COMPARATIVE STUDY OF BOT PROJECTS

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ABSTRACT: When the concept build-operate-transfer or BOT was first introduced in Turkey as part of its privatization program, it immediately captured the interest of other developing countries. They saw BOT as a method to finance the construction of major infrastructure projects without the need for direct sovereign guarantee on the loans. Recent successes by the project sponsors in raising funds for the Channel Tunnel and Sydney Harbour tunnel show that the concept is viable even in large projects. The winning bids in six BOT projects illustrated that government incentives were vital to attract financing. For BOT projects to be successfully implemented, the project sponsors must make sure that the risks are properly allocated and that each participant has sufficient contractual incentives and securities to be committed to the projects. Each of the parties involved must be connected by appropriate contracts and agreements with the project company acting at the hub of the security package. This will foster understanding and cooperation among the parties throughout the concession period.

INTRODUCTION

The concept Build-Operate-Transfer (BOT) can be defined as a major start-up business for which private organizations undertake to build and operate a project that would normally be undertaken by the government. They then return the ownership to the government after a fixed concession period (Neil 1988). Lenders are expected to look to the revenues generated from the completed project as the main source of security for repaying the debts. This financing model was first coined by the Turkish Prime Minister Turgut Ozal in 1984 as part of the government's effort to raise off-balance-sheet financing for its infrastructure and industrial projects (Bueker 1988). Since then, it has become the most prominent innovation in international project financing, especially with the recent success of Eurotunnel in raising $1.5 billion equity for the Channel Tunnel project.

The structures and features of six different BOT projects were studied—three in developed countries and three in developing countries. This paper compares and contrasts the winning bids in terms of financing, responsibilities, and undertakings proposed by the project sponsors. It provides insight into how the financing, technical, and political risks were allocated to the different parties involved. It includes the guarantees and incentives either provided by or negotiated with the governments. As the BOT projects were structured without any direct sovereign guarantee on the loans and without any recourse to the government, these indirect governmental supports proved to be vital in attracting the finance.

The projects (see Table 1) are Australia's $550,000,000 Sydney Harbour tunnel, the United Kingdoms $310,000,000 Dartford bridge, United King-

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Note. Discussion open until June 1, 1990. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on February 27, 1989. This paper is part of the ***Journal of Management in Engineering***, Vol. 6, No. 1, January, 1990. ©ASCE, ISSN 0742-597X/90/0001-0107/$1.00 + $.15 per page. Paper No. 24215.

TABLE 1. Comparative Features of BOT Projects

Feature (1)	Developed Nation			Developing Nation		
	Australia (2)	U.K. (3)	U.K./France (4)	China (5)	Malaysia (6)	Thailand (7)
Project	Sydney Harbour Tunnel	Darford Bridge	Channel Tunnel	Shajio Power Plant	North-South Expressway	Bangkok Second Stage Expressway
Cost	$550,000,000	$310,000,000	$9.2 billion	$517,000,000	$1.8 billion	$880,000,000
Concession period	30 yr[a] (1992–2022)	20 yr maximum (1988–2008)	55 yr (1987–2042)	10 yr (1987–1997)	30 yr (1988–2018)	30 yr (1988–2018)
Equity (sponsors)	$11,000,000	Nominal ($1,800)	$80,000,000	$17,000,000	$9,000,000	$170,000,000 (Total equity)
Equity (shareholders)	$18,000,000	0	$1.72 billion	0	$180,000,000	(See above)
Equity: debt	5:95	0:100	20:80	3:97	10:90	20:80
Rate of return before tax	6% inflation-indexed	N/A	10–20%	N/A	12–17%	10–20%

[a]30-yr concession starts after project completion.

dom/France's $9.2 billion Channel Tunnel, China's $517,000,000 Shajiao power plant in Guandong province, Malaysia's $1.8 billion North-South expressway, and Thailand's $880,000,000 Bangkok Second Stage expressway. These projects are the first to be privately financed under BOT schemes and are currently either under construction or already in operation.

Description of Projects

The Sydney Harbour tunnel project was won by the Sydney Harbour Tunnel Company, which is a joint venture by two construction companies, Australia's Transfield and Japan's Kumagai Gumi. The 30-year concession agreement was signed in 1986, and the project is due for completion in 1992. The tunnel will be 2.3 km long and will link Sydney to the North Shore by a submerged section.

The Dartford bridge will be the third River Thames crossing at Dartford, joining the London M25 orbital motorway. The project company is a consortium composed of several banks and Britain's Trafalgar House group. Under the concession agreement signed in 1988, the cable-stayed bridge will be constructed by Trafalgar's subsidiaries.

The 50-km Channel Tunnel comprises two 7.3-m diameter rail tunnels and a 4.5-m diameter service tunnel linking Great Britain and France. The project company, Eurotunnel, consists of Britain's Channel Tunnel group, a consortium of British banks and contractors, and France's France-Manche, a consortium of French banks and contractors. The same contractors are currently constructing the tunnel, which is scheduled to be completed by 1995. The concession agreement was signed in 1987 (Neil 1988).

The agreements for the 2 × 350-MW coal-fired power station at Shajiao, China, were signed in 1984. It was fully tested, commissioned, and in full commercial operation within a period of 33 months. According to the project

TABLE 2. Comparison of Government Incentives

Government guarantees/incentives (1)	Sydney Harbour Tunnel (2)	Dartford Bridge (3)	Channel Tunnel (4)	Shajiao Power Plant (5)	Malaysian Expressway (6)	Bangkok Expressway (7)
Support loans	Yes	No	No	No	Yes	No
Minimum operating income	Yes	No	No	Yes	Yes	No
Concession to operating existing facility	Yes	Yes	No	No	Yes	Yes (Tolls shared)
Commercial freedom	No	No	Yes	No	No	Yes (Partial)
Foreign exchange guarantee	No	No	No	Yes	Yes	No
Interest rate guarantee	No	No	No	No	Yes	No
"No second facility" guarantee	No	No	Yes	No	No	No

sponsor. Hopewell Holdings of Hong Kong, the plant has been operating profitably since 1987 through the sale of electricity to the Chinese Electricity Purchasing Authority (Lum 1988).

The Malaysian toll road, which is scheduled for completion in 1995, will form part of the 800-km North-South expressway from the Thai border to Singapore. The project company, United Engineers (Malaysia), obtained the concession in 1988 and has formed a new company called PLUS to finance, design, construct, and operate the expressway.

The concession for the 38-km Second Stage Bangkok expressway was signed in 1988. It comprises two routes and connects to the existing First Stage expressway to make a continuous ring of expressways in Central Bangkok. It will be constructed by Bangkok Expressway, a consortium of foreign and Thai contractors (Attajarusit 1988).

GOVERNMENT GUARANTEES

The guarantees and incentives provided by the governments are compared in Table 2 and described in the following. Although the governments did not guarantee the loans, they provided other forms of guarantees to project the sponsors and lenders from political and financial risks during the concession period. Because of the magnitude and complexity of BOT schemes, these indirect guarantees were necessary to ensure the right political and commercial environments in which to advance the projects.

Concession Period

The concession periods given by the governments range from 10–55 years. The Chinese power plant project has the shortest concession period, ten years, for the project sponsors to recoup their investment. The period excludes the construction time.

In contrast, Eurotunnel negotiated the longest concession period, 55 years, from the British and French governments. The concession, however, included the construction period, which is expected to be seven years. Any prolonged delay in the construction work will thus reduce the operating period and will directly affect the project revenues and debt servicing. This may put the company at risk, as the banks can exercise their rights to take charge of Eurotunnel and sell its assets if their targets are not met.

For the Dartford project, the project company was given a maximum concession period of 20 years. The ownership of the project reverts to the British government either at the end of the period or when all accumulated debt has been repaid, whichever is earlier.

Support Loans

Out of the six projects, only the Sydney tunnel and the Malaysian expressway received support loans from the governments. For the Malaysian project, the government allocated $235,000,000 (about 13% of the total project cost) in start-up finance toward the construction costs. The loan was payable over 25 years, including a 15-year grace period and a fixed interest rate of 8% per annum.

For the Sydney tunnel, the government even provided an interest-free loan of $125,000,000 (about 23% of total project costs) to cover the preliminary construction costs of the tunnel. The loan was to be repaid over 30 years.

Instead of providing loans, the Chinese government assisted in arranging an "emergency loan facility" for the sponsors to provide funds in the events of "force majeure."

Minimum Operating Income

Three projects received governmental guarantees of a minimum operating income. The Sydney Harbour Tunnel Company was guaranteed a minimum traffic toll income. The company is protected during the operational phase by provisions for unanticipated increases in electricity tariff, wages, and unforeseen cost rises beyond its control. However, the government limited the company's operating profit under a clawback clause in the contract.

In the Chinese project, the government agreed to purchase a minimum quantity of electricity on a "take-and-pay" basis and also agreed to pay Hopewell a fixed price per kilowatt-hour over the concession period.

The Malaysian government gave similar underwriting in that it would provide additional finance to PLUS in the event the latter had cash-flow problems due to a drop in traffic volume in the first 17 years of operation.

Concession to Operate Existing Facility

Out of the six BOT projects, four were initiated due to a growth in traffic and the inadequacy of the existing crossings or roads to meet the increasing demand. It is no coincidence, however, that these existing crossings or roads are also toll-operated, as the governments view the toll income as an im-

portant factor for the new projects to be successfully implemented under BOT schemes. Not surprisingly, the four project sponsors benefited from these existing toll revenues.

For the Sydney Harbour project, the company obtained the government's concession to operate the Sydney bridge as one of the incentives. To fund the repayment of the debts, toll fees on the bridge were increased from $0.25 to $1.25 per car, and the tunnel will carry the same toll.

The Dartford project company also obtained a similar concession to operate the existing tunnels, but the concession contains unusual features found only in this project. The project company proposed in its winning package to purchase the two existing profitable toll tunnels at a cost of $80,000,000. The company would then earn toll income from the start of the concession, thereby reducing the initial financing requirements and allowing immediate payments to be made to the institutional investors. The toll revenues are estimated to be $120 million during the construction period, about 40% of the total investment.

PLUS was also awarded the concession by the Malaysian government to operate 309 km of the existing expressway without having to purchase it. It has already started toll collections which amount to $1,600,000 per month.

The concession was different for the Bangkok Expressway. One of the government's conditions was that the toll revenues from the existing First Stage expressway would be shared between the government and the sponsors at an appropriate ratio. The existing toll revenue is $80,000 per day.

Commercial Freedom

Of the six projects, only Eurotunnel was given the guarantee of full commercial freedom, including the freedom to determine its tariffs. Partial agreement was given to the Bangkok Expressway to determine suitable toll rates and carry out any development within the right of way of the project, subject to appropriate conditions.

Foreign Exchange Guarantee

None of the companies for the three projects in the developed countries was given foreign exchange guarantees. The Sydney and Dartford projects were locally financed in debt and equity and thus carried no foreign exchange risk.

Hard Currency

Loans made available to projects in developing countries are usually in hard currency, and lenders usually expect repayments to be in the same currency. Governments must provide some form of foreign exchange guarantees to assure lenders that their loans will be paid in hard currency and to assure project sponsors that their earnings and dividends will be remitted freely.

Of the three projects in the developing countries, two were given the foreign exchange guarantee. As the Chinese power plant was 100% financed

in foreign currency, Hopewell negotiated for half of the electricity price to be paid in foreign currency. The other half is in the nonconvertible Chinese currency of Renminbi and is used to pay for Chinese coal. This effectively covers the foreign exchange risk.

The Malaysian government provided the operating company with the guarantee that it would make up the shortfall if the exchange rate drops by more than 15% against the rates at the time of drawdown of funds.

Interest Rate Guarantee

Only the Malaysian project company, PLUS, was given an interest rate guarantee by the government. If the interest rates increase by more than 20%, the sponsors will be reimbursed the difference in repayment cost.

"No Second Facility" Guarantee

One of the concession conditions requested by Eurotunnel that was granted by the government was that there be no second link across the Channel for 33 years. No such guarantee was given to the other projects.

It can be inferred from the preceding discussion and Table 2 that the project sponsors for the two British projects received less government guarantees than the others. This is due to the British government's requirement that the risks, be that construction, financing, or operating, must be fully borne by the private sector.

Undertakings by Project Sponsors

In return for government guarantees and incentives, the project sponsors are normally expected to undertake defined responsibilities to demonstrate their commitment throughout the construction and operating periods and to provide the basic security for the completion and operating risks that are within their control. The project sponsors' undertakings and responsibilities are compared in Table 3 and described in the following.

Construction Risk

The Sydney Harbour Tunnel Company assumed risks and responsibilities for cost and time overruns by offering a turnkey, lump sum construction contract and by providing a performance bond of $23,000,000. The government can draw the bonds if the company abandons the work or if there is more than an 18-month time overrun.

Turnkey Contract

The Dartford River Crossing gave similar agreement to build the bridge on a turnkey contract. It then subcontracted it to its subsidiaries on a firm price basis, but subject to increases relating to inflation and subsequent design changes. An important aspect of the construction contract was that almost all normally accepted risks were eliminated, including the unforeseen ground condition risk of placing bridge piers on the river bed, a risk not

TABLE 3. Project Sponsors—Undertakings and Responsibilities

Sponsors' undertakings (1)	Sydney Harbour Tunnel (Australia) (2)	Dartford River Crossing (U.K.) (3)	Eurotunnel (U.K./France) (4)	Hopewell (China) (5)	Plus (Malaysia) (6)	Bangkok Expressway (Thailand) (7)
Concession Company	Foreign/local contractors J.V.	Local contractors/ banks J.V.	Local contractors/ banks J.V.	Foreign investor	Foreign/local contractors J.V.	Foreign/ local contractors J.V.
Construction contract	Turnkey contract	Lump sum contracts	Lump sum and target cost contracts	Turnkey contract	Turnkey contract	Turnkey contract
Tolls	Agreed to limited toll increase	Agreed to limited toll increase	Rates fixed by Eurotunnel	Electricity price fixed by Hopewell	Agreed to limited toll increase	Tolls fixed by Bangkok Expressway
Project finance	Raised finance locally	Raised finance locally	Raised equity locally	Raised off-shore finance	To raise finance locally and offshore	To raise finance locally and offshore

normally taken by contractors. The project company also arranged $36,000,000 contingent bank loans in its package to meet overrun financing and working capital requirements.

Fixed Price and Target Cost Contracts

Eurotunnel also assumed full construction risks for the Channel Tunnel project and arranged a standby facility of $1.8 billion for cost overruns. Compared with the other project sponsors, however, it gave favorable construction contracts to its contractors, who are also the founder shareholders. Half of the $4.9 billion onshore construction work is on a fixed price contract, while the tunnel itself is on target cost basis. Under the target cost arrangement, Eurotunnel will pay the contractors actual costs plus a fixed fee of 12.36% of the target value. This fee is estimated to be $250,000,000. The contractors will receive half of all savings if the tunnels are completed below the target price. (If actual costs or schedule exceed the target, the contractors will have to pay a specified amount of liquidated damages to Eurotunnel.) In addition, the contracts are subject to price adjustments due to unforeseen ground conditions, variations to specifications, or inflation.

Fixed Price, Turnkey Contract

While the other sponsors are also experienced contractors, Hopewell did not have any experience in either power plant construction or BOT schemes. All it had was the trust of the Chinese government. Yet it undertook to build the plant under a fixed price, turnkey contract, thus establishing one-source responsibility. It then negotiated a turnkey contract with a consortium of equipment suppliers and contractors on fixed price, fixed schedule, and mutually agreed quality terms. With this arrangement, it effectively had the construction risk covered. Despite Hopewell's inexperience, it was able to complete the project six months ahead of schedule due to good engineering design, efficient site supervision, and a dedicated management team.

Both the Malaysian and Thai expressways will also be built by turnkey contractors, who in turn will contract out to subcontractors on a lump sum basis.

Toll Rates

The Sydney Harbour project sponsors accepted the limits imposed by the government in keeping the bridge and tunnel tolls to $1.25 per car at 1986 prices over the life of the project. This will increase $0.65 at a time to keep pace with inflation.

The tolls for the Dartford Crossings are also fixed in real terms for the whole period of the concession. However, they are linked to the retail price index. With growing traffic volumes and motorists accustomed to paying tolls on the crossing, the concession is therefore founded on a profitable base.

Eurotunnel, unlike the others, was given the freedom to set its tariffs. Half of its revenues are to be generated through its railway agreement with the state railways using the tunnel to link London with high-speed train networks now under development in Europe. Other revenues are to flow from shuttling commercial vehicles through the tunnels on high-speed trains.

One of the proposals contained in Hopewell's winning bid was that it would guarantee the Chinese government a fixed electricity price per kilowatt-hour for 10 years at a level that was equal to or lower than the price the Chinese were paying to import power from Hong Kong.

Toll rates on the Malaysian expressway are mutually agreed upon by the government and the sponsors at 5¢/km per car until 1992, when the rate rises to 7.5¢. The fee will rise again in 1995 to 10¢. After that, any further increases will be tied to the country's consumer price index.

The toll rate on the Bangkok Second Stage expressway was proposed by the project sponsors to be $1.20 per car. The rate is subject to revision every five years to meet inflation, but the increase will not be higher than $0.80 in the first 15 years of operation. The sponsors also proposed to share the toll revenues collected from both expressways with the government at the ratios of 60/40, 50/50, and 40/60 for each of the nine-year intervals of the concession period after construction.

Raising of Finance

There is a clear distinction between the financial instruments available in a developed, mature economy such as Great Britian, which has a major domestic investment base, including a stock market and a capital market, and an economy in a developing country such as Indonesia, which may not have these markets in sufficient depth.

In a developed country, a significant amount of equity can be raised for BOT projects from investors in the domestic market, either by means of floating the project company on the stock market or through the raising of

private investor funds (Syrett 1987). High returns are normally offered to compensate for the project risks and the long investment period.

In developing economies, however, the difficulty of privatizing projects under BOT schemes is compounded by the absence of this type of risk-taking capital market. This means that the amount of equity is limited for new projects, and, therefore, debt instruments will play a far more significant role. This is true for the six BOT projects studied. Out of the three projects in Australia and Great Britian, two were financed locally, both the equity and debt. The equity for the other project was raised locally, but the debt came from a consortium of international banks due to its magnitude. However, for the three projects in China, Malaysia and Thailand, a mixture of local and offshore funds must be used to finance the projects.

Tunnel Bonds

Loans and equity amounting to about $150,000,000 from the government and the sponsors will provide support for the construction costs of the Sydney tunnel. The central financing instrument, however, is the $279,000,000, 30-year tunnel bonds, which will provide the balance of funds for the capital expenditures (Fig. 1). This innovative, all-Australian financing reduced fund-raising costs, which would be quite substantial with the traditional debt-equity structures or offshore funding such as that associated with the Channel Tunnel. The bonds, placed privately with Australian institutional investors, contain some unusual features that proved to be attractive to the investors: (1) The extended maturity, longer than the usual maturity of 10 or 20 years in the Australian capital market; (2) repayments of principal with quarterly interest installments; and (3) yield of about 6%, indexed to inflation.

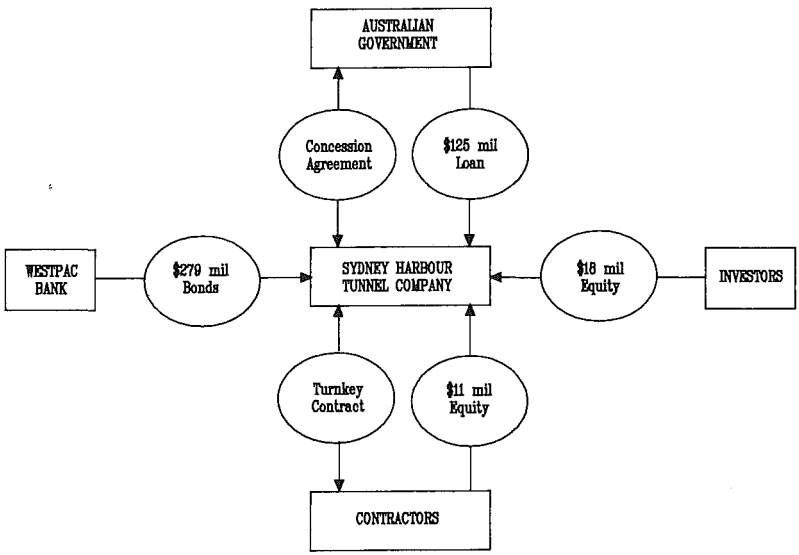

FIG. 1. Project Structure of Sydney Harbour Tunnel

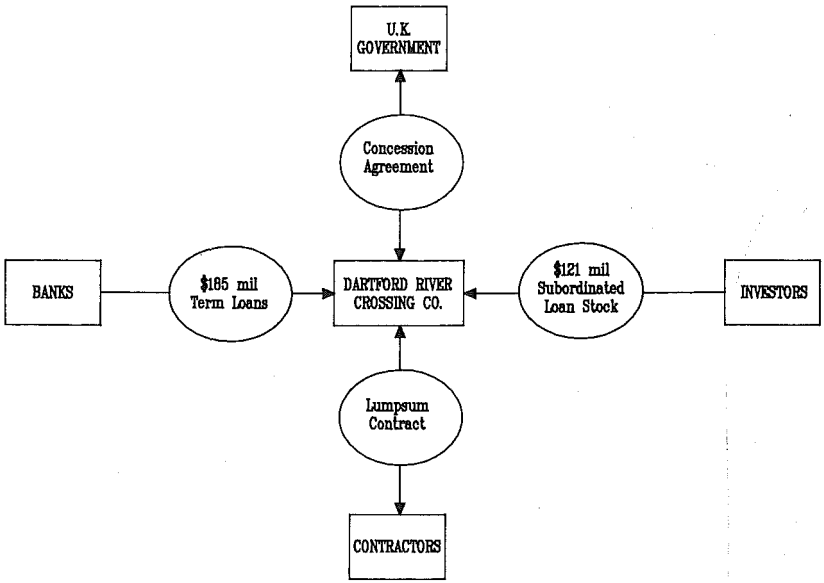

FIG. 2. Project Structure of Dartford Bridge

Subordinated Loan Stock and Syndicated Loan

The financing of the Dartford bridge was similar to the Sydney tunnel in that all the funds were raised locally. Other features were, however, totally different. The project company was capitalized with a purely nominal equity of $1,800. The project was financed by a $121,000,000 subordinated loan stock and a $185,000,000 syndicated bank loan. The equity:debt ratio is thus effectively 0:100. Fig. 2 shows the project structure, and Table 4 shows the sources of funds for the Dartford bridge. The key to the bid's success

TABLE 4. Sources of Funds for Dartford Bridge

Sources (1)	Amount ($) (2)	Remarks (3)
	(*a*) Equity	
Dartford River Crossing	1,800.00	Nominal equity
	(*b*) Debt (Loans)	
Private institutions	64,000,000	Subordinated loan stock at 16 years
Private institutions	57,000,000	Subordinated loan stock at 20 years
Commercial banks	185,000,000	Term loan
Commercial banks	18,000,000	Standby facility
Commercial banks	18,000,000	Working capital facility
Total	342,000,000	–

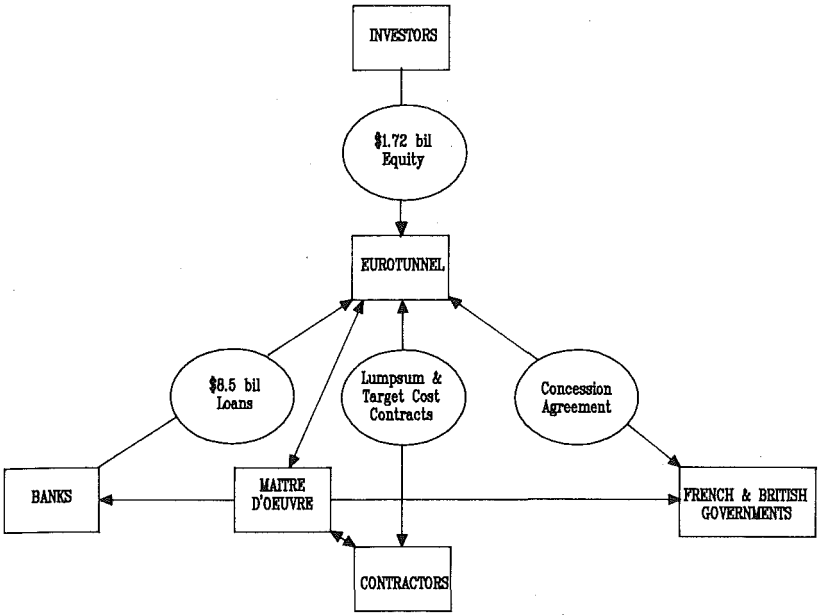

FIG. 3. Project Structure of Channel Tunnel

was that while the equity risk was essentially borne by the subordinated loan stock holders, there was no equity profit. The nominal equity attracts no dividends. Thus, the concession could revert to the government once sufficient surpluses have accrued to meet the cost of all debt. The loan stock holders were compensated by the fixed rate coupons, which were set at a relatively high margin.

Debt and Equity

In the Channel Tunnel project, Eurotunnel was required to adhere to three conditions by the governments:

1. There would be no government guarantees on the loans.

2. The project is to be 100% privately financed on a limited recourse basis whereby the sponsors are to be paid and the debts serviced by the revenues from the completed project.

3. The group must raise 20% in equity, i.e., $1.72 billion in cash.

The finance is to total $9.2 billion, making it one of the largest infrastructure projects to be privately financed to date. The $7.4 billion loan would be raised from 209 international banks, the biggest private sector syndication in history. The bulk of the equity was successfully raised in four issues in British pounds and French francs, with the first $80,000,000 being subscribed by the 14 original project contractors and banks. Fig. 3 shows the project structure, while Table 5 shows the sources of funds for the project.

TABLE 5. Sources of Funds for Channel Tunnel

Sources (1)	Amount ($) (2)	Remarks (3)
	(*a*) Equity	
Banks and contractors	80,000,000	Founder shareholders
Private institutions	370,000,000	First tranche (end 1986)
Public investors	800,000,000	Second tranche (end 1987)
Public investors	275,000,000	Third tranche (end 1988)
Public investors	275,000,000	Fourth tranche (end 1989)
	(*b*) Debt (Loans)	
Commercial banks	6,800,000,000	Main facility
Commercial banks	1,700,000,000	Standby facility
Total	10,300,000,000	—

Offshore Funds

Realizing that the Chinese government could not build power stations at Shajiao due to a lack of foreign exchange, Hopewell looked to raise the finance offshore. The $500,000,000 syndicated bank loan involved 46 in-

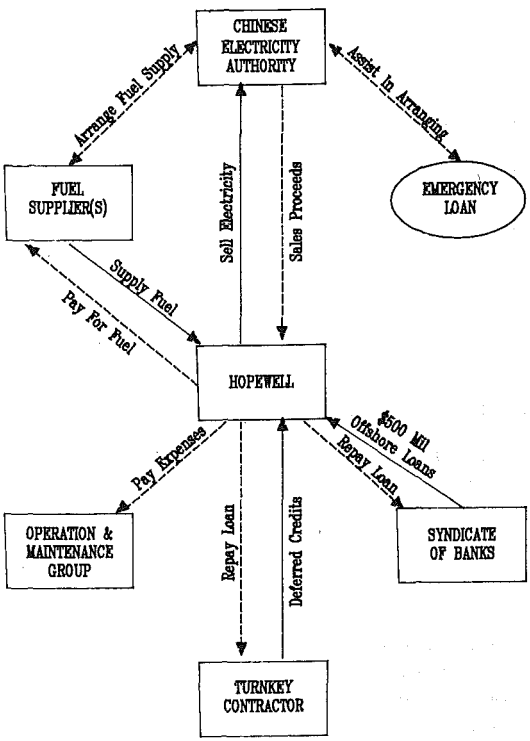

FIG. 4. Key Elements of BOT Arrangement in China's Power Plant Project

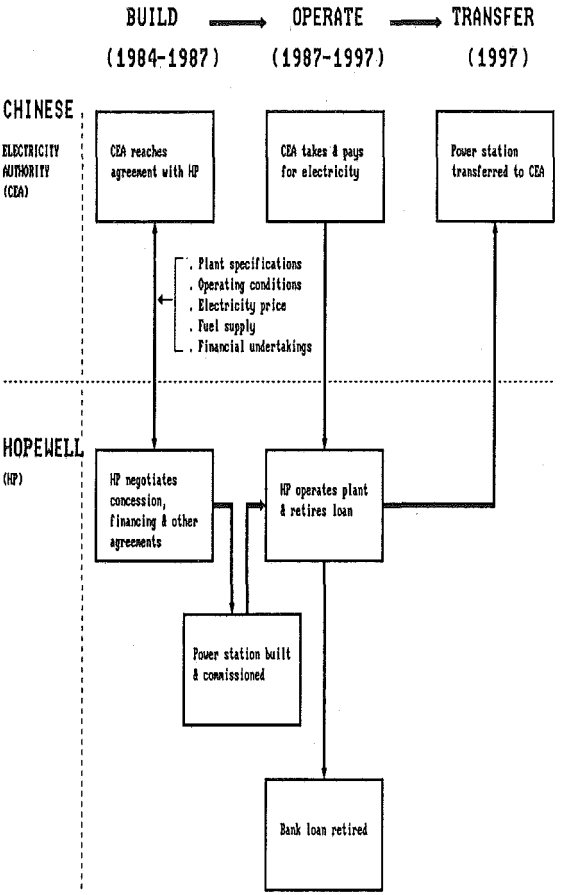

FIG. 5. Key Activities in China's BOT Project

ternational banks; they agreed to look only to the electricity sale proceeds for repayment. Hopewell also agreed to invest $17,000,000 equity in the project. In addition, it negotiated deferred credits from the construction consortium, allowing for repayments over a 7.5 year period. This eased the cash flows of the company. Fig. 4 shows the key elements of the BOT security package, and Fig. 5 shows the key activities involved during the building, operating, and transferring phases of the project.

Debt and Equity

The project finance for the Malaysian expressway will be arranged in the conventional debt and equity structure. The project company is responsible for raising $900,000,000 in offshore funds in Hong Kong, Singapore, and London on a limited recourse to the government. Unlike the Chinese project, this project received a $235,000,000 support loan from the government. To ease its cash flow, the sponsors proposed to pay its subcontractors, be they local or foreign, 87% of the contract values in cash and 13% in equity shares

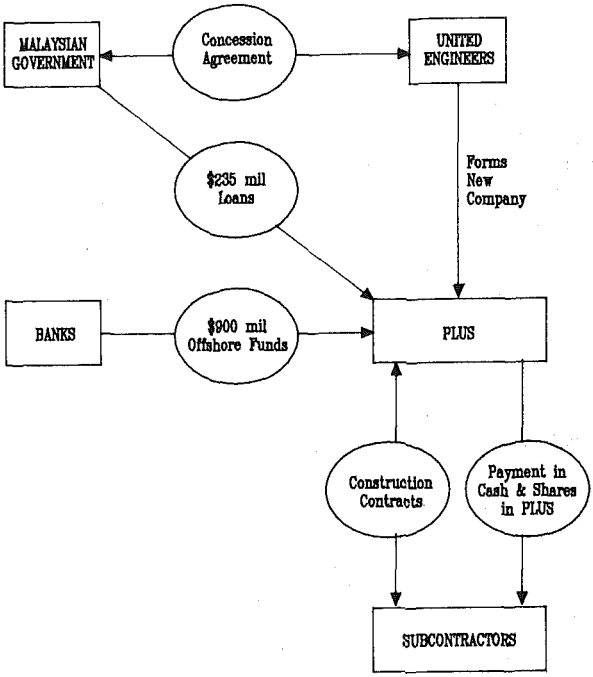

FIG. 6. Project Structure of Malaysia North-South Expressway

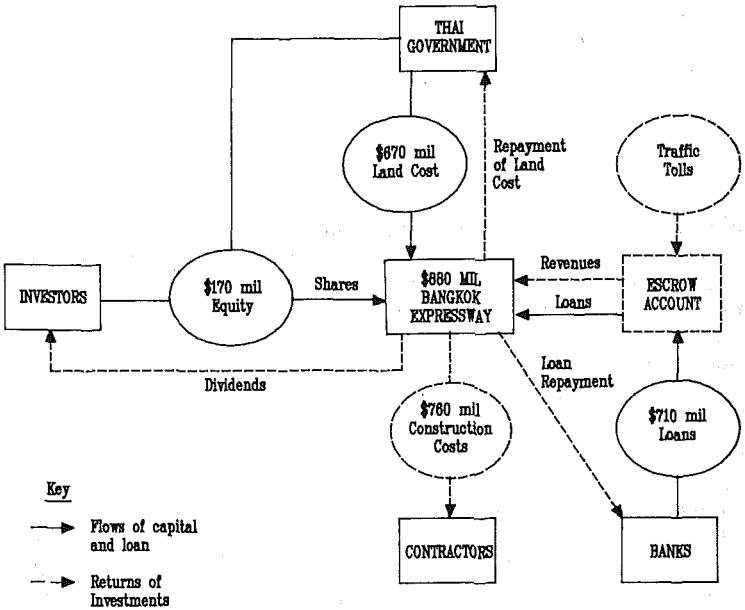

FIG. 7. Project Financing and Capital Flows for Bangkok Expressway

in the project company, which will be listed in the local stock exchange. The shares can only be sold at the end of the construction period, i.e., in seven years. This effectively passed the bulk of the equity risk to the subcontractors. The paid-up capital of the company will thus continue to grow as work proceeds on the expressway. The rate of return on the investments is expected to be at least 12%. Fig. 6 shows the financial plan and contractual relationships for this project.

Debt and Equity

The financial structure of the Bangkok Expressway project is based on an equity/debt ratio of 20/80. Though the Thai government stated that it will not give any financial subsidy, it agreed to participate in 49% of the equity, which will be about $80,000,000. Unlike the other projects, however, the project company must bear the land acquisition cost of $670,000,000. Advanced payment was made by the government, but the company must pay back the cost plus interest from the 15th to the 30th year of the concession period. This was the extra financial burden that the company had to evaluate in its cash flow projection. Fig. 7 shows the project financing and capital flows of this project.

Conclusion

The study showed that BOT projects have different characteristics and structures. The costs of the six projects ranged from $310,000,000 to $9.2 billion, and the concession periods ranged from 10–55 years. The project sponsors used different types of financial instruments and assumed different risks and responsibilities, while the governments provided their own indirect guarantees and incentives.

Even though there was no direct sovereign guarantee for any of them, these six projects, despite their differences, are now either in smooth operation or are under construction by experienced contractors. This proves that the BOT concept, which brings together the government, sponsors, lenders, investors, and contractors in one common interest, is viable even in large infrastructure projects. It is essential that government support be available, that the risks be properly allocated, and that each party be given meaningful contractual incentives and guarantees. Thee are vital for successful BOT project financing and will also ensure successful project completion and smooth operation.

Acknowledgments

The writer is grateful to James Neal of Morgan Grenfell (Singapore) for providing materials from the conference on Planning, Packaging, and Implementing BOT Projects and other useful articles on BOT projects.

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