BUILD-OPERATE-TRANSFER GEOTHERMAL POWER DEVELOPMENTS

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SUMMARY

Build–Operate–Transfer (BOT) is a mechanism for private investment for infrastructural projects. This paper presents an overview of the BOT concept from both the host country/utility and the developer's prospectives. It finally briefly discusses the PowerDesignBuild Group proposed development on Leyte in the Philippines.

1. INTRODUCTION

The major financial investment required to provide for the expansion of generating capacity to meet rapidly escalating demand, is presently constraining the economic development of many countries in the SE Asia region. Steps are therefore being taken to attract private capital through deregulation of the electric supply industry and the encouragement of private sector investment through Build-Operate-Transfer (BOT), Build–Own–Operate (BOO), or Build–Transfer (BT) developments.

The success or failure of BOT projects is largely influenced by national government attitudes, and there is no doubt that the private sector's interest and role in BOT–type infrastructure projects can be considerably enhanced if governments:

- adopt policies to establish a credible framework for the development of BOT projects, and firmly commit to policies which allow certain public services to be privately owned and operated;
- permit commercial incentive mechanisms, adopt a pragmatic stance on the risk–reward aspects, and are aware of the cost of failure if the projects are delayed or not successfully implemented; and
- convince sponsors and lenders of their commitments to conclude deals within a reasonable time by adhering to the BOT development process.

2. BUILD–OPERATE–TRANSFER CONCEPT

The Build–Operate–Transfer (BOT) mechanism provides a means for private enterprises to participate effectively in the formulation, construction, operation and maintenance of infrastructure facilities under private ownership and financing, and has a number of variations. All involve the establishment of a private sector company as a vehicle for ownership, financing, construction and operation of the project for a certain period called the "Cooperation Period". The costs associated with implementing the project, together with the required rate of return on the investment, are recouped by charges on the service provided throughout this period, and thereafter, ownership is usually transferred to the public sector.

There is a distinction between this type of development and that form of private power development commonly found in places such as the United States. In the BOT case the development is being undertaken as a commercial venture by a private sponsor on behalf of a host utility, as an alternative to the host utility undertaking the development itself. The development itself will often already appear in the host utilities power plan. This is in contrast to the situation where the developer is establishing a power generation facility in competition to an established source of power supply.

3. A BRIEF HISTORY OF BOT

The first successful BOT development, which received considerable publicity, was the 700 MW coal–fired project, Shajiao B, in Guangdong Province in the People's Republic of China, undertaken by Hopewell of Hong Kong using entirely commercial funding. The project was constructed in record time and is reportedly showing a handsome return to the developer, whilst providing the host utility with an important addition to their generation base which they may not otherwise have been able to have access to in the required timescale. Apparently, both parties are happy with the result and the project perhaps demonstrates some of the best reasons for using this method of development.

Hopewell are continuing to develop their BOT model, and they currently have proposals under consideration in the Philippines.

Another well publicised major development now under way is the Hab River project in Pakistan. In this case,

the funding has been, in part, from the World Bank, and thus the project has resulted in a somewhat different model for the development process. A major difference has been the time required to actually get the project under way.

4. BOT ADVANTAGES TO HOST GOVERNMENT/UTILITY

The advantages of the BOT concept from a national government's point of view are:

- It contributes to the expansion and improvement of much needed infrastructural facilities which otherwise would not have come on-stream and whose absence would constrain economic development.
- It attracts domestic and foreign private entrepreneurial energy and capital that would not be otherwise available for national development.
- Since no borrowing on the part of the Government or a Government-owned entity is involved, it shifts the debt burden and project risk from the government to the private sector.
- The BOT owner/operator handles contracts, arranges financing, and is responsible for operation and maintenance and guaranteed output of the plant for the duration of the Cooperation Period.
- The private sector is likely to provide sound management, speedy implementation and operational efficiency, including the adoption of innovative design features.
- It releases scarce Government sector manpower and financial resources to concentrate on other equally important infrastructure development projects.

5. BOT ADVANTAGES/DISADVANTAGES TO INVESTORS/DEVELOPER

Advantages

There are a number of reasons why an industry developer may be interested in undertaking a BOT project. Essentially, all of these reasons will have a basis in producing a commercial advantage to the developer, either directly to itself, or indirectly to an associate. Some of these can be summarised as follows:

- The company may consider that the only way a particular project in which it has an interest can take place is by the injection of private sector funds.
- By taking the lead in developing such a project, the company may be able to gain a commercially advantageous position over its competitors for the work.
- The company concerned may have interests in the upstream and/or downstream aspects of the project; for example, it may have access to fuel (coal, gas or geothermal) resources which it wishes to utilise over the project co-operation period (or longer term in the case of BOO), or it may be a major end user of power which wants to protect its source of supply.

Disadvantages

Balanced against these advantageous reasons for undertaking the development will be a number of disadvantages, such as:

- The sponsoring company will undoubtedly have to take an equity position in the project, resulting in its funds being locked up over an extended period. This may be acceptable to a company which is engaged primarily in investment (such as, perhaps, Hopewell or a banking concern), but may produce difficulties for those engaged primarily in such activities as manufacturing, construction or consulting.
- Associated with many countries where opportunities exist for BOT developments, there is a perceived risk involved in making a long-term investment. This risk may be somewhat discounted by those who are working on the ground in the country concerned, but the perception amongst the financial community that is being asked to provide funds will undoubtedly take precedence in decision making.
- The sponsoring company may well find itself having to extend its scope of work outside of its existing core business. For example, a company whose main business is plant manufacture may have to become involved in long-term plant operations. These extra activities may be handled by engaging a specialist partner or subcontractor, but the sponsor will have to develop at least some understanding of the issues involved in order to ensure that their own investment is protected.
- The front-end costs for developers putting together viable BOT projects are very high, reaching millions of US dollars by the time a sale of power contract has been established. This front-end investment, which must be carried by the developer, can only be made if there is a high degree of confidence that the proposal will be successful.

6. BOT DEVELOPMENT PROCESS

The development of a BOT project is a lengthy process and a number of factors have to be considered.

Proposal Development

The high proposal cost means that developers become cautious in responding to open solicitations for proposals. If they do respond, their response will initially be in the nature of a very tentative plan, and accurate evaluation of such proposals by the host government or utility will be very difficult. It will not be until the developer has received a strong indication of acceptability of the project that the commitment to undertake the investment

required to amplify the proposal and offer firm power selling prices will be made.

Because of the high costs involved, even unsolicited proposals require early negotiations during which the funding plan will only be indicative in nature. The project will have to develop in stages, with the host organisation being prepared to give interim or provisional commitments which the developer can take to the partners or investors in order to secure their increasing commitment to the project. It is unlikely that the finance market will give firm undertakings on a project which is only conjectural.

Bureaucratic Support

BOT developments to date have required a number of features in the regulatory environment for the project to get off to a successful start. The most important of these is a willingness by the host utility (which usually means the host Government) to entertain commercial involvement in the power sector. This is by no means universally acceptable, and some very dear and high level signals must be given to the industry before developers will become serious. Even then, the willingness to accept a commercial partner must extend not only through the upper echelons of the bureaucracy, but must also include the lower, working levels who will be involved in the day-to-day development and eventual implementation of the project.

Return on Investment

There has, in the past, been an occasional perception by the host organisation that the private sector developer is setting up to make an enormous profit at the expense of the consumer. The developer, and investment partners, will certainly require to make a commercial return on their investment, otherwise why would they bother to make the investment at all. The desire to avoid profiteering is probably behind most attempts to call competitive proposals for a development; however, it is unlikely that fully developed proposals will be obtained in response to such open invitations.

The utility which seeks to encourage BOT developments should really try to find another method of protecting its, and its consumers', interests. Possibly the best method is to determine its own cost of generation (preferably the long run marginal cost), and then to indicate what it is prepared to pay for power from another source - e.g. at no more than LRMC, or perhaps LRMC plus or minus a premium. It is then up to the developer to meet this cost in the most effective way possible to maximise the return within the established frame work. There may also be scope for some sharing of the benefits between the developer and the host utility, thus encouraging the most cost-effective approach to the development by all parties.

The actual size of return sought by the developer will depend largely on the cost of finance available to the project. In fact, it is the cost of finance that will have the greatest impact on the viability of the project, far more *so* than the direct capital *cost* of the actual plant. The cost of finance will depend, amongst other things, *on* the level of risk being carried within the project. The developer will seek to minimise this risk, not only to protect their own investment, but also to extend the availability of resources at a sensible price.

Risk Sharing

As in any successful contractual relationship, best results will be obtained by a sensible sharing of risks. There are probably three main groupings of risk being faced in a BOT project:

- Project risk - this is the risk that the project will be executed successfully, on time and to budget, such that power is being made available for sale at a truly economic price. Most of the technical features of the project will be covered under this heading. These risks are best covered by the developer.

- Financial risk - this is the risk that arises, for example, from fluctuations in currency exchange rates and variations in inflation rates in different countries. The risk to the developer can be minimised by seeking repayment in a currency mix which reflects the original investment. It is possible to arrange some insurance to cover this risk, and agencies such as the World Bank have taken a role in this aspect.

- Country risk - this is the political risk involved in a developer investing in another country. Assurances will be needed from the host utility and government regarding non-sequestration of assets, although these assurances may be difficult to support - how can the developer actually remove the assets once they are constructed as a major power station? This may require the host government to give undertakings regarding fund repatriation.

The host utility can make a useful contribution to the success of the project by working with the developer in addressing the above issues. It is in everyone's interest to minimise the *cost* of risk coverage as this cost will eventually be built into the price of power to the consumer.

Cooperation Period

For a BOT project, the developer must recover the investment as revenue over the cooperation period. The power purchaser will see an advantage in extending this period since the initial capital cost is then spread over a greater quantity of power. However, beyond a certain point, extending the cooperation period will have minimal effect in reducing the unit selling price of power, since interest charges predominate. Offsetting the advantage to the host utility of extending the cooperation period is the fact that, if the asset is transferred at a relatively early stage in the total economic life of the facility, the utility has the benefit of a facility from which it can obtain power at operating and maintenance costs only, without having to invest further capital costs.

Reductions in power selling price become very small for cooperation periods of more than twelve to fifteen years.

Role of International Aid Agencies

Many of the projects being considered for BOT development are very large, with finance requirements ranging from several hundred million to over one billion US dollars. When all is said and done, the reason that they are being considered for BOT is that they are so big and there is a shortage of "conventional" funding for them. This demand on resources will, in due course, tend to distort the commercial finance markets and, of course, those markets themselves are finite. For this reason alone there is a role for the international aid agencies to participate in BOT projects.

A stronger reason for their involvement is the confidence which their presence gives to other investors (this reflects back to the point made earlier about country risk). Particularly when government guarantees are not given, (and sometimes even when they are given), investors will be seeking assurances that they can recover their money. The presence of the major aid agencies as part of the structure of a project goes a long way towards conferring that assurance. However, the nature of aid agency participation in such projects must still be considered carefully. If they are a minority investor, do they have the right, for example, to demand that their normal tendering rules be applied? How do they actually participate in a private sector project - via a local government agency or directly?

Agency officials are acutely aware of these types of issue, and they are acknowledging that commercially funded projects may require different procedures. It remains to be seen how their institutions will react to the challenges facing them, as they seek to become participants in these types of developments.

7. LEYTE A BOT PROJECT

Introduction

The proposed Leyte A BOT development arises from opportunities created by the Philippines Government for private sector involvement in power generation facilities through the issue of Executive Order No. 215, dated 10 July 1987, which recognised that involvement of the private sector in the generation of electricity would help to meet the projected increase in demand by permitting the construction, ownership and operation of generation facilities by private persons and corporations.

The proposed project complies with the criteria laid down in Executive Order 215, and provides the potential for the National Power Corporation (NAPOCOR) and the Philippines Government to take full advantage of the benefits provided by the BOT concept, including *speedy* development of much needed power generation facilities and the release of scarce manpower and financial resources to concentrate on other equally important projects.

Technical Aspects

The project covered by the BOT proposal is sited on the Leyte A (Greater Tongonan) geothermal field, situated on the island of Leyte in the Visayas region of the Philippines. It nominally will consist of four 2 x 55 MW units at Tongonan IVI (Malitbog), Tongonan III (Mahanagdong) Tongonan IV (Upper Mahiao) and Alto Peak.

All power plant will be of similar design,-using 55 MW condensing turbines and forced draught cooling tower modules. Each power plant would be linked by 138 kV AC transmission lines and power will be delivered to the AC/DC converter station to be located near Ormoc. A centralised administration/ workshop complex will be located near one of the power plants, and a permanent residential village for operation and maintenance staff will be constructed.

Project Management

Overall implementation of the project is being managed in five phases.

- A 'promotion' phase, leading to the submission of the proposal to the Philippine Authorities by the project sponsors. This phase is now essentially complete.
- A 'negotiation' phase, leading to an Energy Sales Agreement,' implementation Agreement between the sponsors, the Philippines Government Authorities concerned, and NAPOCOR.
- A 'development' phase, covering development of the final firm offer by the sponsors, and of the various agreements and legal contracts necessary for financing and carrying out the project.
- An 'implementation' phase covering project financing, design, construction and commissioning.
- An 'operational' phase that commences with implementation of the energy sales agreement between the project development company and NAPOCOR, and finishes with the hand-over of the facilities to NAPOCOR at the end of the 'Cooperation Period'.

However, because of the short timescale available, some of these phases will be required to overlap.

Project Sponsors

The Joint Sponsors for the proposal are PowerDesignBuild Group Ltd and Mitsui & Co. of Japan.

PowerDesignBuild Group is a wholly-owned subsidiary of the Electricity Corporation of New Zealand Ltd, the national power utility. PowerDesignBuild has current, extensive experience in the development of geothermal power plants, and as a utility-backed organisation is able to ensure that projects undertaken are based on sound practical experience, and that operational support is available.

Mitsui ranks among the world's top trading companies. In addition to providing basic trading services, Mitsui is active in financing technology transfer, resource development and organisation of business ventures. Mitsui has a long-standing record of achievements in the

field of power projects, including an involvement with the coal-fired BOT project at Shajiao in the Peoples' Republic of China.

Project Development

PowerDesignBuild Group has been involved, since mid-1989, in discussions with NAPOCOR staff and Philippine Government authorities on the subject of unsolicited proposals for the private sector development of geothermal projects.

As a result of the initial reviews and project analysis carried out by PowerDesignBuild Group, and favourable feedback from NAPOCOR, it was considered that further development of the Tongonan Geothermal Resource was both technically and economically attractive on a BOT basis, and an initial expression of interest in developing the proposed Leyte geothermal power projects was forwarded to NAPOCOR in October 1989. A positive initial response was received inviting a formal proposal, and consequently the original proposal covering both power plant and HVDC transmission link was prepared and submitted for consideration in April 1990.

In June 1990, the World Bank appraised the project and recommended that only the power plant be considered for construction on a BOT basis. As a result of this recommendation, and in response to NAPOCOR's requirements for some changes of technical scope, a revised proposal covering the geothermal power plant only was submitted on 31 October 1990.

PowerDesignBuild Group has made a considerable commitment to the project since November 1989. We have utilised our experience in the geothermal field, as well as that of Electricorp Production (who are responsible for operating and maintaining New Zealand's geothermal power plants), to develop appropriate conceptual designs for this project.

On the commercial side, a considerable amount of work has been undertaken to identify potential sources of funding and equipment suppliers, and to develop appropriate financial and tariff models. PowerDesignBuild Group-Mitsui has consequently formally approached the Asian Development Bank and its subsidiary, the Asian Finance Investment Corporation, the World Bank's International Finance Corporation and commercial banks, and received positive expressions of interest and support from them.

In February 1991, the Philippines Board of Investments approved the project for registration under the Omnibus Investments Code and granted it Pioneer Status, subject to certain conditions which are now in the process of being satisfied.

Letter of Intent

In recognition of the considerable amount of work that the PowerDesignBuild Group-Mitsui joint venture have already put into this project, NAPOCOR issued a letter of intent confirming interest in the proposal submitted in April, and invited negotiations on contract provisions for project implementation. However, the joint venture was still required to respond to the advertisement placed by NAPOCOR in the press in August 1990 inviting submissions from all interested parties, and consequently on 31 October 1991 submitted the revised proposal for power plant only. NAPOCOR has now confirmed that the revised proposal will form a satisfactory basis for negotiation, and negotiations on the energy conversion agreement and other contractual matters associated with the project have commenced.

Commercial Aspects

The total development capital costs in 1994 dollars for the project, including escalation, interest and contingencies are estimated to be US$520 million.

The outline funding plan assumes a debt/equity ratio of 75:25 in accordance with Board of Investment requirements, and a portion of both the debt and the equity will be raised within the Philippines if possible. Other funding would come from international development finance organisations (ADB, IFC and AFIC), export credits and off-shore corporate and financial institutions.

The project development company, Leyte Geothermal Power Incorporation (LGPI), is in the process of being set up to finance, build and operate the power plant, with power being sold to NAPOCOR at the HVDC converter station to be built at Ormoc. A 15-year cooperation period is proposed, with ownership of the power plant being transferred to NAPOCOR at zero cost at the end of this period.

The project would be built on land owned by and provided free-of-charge by NAPOCOR, and the steam would also be provided free-of-charge, with NAPOCOR being charged an "energy conversion fee" for conversion of the energy in the steam to electricity. This is similar to the arrangements planned for NAPOCOR's other proposed BOT projects.

The selling price (energy conversion fee) for power at the Ormoc switchyard depends on the assumptions made as to inflation, interest charges and required rate of return to investors, but will be roughly in line with NAPOCOR's own avoided costs.

Risks associated with implementation and management of the project have been identified and analysed in the proposal. The principle of risk-sharing and risk-allocation is proposed, with the LGPI carrying responsibility for risks that reasonably fall within its control, and the Philippines Authorities bearing risk arising from external factors. Certain undertakings relating to the performance of Government sector entities and the transfer of capital would therefore need to be provided.

Project Timing

The development would formally commence in late 1991 with finalisation of the Energy Conversion and Implementation Agreements, although some initial design and investigation work would need to be carried out prior to that date. Full design for Leyte A would commence in 1992, leading to equipment procurement, site construction and commissioning over the period 1992 to

1996. Initial operation, resulting in the delivery of power to the Luzon grid, would commence in mid 1996, although this date is, of course, totally dependent upon satisfactory completion of the Leyte–Luzon HVDC transmission link.

The development risk is assessed to be low in view of the well researched and documented nature of the geothermal field.

The very tight timescale imposed on implementation of the proposal for the BOT development of the Leyte geothermal power projects and the Leyte–Luzon HVDC link, is driven by two key factors.

- The current shortfall of installed generating capacity in the Philippines, and its inhibiting effect on economic growth.
- The high priority that the projects have on NAPOCOR's own expansion programme and their plans to proceed in parallel with their investigation into project implementation via conventional funding.

The Sponsors are confident that all the technical requirements of the project can be met within the time allowed, but the project's eventual success will ultimately depend on many factors not directly within their control. It is expected the Philippines Authorities will adopt a pragmatic stance on the risk–reward aspects of the project, and will be fully aware of the cost to all parties if unnecessary delay occurs.

CONCLUSION

The growth of opportunities for development of power systems on a BOT basis presents many exciting challenges for developers, financiers, governments and utilities. There are a great many issues that will require resolution before any particular project can come on stream, and the resolution of these issues will require all parties involved in the project to adopt an open and innovative approach during negotiations. Many of the points discussed above will arise during the development of a complete project, and they must be addressed at as early a stage as possible. The resolution of each issue will undoubtedly be reflected in the large number of inter–connected contracts which have to be established between the various parties, leading up to the sale of power agreement. This series of contracts and agreements will be complex and it will require hard work to assemble them; however, as in any contractual arrangement, hard and careful, but fair, work at the beginning will ensure a smooth relationship in the future.

Developers need to understand the requirements and concerns of the host utility, but the host utility has to similarly understand what is motivating the developer and what he needs from his client in order to be able to marshall the very great resources that are available within the private sector to assist the public sector in meeting its national goals.