ESTABLISHING THE POWER PLANT CONTRACTS FOR THE LEYTE GEOTHERMAL POWER PROJECT

S P Javellana[1], J B Randle[2], F M Dolor[1], M A Medado[1], M V de Jesus[1]. P R Barnett[2]

[1]Philippine National Oil Company - Energy Development Corporation, Manila, Philippines
[2]Kingston Morrison Ltd, Auckland. New Zealand

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ABSTRACT

This paper describes the process whereby PNOC-EDC, as resource developer and host utility, established a number of Build, Operate, Transfer (BOT) contracts for the power plants involved in the Leyte Geothermal Power Project. It backgrounds the project itself and describes some of the issues involved in selecting the strategy for establishing the contracts The bidding, evaluation and award processes are outlined and a number of lessons are drawn from the experience gained, these lessons being of significance to both hosts and prospective private sector developers. It concludes that the establishment of the contracts has been well executed and emphasises that maintaining a very short timetable for bidding is a definite advantage.

1. BACKGROUND

Initial surface exploration of the Leyte geothermal resources commenced in 1972, and the Tongonan 1 geothermal project came on line in 1983, using the lower Mahiao and Sambaloran sectors of the Mahiao reservoir. That project was structured as a steamfield development by Philippine National Oil Company - Energy Development Corporation (PNOC-EDC) selling steam to a power station constructed, owned and operated by National Power Corporation (NAPOCOR). Drilling by PNOC-EDC continued in other sectors of the resource reservation in anticipation of further power plant developments being undertaken by NAPDCOR. However, this development did not eventuate for a number of years.

During the late 1980's the Leyte project again came under consideration, in conjunction with an HVDC transmission link to Luzon The project was included in the national energy plan, and a proposal was received by NAPOCOR to undertake the power plant development on a BOT basis. This proposal was integrated into an overall project being planned with the World Bank, which included the HVDC link to Luzon, now rated at 450 MW, plus another link of 200 MW to Cebu. Unfortunately, the private sector developer involved withdrew from the project at a very late stage, and it became apparent to PNOC-EDC that the development of the project as a whole was at risk.

At that stage, in consultation with NAPOCOR, PNOC-EDC decided to undertake itself the power development for Leyte-Cebu, comprising both steam field and power plants as an integrated development. A study was commissioned by PNOC-EDC to ommend a project structure and to prepare the bidding documentation to undertake the power plant development

2. DEVELOPMENT STRATEGY

Three key elements were identified as comprising the project. the energy resource, the plant required to convert the energy to electricity and the electricity market Traditional, independent development structured the relationship between these in a linear form, and in the Philippines, the conversion plant and the electricity market had both been the responsibility of NAPOCOR Figure 1 illustrates this concept

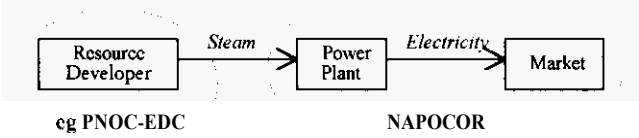

Figure 1 - Traditional Geothermal Development in the Philippine

For the agreed development at Leyte, the power plant component would be undertaken by PNOC-EDC. However, the capital investment required (initially estimated as being of the order of US$ 700 million in addition to the resource and steamfield developments) was too much to be undertaken on a self funded basis, and it was therefore decided to seek external participation by private sector power plant developerdoperators.

In the case of a private sector involvement in the power plant, the same linear structure is possible, with energy sales contracts linking the components. However, this involves the private sector contractor in establishing back-to-back energy sales wntracts with two government (or quasi-government) authorities and this was perceived as being less desirable from the contractor's perspective and hence less likely to attract prospective contractors. There are a number of possible alternatives to avoid this double contract interface for the private contractor, using both energy sales and energy conversion contracts for the power plant contractor.

Given the agreement already reached with NAPOCOR for PNOC-EDC to undertake the power plant development, the alternative shown in Figure 2 was seen to offer a number of important advantages, both commercially and from a resource development and management perspective.

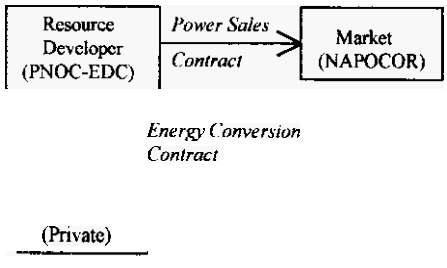

Figure 2 - Power Plant Operator Linked to Resource Developer

The Leyte resource, as shown in Figure 3, is a diverse resource comprising a number of production sectors largely controlled by surface topography, distributed over three discrete reservoirs

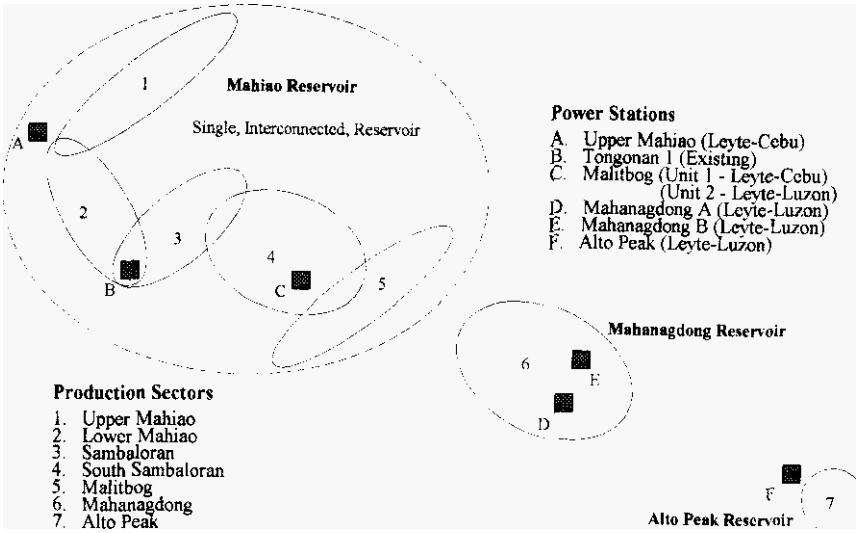

Figure 3 - Leyte Geothermal Reservoirs, Sectors and Power Stations

(Mahiao, Mahanagdong and Alto Peak). The existing Tongonan 1 power station is supplied from the Mahiao and Sambaloran sectors of the Mahiao resource, whilst the new developments are to be supplied from the Upper Mahiao, South Sambaloran and Malitbog sectors of the Mahiao reservoir and the Mahanagdong and Alto Peak reservoirs By taking the pivotal role in the development, PNOC-EDC is able to retain overall control of the development and will have future flexibility in controlling the relative draw downs from the different sectors, thus being able to balance reservoir development with commercial optimisation. A key consideration was the desire to closely control pressure drawdowns and reinjection which could otherwise seriously damage the overall performance of the resource PNOC-EDC, being in control of both reservoir development and generation is thus in the best position to control these risks.

The selected project structure permitted the project to be split into a number of sub-projects, whilst still permitting PNOC-EDC to retain overall control. As mentioned above, the **overall** development was to be undertaken in two stages to suit NAPOCOR's transmission system development. The first development, for approximately 200 MW to be directed to a new AC transmission link to Cebu (and hence to the rest of the Visayas grid), would comprise the Upper Mahiao and Malitbog Valley sector$ to be commissioned in mid 1996. The second stage, far approximately 440 MW to be transmitted via a DC link to Luzon, would comprise South Sambaloran, Mahanagdong and Alto Peak, to be commissioned in mid-1997. This second stage also contemplated additional generation from the existing Tongonan 1 power station, which is under utilised in feeding only the Leyte/Samar grid.

The splitting into sub-projects enabled competing contractors to bid for more readily fundable packages, permitted staggered timing of the sub-projects and also permitted on going competition between operators, desirable for PNOC-EDC to be assured of effective services in converting their energy to electricity. The project structure also permitted future modules to be added independently of the main power stations, a feature which has recently become valuable to PNOC-EDC in optimising the total output of the project by adding topping and bottoming cycle units at strategic locations throughout the project area.

3. CONTRACT FORMATS

A feature of the development of PNOC-EDC's strategy for obtaining private sector involvement in Leyte was debate on the nature of the private sector developer's role - would this be permanent or temporary and hence would the Build, Own, Operate (BOO) or Build, Operate, Transfer (BOT) model be more appropriate. PNOC-EDC made a conscious decision to follow a process of vertical integration of its role in the energy sector, by moving from being purely an energy resource company into electricity generation. Although it had no in-house generation experience at the time, it was clearly seen as part of an overall corporate strategy that the Leyte project provided an avenue for the company to obtain that experience and to become involved directly in power generation It was therefore decided that the role of the private sector developers would be temporary and to adopt the BOT model of contract.

The form of the development strategy favoured the use of energy conversion agreements (ECA) for the power stations. In the project formats shown in Figures 3(a) and 3(b), the private developer establishes a contract with another agency which for the sake of simplicity, is referred to here as the "host utility" (although the term usually applies to the power utility, ie NAPOCOR, in this case the private sector contracts are with PNOC-EDC who is therefore adopting the role of "host").

The main feature of an ECA is that the private sector developer is relieved of any risk associated with the energy source. In the case of a geothermal development, this is an attractive feature since the risks associated with geothermal resource exploration and management are relatively high and demand a different investment attitude (controlled capital expenditure at relatively high risk and with correspondingly high returns) from that normally associated with conventional power plant (large capital expenditure at low risk and with more modest returns). Splitting the risk allocation in this way was seen as a means of simplifying funding for the development since the private sector developer would not be mixing risk venture capital for drilling with the lower risk power station development

However, the use of an ECA does mean that the host (PNOC-EDC) essentially retains ownership of the associated energy and therefore places a very high premium on the efficient use and conversion of that energy to electricity. Monitoring of efficient performance is a feature of the contracts being established by PNOC-EDC, and this monitoring calls for on-line measurement of steam input and electricity output, plus continuous calculation of correction factors (for, eg, ambient conditions, power factor, steam pressure etc) in order to determine the cumulative theoretical steam consumption compared with the actual consumption over a billing period.

The project development strategy assumed that the power plants would be operated as base load generation on NAPOCOR's grid. This assumption was based on knowledge of the overall project economics, which indicate that the transmission links (AC to Cebu and especially the DC link to Luzon) should operate at high load factors in order to be economically viable and that geothermal power is a very competitive electricity source in the Philippines. With PNOC-EDC being responsible for the resource development, and hence the basic energy supply, it made sense to use capacity based contracts for the energy conversion. This was consistent with other BOT contracts then being established by NAPOCOR It was also

assumed at this stage that, for PNOC-EDC, the ECAs with the private sector power plant contractors and the Power Purchase Agreement (PPA) for electricity sale to NAPOCOR would be back-to-back, ie very similar in format. Subsequently, the PPA has deviated from the capacity contract format into an energy contract format, rather more similar to PNOC-EDC's steam sale contracts with NAPOCOR. This has introduced some complications for PNOC-EDC, but these are manageable.

It is also worth noting that the PPA with NAPOCOR is actually in the form of a BOO contract, as distinct to the BOT format used for the power stations. This is another indication of PNOC-EDC's strategy of making a long term commitment to power generation as part of its core business.

In general terms, the form of contract adopted by PNOC-EDC was based on contracts already proposed or in use in the Philippines, with inputs taken also from contract formats used elsewhere in South East Asia. Considerable caution was used (and should be used by developers) when comparing with contract formats used in, for example, the United States, where domestic legislation has a significant impact an the nature of the private independent power business. By using a format that is similar to other projects in the Philippines, it has been possible to obtain government approvals and support for the Leyte project contracts in a very short time - unfamiliar contractual terms would undoubtedly have delayed this process.

4. BIDDING PROCESS

BOT and similar contracts for private sector involvement in infrastructure projects within the Philippines are permitted under legislation (Republic Act 6957). The overall legislative framework is very attractive to investors, with special tax and other concessions available under the Omnibus Investment Code. The procedures for establishing the contracts are contained in Implementing Rules and Regulations.

Under the Circumstances of the failure of the previous private sector proposal to NAPOCOR, there was considerable concern regarding the timing of the power station part of the overall Leyte project. The power stations had to be commissioned in time to supply the transmission links to Cebu and Luzon, which links were being developed by NAPOCOR under World Bank funding. Taken in consideration with the expected time to design, manufacture and construct the power stations, this imposed a very tight timetable on PNOC-EDC in establishing the required contracts It was therefore considered that, although the competitive bidding process would be retained, it was necessary to accelerate the timetable laid down in the Implementing Rules, and a Presidential Approval for this was sought and granted under the then existing emergency provisions relating to power projects in the Philippines (this was at the time of extensive daily brown-outs throughout Manila, when very strenuous efforts were being made to bring power projects on line as soon as possible). The main feature of the accelerated timetable was that there was no separate issue of pre-qualification and bidding documents.

The initial development strategy developed for the project had assumed that there would be a considerable delay between implementing Leyte-Cebu and Leyte-Luzon. The selection of production sectors to include in each package was predicated on this assumption It became apparent later in the planning process that Leyte-Luzon would follow very shortly after Leyte-Cebu, and that the initial packaging (Upper Mahiao and Malitbog Unit 1 for Leyte-Cebu, Malitbog Units 2 and 3, Mahanagdong and Alto Peak for Leyte-Luzon) might be sub-optimal, however at that stage it was too late to reconfigure the packaging and bidding continued independently for the two parts of the project.

Similar bidding timetables were established for both the parts of the project, as shown in Table 1 The bid documents were issued immediately following a brief advertisement period. with bidders required to submit pre-qualification documents in parallel with their preparation of their main bids. The pre-qualification submissions were evaluated in time to advise prospective bidders of their qualification status prior to the pre-bid conference and site visit.

The bidding process was considered very successful for both phases, with valid bids received from a number of bidders In practise, not all pre-qualified bidders submitted independent bids, as many of them formed consortia fallowing the pre-bid conference. This was especially so of companies whose main business is general trading or plant manufacture.

Table 1 - Bidding Timetable

Activity	Leyte-Cebu	Leyte-Luzon
Bids First Advertised	12 Dec 92	5 Jan 93
Bid Documents Issued	15 Dec 92	26 Jan 93
Pre-Qual Submission	4 Jan 93	26 Feb 93
Notify Pre-Qual Status	8 Jan 93	9 Mar 93
Pre-Bid Conference	15/16 Jan 93	15/17 Mar 93
Bids Close - Open Technical Bid	15 Feb 93	26 Apr 93
Open Financial	1 Mar 93	12 May 93
Invitation to Negotiate	13 Apr 93	30 Jul 93
Contracts Signed	6 Sep 93	18 Sep 93
Contracts Effective	8 Apr 94	29 Jul 94
Commissioning	Apr/Jul 96	Apr/Jul 97

5. EVALUATION AND AWARD

The evaluation of the bids was remarkably straight forward. Technically, there were very few problems, although there were some non-compliances by bidders offering innovative technical solutions. The bid documents had purposely provided for various technologies by offering steam, brine and two phase fluid streams There were no offers to utilise two phase fluids, although one bidder did consistently propose plant to utilise the waste heat in the brine stream. The majority of the plant offered used conventional condensing steam turbine generators.

The economic evaluation was also straight forward, with initial results available within a few hours of opening the financial proposals. The evaluation concentrated on determining the overall net present value to PNOC-EDC of energy sales from the total project, taking into account both the resource development (wells and steamfield) and the power plant, and also capital investment, operating costs and energy conversion tariffs The analysis determined the overall levelised cost of electricity production, and a levelised return to PNOC-EDC per unit of electricity sold.

Some of the results of the analysis required further review, analysis and debate in order to ensure that the interpretation of the analysis was valid. Obviously. this process was most protracted for the Leyte-Cebu bid evaluations, which were the first such evaluations undertaken by PNOC-EDC.

Invitations to negotiate were initially issued to two bidders for components of the Leyte-Cebu bidding and negotiations commenced on the basis of a split award. In fact, the Leyte-Luzon evaluation process caught up with the Leyte-Cebu negotiations, which gave PNOC-EDC the opportunity to consider a combined award for the Malitbog power station. Negotiations were concluded to contract signing stage for Upper Mahiao and the combined Malitbog power station within about three months from issuing the invitations to negotiate. It is worth noting the extent to which both sides of the negotiating process gained experience, in that the actual negotiations for the Mahanagdong contract (which involved a bidder who had become involved in the late stages of the Upper Mahiao contract) were completed in only three days!

Alto Peak proved to be rather more problematical, mainly because the Leyte-Luzon bidding round had asked bidders to consider each sector independently. As a much smaller reservoir, somewhat remote from the rest of the project, bid prices were very high After discussions with bidders to ascertain the reason for the unfavourable

prices, the two technically qualified bidders (who had already been successful in bidding on other sectors) were invited to resubmit prices assuming that Alto Peak was to be operated as a satellite from their other plant and that PNOC-EDC would assume the civil works risk. Viable prices were received and an award made.

6. IMPLEMENTATION

The contracts as signed contained a number of important events to be completed in order to achieve effectivity. This included such commercial issues as establishment of full funding for the work, in particular the debt portion of the funding, and issue of various government guarantees and permits. Technical issues included resolution of interface conditions, which had been indicative only in the bid documentation.

The current status of the contracts is that. with the exception of Alto Peak, all contracts have achieved effectivity Steam field and power plant construction is under way at Upper Mahiao and Malitbog and is about to commence at Mahanagdong. PNOC-EDC has full confidence that the project overall will be completed and commissioned on time to meet the NAPOCOR programme for the two transmission links.

7. LESSONS LEARNED

A number of important lessons have been learned during the establishment of these contracts. Some of these are points that PNOC-EDC themselves are already applying to further power projects and some of them are issues that need to be noted by prospective private sector power plant contractors.

Initially there was some concern that the very short bidding period would be a problem. However. some very favourable comments were received from the bidders to the effect that by keeping this period short, their need to spend a lot of money at high risk was curtailed. Establishing a full BOT project is a very expensive process which may involve up to US$ 5 million. By keeping a very short bidding period and then negotiating with a single selected bidder, the risk exposure of this expenditure is minimised. There is of course a corollary to this in that the basis of the bid must be tentative - this requires flexibility by both sides in subsequently establishing the contract and implementing the project, and the bidder should include adequate margins for anything that he may have assumed incorrectly.

A speedy bidding process does, however. mean that the contract will be signed with a considerable number of issues, including full financing still to be resolved before it becomes effective. These require considerable time to resolve, and 90 days is generally insufficient time to do so. A minimum of 120 days is probably required, and possibly up to 180 days, although as the project develops, with increasing confidence on both sides, it may well be possible to waive a number of effectivity conditions.

Bidders, and subsequently contractors, must be aware that the host entities that they are dealing with are generally going to be government or quasi-government agencies, rather than private sector wmpanies. This means that the host is subject to considerable constraints when undertaking negotiations and especially when considering departures from the bid documentation or subsequent requests for changes. Such departures or changes could well involve a change in the ranking of bidders which would invalidate an award of contract. Even where a change may appear to be to everyone's benefit, and especially to the overall benefit of the project as a whole, government checks and balances may make it very difficult to agree The better a negotiator understands this, the better it will be able to assist the host in presenting a justified case for approval.

All parties have to recognise that establishing a BOT or BOO contract represents the *start* of a very long term relationship - much longer than normal construction contract relationships. This means that a rather different approach must be adopted by the parties, one of flexibility and, co-overation rather than confrontation. Both sides need to be solution onented, rather than looking for problems. It is probable that bidder consortia that are led by, or at least include, an operating company rather than a manufacturer or construction contractor will have a better understanding of the need for this longer term view when undertaking negotiations.

The procurement guidelines of the IBRD and ADB present a potential conflict to their participation in the private sector development of the power stations themselves. However, the involvement of such organisations as the World Bank somewhere in the project overall has a very beneficial effect in providing a level of confidence to both commercial investors and also the export credit agencies. It also eases access to better insurance terms for political risk coverage.

Equitable risk allocation is fundamental to the success of projects such as these. In the case of Leyte, PNOC-EDC is assuming all the resource and market risks, and political risk is largely wvered by government guarantees Private sector contractors must appreciate this and be prepared tc shoulder themselves the risks that they are best able to control, such as plant technology and completion. If the host utility faces large potential penalties for late completion of the project, the contractor should not be surprised to find these same penalties being passed through to himself for the power station

Several financing methods are available to private sector contractors, ranging from complete self financing (at least in the shon term) to more conventional debt raising and bond issues If any one method of raising finance has failed or not been used, it should not be assumed by anyone that the wntract has failed

Bidders should feel free to offer alternative technical and commercial schemes for wnsideration by the host. An experienced operator should be in a position to draw on his experience elsewhere and his knowledge of the technology to offer attractive alternatives that the host may not have considered However, such alternatives can present problems during evaluation, and complying proposals must be offered for evaluation, with the impact of the alternatives being clearly identified as changes (improvements) from the complying proposal. The alternatives must also take into account any technical or other limitations that the host may be constrained by.

Finally. a project such as Leyte represents a long term commitments between the host and the contractor. For that reason, the host will be looking for a contractor who will stay in the project for its full duration and therefore an experienced operator is an essential part of the bidding consortium. In practise, it is likely that the best long term relationships will be established if the bidding consortium is led by the operator, rather than a manufacturer or construction wntractor whose interest is mainly limited to the construction phase of the project

8. CONCLUSIONS

Establishing the power plant contracts for the Leyte Geothermal Power Project has been a rewarding process. The project is now well under way with every prospect of successful commissioning in time to meet the external programme.

Overall, although there have been a lot of lessons learned by all the parties concerned, in hind sight the process was well executed. The very short time table for hidding is a feature that we believe is beneficial and should be retained