and experienced group provides a flexible capability in all major engineering disciplines and project management. In the meantime, Verbundplan has involved in the Birecik Project in Turkey, and is responsible for the detail design and the supervision on site during construction period, and is also assigned to the operation of the plant in the operation phase.

What is the role of an Engineering Company, like Verbundplan in a BOT-Project?

Verbundplan can offer:

- **Services for Owners and Investors as Owner's Engineer,** because the selection of projects, which is on the high level of feasibility and profitability, is a critical decision for the Sponsor or the Sponsor Group.
- **Services for Banks as Independent Technical and/or Environmental Adviser,** because banks are faced with crucial decisions whether or not to support an BOT-Scheme. In this evaluation process, an Engineering company is able to provide a full service to assist in negotiation with the various parties and remove or mitigate risk during construction and operation period
- **Services for Governments and Utilities as Technical and/or Economic Advisor,** because one of the key issues from the government's or utility's point of view is the definition and implementation of a comprehensive pre-qualification and tendering procedure and methodology
- **Services for the constructor as Designer, Site Supervisor and Coordinator,** because in such a complex project it is a mitigation of risk to have experienced specialists working at the project.
- **Services for Operator as Controller and Trainer**

The disadvantage of BOT-Schemes for Engineering Companies is, that a successful conclusion of a project requires initial investment. The Engineering Company starts their works on the project in an early stage, before contracts were signed, that means for the developer, he has to bear the investment cost as well as the risks associated with developing the project. Normally, the concept development of a HPP-Scheme might need at least two years of work and these costs have to be compensated by the other parties of the project.

7 A CASE STUDY OF THE HPP BIRECIK PROJECT IN TURKEY

The Birecik - Hydro Power Plant, located on the Euphrates River in Southeast Turkey, about 30 km north of the Syrian border, belonging to a number of dam projects on the Euphrates River of Turkish Government for irrigation and power generation purposes.

Technical Date:

Birecik dam is more than 2,5 km long and consists of earth embankment dams on the left and right banks of the Euphrates River, as well as a concrete gravity dam in between. The dam will have a maximum height of 62,5m. Six Francis turbines with 112 MW each, with a total capacity of 672 MW, will be installed in the powerhouse. An annual production of electricity of about 2500 GWh is expected. The whole facility will be ready for operation within 5,5 years,

Project Participants and Project Structures:

The Birecik project is the first major project in Turkey financed through the BOT model. Like any other BOT projects, it takes a long lead times and construction periods. About 11 years ago, the first feasibility study was carried out by interested parties, and till November 1995 the implementation contract was signed with Turkish Government. The total construction period will take 5,5 years and after an operation period of 15 years, the facility will be transferred to the Turkish Government.

To manage the overall controlling and monitoring effectively, an independent project company- **Birecik A.S.** was founded and awarded the contract for the construction, financing and operation of the dam and the power plant (see 4th). All of the participants in the project are represented in this company. They are:

Birecik A. S. consists of	
Design & Planning	Verbundplan GmbH (Austria)
Civil Works	Philipp Holzmann (Germany) GAMA A.S. (Turkey) Strabag AG (Austria)
Turbines	Sulzer Hydro GmbH (Germany) GEC S.A. (France)
Generator	GEC S.A. (Belgium)
Electrical Equipment	CEGELEC S.A.(France) CEGELEC S.A.(Belgium) GAMA A.S. (Turkey)

the Verbundplan GmbH has been involved in this project for many years. In the meantime, it functions as general project manager in the project company and provide full support to private investor in terms of their technical. environmental and contractual concerns. As an important company in the construction consortium, Verbundplan takes responsibilities not only for design and plan, but also other engineering and coordinating works.

The contractual relationship between the Project Consortium and other parties leads to a network of interrelated contracts. There are 54 separate documents in Birecik project, which took nine years to negotiate. An army of lawyers, have been

involved in creating a legal framework to guides investment by foreign banks and companies

BOT financing

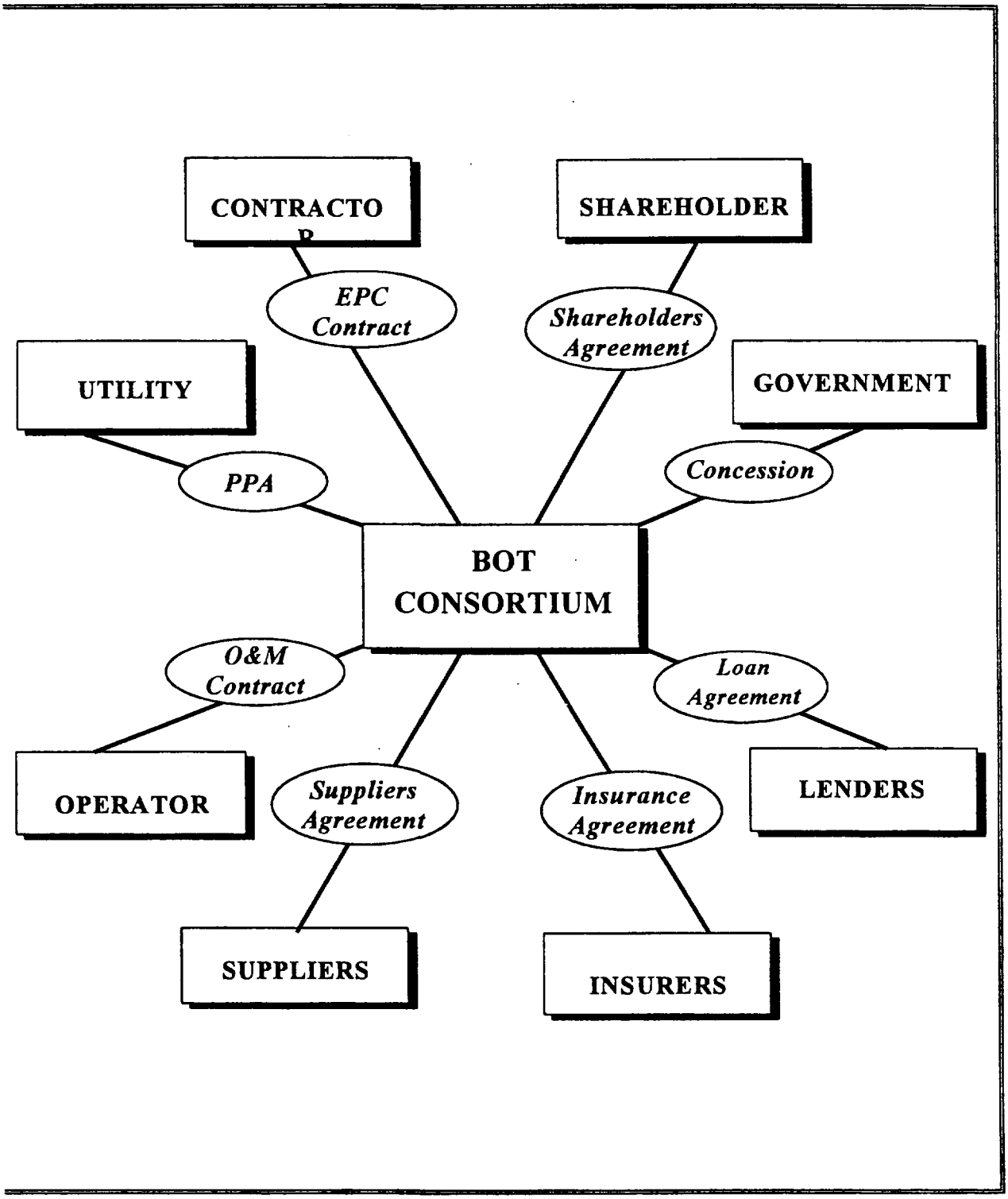
With a total investment of about 2,3 billion DM, it ranges to the largest single financed package arranged for a project in Turkey. The Birecik project is financed with 15% of equity, 61% of Export Credit, 21% of Commercial loan of entirely Turkish debt and 3% of operating revenues during start-up. The Export Credit tranches are guaranteed by Hermes of Germany, OeKB of Austria, Ducroire of Belgium and COFACE of France. The total debt, arranged by a syndicate of about 44 banks out of ten countries, are a packages of Export Credit and commercial Turkish debt at a ration of 3:1, which made this project attractive to commercial banks because of the risk diversification among many lenders (see Appendix 5).

8 CONCLUSIONS

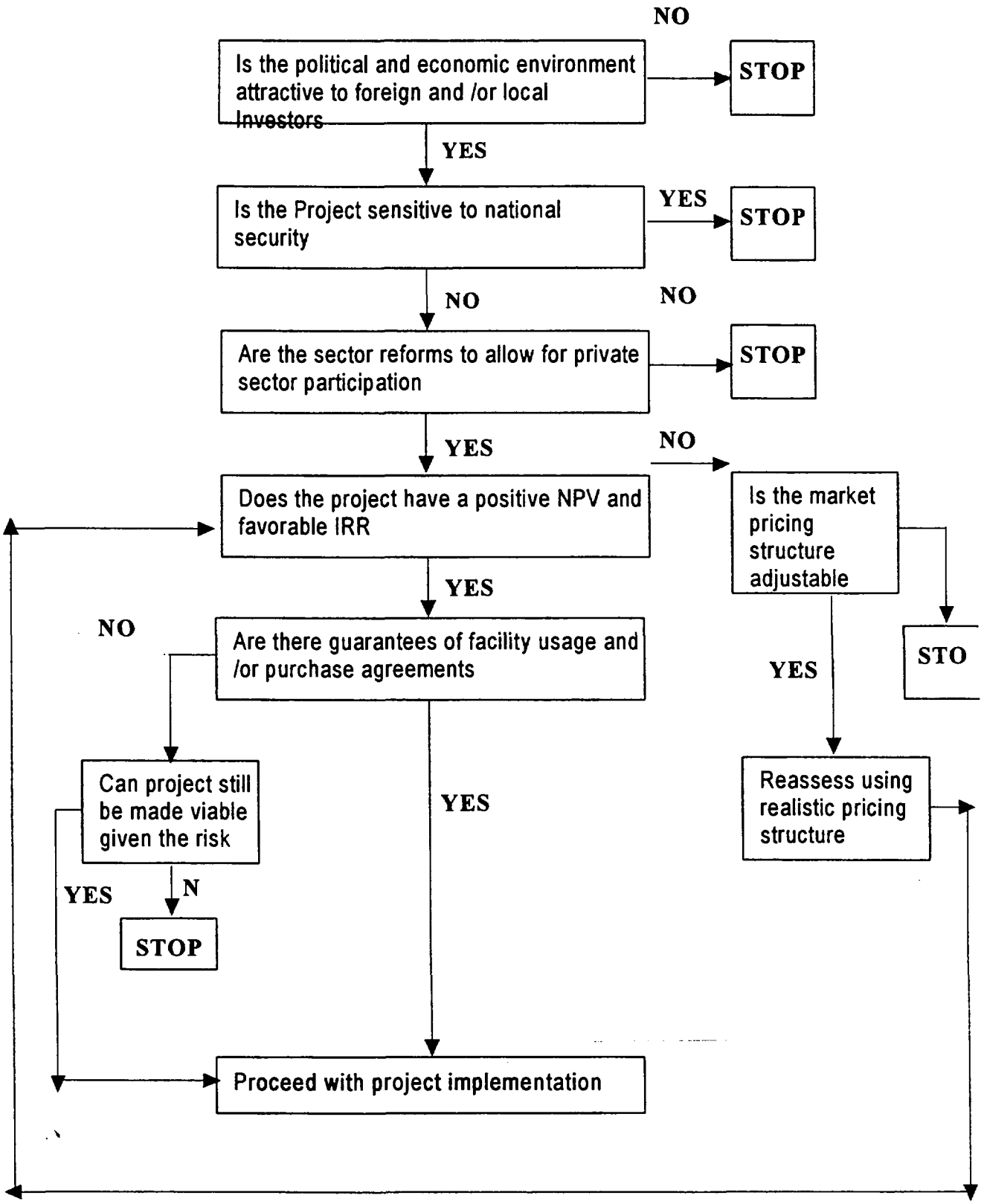
Knowing how difficult and risky it can sometimes be for private participation in power project by means of BOT scheme, particularly in developing countries, and believing there is still chance for the successful project implementation like the Birecik Project. I sincerely hope you will be encouraged to continue your efforts to realize these BOT Hydro Power Project.

Hydro Power development provides not only the best way to produce electricity, it can also solve problems in different fields, such as navigation problems in case of run-of-the river plants, ground water management systems and flood control etc. This makes HPP projects not cheaper, but hydro energy is a clean and renewable energy and the hydro electric potential worldwide will play a major role to meet the increased demand in the future.

Appendix 1. BOT Structure



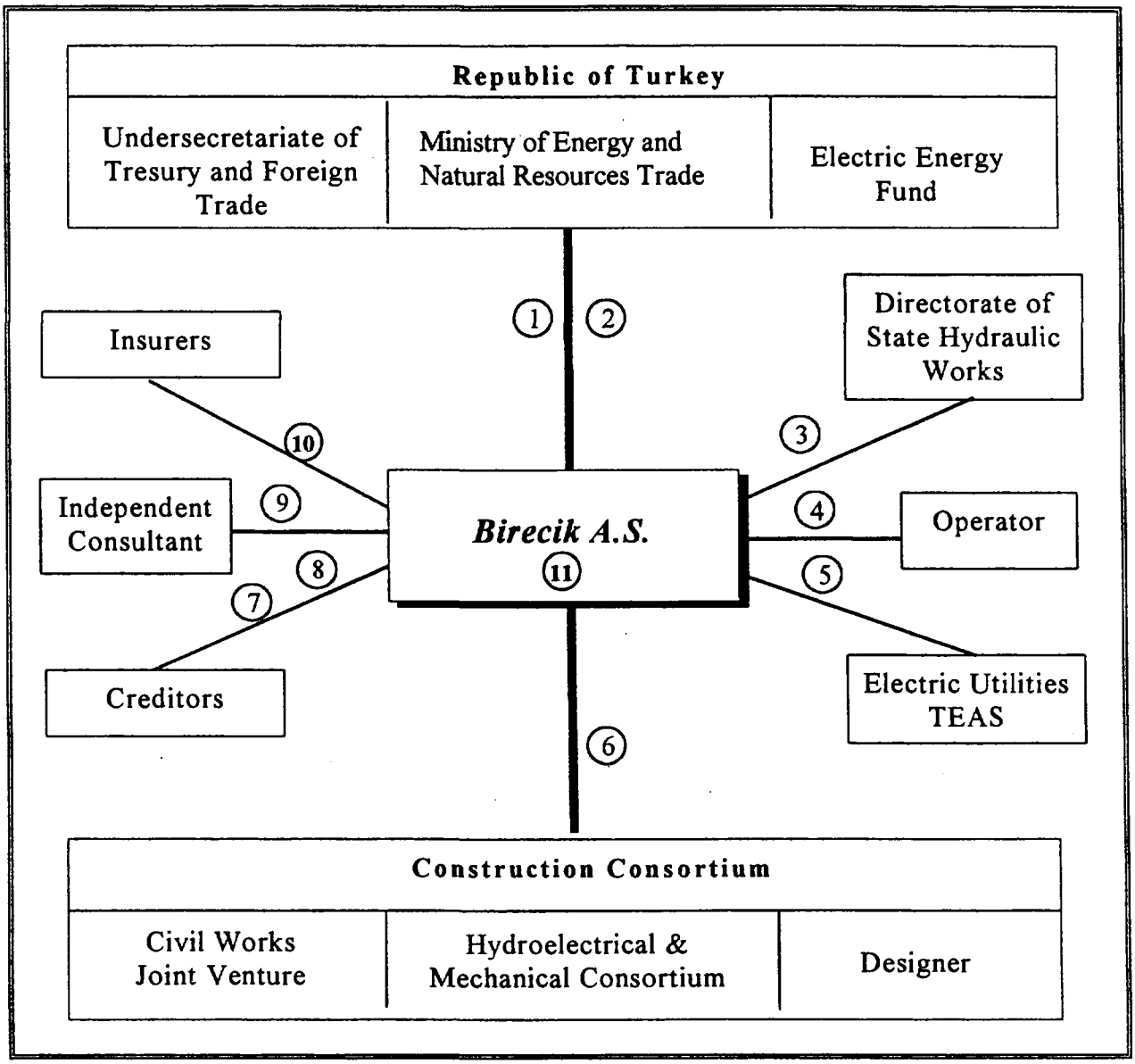
Appendix 2. Project Selection Flow Chart for BOT - Schemes



Appendix 3. List of Risk and Possible Solutions

RISK	POSSIBLE SOLUTIONS
Political risk	– government undertakings by the means of guarantee operations – involvement of government or strong local sponsors – seeking for parallel commercial co-financing to spread the risk – political risk insurance through private insurer
Construction risk	– feasibility study – experienced contractor – liquidated damages for time overruns
Economic risk	– economic risk insurance through guarantee operation of government – additional subordinated loans or equity from sponsors – control over expenditure and revenues of project
Currency risk	– matching the currency of the loan to the currency of the revenues – government undertakings as to availability of foreign exchange – interest rate and currency swap and hedging to prevents the exchange rate fluctuations
Revenue risk	– take or pay contracts – throughput agreements and production payments – mechanism for increase of future offtake, e.g. marketing strategies
Operating risk	– completion test, e.g. trial runs, appreciate warranty period granted by equipment suppliers – planned and routine maintenance – training of local staff for efficient operation and maintenance

Appendix 4. Birecik Project Structure



1. Government Guarantee
2. Fund Agreement
3. Water Supply Agreement
4. O & M Contract
5. Power Purchase Agreement
6. Construction Agreement
7. Loan Agreement
8. Escrow Agreement
9. Consulting Agreement
10. Insurance Contract
11. Shareholders Agreement

Appendix 5. Financing Structure of Birecik Project