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IMPLEMENTATION COMPLETION REPORT

CHINA

**YANTAN HYDROELECTRIC PROJECT
(LOAN 2707-CHA)**

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**Industry and Energy Operations Division
China and Mongolia Department
East Asia and Pacific Regional Office**

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CURRENCY EQUIVALENTS

Currency Unit: Yuan (Y)
At Appraisal (November 1985) \$1 = Y 3.0

Exchange Rates During Project Years

	<u>Year Ave.</u>
1986	3.46
1987	3.73
1988	3.73
1989	3.73
1990	4.86
1991	5.36
1992	5.49
1993	5.75
1994	8.60

WEIGHTS AND MEASURES

Metric System

FISCAL YEAR

January 1 to December 31

ABBREVIATIONS AND ACRONYMS

AGN	-	Advisory Group of Norway
EMMP	-	Environmental Monitoring and Management Program
GEPB	-	Guangxi Electric Power Bureau
GEPIDI	-	Guangxi Electric Power Investigation and Design Institute
GHCB	-	Guangxi Hydroelectric Construction Bureau
GIS	-	Gas Insulated Switchgear
GRO	-	Guangxi Resettlement Office
GYHPCC	-	Guangxi Yantan Hydroelectric Project Construction Corporation
ICB	-	International Competitive Bidding
ICR	-	Implementation Completion Report
IERR	-	Internal Economic Rate of Return
Longtan	-	The (proposed) Longtan Hydroelectric Project
LRAIC	-	Long-Run Average Incremental Cost
SBC	-	Special Board of Consultants
SCEPA	-	South China Electric Power Administration
SCEP	-	South China Electric Power Joint Venture Corporation
TSQ	-	Tienschengqiao Hydroelectric Development

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YANTAN HYDROELECTRIC PROJECT (LOAN 2707-CHA)

PREFACE

This is the Implementation Completion Report (ICR) for the Yantan Hydroelectric Project in China for which Loan 2707-CHA in the amount of \$52 million was approved on May 29, 1986 and made effective on August 27, 1986.

The loan was closed on June 30, 1994, one year beyond the date originally envisaged. Final disbursement was made on October 28, 1994 when the balance of the loan, \$60,894.11, was canceled. Cofinancing for the project in the amount of NK 18 million was provided by the Government of Norway.

The ICR was prepared by Barry Trembath, Industry and Energy Operations Division, China and Mongolia Department of East Asia and Pacific Region, with contributions from Robert Crooks, Alice Huang and Martin ter Woort (consultants). It was reviewed by Mr. Richard Newfarmer, Division Chief, and Mr. Yo Kimura, Project Advisor. The borrower/beneficiary provided comments, which are included as an annex to the ICR.

Preparation of this ICR was begun during the Bank's completion mission in April 1995. It is based on the Staff Appraisal Report, the Loan and Project Agreements, Supervision Reports, correspondence between the Bank and the Borrower/Beneficiary, internal Bank memoranda and interviews with Bank and Borrower/Beneficiary staff involved in project implementation. The Borrower/Beneficiary contributed to the preparation of the ICR by preparing their own evaluation report of the project's execution and implementation, and by providing comments on the draft Bank ICR, which were incorporated in the final version.

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YANTAN HYDROELECTRIC PROJECT (LOAN 2707-CHA)

EVALUATION SUMMARY

Project Objectives

1. The objectives of the project were to: (a) help address the acute energy shortage in Guangxi autonomous region and Guangdong province through the cascade development of the Hongshui River; (b) promote interconnection within the South China grid; (c) help build relations with GEPB and the regional authority, South China Electric Power Administration (SCEPA), with whom the Bank expected to collaborate on future projects; (d) provide transfer of technology in dam design and construction; and (e) upgrade financial planning and management practices in the electricity subsector. Additional implied objectives were those of financial, environmental and social sustainability.

2. The project comprised: (a) construction of the Yantan hydroelectric development consisting of a 110 m high concrete gravity dam with associated spillway, shiplift and powerhouse with an installed capacity of 1,100 MW; (b) 500 kV transmission lines and associated substations; (c) consulting services for construction management; training of GEPB staff and government officials in financial practices; and (d) resettlement of the reservoir population, involving relocation and reestablishment of living standard of an estimated 36,435 persons, in 423 villages.

3. The loan amount of \$52 million represented 5 percent of overall project cost, and was small compared to other China power loans (\$225 million for a thermal power plant approved on the same day). Nevertheless, the project objectives supported both Government objectives and Bank strategy for the power sector (paras. 5-7). They were important, and remain important today, given the juxtaposition in South China of energy resource-rich inland provinces and fast-growing coastal provinces and the concomitant opportunities for synergistic development. The financial and institutional development objectives helped to lay the groundwork for the more ambitious commercialization objectives of present day power projects in China.

Implementation Experience and Results

4. The project achieved its primary objective of supporting economic growth through development of an important indigenous resource. Despite modest implementation delays, the original conclusion that Yantan was part of the least-cost expansion plan is confirmed. The Internal Economic Rate of Return (IERR) is also greater than originally

estimated because "willingness to pay" for power is demonstrably higher than original estimates. Both transfer of technology and institutional development objectives were achieved, and the good relations established with the power entities in South China are likely to assist the Bank to continue to positively influence the structure and commercial orientation of the power sector in South China.

5. The first generating unit was commissioned in September 1992, three months behind the appraisal schedule. The next three units were commissioned five to nine months behind schedule. The main reason for the delays was the late delivery of the main components of the turbines, due to the heavy commitments of the supplier, the technical difficulties associated with large units (among the world's largest) and the lack of experience in manufacturing such large machines.

6. With regard to final costs in comparison to those estimated at appraisal, there was a cost underrun of about 22 percent when expressed in US dollars and a cost overrun of about 38 percent when expressed in local currency. These variations are due to the higher than expected inflation in China and the devaluation of local currency from an exchange rate of Y 3.0 to \$1 at the time of appraisal to Y 8.5 to \$1 by the end of 1994. If actual expenditures are deescalated to the appraisal date, then overall costs are 9 percent higher than estimated at appraisal (base costs plus physical contingencies). This represents relatively good agreement, considering the large local inflation during the period, which may be imperfectly estimated by the Consumer Price Index at the national level.

7. The resettlement task proved to be more extensive than originally foreseen. It has taken 10 years and still is not completed since two out of three relocatees have not fully reestablished economically. However, aggressive interim measures are being taken to support living standard until incomes are fully restored. The situation should improve significantly in the next few years as newly planted orchards reach production and experience with fish cages results in sustainable production. Ultimately, 43,176 persons were physically relocated and new production arrangements found for 62,430 persons (compared to the 36,435 originally estimated).

8. All elements are present to ensure sustainability of the project. The power plant is of good quality, and efficient and economic operations are expected to continue, based on the established operation and maintenance arrangements and operating experience to date. The pricing arrangements for the plant output will ensure satisfactory financial and economic returns. On the institutional side, the tide of economic reform in China is creating expectations far beyond those at appraisal. With regard to resettlement, while income targets have not yet been met, it is expected to become fully sustainable within a few years, as the economic base is fully reestablished. The Environmental Monitoring and Management Program (EMMP) is sustainable given that it was designed and implemented without requiring any influence from the Bank, together with the fact that such programs are standard operational procedure on large dams in China.

9. Bank performance overall was satisfactory. There were some particularly positive aspects during project preparation and appraisal and, with hindsight, a few

negative aspects. Supervision was satisfactory. GEPB successfully completed the project with only modest cost and time overruns. It overcame problems as they arose, introduced and absorbed modern technologies, and took full advantage of the training opportunities. Yantan was one of the first projects implemented under the Government's construction industry reform measures, which provided for separation of owner, designer and construction manager, and competitive bidding. The various parties adapted well to their new roles and responsibilities.

Summary of Findings, Future Operations and Key Lessons Learned

10. The objectives of the project were consistent with those of the Chinese Government and the Bank and the project achieved its major objectives. Commissioning delays up to nine months and the fact that income has not yet been fully reestablished are the only areas where objectives have not been fully achieved. The project is rated as satisfactory and is considered to be sustainable in all areas.

11. The Project Operation Plan provides for future power plant operation and maintenance and environmental monitoring. With regard to resettlement, production development is continuing, grain subsidies are being provided until income targets are met and reservoir development financed from power plant revenue will continue in perpetuity. The Bank expects to continue its involvement in South China in connection with the proposed Longtan Hydroelectric Project (Longtan), which is located upstream of the Yantan project and will include more ambitious goals for institutional development and sector commercialization. It will also continue to monitor Yantan operations particularly in regard to resettlement in connection with the preparation of Longtan.

12. The key lessons to be learned from this project are:

- In a project such as Yantan, which relies heavily on local capabilities, it is important to guard against overoptimism with respect to these capabilities in areas where traditional Chinese hydroelectric implementation has not provided exposure to modern techniques and technology. In the context of China's rapid economic growth, it is also important to assess the manufacturing capacity and workload of local suppliers and thus their capability to deliver on time.
- In the area of resettlement, the key lesson learned is that for a large resettlement project such as Yantan, it is important that project preparation in relation to resettlement be at least as detailed as that of the construction component.

IMPLEMENTATION COMPLETION REPORT

CHINA

YANTAN HYDROELECTRIC PROJECT (LOAN 27076-CHA)

PROJECT IMPLEMENTATION ASSESSMENT

A. PROJECT OBJECTIVES

1. The objectives of the project were to: (a) help address the acute energy shortage in Guangxi autonomous region and Guangdong province through the cascade development of the Hongshui River; (b) promote interconnection within the South China grid; (c) help build relations with the Guangxi Electric Power Bureau (GEPB) and the regional authority, SCEPA, with whom the Bank expected to collaborate on future projects; (d) provide transfer of technology in dam design and construction; and (e) upgrade financial planning and management practices in the electricity subsector. Additional implied objectives were those of financial, environmental and social sustainability. The Government invited the Bank to participate in the project although preparatory works had started, in the belief that the Bank could provide technical inputs in dam design and construction, which were considered to be critical to upgrade the technical capabilities of GEPB.
2. The project comprised:
 - (a) construction of a 110 m high concrete gravity dam, a spillway, a powerhouse and shiplift;
 - (b) provision and installation of four generating units, each of 275 MW;^{1/}
 - (c) construction of two single circuits of 500 kV transmission lines and three associated substations;
 - (d) provision of about 160 person-months of consulting services for construction management; and

^{1/} In August 1986, a decision was made to increase the capacity of each unit to 302.5 MW, bring total installed capacity to 1,210 MW.

- (e) training of GEPB staff and upgrading of GEPB training facilities, and training for government officials in financial practices.

3. The resettlement of the reservoir population was not singled out as a development objective or project component. However, the detailed resettlement plan provided for the relocation and reestablishment of living standard of 36,435 persons, in 6,500 households and 423 villages. Due to the lack of replacement land for traditional agriculture, the plan provided for alternatives such as forestry and orchards developed on hillslopes. Assurances were obtained from the Government that a satisfactory resettlement plan would be carried out.

4. The objectives, as cited in the various project documents, are reasonably clear. They are also realistic. The loan amount of \$52 million represented five percent of overall project cost, and was small compared to other China power loans (e.g., \$225 million for a thermal power plant approved on the same day). Nevertheless, the project objectives supported both Government objectives and Bank strategy for the power sector at the time of project appraisal. Government objectives were to modernize the sector, increase its efficiency and expand it at a rate sufficient to meet the requirements of economic development. The Government strategy for achieving these objectives included the following elements which are directly supported by the project: (a) phased increase in financial autonomy of enterprises; (b) gradual introduction of a more rational pricing system; (c) introduction of modern techniques in project design; and (d) acceleration of hydro development and interconnection of remote hydro sites to regions of high economic growth.

5. The Bank strategy was to support economic growth through improved efficiency and economic reform. In the energy sector, technology transfer would be achieved by bringing the Bank's experience to bear on project design and implementation with foreign technical assistance where appropriate. Economic reform would be supported by assisting utilities to rationalize investment decisions through modernization of system planning, project preparation, construction, operation and utility management. The project design generally conformed to this strategy.

6. The objectives of supporting growth, establishing relations with the power entities and promoting interconnection in South China were important in view of the juxtaposition in South China of energy resource-rich inland provinces and fast-growing coastal provinces, which presents obvious opportunities for synergistic development. The financial and institutional development objectives were in keeping with the status of reform in the power sector at the time. They were important in that they laid the groundwork for the more ambitious commercialization objectives of present-day power projects in China.

7. The project was not complex. While the main component shared the complexity of all hydropower projects, it was evidently within the capabilities of GEPB given their previous hydropower experience, although such projects were constructed to less demanding schedules and standards than envisaged for Yantan. In retrospect, the appraisal assessment of risk as being normal for hydropower projects was understated

given the limited technology transfer and technical assistance envisaged and the heavy reliance on local resources and technology.

B. ACHIEVEMENT OF PROJECT OBJECTIVES

8. The project achieved its primary objective of supporting economic growth through development of an important indigenous resource. Economic and power demand growth in Guangxi were in line with expectations. Despite implementation delays, the original conclusion that Yantan was part of the least-cost expansion plan is confirmed. The Internal Economic Rate of Return (IERR) is also greater than originally estimated because "willingness to pay" for power is demonstrably higher than original estimates.

9. Good relations have been established with GEPB, and the South China Electric Power Joint Venture Corporation (SCEP), the successor to SCEPA, thus achieving this objective. The Bank has been cooperating with both entities in the preparation of Longtan, a major development immediately upstream of Yantan. The Bank is also discussing with the Government the establishment of a South China power market, involving Guangxi, Guizhou and Yunnan, which have relatively large energy resources, and the fast-growing coastal areas of Guangdong, Shenzhen, Fujian, Hainan and, from 1997, Hong Kong.

10. The transfer of technology objective was also achieved. The imported material, equipment and services financed by the Bank loan were vital to the construction of the project in accordance with the appraisal schedule, which was one year faster than originally envisaged by the Government. Goods financed included specialized steel products, large construction equipment and sophisticated electrical and electronic equipment. The consulting services were particularly useful in construction planning and quality control. The Special Board of Consultants (SBC) positively contributed to the execution of the project in terms of cost, quality and completion time.

11. The institutional development objective was achieved in that the envisaged training programs were all successfully implemented, and the organizations created to manage and construct the project grew into substantial entities in their own right.

C. IMPLEMENTATION RECORD AND MAJOR FACTORS AFFECTING THE PROJECT

Implementation Arrangements

12. Yantan was one of the first projects implemented under the Government's construction industry reform measures, which provided for separation of owner, designer and construction manager, and competitive bidding for most works and goods. Construction management was entrusted to the Guangxi Yantan Hydropower Construction Company (GYHPCC). Design was entrusted to the Guangxi Electric Power Investigation and Design Institute (GEPIDI). While many locally bid contracts were awarded to suppliers and contractors from outside the province, the contract for dam construction was awarded to the Guangxi Hydroelectric Construction Bureau (GHCB). Resettlement was

carried out by the Guangxi Resettlement Office (GRO). Consultants were retained to advise GYHPCC and GEPIDI and a Special Board of Consultants (SBC) was also set up. Performance of the various parties is discussed in paras. 24 and 25.

Implementation Schedule

13. The first generating unit was commissioned in September 1992, three months behind the appraisal schedule. The next two units were commissioned five to six months behind schedule, and the last unit, to be commissioned in June 1995, will be nine months behind schedule. Despite early delays, the combined efforts of all parties led to the generally on-time completion of the dam and powerhouse civil works, except for the noncritical shiplift, which is designed to handle future rather than current traffic. The main reason for the delays was the late delivery of the main components (runner and top cover) of the turbines, due to the heavy commitments of the supplier, the technical difficulties associated with large units (among the world's largest) and the lack of experience in such large machines. Because of the overcommitment of the Government owned supplier, the Government established priorities which caused some delays in Yantan deliveries.

14. Delays also occurred in transmission line construction. While transmission lines were included in the project description, they were not Bank-financed and GEPB separated them from the project and assigned their implementation to other units. Despite general transmission delays, temporary arrangements prevented restriction of Yantan output until the third generating unit was commissioned, when a locally manufactured 500 kV transformer failed acceptance testing. Corrective measures are underway and a backup foreign transformer has been ordered, but some loss of output has occurred.

15. Procurement difficulties (paras. 22 and 23) also caused late delivery of gas insulated switchgear (GIS). Temporary arrangements were able to prevent delays in generator commissioning, but it is likely that if the overall commissioning schedule had not already been affected by turbine deliveries, it would have been delayed by switchgear deliveries.

Resettlement

16. The resettlement task proved to be more extensive than originally foreseen: in the end 43,176 persons were physically relocated and new production arrangements had to be made for 62,430 persons (compared with 36,435 quoted in the SAR). The task has taken 10 years and still is not completed as two out of three relocatees are not yet considered fully rehabilitated economically by the end of 1994. However, this situation should improve significantly in the next few years as newly planted orchards reach production and experience with fish cages results in sustainable production. Work is continuing on production development and, as anticipated in the original plan, grain subsidies are being provided until income is reestablished. After the resettlement construction budget has been expended, two special funds are provided: one that extends for 10 years for completion work, and another one, which provides for Y 0.001 per kWh

from power plant revenue towards development in the reservoir area, for the life of the project. On the physical side, more than 1 million square meters of new housing was constructed and inundated infrastructure was replaced. Housing and infrastructure quantity and quality are considerably better than the original. Overall, Y 426 million (Y 6,800 per capita) was spent.

17. The main factor that affected resettlement implementation was the early emphasis on physical relocation at the expense of household and village production systems. Since production systems such as orchards, forestry and fish cages required a lead time of several years before producing revenue, a time lag developed between the loss of income and produce from reservoir lands and the production and associated income from new systems. Furthermore, during implementation a shift in selected orchards was made, from citrus to "longan," resulting in further delay. The underestimation of the time to bring new systems into production stems largely from inexperience, and the lack of early detailed planning.

Environment

18. Although the SAR did not elaborate extensively on the proposed environmental management and monitoring, a considerable amount of environmental work was carried out, commencing with an Environmental Impact Assessment Report prepared over the period 1983-85 (i.e., before start of construction), followed by an environmental monitoring and management program (EMMP) extending from the start of construction into the operational stage. In this regard, GEPB, acting in accordance with Government regulations, may have been ahead of the Bank on environmental issues at the time of appraisal.

19. The specific undertaking mentioned in the SAR (the public health program) actually covered a wide variety of issues including the incidence of schistosomiasis vectors at several villages near the reservoir thought to be at risk in this regard. Other aspects of the EMMP included monitoring of: potential leakage in karst areas; sediment accumulation in the reservoir; water quality in the reservoir and downstream; climate; terrestrial and aquatic organisms; impacts of the resettlement program (soil and water conservation, socioeconomics); and bank stability in the reservoir drawdown area.

20. Monitoring results indicate that adverse impacts are limited and consistent with expectations. The most significant negative impact was unanticipated reservoir induced waterlogging in some areas, as a result of which affected households were relocated. The reservoir is presently subject to significant algal blooms, due to nutrient enrichment from decaying submerged vegetation, but this is to be expected and is likely to be only a short-term phenomenon. It appears not to be adversely affecting fishing nor does the water quality monitoring indicate any adverse effects (such as depleted dissolved oxygen levels).

21. **Procurement.** The project included 51 procurement contracts, of which 38 were awarded after International Competitive Bidding (ICB) in accordance with Bank

guidelines. For most ICB contracts, there were no major procurement problems, but the process was protracted largely due to the numerous steps required (according to GYHPCC 18 domestic and 9 external). This resulted in an average period of one year between completion of a bid document and award of contract. The situation was aggravated through the inexperience of GHPCC in international tendering and the limited input of experienced procurement consultants.

22. There were two cases where procurement delays substantially affected project implementation, one relating to a high-speed cable crane for construction and the other relating to gas insulated switchgear (GIS). In the case of the cable crane, initial problems arose due to unclear interface specifications such that the grounding system was not supplied with the crane, and later delays arose as differences in interpretation of the contract continued. These delays could probably have been reduced with improved documentation, and assistance of consultants experienced in contract administration.

23. The second instance of delay was in relation to GIS. This was not originally included in the Bank-financed scope of supply since it was thought that equipment of adequate quality could be procured locally. When this was found not to be the case, a protracted process ensued, extending over one year, involving a search for non-Bank financing, followed by a request and eventual agreement to reallocate a part of the Bank loan. The procurement process itself took a further two years, involving extensive Bank comments on documents, bids being received 50 percent above estimates, unsuccessful negotiations with the lowest bidder, rebidding with reduced scope and eventual award. In this case, additional delays can be attributed to: overoptimism in assessment of local supply capabilities; inadequate allowance in loan amount for contingencies; overoptimistic estimate of equipment cost; and failure to immediately rebid with reduced scope of supply.

24. **Consulting Services and Training.** The main consulting services were financed by an NK 18 million grant from Norway. Members of SBC were financed from the same source, by an IDA Technical Cooperation Credit (TCC) and from the Bank loan. The consultants were employed in an advisory capacity, and the main areas where they made positive contributions were in design for dam safety, computerized scheduling, construction equipment maintenance and quality control of concrete. In the design area their main influence was to counterbalance the traditional conservatism of Chinese designers. In the other areas, their contribution was particularly important because of lack of experience in China of highly mechanized construction. Areas where additional consultant input would have been beneficial are international procurement and cost monitoring. While costs were evidently kept within reasonable bounds, supervision missions were unable to adequately determine the expected cost to completion, nor to identify the causes of variations from original estimates.

25. The SBC consisting of four consultants, from Norway, Canada and China, met six times during project execution. Their contribution might have been even greater if their numbers and composition were adjusted in keeping with the construction status. For example, while a geologist member is very useful in the early stages of construction, other specialties might be more appropriate during later stages. A more flexible

arrangement should be considered in future projects. With hindsight, the SBC would also have benefited from a resettlement expert, who could have provided continuity to resettlement review.

26. GEPB took full advantage of the Bank loan to finance technical consultation and training. Visits abroad totaled 47 person-times to United States, Norway, Australia, France, Thailand, Hong Kong and Japan. Topics covered were high-strength steel penstocks, ICB documents, roller-compacted concrete, international loan management, project budgeting and claim analysis and utility financial management.

27. **Project Costs.** The estimated cost of the project at appraisal (excluding interest during construction) was \$139.4 million in foreign costs and Y 1,878.9 million in local costs, equivalent to a total of \$542.0 million (Y 2,941.6 million)^{2/}. The final cost was \$51.9 million in foreign costs and Y 2,941.6 million in local costs, equivalent to a total of \$593.9 million (Y 3,176.7 million) (see Tables 8a-1 and 8a-2 for details).^{3/} Considering overall costs (foreign plus local), there is a cost underrun of about 22 percent when expressed in US dollars and a cost overrun of about 38 percent when expressed in local currency. These variations are due to the higher-than-expected inflation in China and the devaluation of local currency from an exchange rate of Y 3.0 to \$1 at the time of appraisal to Y 8.6 to \$1 by the end of 1994. To obtain a more exact comparison foreign costs, expressed in US dollars, and local costs, expressed in yuan, were separately deescalated to the appraisal date and compared to base costs plus physical contingencies. This analysis shows that foreign costs are 64 percent lower, local costs are 17 percent higher, and overall costs are 9 percent higher than estimated at appraisal. This represents relatively good agreement, considering the large local inflation during the period, which may be imperfectly estimated by the Consumer Price Index at the national level. The reason for the large reduction in foreign costs is that the appraisal estimate includes indirect foreign costs, while GYHPCC's final tabulation does not.

28. **Economic Performance.** For the appraisal, generation planning studies were undertaken to demonstrate that Yantan was part of the least-cost expansion plan for South China, which was independently verified by comparing Yantan with a coal-fired thermal alternative. The latter analysis, which indicated an equalizing discount rate of 13 percent, was repeated ex-ante as shown in Table 9, yielding an equalizing discount rate of 19 percent. The long-run average incremental cost (LRAIC) of Yantan is calculated at 25 fen/kWh (1994 price levels) in comparison with 36 fen for the thermal alternative, demonstrating that, despite delays in project completion, the original conclusion that Yantan is part of the least-cost expansion program remains valid. Moreover, the analysis takes no account of future benefits of reduced spill and firming up of Yantan energy by the upstream reservoirs of Tienshengqiao (TSQ) (under construction) and Longtan.

^{2/} Transmission lines have been excluded in both cases since they were constructed by another entity, and insufficient detail in regard to final cost is available for analysis.

^{3/} Final costs represent costs to date plus estimate to complete since the project works are not yet complete. In particular, the shiplift is not scheduled to be complete until 1997.

29. At appraisal, the IERR was calculated on a programmatic basis with costs of Yantan and TSQ related to estimated 1993 system tariffs at end-1985 price levels, yielding an IERR of 12 percent. Yantan without TSQ yielded 11 percent. Since TSQ is being implemented by another agency and costs are not available, the IERR of Yantan alone was repeated ex-ante. With 1994 economic costs and average system tariff, IERR decreases from 11 to 8 percent, which is a reflection of low GEPB average tariffs (17.47 fen/kWh), which considerably underestimate current "willingness to pay". Due to tariff reforms since the original appraisal, Yantan power is now sold to the grid at a price (25.04 fen/kWh) which provides a more direct measure of "willingness to pay." At this price the IERR increases to 12.5 percent. A less conservative estimate based on the price paid for energy from joint investment thermal power plants, 38 fen/kWh, increases the IERR to 16 percent. It can be concluded that the economic justification of the project remains valid.

30. **Financial Performance.** GEPB's projected and actual financial statements for 1986-1994 are presented in Annex 1. Over that period, increases in annual energy sales and average tariffs were generally higher than projected. Energy sales in 1994 were double those in 1986, and the average tariff increased from 7.2 fen/kWh in 1986 to 17.47 fen/kWh in 1994. While GEPB's operating revenue increased almost fivefold, net operating revenue growth was slower than projected due to higher-than-expected inflation, and higher power purchase costs. The latter have increased dramatically, since nonutility generation has increased considerably in recent years. This has adversely affected GEPB's net income; the profit ratio in 1993 was around 8 percent, as opposed to the projected 18 percent. Despite the unfavorable cost structure and lower net income, GEPB has maintained its profitability to a satisfactory degree. For the past nine years, it has complied with the break-even financial covenant, which requires annual operating revenues to exceed the sum of annual cash operating costs and financial obligations. The Funds Flow Statement shows that from 1989 to 1991 borrowing and capital expenditures were less than projected by approximately Y 800 million, again reflecting its reduced share of new generation. This led to lower fixed assets on the balance sheet than projected until 1993 when fixed assets were revalued pursuant to a nationwide policy. The lower-than-expected borrowing enabled GEPB to maintain low debt:equity ratios (40 to 60 percent) and a high debt service coverage, the lowest being 2.9 times in 1993, in comparison with the covenanted value of 1.3.^{4/} In summary, GEPB has achieved a satisfactory operating performance and maintained reasonable capital structure, and complied with financial performance covenants.

D. PROJECT SUSTAINABILITY

31. All elements are present to ensure sustainability of the project. Technically, the finished hydroelectric development is of good quality and the units have operated at a high availability over the initial operating period of up to three years. Efficient and economic operation is expected based on GEPB's past record of hydroelectric plant

^{4/} Unaudited 1994 accounts show a debt service ratio of 1.4. However, this is apparently due to anomalous loan repayment numbers.

operation and the arrangements for the current project, as set out in the Operation Plan. Financially, the pricing arrangements for the plant output will ensure satisfactory financial and economic returns. On the institutional side, the tide of economic reform in China is creating expectations far beyond those at appraisal. Various institutional restructuring arrangements are being considered including the vesting of the hydro assets on the Hongshui into a new company, where they will be used to generate funds and raise capital for future hydro developments on the Hongshui, in particular the Longtan project.

32. With regard to resettlement, although income targets have not yet been met, the resettlement is expected to become fully sustainable within a few years, as the economic base becomes fully established. The replacement of much rice and corn agriculture with orchards has the potential to significantly improve standards of living in the medium term. The EMMP is sustainable as evidenced by the fact that it was designed and implemented in the absence of any apparent influence from the Bank (there were no conditionalities beyond the public health program), together with the fact that such programs are standard operational procedure on large dams in China and have been for many years.

E. BANK PERFORMANCE

33. Bank performance in project preparation and appraisal was satisfactory. Positive aspects were its agreement to participate based on the Borrower's perception of the advantages of Bank involvement, early concentration on procurement of key items, and technical assistance to a beneficiary who had no international experience. The appraisal of the environment and resettlement plan were in keeping with practice at the time. In retrospect, negative aspects were overoptimism in assessment of local capabilities and inadequate allowance in the loan amount for contingencies. An increase in the loan amount from 5 to 10 percent of project costs would still have entailed minimum use of foreign exchange, while implementation delays could probably have been avoided.

34. In the supervision phase, the Bank's performance was generally satisfactory, although project visits were less frequent in the later phases. More importantly, the supervision of resettlement did not fully reflect the increased emphasis given to this aspect in China over the implementation period. Each Bank mission covered resettlement, but the emphasis was on relocation of population rather than reestablishment of income. There were two specific resettlement missions in 1991 and 1992, the latter in conjunction with an overall resettlement review in Bank projects in China. While both missions provided many useful suggestions, neither emphasized that production measures were running behind relocation measures.

F. BORROWER PERFORMANCE

35. GEPB successfully completed the project with only modest cost and time overruns. It overcame problems as they arose, introduced and absorbed modern technologies and construction management techniques, and took full advantage of the training opportunities. It is also worth noting that Yantan was one of the first projects

implemented under the Government's construction industry reform measures, which provided for separation of owner, designer and construction manager, and competitive bidding for most works and goods. During implementation, the various parties adapted well to their new roles and responsibilities. In particular, the construction manager, GYHPCC, has emerged as a strong, competent company which is expected to manage construction of Longtan. The main contractor, GHCB, reportedly "went through a tortuous and arduous course" in adapting from force account unit to contractor, but eventually achieved production rates similar to international contractors. It has now been successful in winning contracts internationally, and intends to bid in joint venture for Longtan.

G. ASSESSMENT OF OUTCOME

36. The project outcome is rated as *satisfactory*. It would have been rated as *highly* satisfactory except for commissioning delays, which extended to one year for later generating units and delays in full income restoration of resettlers.

H. FUTURE OPERATION

37. GEPB's Operation Plan summarizes the arrangements made for future operations of the power plant in terms of organization and staffing of the operating unit, operating and maintenance procedures, dam safety inspections, spillway operations, and environmental monitoring. With regard to resettlement, Y 51 million of the budget of Y 426 million has yet to be spent on production development in 1995. Thereafter, the reservoir development fund will generate income based on energy production; this should sustain the workplan of the GRO. It is clear that the GRO should remain fully active until it has been demonstrated that resettlers have reached income targets and are engaged in sustainable activities. This may take several years. The EMMP provides for continuation of monitoring as required (not all aspects need to be continued indefinitely) and, based on performance to date, there is every expectation that this will happen.

38. The Bank expects to continue its involvement in South China in connection with the Longtan project, which will include more ambitious goals for institutional development and sector commercialization. It will also be important in justifying the Longtan project to demonstrate that the Yantan project eventually met its resettlement objectives, and to incorporate lessons learned at Yantan in the Longtan resettlement planning and implementation. In this context, the Bank will continue to observe and comment as appropriate on continuing operations at Yantan.

I. KEY LESSONS LEARNED

39. In a project such as Yantan, which relies heavily on local capabilities, it is important to guard against overoptimism with respect to these capabilities, particularly in areas where traditional Chinese hydroelectric implementation has not provided exposure to modern techniques and technology. In the context of China's rapid economic growth, it is also important to assess the manufacturing capacity and workload of local suppliers

and thus their capability to deliver on time. The three areas where local capabilities were evidently overestimated are the following:

- (a) **Turbine and generator manufacturing capacity** was overestimated given the advanced technology and the supplier's heavy commitments on other projects, also with high national priority; an arrangement where a high proportion of local content is maintained but a fully experienced foreign manufacturer takes full responsibility and provides enforceable guarantees would probably have provided on-time commissioning.
- (b) **High technology equipment quality** was overestimated in two cases: the 500 kV gas insulated switchgear (GIS), and transformers. The lack of domestic capability to produce the GIS was recognized early, but with foreign exchange limitations, the decision to use a foreign manufacturer led to delays. The transformer deficiencies were not recognized until the equipment failed acceptance tests. While the objective of upgrading local manufacturing capabilities is laudable, it is important to build safeguards into the process, such as guarantees by fully experienced manufacturers; backup of unproven equipment with fully tested designs; and allowance in schedules for possible delays.
- (c) Local organizations performed admirably, particularly considering that this was their first exposure to Western contract management methods. However, the project would probably have benefited from **increased technical assistance** in a few areas, including international procurement, cost control and resettlement.

40. In the area of resettlement, while the Chinese authorities have been diligent in the execution of their duties and the resettlement program is expected to eventually achieve its objectives, the reestablishment of living standard is not yet complete. The key lesson learned is that, in common with most resettlement projects, the resettlement was more extensive, more costly, more complex and more time-consuming than originally contemplated. For a large resettlement project such as Yantan, it is important that project preparation in relation to resettlement be at least as advanced as that of the construction component, and preferably further advanced. This would help to solve the underestimation of numbers and costs, and allow early concentration on the true critical-path activity: the reestablishment of income. On the Bank side, increased resettlement supervision and, in particular, an extensive mid-term review of resettlement implementation would probably have resulted in a more favorable outcome.

PART II: STATISTICAL TABLES

Table 1: SUMMARY OF ASSESSMENTS

Achievement of Objectives

	Substantial	Partial	Negligible	Not applicable
Macroeconomic policies				X
Sector policies				X
Financial objectives	X			
Institutional development	X			
Physical objectives	X			
Poverty reduction				X
Gender concerns				X
Other social objectives		X		
Environmental objectives	X			
Public sector management	X			
Private sector development				X

Project Sustainability

Likely	Unlikely	Uncertain
X		

Bank Performance

	Highly satisfactory	Satisfactory	Deficient
Identification		X	
Preparation assistance		X	
Appraisal		X	
Supervision		X	

Borrower Performance

	Highly satisfactory	Satisfactory	Deficient
Preparation		X	
Implementation		X	
Covenant compliance	X		

Assessment of Outcome

Highly satisfactory	Satisfactory	Unsatisfactory	Highly unsatisfactory
	X		

Table 2: RELATED BANK LOANS

Loan title	Purpose	Year of approval	Status
Ln 2382-CHA Lubuge Hydroelectric Project	To construct a rockfill dam, a spillway, an underground powerhouse, to install four generating units of 150 MW each, three single circuits of 220 kV transmission lines; to provide consultant services and a training program.	02/21/84	Loan was closed on 06/30/92.
Ln 2493-CHA Second Power Project	To construct a 500 kV transmission line from Xuzhou to Shanghai and 5 associated substations totaling 3,500 MVA in capacity, to install tele-control and telecommunications equipment for load dispatching, and to provide training for 500 kV transmission lines and substations.	02/19/85	Loan was closed on 06/30/92.
Ln 2706-CHA & Ln 2955-CHA Beilungang Thermal Power Projects I & II	To construct a coal-fired thermal power project with two units of 600 MW and two single circuit of 500 kV transmission lines, and to carry out a tariff study, a study on ZPEPB's reorganization and management improvement and a study for improvement of distribution networks for the cities of Hangzhou and Ningbo.	06/14/88	First loan closed 06/30/94. Closing date for second 06/30/95.
Ln 2707-CHA Yantan Hydro- electric Project	To construct a 110 m high concrete gravity dam, a spillway, a powerhouse, and a shiplift; to install 4 generating units of 275 MW each, 2 single circuits of 500 kV transmission lines and 3 associated substations; and to carry out a training program.	05/29/86	Loan was closed on 06/30/94.
Ln 2775-CHA & Ln 3515-CHA Shuikou Hydroelectric Projects I & II	To construct a 101 m high, concrete gravity dam, a spillway, a powerhouse and a navigation lock; to install 7 generating units of 200 MW each; to carry out a resettlement program in the reservoir, an action plan for tariff reform, and a training program for planning and financial management.	01/06/87 & 09/01/92	Implementation under way. Closing dates 06/30/93 & 12/31/96.

Table 2: (CONT'D)

Loan title	Purpose	Year of approval	Status
Ln 2852-CHA Wujing Thermal Power Project	To install 2 additional coal-fired units of 300 MW each and associated 220 kV transmission lines and substations; to provide on-line computer control and automatic load dispatching center; to carry out a masterplan study for the distribution network in Shanghai and a training program.	06/23/87	Two units commissioned in 1992. Closing date 06/30/95.
Ln 3387-CHA Ertan Hydro- electric Project	To construct a 240 m high arch dam with an underground powerhouse, to install 6 550-MW generating units and associated equipment; to carry out an environmental management program, studies of power pricing and reservoir operation, and a training program.	07/02/91	Implementation under way. Closing date 12/31/96.
Cr 2305 & Ln 3412-CHA Daguangba Multipurpose Project	To construct a 56 m high gravity dam and an underground powerhouse with 4 x 60 MW generating units; to erect a 36 km long double-circuit 220 kV transmission line and to build canals to irrigate 12,700 ha of land.	10/31/91	Implementation under way. Closing date 12/31/97.
Ln 3433-CHA Yanshi Thermal Power Project	To install 2 300-MW generating units and 5 220-kV transmission lines and associated substations; to carry out a tariff study, a tariff action plan, and a training program for upgrading the technical, financial and management skills for HPEPB staff.	01/14/92	Implementation under way. Closing date 12/31/97.
Ln 3462-CHA Zouxian Ther- mal Power Project	To install 2 additional 600 MW generating units; to construct 500 kV and 220 kV transmission lines and substations; and to carry out an air quality control study, a power tariff study, an action plan for tariff adjustment, and a training program for the technical, financial, and management staff of SPEPB.	04/12/92	Implementation under way. Closing date 06/30/99.

Table 2: (CONT'D)

Loan title	Purpose	Year of approval	Status
Ln 3606-CHA Tianhuangping Hydroelectric Project	To construct a pumped-storage hydroelectric power plant with six 300 MW reversible pump-turbine units, together with upper and lower reservoirs, a water conveyance system, an underground powerhouse; to erect 250 km long 500 kV transmission lines; to carry out studies of optimal power plant operation and its output pricing; and to strengthen the beneficiary's organization through technical assistance and training.	05/18/93	Implementation under way. Closing date 12/31/2001.
Ln 3718-CHA Yangzhou Thermal Power Project	To construct a coal-fired thermal power plant with two 600 MW generating units; to erect two 500 kV transmission lines (30 km long); to extend technical assistance for the development and implementation of improved accounting and financial management information systems; and undertake management development and staff training.	03/22/94	Implementation under way. Closing date 12/31/2000.
Ln 3848-CHA Sichuan Transmission Project	To construct a new 500 kV transmission network consisting of 2,260 km of transmission lines and 5,250 MVA of substations, provide technical assistance for implementation of sector reform plan, organizational improvements and financial management systems.	02/28/95	Implementation commenced. Closing date 12/31/2001
Ln 3846-CHA Zhejiang Power Development Project	To construct Beilungang Phase II power plant consisting of three 600 MW coal fired units; to construct 400 circuit km of 500 kV transmission lines, 2250 MVA of 500 kV substations and reinforce distribution networks in Hangzhou and Ningbo; to extend technical assistance to assist the power company in commercialization and corporatization, establish computerized financial management information system, improve transmission and distribution planning and upgrade environmental monitoring.	02/28/95	Implementation commenced. Closing date 12/31/2002

Table 3: PROJECT TIMETABLE

Steps in project cycle	Date planned	Date actual/latest estimate
Identification		06/85
Preparation	09/85	09/85
Appraisal	02/86	11/85
Negotiations	09/86	04/86
Board presentation	12/86	05/29/86
Signing		07/01/86
Effectiveness		08/27/86
Project Completion	12/30/92/a	05/94
Loan closing	06/30/93	06/30/94

/a Bank-financed components.

Table 4: LOAN DISBURSEMENTS: CUMULATIVE ESTIMATED AND ACTUAL

	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95
Appraisal estimate	2.0	22.0	34.0	41.0	46.0	50.0	52.0	52.0	52.0
Actual /a	8.6	20.2	26.8	31.5	35.6	38.5	49.9	51.8	51.9
Actual as % of estimate	430.0	91.8	78.8	76.8	77.4	77.0	96.0	99.6	99.8

Final disbursement: October 1994.

/a Total disbursement amount is \$51,939,106.

Table 5: KEY INDICATORS FOR PROJECT IMPLEMENTATION

Indicators	Appraisal Estimate	Actual
1. Preparatory	1/86-12/87	1/86-12/88
2. Resettlement	1/88-12/92	1/88-12/93
3. Civil Works		
a. River Closure	12/88	12/87
b. Impoundment	3/92	3/92
c. Excavation		
(1) dam	1/86-12/88	1/86-12/88
(2) power house	1/87-12/88	1/87-6/89
(3) shiplift	1/91-3/92	12/92-2/93
d. Concreting		
(1) dam	4/88-9/91	4/88-3/92
(2) power house	1/89-12/91	4/88-3/92
(3) shiplift	1/89-12/91	2/93-12/95
4. Equipment Installation/ <u>a</u>		
Unit 1	6/92	9/92
Unit 2	3/93	8/93
Unit 3	12/93	6/94
Unit 4	9/94	6/95
5. Project Completion	12/94/ <u>b</u>	

/a Commissioning of generating units.

/b Except for shiplift which will be completed 12/97.

Table 6: KEY INDICATORS FOR PROJECT OPERATION

(Not Applicable)

Table 7: STUDIES INCLUDED IN PROJECT

(Not applicable)

Table 8a-1: PROJECT COSTS

Item	Appraisal estimate (Y M)			Actual/latest (Y M)		
	Local	Foreign	Total	Local	Foreign	Total
Preparatory work	35.9	-	35.9	81.7	-	81.7
Land, compensation and resettlement	75.8	-	75.8	88.2	-	88.2
Construction equipment and plants	78.3	19.4	97.7	20.4	21.9	42.3
Civil works	124.1	72.0	196.1	203.0	12.9	215.9
Electrical, mechanical equipment and computers	100.5	2.8	103.3	101.4	16.5	117.9
Engineering and consulting services	5.3	2.5	7.8	1.9	0.2	2.1
Supervision and administration	1.8	-	1.8	4.7	-	4.7
Training	1.6	1.0	2.6	0.7	0.4	1.1
<u>Base Cost</u>	<u>423.3</u>	<u>97.7</u>	<u>521.0</u>	<u>502.0</u>	<u>51.9</u>	<u>553.9</u>
Contingencies						
Physical	39.5	8.5	48.0	21.8/a	-	21.8
Price	163.5	33.2	196.7	18.2	-	18.2
<u>Total Project Cost</u>	<u>626.3</u>	<u>139.4</u>	<u>765.7</u>	<u>542.0</u>	<u>51.9</u>	<u>593.9</u>
Interest during construction						
Bank loan	-	17.5	17.5	-	14.0	14.0
Local loans	133.0	-	133.0	47.0	-	47.0
<u>Total Financing Required</u>	<u>759.3</u>	<u>156.9</u>	<u>916.2</u>	<u>589.0</u>	<u>65.9</u>	<u>654.9</u>

/a Physical and price contingencies until completion of shiplift. These represent balance of contingency remaining after last reestimate and probably overestimate actual cost at completion.

Table 8a-2: PROJECT COSTS

Item	Appraisal estimate (Y M)			Actual/latest (Y M)		
	Local	Foreign	Total	Local	Foreign	Total
Preparatory work	107.6	-	107.6	336.5	-	336.5
Land, compensation and resettlement	227.5	-	227.5	439.3	-	439.3
Construction equipment and plants	234.9	58.2	293.1	80.3	82.7	163.0
Civil works	372.3	216.0	588.3	1,088.4	57.2	1,145.6
Electrical, mechanical equipment and computers	301.4	8.4	309.8	685.3	74.9	760.2
Engineering and consulting services	15.9	7.5	23.4	10.4	0.8	11.2
Supervision and administration	5.4	-	5.4	23.4	-	23.4
Training	4.8	3.0	7.8	3.5	1.6	5.1
<u>Base Cost</u>	<u>1,269.8</u>	<u>293.1</u>	<u>1,562.9</u>	<u>2,667.1</u>	<u>217.2</u>	<u>2,884.3</u>
Contingencies						
Physical	118.4	25.7	144.1	139.0	5.9	144.9
Price	490.7	99.7	590.4	135.5	12.0	147.6
<u>Total Project Cost</u>	<u>1,878.9</u>	<u>418.5</u>	<u>2,297.4</u>	<u>2,941.6</u>	<u>235.1</u>	<u>3,176.7</u>
Interest during construction						
Bank loan	-	52.4	52.4	-	80.0	80.0
Local loans	398.9	-	398.9	346.1	-	346.1
<u>Total Financing Required</u>	<u>2,277.83</u>	<u>470.9</u>	<u>2,748.7</u>	<u>3,287.7</u>	<u>315.1</u>	<u>3,602.8</u>

Table 8b: PROJECT FINANCING /a

Source	Appraisal estimate (\$ M)			Actual (\$ M)		
	Local	Foreign	Total	Local	Foreign	Total
IBRD	0	52.0	52.0	0.0	51.9	51.9
Local bank	759.3	104.9	864.2	590.0	13.0	603.0
<u>Total</u>	<u>759.3</u>	<u>156.9</u>	<u>916.2</u>	<u>590.0</u>	<u>64.9</u>	<u>654.9</u>

/a Does not include NK 18 million financing from Norway, which was anticipated at appraisal (but not included in tables) and actually occurred.

Table 8c: ACTUAL AND PROJECTED PROJECT COSTS

(in Y or \$ million)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
Foreign																
1. construction equipment	0.00	0.00	0.00	0.00	14.06	5.47	1.30	0.29	0.05	0.00	0.01	0.03	0.00	0.00	0.00	21.22
2. steel	0.00	0.00	0.00	0.00	0.00	4.42	0.64	7.54	0.37	0.00	0.00	0.00	0.00	0.00	0.00	12.97
3. station automation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.99	0.20	0.00	0.00	0.00	0.00	2.00
4. penstock processing equipment	0.00	0.00	0.00	0.00	0.00	0.47	0.07	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.64
5. computers for design	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.47	0.00	0.00	0.00	0.67
6. GIS equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	11.20	1.41	0.00	0.00	0.00	0.00	13.85
7. technical consultation	0.00	0.00	0.00	0.00	0.06	0.06	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
8. technical training	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.36
Total IBRD Loan	0.00	0.00	0.00	0.00	14.12	10.43	2.22	8.05	2.51	12.19	1.82	0.60	0.00	0.00	0.00	51.94
IBRD Loan in Yuan	0.00	0.00	0.00	0.00	52.69	38.90	8.48	38.80	13.44	67.42	10.51	5.22	0.00	0.00	0.00	235.47
Domestic																
1. capital training in yuan	8.76	57.03	100.42	145.00	135.47	131.51	131.02	201.20	303.46	298.81	317.19	604.85	160.00	194.49	152.34	2,941.56
2. interest during construction																
Foreign - accrued (\$)	0.00	0.00	0.00	0.00	0.72	0.18	2.11	2.78	1.47	0.00	0.00	0.00	0.00	0.00	0.00	
* (Y)	0.00	0.00	0.00	0.00	2.68	6.74	8.96	13.94	7.86	0.00	0.00	0.00	0.00	0.00	0.00	40.17
Foreign - paid (\$)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	3.76	1.94	0.00	0.00	0.00	0.00	
* (Y)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.43	21.20	10.33	0.00	0.00	0.00	0.00	39.97
Domestic IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.16	27.56	88.97	89.86	100.00	35.51	0.00	346.06
Total local investment	8.76	57.03	100.42	145.00	135.47	131.51	131.02	201.20	316.06	347.58	416.49	694.71	260.00	230.00	152.34	3,327.59
Total Project Costs in Yuan	8.76	57.03	100.42	145.00	188.16	170.42	139.50	240.00	329.50	415.00	427.00	699.93	260.00	230.00	152.34	3,563.06
Total Project Costs (excl. IDC)	8.76	57.03	100.42	145.00	188.16	170.42	139.50	240.00	316.91	366.24	327.70	610.07	160.00	194.49	152.34	3,177.03
Official exchange rate	1.9859	2.7032	3.62	3.7314	3.7314	3.7314	3.8149	4.8174	5.3643	5.5305	5.7737	8.72	8.72	8.43	8.43	
Shadow exchange rate	1.9859	2.7032	3.62	3.2	4	5.5	5.5	5.5	5.5	6.3	7.5	9	8.43	8.43	8.43	
SCF (standard conversion factor)	1.00	1.00	1.00	0.86	1.07	1.47	1.44	1.14	1.03	1.14	1.30	1.03	0.97	1.00	1.00	
CF used for Yantan project	1.20	1.20	1.20	1.03	1.29	1.77	1.73	1.37	1.23	1.37	1.56	1.24	1.16	1.20	1.20	
Inflation (actual rates before 1994)																
foreign (MUV)	-2.3	-2.1	0.8	17.9	9.8	7.3	-0.7	5.7	2.1	4.3	-0.4	3.1	2.6	2.6	2.6	
domestic	1.5	2.8	8.8	6	7.3	18.5	17.8	2.1	2.9	5.4	13	20	14	10.5	8.5	
Deescalation factor (1985 price level)																
foreign			1	1.09	1.24	1.34	1.38	1.42	1.47	1.52	1.55	1.57	1.62	1.66	1.70	
domestic			1	1.03	1.10	1.24	1.47	1.60	1.64	1.71	1.87	2.19	2.55	2.86	3.13	
Deescalated costs (1985 price level)																
foreign	0.00	0.00	0.00	0.00	11.42	7.77	1.61	5.68	1.70	8.02	1.17	0.38	0.00	0.00	0.00	37.74
local (excl. IDC)	8.76	57.03	100.42	140.78	123.30	105.84	89.27	125.41	184.53	174.43	169.40	276.78	62.72	67.99	48.66	1,735.31
Total deescal. costs (1985 price level)																1,871.95

Table 9: (CONT'D)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Yantan											
Power absorption by grid (MW)	963	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Energy absorption by grid (GWh)	4,300	5,100	5,500	6,000	6,420	6,420	6,420	6,420	6,420	6,420	6,420
Economic capital cost (Yx10 ⁶ , 1994 constant)	185.61	241.41	189.09								
Operating cost (Yx10 ⁶)	75.18	85.92	85.92	85.92	85.92	85.92	85.92	85.92	85.92	85.92	85.92
Total cost (Yx10 ⁶)	260.80	327.33	275.02	85.92	85.92	85.92	85.92	85.92	85.92	85.92	85.92
AIC of Yantan (Yuan)											
Coal Alternative											
Equivalent coal capacity	1,195.95	1,242.55									
Equivalent coal energy	4,558.00	5,406.00	5,830.00	6,360.00	6,805.20	6,805.20	6,805.20	6,805.20	6,805.20	6,805.20	6,805.20
Installation schedule	300	300									
Cumulative capacity	1,200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Coal unit 1											
Coal unit 2											
Coal unit 3											
Coal unit 4	366.36										
Coal unit 5	732.72	366.36									
Capital cost (Yx10 ⁶)	1,099.08	366.36									
Fuel cost (Yx10 ⁶)	571.57	677.91	731.08	797.54	853.37	853.37	853.37	853.37	853.37	853.37	853.37
Operating and maint. (Yx10 ⁶)	219.82	274.77	274.77	274.77	274.77	274.77	274.77	274.77	274.77	274.77	274.77
Total cost (Yx10 ⁶)	1,890.47	1,319.04	1,005.85	1,072.31	1,128.14	1,128.14	1,128.14	1,128.14	1,128.14	1,128.14	1,128.14
AIC of coal alternative (Yuan)											
Cost difference (coal-hydro)	1,704.85	1,077.63	816.76	1,072.31	1,128.14	1,128.14	1,128.14	1,128.14	1,128.14	1,128.14	1,128.14
Equalizing discount rate											
NPV of Yantan project costs											
NPV of thermal alternative											
NPV of thermal/NPV of hydro											
IRR calculations											
Benefit (GEPB 1994 average tariff)	597.02	708.10	763.64	833.06	891.37	891.37	891.37	891.37	891.37	891.37	891.37
Benefit - cost	411.41	466.69	574.54	833.06	891.37	891.37	891.37	891.37	891.37	891.37	891.37
IRR based on GEPB 1994 tariff											
Benefit (tariff to the grid)	1,076.72	1,277.04	1,377.20	1,502.40	1,607.57	1,607.57	1,607.57	1,607.57	1,607.57	1,607.57	1,607.57
Benefit - cost	891.11	1,035.63	1,188.11	1,502.40	1,607.57	1,607.57	1,607.57	1,607.57	1,607.57	1,607.57	1,607.57
IRR based on Yantan tariff to grid											
Benefit (willingness to pay)	1,634.00	1,938.00	2,090.00	2,280.00	2,439.60	2,439.60	2,439.60	2,439.60	2,439.60	2,439.60	2,439.60
Benefit - cost	1,448.39	1,696.59	1,900.91	2,280.00	2,439.60	2,439.60	2,439.60	2,439.60	2,439.60	2,439.60	2,439.60
IRR based on willingness to pay											

/a Economic costs in US dollars calculated annually by (i) multiplying local costs by conversion factor (2.0 for mechanical and electrical equipment, and standard conversion factor for other items); (ii) converting at the official exchange rate; and (iii) adding to foreign costs. These were escalated to 1994 using MUV index, and reconverted to Yuan using the 1994 exchange rate.

Table 10: STATUS OF LEGAL COVENANTS

Agreement	Section	Covenant type	Present status	Original fulfillment date	Revised fulfillment date	Description of covenant	Comments
Loan	3.01	10	C			Government to carry out training program to strengthen capability of MWREP and other related institution in financial planning.	
	3.04	7	C			Government to carry out resettlement program satisfactory to the Bank.	
	4.01(b) & (c)	1	C			Government to furnish to the Bank, not later than June 30, annual audit reports by independent auditors.	
Project	2.05(b)	10	C			GEPB to carry out training program to strengthen capability of GEPB in operation and maintenance, financial management and planning.	
	3.04	10	C			GEPB to carry out a program acceptable to the Bank to improve public health in the reservoir area	
	3.05	10	C			GEPB to provide for periodic independent inspection of dams during construction and after completion	
	4.01(b)	1,2	C			GEPB to furnish to the Bank, not later than June 30, (a) annual financial statements audited by independent auditors acceptable to the Bank, and (b) audit reports.	

Table 10: (CONT'D)

Agreement	Section	Covenant type	Present status	Original fulfillment date	Revised fulfillment date	Description of covenant	Comments
	4.02	2	C			GEPB will take, or cause to be taken, measures as shall be required to produce for each of its fiscal years after December 31, 1985, operating revenues equivalent to not less than the sum of its total operating expenses and the amount by which its financial obligations exceed the provision for depreciation and any other noncash operating expenses.	
	4.03	2	C			GEPB will not incur any long-term debt if the debt service coverage is projected to be less than 1.3 times.	
	4.04	2	C			GEPB will furnish to the Bank by December 31 of each year, for its comment, a five-year rolling financial plan containing income statements, sources and uses of funds, and balance sheets.	

Table 11: COMPLIANCE WITH OPERATIONAL MANUAL STATEMENTS

(Not Applicable)

Table 12: BANK RESOURCES: STAFF INPUTS

Stage of project cycle	Actual	
	Weeks	\$'000
Preparation to appraisal	17.4	n.a.
Appraisal	25.8	n.a.
Negotiations through Board approval	3.8	n.a.
Supervision	53.5	n.a.
Completion	9.0	n.a.
<u>Total</u>	<u>109.6</u>	<u>n.a.</u>

Table 13: BANK RESOURCES: MISSIONS

Stage of project cycle	Month/ year	No. of persons	Days in field	Specialized staff skills represented/ <u>a</u>	Performance rating		Types of problems
					Implem. status	Dev. objectives	
Through appraisal	06/85	2	2	E,FA			
	11/85	4	15	E,FA,FA,R			
Appraisal through Board approval							
Board approval through effectiveness							
Supervision	(1)	10/86	1	5	E	NR/ <u>b</u>	Flood damage.
	(2)	11/87	2	8	E,FA	1	Training delays, progress reports.
	(3)	08/88	2	6	E,FA	1	Procurement, foreign fund shortage, cableway, progress reports.
	(4)	10/89	2	4	E,FA	1	Cableway, delay, spare part shortages, procurement, resettlement financing.
	(5)	10/90	3	5	E,E,FA	1	Cableway delays, procurement, foreign fund, cost control.
	(6)	12/91/ <u>c</u>	1	6	R	NR	Economic rehabilitation planning.
	(7)	09/92/ <u>c</u>	1		R	NR	
	(8)	05/93	1	3	E	1	Concrete quality, cost overrun, progress reports, equipment delivery delays.
	(9)	10/93	1	7	E	1	Equipment delivery delays

/a E: Engineer, FA: Financial Analyst, EC: Economist, R: Resettlement Specialist.

/b NR: Not Rated.

/c Supervision of resettlement component. No Form 590 prepared.

**ANNEX 1: PROJECTED AND ACTUAL
FINANCIAL STATEMENTS OF GEPB (1986-94)**

Table 1: INCOME STATEMENT
(Y million)

Year Ended December 31	1986		1987		1988		1989		1990		1991		1992		1993		1994	
	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual
Operating Revenues																		
Sales Increase (%)	7.1	15.3	10.0	13.1	10.5	(4.1)	10.3	8.9	15.0	15.0	9.3	9.1	9.0	9.5	9.2	23.1	9.3	12.7
Energy Sales (GWh)	5,280	5,908	5,810	6,683	6,420	6,410	7,080	6,984	8,142	8,033	8,900	8,760	9,700	9,596	10,590	11,812	11,570	13,316
Average Price (fen/kWh)	7.1	7.2	7.1	7.4	7.1	7.7	7.1	9.1	7.7	8.7	7.7	10.9	8.6	11.1	11.3	11.8	11.3	17.5
Total Operating Revenues	375	424	413	491	456	491	503	634	630	699	689	953	838	1,063	1,201	1,397	1,312	2,326
Operating Costs																		
Fuel	83	104	113	145	140	149	184	158	222	148	251	297	303	328	296		307	
Purchased Power	22	24	22	23	22	23	25	120	67	124	50	177	70	214	77		47	
Operation & Maintenance	36	42	45	51	48	56	57	63	65	86	73	100	77	115	104		130	
Administration	10	12	11	13	13	16	14	18	15	30	17	30	19	43	20		22	
Sales Tax	56	104	62	117	69	85	75	99	95	105	103	122	126	135	180	152	197	356
Depreciation	38	45	45	54	50	61	57	64	67	71	77	86	84	95	111		158	
Other Expenses	0	0	0	1	0	1	0	6	0	7	0	8	0	15	0		0	
Total Operating Costs	245	331	298	403	342	390	412	528	531	571	571	820	679	945	788	1,240	861	1,967
Operating Income	130	93	115	88	114	101	91	105	99	128	118	133	159	118	413	158	451	359
Other Income (Losses)	0	(3)	0	(2)	0	(3)	0	8	0	(3)	0	(9)	0	(8)	0	(4)	0	67
Interest Charged to Operation	0	0	4	0	9	0	12	0	10	0	10	0	40	0	41	13	38	185
Net Income Before Income Tax	130	90	111	86	105	98	79	113	89	125	108	123	119	110	372	141	413	241
Income Tax	72	38	51	36	51	27	30	35	40	38	50	36	19	30	156	26	198	65
Net Income	58	52	60	50	54	70	49	78	49	86	58	87	100	80	216	115	215	176
Distribution of Net Income																		
Remittance to Government	49	18	32	11	32	15	11	17	11	17	6	13	4	18	19	0	47	0
Transferred to Government Fund	0	18	18	19	12	46	25	48	17	53	19	57	84	54	87	0	54	0
Retained Earnings	9	16	10	20	10	9	13	14	21	16	33	17	12	7	109	115	115	176
Rate of Return on Average Net Fixed Assets in Service	13.6	4.4	10.1	3.8	8.9	5.3	6.3	5.2	5.7	5.2	6.0	4.8	7.5	4.3	14.1	3.6	10.3	8.1

Table 2: BALANCE SHEET
(Y million)

Year Ended December 31	1986		1987		1988		1989		1990		1991		1992		1993		1994	
	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual
ASSETS																		
Current Assets																		
Cash	72	78	86	67	101	75	118	171	136	267	157	245	184	271	195	650	227	1,084
Inventories	25	39	29	42	33	48	38	61	43	77	47	65	52	70	56	92	61	128
Accounts Receivable	42	44	44	34	46	44	48	54	50	118	52	234	54	232	55	560	58	529
Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	9
Total Current Assets	139	161	159	143	180	166	204	287	229	462	256	543	290	575	306	1,303	346	1,749
Long-term Investment	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	77	0	1,000
Fixed Assets																		
Plant in Service	1,317	1,689	1,662	1,757	1,702	1,820	2,086	1,938	2,397	2,033	2,708	2,173	2,893	2,219	4,495	4,535	6,032	5,098
Less: Accum. Depreciation	(330)	(332)	(374)	(383)	(425)	(438)	(482)	(498)	(549)	(555)	(625)	(640)	(709)	(721)	(820)	(1,195)	(978)	(1,260)
Net Plant in Service	987	1,358	1,288	1,374	1,277	1,382	1,604	1,441	1,848	1,478	2,083	1,533	2,184	1,498	3,675	3,340	5,054	3,837
Construction WIP	704	506	768	772	1,225	1,004	1,448	1,099	1,990	1,363	2,746	1,814	3,471	2,522	2,867	3,215	2,278	2,662
Total Fixed Assets	1,691	1,863	2,056	2,147	2,502	2,385	3,052	2,540	3,838	2,841	4,829	3,347	5,655	4,020	6,542	6,556	7,332	6,499
Special Fund Assets	50	89	54	145	54	144	65	85	67	118	76	116	82	0	106	0	116	0
Deferred and Intangible Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	67	0	194
Total Assets	1,880	2,113	2,269	2,435	2,736	2,696	3,321	2,912	4,134	3,421	5,161	4,006	6,027	4,642	6,954	8,003	7,794	9,442
LIABILITIES & EQUITY																		
Current Liabilities																		
Accounts Payable	33	38	32	42	33	68	30	87	31	199	28	271	30	135	35	413	27	471
Due to Government	40	41	42	17	43	21	45	22	47	31	49	27	51	56	24	134	25	157
Short-term Loan	0	0	0	0	0	0	0	34	0	49	0	49	0	54	0	9	0	28
Other Current Liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	261	0	515	0	784
Total Current Liabilities	73	78	74	59	76	89	75	142	78	279	77	346	81	505	59	1,071	52	1,440
Consumer Deposits	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0
Working Capital Funds	20	33	20	35	20	39	22	24	22	27	22	27	24	0	24	0	24	0
Long-term Debt	753	848	1,107	1,129	1,545	1,321	2,084	1,391	2,838	1,653	3,796	2,050	4,549	2,663	5,279	4,203	5,947	4,598
Government Funds	938	1,016	951	941	960	990	972	1,058	1,005	1,108	1,039	1,211	1,112	0	1,268	0	1,391	0
Special Funds	94	139	115	194	133	183	165	206	189	273	225	285	259	0	322	0	378	0
Capital Construction Alloc.	0	0	0	77	0	74	0	91	0	80	0	86	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0	1,435	0	1,619	0	2,549
Capital Surplus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,036	0	609
Retained Earnings	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	74	0	245
Total Liab. & Equity	1,880	2,113	2,269	2,435	2,736	2,696	3,320	2,912	4,134	3,421	5,161	4,006	6,027	4,642	6,954	8,003	7,794	9,442
Long-term Debt % as of LT Debt and Equity	42.2	42.3	50.9	49.9	58.6	53.0	64.7	52.4	70.4	54.5	75.0	57.8	76.8	64.4	76.9	60.6	77.1	57.5
Current Ratio	1.9	2.1	2.1	2.4	2.4	1.9	2.7	2.0	2.9	1.7	3.3	1.6	3.6	1.1	5.2	1.2	6.7	1.2

Table 3: FUNDS FLOW STATEMENT
(Y million)

Year Ended December 31	1986		1987		1988		1989		1990		1991		1992		1993		1994	
	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual	Proj.	Actual
SOURCES OF FUNDS																		
Internal Cash Generation																		
Net Income	59	52	60	50	54	70	49	78	49	86	59	87	100	80	215	115	215	176
Depreciation & Amortization	38	46	45	55	50	62	57	65	67	72	77	88	84	97	111	132	158	308
Maintenance	18	21	23	23	24	24	29	25	34	37	38	50	41	52	63	0	84	0
Connection Charge	9	19	9	19	10	20	10	18	10	13	11	13	11	25	11	0	12	0
Other Resources	0	36	0	46	0	10	0	29	0	53	0	35	0	62	0	0	0	0
Total Internal Sources	124	173	137	194	138	187	145	216	160	261	185	273	236	316	400	247	469	484
Borrowings																		
Proposed IBRD Loan	0	0	36	53	48	39	29	10	18	42	14	15	12	70	0		0	
Other Yantan Project Loan	199	0	213	173	262	143	285	247	421	268	496	359	457	377	239		203	
Other Loans	114	298	122	142	141	182	238	66	319	46	439	81	369	259	499		476	
Total Borrowings	313	298	371	368	451	364	552	323	758	356	949	455	838	707	738	1,607	679	396
Government Funds - Grants	7	9	8	8	7	5	6	12	19	17	16	16	10	19	18	1,255	2	0
Total Sources of Funds	444	480	516	570	596	556	703	551	937	635	1,150	743	1,084	1,041	1,156	3,109	1,150	880
APPLICATIONS OF FUNDS																		
Capital Expenditure																		
Proposed Yantan Project	183	148	227	203	281	194	275	264	384	324	435	382	367	490	200		139	
Other Construction	121	159	126	137	145	175	242	71	336	50	454	89	379	235	517		478	
Interest During Construction	16	0	23	0	30	0	43	0	66	0	98	0	102	0	135		166	
Renovations	28	0	31	0	35	0	34	0	45	0	47	0	56	0	62		86	
Total Capital Expenditures	348	307	407	339	491	369	594	335	831	374	1,034	470	904	725	914	2,656	869	(57)
Operational Requirements																		
Changes in Working Capital	5	(11)	7	47	5	(18)	8	(14)	7	(61)	8	34	3	(67)	1	217	15	357
Changes in Special Funds Assets	2	25	4	56	0	(1)	11	(59)	2	33	9	(2)	6	92	24	0	11	0
Loan Repayment	0	25	19	30	19	56	25	56	25	60	25	65	90	62	90	67	90	310
Remittances to Government	48	18	31	11	30	15	9	17	9	17	4	13	2	18	46	76	46	0
Special Fund Expenditures	29	96	34	97	35	127	40	120	44	117	48	185	51	185	69	0	87	0
Increase in LT Investment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	0	923
Total Oper. Requirements	84	153	95	242	89	179	93	120	87	166	94	295	152	290	230	419	249	1,590
Total Applications of Funds	432	460	502	581	580	548	687	454	918	539	1,128	765	1,056	1,015	1,144	3,075	1,118	1,533
In(de)creases in Cash	12	20	14	(11)	16	7	16	96	19	96	22	(22)	28	26	12	34	32	(653)
Annual Debt Service Coverage (times)	6.8	6.1	6.4	5.3	3.3	4.2	3.9	4.9	4.3	5.6	4.2	2.1	5.1	3.4	3.3	4.0	1.4	

ANNEX 2: PROJECT REVIEW FROM THE BORROWER'S PERSPECTIVE

Part One: Dam and Power House Works

Dam and power house works of Yantan Hydroelectric Project were wholly completed in 1994. Units 1, 2, 3 have been duly put into operation. Unit 4 shall be put into operation in June 1995. The last item of the Project is ship lift works with 250t, which is under construction and scheduled for navigation in 1997.

We are satisfied with the enforcement results and benefits of this Project. From the construction duration point of view, the construction time has certain ahead of schedule; from the project quality point of view, based on the requirements of design and specification, the percentage of qualification is 100%, the percentage of good quality 70%, the percentage of good quality of concrete 87.5%, the overall construction quality is good. From finance point of view, it is controlled very well and about 5% of the investment be saved; from procurement contracts point of view, they are implemented quite smoothly, which play an active role in speeding up the construction schedule of Yantan Project; from power grid systems point of view, three units put into operation up to 1994 was accumulated to 907.5 MW, which occupied 33% of capacity of the whole Guangxi power grid and 50% of hydro power capacity. The power generation capacity of Yantan in 1994 was 3.099 TW.h, which occupied 25% of total power amount of Guangxi power grid and 42.8% of hydropower capacity. This Project can more develop regulating benefits and improve economic characteristics of power grid operation. More power energy can be transmitted to Guangzhou before flood, which has realized power transmission from west to east.

The cooperation between international consultancy companies and the units concerned at home is good, which is an important guarantee to realize project target.

Part Two: Environment

The systematic environmental monitoring activities have been carried out during the construction of Yantan Hydroelectric Project. After impounding, the environmental monitoring in the initial operation are being made one after another. Based on the present monitoring results, they are basically consistent with the prediction results in the "Environmental Impact Report."

According to the environmental problems revealed by the impounding of Yantan Project, the monitoring work for karst water logging areas, slopeslipes and induced earthquake should be strengthened.

In order to meet the requirements of the relocatees' production, solution oxygen, nutrient level should be monitored for cage fisheries, besides monitoring aquatic organisms in the reservoir area.

Due to reservoir impounding, variations of climate in some areas are advantageous to growth of vegetation and no big changes happen in plant area. So, planting industry in reservoir area should be emphatically studied and developed.

Environmental problems must be paid attention to in the capital construction. The environmental protection activities must be carried out with design, construction and management of the main works in parallel.

Part Three: Resettlement

On the basis of carrying out conscientiously the resettlement plan of Yantan reservoir, the relocation and construction of resettled people were started in 1985 and ended in 1995. At present, 20,980 resettled people have been well relocated for production and development. The rest people 41,550 have got preliminary arrangement, but their income is below the standard of Guangxi income target. They still belong to unsteadily relocation. In order to have a good relocation and catch up the local average living standard, efforts must be made from this year and several years in the future.

In 1991, the total investment of submergence approved was added from 195.30 million yuan to 426.30 million yuan. In 1994, all the fund had been obtained, of which there are still 51 million yuan for 1995, which will be mainly used for production and development.

As for 1995, there is still 12 million yuan for reservoir maintenance. In the future, there will be about 20 million yuan for reservoir maintenance year by year. All these funds will be used for development and construction in the reservoir area and improving the living standard of the resettled people.

Part Four: Financial Management

Guangxi Electric Power Bureau (GEPB) is a large electric power enterprise of State under the jurisdiction of the Ministry of Electric Power of China, which implements independent accounting. In regard to finance and accounting, GEPB implements "General Provisions of Enterprise Finance," "Guidelines of Enterprise Accounting" and "System of Finance and Accounting of Industrial Enterprise" issued by the Ministry of Finance.

Part Five: Operation Plan of Yantan Power Plant

1. Dam and Power House Works

From September 16, 1992 to April 30, 1995, power generating capacity of three units of Yantan Power Plant accumulated to 6.876 billion kWh, with unit cost of 17.5 yuan/MWh. The utilization for three units were 90.5% for Unit 1, 72.31% for Unit 2 and 46.12% for Unit 3 respectively.

The preparatory works for Yantan Power Plant was started early in 1986 and preparation for production was ready in August 1992. Through the actual operation and inspection for more than three years, the preparation for production is in a better and solid condition. Today, the organization for the Plant is simplified and its personnel have a high level of competence through professional training.

Procedures for Equipment Operation and Maintenance of the Power Plant:

Work in the power house is carried out according to the relative regulations of the Ministry of Electric Power. Every operator has one copy of Operation Manual in hand and implements regular maintenance schedule. Once some problems appear, they must be solved in time. The regular maintenance schedule for units and main equipments shall be made (one overhaul in every 5 years and one routine maintenance in every year).

Reservoir dispatching shall be carried out correctly and effectively, which is the dispatching rules to minimize water loss and maximize operating efficiency.

Safety procedures shall be done according to the safety standard procedures and plan for power house operation, including regular observation and maintenance for dam and power house structures and safety inspection for dam, spillway operation and gate operating procedures.

2. Environment

Environmental work shall be implemented according to Environmental Monitoring Plan of Yantan Hydroelectric Project approved by the Ministry of Electric Power and State Energy Investment Corp., including submergence monitoring, sand and mud accretion in the reservoir monitoring, water quality monitoring, climate monitoring, earthquake monitoring, ecological impact monitoring, bank caving and depression monitoring, schistosomiasis and snail vectors monitoring in Hase of Dahua county, etc. The total fund for monitoring is estimated about 2.10 million yuan.

3. Resettlement

Based on the total investment for submergence approved in 1991, it is 426.30 million yuan, all the fund was obtained in 1994. There is still 51.00 million yuan in 1995, which shall be mainly used for production and development. As for 1995, there

is still 12 million yuan for reservoir maintenance. In the future, there will be 20 million yuan for reservoir maintenance year by year, which will be used for production and development and improving living standard of the resettled people.

ANNEX 3: AIDE-MEMOIRE FOR COMPLETION MISSION

Yantan, China
April 8, 1995

1. A World Bank mission consisting of Barry Trembath, Robert Crooks, Martin ter Woort, Scott Ferguson and Youxuan Zhu visited Guangxi Electric Power Bureau (GXEPB) and the Yantan project from March 29 to 31, 1995 and the Yantan Reservoir over the period April 4 to April 7, 1995 to discuss requirements for the completion report for the Yantan project. Officials from the Bureau and from the Guangxi Yantan Hydroelectric Project Construction Corporation (YHPCC) were joined by representatives of the Guangxi Resettlement Office (GRO) in the discussions. The mission would like to express its appreciation for the excellent arrangements for the visit, the courtesy and cooperation of the participants to the various discussions, and for the gracious hospitality extended to the mission. This aide-memoire outlines the mission's findings and suggestions for finalization of the completion report.

Borrower's Completion Report

2. The mission was provided with a draft completion report for the main project, and detailed reports on environmental and resettlement aspects. These are close to meeting the requirements for the Borrower's completion report, required by the new Bank guidelines. Comments on the reports were provided by the mission. **A report should also be provided by GXEPB on the financial and utility management component of the project.** Since these four reports in total are longer than eight pages, the mission requested that a summary report of less than eight single spaced pages also be prepared for attachment (unedited) to the Bank's own completion report.

Operation Plan

3. The new guidelines also require that an **Operation Plan be prepared setting out the plans for future operations to ensure efficient, economical operations of the project.** The mission suggested that this plan be prepared for the Yantan dam and power station (prepared by the Yantan Power Plant), the reservoir (prepared by the GRO) and the environment (prepared by the Environmental Monitoring Center). Suggested outlines were provided by the mission.

Reevaluation of Economics

4. The mission was advised that Yantan power is being sold to the grid at 25.04 fen/kWh. This value will be used for re-evaluating the economics of the project. The mission also requested **disbursements to be prepared in the form set out in Annex A in the comments on Section I-2 of the dam and power station completion report**, to facilitate the economic analysis. **The mission also requested that the current tariff schedule of GXEPB be provided.**

Financial Data

5. The mission received financial tables from GXEPB. These will be reviewed by financial analysts in Washington and any further requirements will be advised from there.

Timing

6. The mission requested that **the revised and additional reports and data be forwarded to Washington by courier by May 20, 1995.**

IMAGING

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