

Document of  
The World Bank

Report No: 22676-CN

PROJECT APPRAISAL DOCUMENT  
ON A  
PROPOSED LOAN  
IN THE AMOUNT OF US\$105 MILLION  
TO THE  
PEOPLE'S REPUBLIC OF CHINA  
FOR  
HUBEI HYDROPOWER DEVELOPMENT IN POOR AREAS PROJECT

May 30, 2002

Energy and Mining Sector Development Unit  
East Asia and Pacific Region

## CURRENCY EQUIVALENTS

(Exchange Rate Effective 11/15/2001)

Currency Unit = Yuan (Y)

Y 1 = US\$0.12

US\$1 = Y 8.28

## FISCAL YEAR

January 1 -- December 31

## ABBREVIATIONS AND ACRONYMS

|     |   |   |
|-----|---|---|
| m   | - | Meter                                     |
| km  | - | Kilometer (=0.62 miles)                   |
| kW  | - | Kilowatt (=1,000 watts)                   |
| MW  | - | Megawatt (1,000,000 watts)                |
| GW  | - | Gigawatt                                  |
| kWh | - | Kilowatt hour (=860.42 kcal)              |
| MWh | - | Megawatt hour (=1,000 kWh)                |
| GWh | - | Gigawatt hour (=1,000,000 kilowatt hours) |
| kV  | - | Kilovolt (1,000 volts)                    |
| MVA | - | Megavolt-Ampere (1,000 kilovolt-amperes)  |

|                                 |                     |
|---------------------------------|---------------------|
| Vice President:                 | Jemal-ud-din Kassum |
| Country Manager/Director:       | Yukon Huang         |
| Acting Sector Manager/Director: | Mohammad Farhandi   |
| Task Team Leader/Task Manager:  | Barry Trembath      |

## ABBREVIATIONS AND ACRONYMS

|   |  |
|---|--|
| ADB - Asian Development Bank  | HPPAO - Hubei Provincial Poverty Alleviation Office                          |
| ASTAE - Asia Alternative Energy Programme                                 | HPPDC - Hubei Provincial Planning and Development Commission                 |
| BP - Bank Procedures  | IAS - International Accounting Standards                                     |
| CAS - Country Assistance Strategy   | IBRD - International Bank for Reconstruction and Development                 |
| CFAA - Country Financial Accountability Assessment                        | ICB - International Competitive Bidding                                      |
| CFB - County Finance Bureau   | IDC - Interest During Construction   |
| CIF - Cost, Insurance, Freight  | LGPR - Leading Group for Poverty Reduction                                   |
| COSU - Central Operational Service Unit                                   | MFB - Municipal Finance Bureau   |
| CPC - Chinese Communist Party   | MOF - Ministry of Finance  |
| CPMO - County Project Management Office                                   | MMS - Mandated Marked Share  |
| CQ - Selection Based on Consultants' Qualifications                       | MS Co. - Hydropower Construction Engineering Consulting<br>Mid-South Company |
| CRAES - Chinese Research Academy of Environmental<br>Sciences             | MWR - Ministry of Water Resources  |
| CRESP - China Renewable Energy Scale-up Program                           | NCB - National Competitive Bidding   |
| CWRC - Changjiang Water Resources Commission                              | NPL - Normal Pool Level  |
| DRA - Debt Reserve Account  | OD - Operational Directives  |
| DSCR - Debt Service Coverage Ratio  | OP - Operational Policies  |
| EA - Environmental Assessment   | PAP - Project Affected People  |
| EDR - Equalizing Discount Rate  | PCD - Project Concept Document   |
| EIRR - Economic Internal Rate of Return                                   | PDR - Preliminary Design Report  |
| EMP - Environmental Management Plan                                       | PIP - Project Implementation Plan  |
| ESCO - Energy Service Company   | PMF - Probable Maximum Flood   |
| ESMAP - Energy Sector Management Assistance Programme                     | POE - Panel of Experts   |
| ETI - Sichuan Ertan International Engineering Consulting<br>Company, Ltd. | PPMO - Provincial Project Management Office                                  |
| FIRR - Financial Internal Rate of Return                                  | PRA - Participatory Rural Appraisals   |
| FMIS - Financial Management Information System                            | QCBS - Quality and Cost Based Selection                                      |
| FSR - Feasibility Study Report  | RAP - Resettlement Action Plan   |
| GAAP - General Accepted Accounting Principles                             | RLG - Resettlement Leading Group   |
| GEF - Global Environmental Facility                                       | SA - Social Assessment   |
| GHG - Greenhouse Gas  | SDPC - State Development and Planning Commission                             |
| GOC - Government of China   | SE - Supervision Engineer  |
| GP - Good Practices   | SPC - State Power Corporation  |
| HEPB - Hubei Environmental Protection Bureau                              | SPEC - State Power Economic Research Center                                  |
| HEPRI - Hubei Environmental Protection Research Institute                 | SS - Single-Source Selection   |
| HIDI - Hubei Investigation and Design Institute                           | TTL - Task Team Leader   |
| HPFB - Hubei Provincial Finance Bureau                                    | UNDP - United Nations Development Programme                                  |
|   | WBOB - World Bank Office in Beijing  |





**CHINA**  
**HUBEI HYDROPOWER DEVELOPMENT IN POOR AREAS PROJECT**

**CONTENTS**

|   | <b>Page</b> |
|---|-------------|
| <b>A. Project Development Objective</b>   |             |
| 1. Project development objective  | 3           |
| 2. Key performance indicators   | 3           |
| <b>B. Strategic Context</b>   |             |
| 1. Sector-related Country Assistance Strategy (CAS) goal supported by the project | 3           |
| 2. Main sector issues and Government strategy                                     | 3           |
| 3. Sector issues to be addressed by the project and strategic choices             | 11          |
| <b>C. Project Description Summary</b>   |             |
| 1. Project components   | 13          |
| 2. Key policy and institutional reforms supported by the project                  | 16          |
| 3. Benefits and target population   | 16          |
| 4. Institutional and implementation arrangements                                  | 17          |
| <b>D. Project Rationale</b>   |             |
| 1. Project alternatives considered and reasons for rejection                      | 17          |
| 2. Major related projects financed by the Bank and other development agencies     | 22          |
| 3. Lessons learned and reflected in the project design                            | 23          |
| 4. Indications of borrower commitment and ownership                               | 24          |
| 5. Value added of Bank support in this project                                    | 24          |
| <b>E. Summary Project Analysis</b>  |             |
| 1. Economic   | 25          |
| 2. Financial  | 26          |
| 3. Technical  | 28          |
| 4. Institutional  | 29          |
| 5. Environmental  | 33          |
| 6. Social   | 37          |
| 7. Safeguard Policies   | 44          |

|   |     |
|---|-----|
| <b>F. Sustainability and Risks</b>  |     |
| 1. Sustainability   | 45  |
| 2. Critical risks   | 45  |
| 3. Possible controversial aspects   | 47  |
| <b>G. Main Conditions</b>   |     |
| 1. Effectiveness Condition  | 47  |
| 2. Other  | 47  |
| <b>H. Readiness for Implementation</b>  | 50  |
| <b>I. Compliance with Bank Policies</b>   | 50  |
| <br>  |     |
| <b>Annexes</b>  |     |
| Annex 1: Project Design Summary   | 51  |
| Annex 2: Detailed Project Description   | 54  |
| Annex 3: Estimated Project Costs  | 66  |
| Annex 4: Cost Benefit Analysis Summary, or Cost-Effectiveness Analysis Summary        | 67  |
| Annex 5: Financial Summary for Revenue-Earning Project Entities, or Financial Summary | 73  |
| Annex 6: Procurement and Disbursement Arrangements                                    | 88  |
| Annex 7: Project Processing Schedule  | 108 |
| Annex 8: Documents in the Project File  | 109 |
| Annex 9: Statement of Loans and Credits   | 110 |
| Annex 10: Country at a Glance   | 114 |
| Annex 11: Energy Sector Issues and Bank Strategy                                      | 116 |
| Annex 12: Financial Management Assessment   | 127 |
| Annex 13: Environmental Summary   | 135 |
| Annex 14: Land Acquisition and Resettlement   | 145 |
| Annex 15: Social Assessment   | 159 |
| Annex 16: Poverty Alleviation Impacts   | 172 |
| Annex 17: Social Assessment Appraisal Mission Report                                  | 180 |
| Annex 18: Institutional Arrangements for Implementation and Operation                 | 192 |



**Borrower:** CHINA

**Responsible agency:** HUBEI PROVINCIAL FINANCE BUREAU

Hubei Provincial Project Management Office (PPMO)

Address: 8 Zhongbei Road, Wuchang District, Wuhan City, Hubei 430071, China

Contact Person: Mme. Guo Shimin

Tel: (86-27) 8784-9682

Fax: (86-27) 8784-9682

Email: guoshimin\_wh@163.com

Other Agency(ies):

Project Companies:

**Xuan-en Dongping Hydroelectric Power Company Limited**

Address: Xuan-en County Seat, Hubei 430077, China

Contact Person: Mr. Cheng Tao, President

Tel: (86-27) 88566522

Fax: (86-27) 86782348

Email:

**Laifeng County Najitan Hydroelectric Power Development Company Limited**

Address: 39 Fengnan Road, Xiangfeng Town, Laifeng County, Hubei 445700, China

Contact Person: Mr. Zhen Shizhou, Vice President

Tel: (86-718) 6287398

Fax: (86-718) 6287398

Email:

**Zhushan Duhe Hydroelectric Power Development Company Limited**

Address: 39 Renmin Road, Zhushan County Seat, Hubei 442200, China

Contact Person: Mr. Zhu Ze, President

Tel: (86-719) 4226191

Fax: (86-719) 4226191

Email:

**Nanzhang Xiakou Electric Power Company Limited**

Address: 424 Shuijing Road, Nanzhang County Seat, Hubei 441500, China

Contact Person: Mr. Wu Hanxin, President

Tel: (86-710) 5258660

Fax: (86-710) 5258660

Email:

**Estimated Disbursements ( Bank FY/US\$m):**

|                   | 2003  | 2004  | 2005  | 2006  | 2007   | 2008   |  |  |
|-------------------|-------|-------|-------|-------|--------|--------|--|--|
| <b>Annual</b>     | 12.00 | 27.50 | 32.50 | 20.00 | 9.00   | 4.00   |  |  |
| <b>Cumulative</b> | 12.00 | 39.50 | 72.00 | 92.00 | 101.00 | 105.00 |  |  |

**Project implementation period:** Seven years

**Expected effectiveness date:** 09/30/2002 **Expected closing date:** 12/31/2008

## **A. Project Development Objective**

### **1. Project development objective: (see Annex 1)**

The project has three objectives: (a) facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner; (b) enhance the efficiency of the electricity sector in Hubei by commercializing county level generation companies; and (c) contribute to poverty alleviation efforts in poor communities in Hubei.

### **2. Key performance indicators: (see Annex 1)**

The performance indicators for monitoring and evaluation purposes are listed in Annex 1.

## **B. Strategic Context**

### **1. Sector-related Country Assistance Strategy (CAS) goal supported by the project: (see Annex 1)**

**Document number: R 98-107 (Progress Report) Date of latest CAS discussion: 05/29/1998**

The CAS goals were to reduce infrastructure bottlenecks by adjusting the investment pattern in favor of water management, energy, transportation, and telecommunications, to adjust the balance between energy development and conservation, and to develop alternative energy sources. The CAS is currently under revision and is expected to be presented to the Board in October 2002 and major themes emerging are assistance to China in its transitions from a command economy to a market economy; and from a rural, agricultural economy to an urban society, focusing on development of institutional frameworks, development of environmentally sustainable infrastructure; and addressing the needs of disadvantaged peoples and regions.

The Bank's energy sector strategy contributes to these three objectives focusing on: transitioning the state owned energy sector to a diversely owned market based system; conversion to clean fuels and increasing energy efficiency; and raising incomes in poorer western areas by assisting them to develop and export their energy resources. The current status, major issues and Bank strategy in addressing these issues (with particular reference to the power sub-sector) are described in Annex 11, and summarized in the following paragraphs, with particular reference to the issues addressed by the current project.

### **2. Main sector issues and Government strategy:**

#### **Transitioning the Power Sub Sector**

**Background.** Until the early 1980s, China's power systems were entirely government owned. For the most part, power was provided through a centralized government department with operating units at the province, prefecture (or municipality) and county levels. However, because not all rural areas were connected to main grids, local systems also grew up at county level and even at local government levels (township and village). Governments down to county level are considered to be part of the Chinese Government. Below the county level, governments are considered to be representatives of collectives, which were formerly organized into communes (now referred to as townships) and brigades (now referred to as villages). Except for local government systems, investments were centrally decided and financed through budget allocations. Prices were centrally controlled and covered only a small portion of supply costs. Private ownership of power assets was illegal. Power shortages were endemic.

Over the two decades since 1980 there have been very great changes. The sector is now largely corporatized and its ownership is diverse, budget allocations have been phased out, subsidies eliminated

and electricity prices are in line with or above marginal supply costs in most grids. This has enabled the sector to grow dramatically with installed capacity and generation quadrupling to over 300 GW and about 1250 TWh, such that China's power sector is by now the second largest in the world, and supply and demand are basically in balance.

The provincial power companies still form the core of the current system. These state owned entities own and operate the main transmission grids, act as single buyers in the purchase of power from generators (except for "embedded" generation) and its sale to distributors, and continue to have substantial interests in generation and distribution. The single buyer structure has showed strains in recent years and the Government therefore intends to introduce and expand competition, starting with generation in the short term and eventually extending to retail competition in the longer term (5 to 10 years). As initial steps, the government mandated the separation of generation from transmission and distribution, selected six provinces to test competitive generation markets and started to revise the Electricity Law to provide a stronger legal basis for reform. This was followed in late 2000 by a government mandate to State Development Planning Commission (SDPC) to investigate in detail the future direction of power sector reform. SDPC's recommendations, which have been substantively adopted in April, 2002 by State Council include the following measures:

**Objectives.** Break up monopolies and introduce competition to improve efficiency and reduce cost while optimizing resource allocation and promoting power development, through acceleration of grid integration and development of a fair, orderly and healthy power market system under appropriate government regulation.

**Restructure State-owned Assets In Power Sector.** Principles for this restructuring are as follows:

- Separate generation and network business businesses at all administrative levels.
- Restructure State Power Corporation (SPC) owned generation assets into independent generation enterprises, such that the capacity share of a generation company in a power market should not exceed 20 percent.
- Establish a national grid company and six regional grid companies, with provincial grid companies becoming branches or subsidiary companies of the regional companies responsible for power transmission and distribution locally.
- The grid companies may retain both transmission and distribution business during the 10th plan period, but should achieve accounting separation. In case of multiple asset ownership within a county, limited liability or shareholding companies should be established based on net assets owned by each party.

**Bid for Dispatch and New Pricing Mechanisms.** The following principles will apply:

- Power trading centers will be established and generators will bid for dispatch. Within the jurisdiction of each regional grid company, one or more dispatch centers will be established depending on local conditions, all managed by the regional grid companies with free trading between dispatch centers.
- The issue of price difference relating to different historical costs should be managed by asset

restructuring or merging and acquisition to form independent power plants with revalued assets, able to compete fairly in the new market environment; the detailed procedure for introduction of competition may be developed by each power dispatch and trading center.

- Environmental emission pricing standards are to be implemented along with the introduction of bidding for dispatch. In order to support the development of clean energy, preferential policies should be developed for newly commissioned hydropower and wind power projects; VAT should not exceed eight percent and detailed methods will be developed by MOF.
- The precise timetable to introduce competition should be determined by the structure of the local industry, local management capability, and adequacy of technical support systems. Regions with the needed conditions should establish trading centers and introduce bidding for dispatch as early as possible.
- A rational wholesale power pricing mechanism shall be developed. The electricity prices will be divided into generation, transmission, distribution price and consumer supply. The generation price will consist of a government determined fixed capacity price and competitive-market determined energy price. The government will determine the principles of transmission pricing and distribution pricing. The consumer price will be made up of the above prices and will fluctuate with generation price. The government will regulate and monitor the prices of each segment according to the principles of efficiency, incentive mechanisms, taking into consideration the need to attract investment and the absorption capability of society.
- In areas where conditions permit, direct electricity supply of generators to large energy consumers and distributors should be piloted. The generation price will be negotiated between the parties; the government will determine the transmission price.

**State Power Regulatory Agency.** A power regulatory agency will be established under the State Council. It will perform the regulatory duties and functions authorized by the State Council. The institutional framework of the regulatory agency will follow a vertical approach. The regulatory agency will have branch offices in areas with regional power grid companies and trading centers. The principle duties of the state regulatory agency include: development of power market rules and monitoring of market operations, ensuring fair competition, recommending price adjustment to the government, supervising the service quality of the power enterprises, issuing and supervising licenses, resolving market disputes and monitoring the implementation of public access.

**Staged Power Sector Reform.** Highest priority should be given to the establishment of the state regulatory agency. The national grid company, regional grid companies and power generation companies should be established within about one year. Each regional grid company should start to deploy the necessary technical support systems for bidding and to implement monitoring facilities for environmental compliance. By the end of the 10th five-year plan period, all the main generation companies in each region should participate in bidding for dispatch. A new power pricing mechanism will be implemented nationally. After completion of the above reforms, separation of transmission from distribution should be gradually piloted and implemented and retail competition introduced.

The goal of proceeding to retail competition, over a single decade, to a power sector as large and diverse as that existing in China, while at the same time ensuring at least 200 GW growth in capacity, is ambitious. However, this has been facilitated by the clear statement of the principles and timing now established by

government. Clearly, the challenge now is to implement this strategy in accordance with principles laid down, without dilution that could occur through the influence of vested interests. **Impediments to widespread implementation** include the following:

**Regulation.** Implementation of a new regulation system appropriate to competitive markets will be key to implementation of competitive power markets. The current regulatory system is still reflective of a command economy and the challenge will be to change the mind-set of the regulators such that they allow the market to determine prices where appropriate. Power markets cannot function unless there is a clear and timely mechanism for passing variations in wholesale prices (as determined by the market) through to consumers, and procedures for timely licensing of new capacity according to needs signaled by the market. In addition, power market regulation involving matters such as market code development, ancillary services pricing, transmission pricing, and market monitoring, requires substantial institutional capacity and specialist skills. There is therefore an urgent need to develop the detailed principles of market regulation, followed by the related regulations. This will need to be paralleled by development of the necessary skills in regulation by personnel at various levels of government.

**Restructuring.** The Government has wisely recognized that a one-size-fits-all approach is not appropriate to a country of the size and diversity of China, and that restructuring models will vary from region to region. However, this does leave the process open to entrenched interests, which will need to be resisted. The restructuring of existing generation owned by various levels of government to take into account diverse ownership and different historical costs, to create a level playing field for all new power companies also poses a major challenge.

**Competitive Markets.** The Government's reform plan recognizes that different strategies will be appropriate in each region. Development and implementation of detailed strategies for each region, faithful to the principles laid down by State Council is now a priority.

**Lack of Required Institutional Infrastructure.** Pilot provincial power markets, particularly the Zhejiang market sponsored by the Bank under the Tongbai Pumped Storage Project, have shown that Chinese power sector participants have the necessary understanding and technological capability to develop and operate power markets. However, the Zhejiang market was developed by a power company which had already undertaken comprehensive upgrading of management and information systems over the previous five years. While Zhejiang's experience could provide a head start for other implementing entities, the difficulties of widespread implementation of power markets throughout China, given the greatly varying degrees of institutional capacity should not be underestimated.

**Power System Infrastructure Weaknesses.** Effective markets involving adequate numbers of participants will, in many areas of China, require considerable reinforcement of transmission systems, and upgrading of other systems such as communications, metering etc. Moreover, generation mixes should initially be reasonably balanced providing appropriate proportions of base load, mid-merit and peaking capacity.

**Lack of Strategy for Distribution Restructuring.** Little consideration has yet been given to separation of distribution from transmission and the structure of distribution and supply. The need to consider this in detail has been precipitated by massive rural rehabilitation programs undertaken over the 1998 to 2001 period and the restructuring will need to be implemented before the second stage of market development.

**Unreformed County and Locally Owned Generation.** Separation of generation and the transmission has extended to the county level with provincial power companies taking over management of distribution and



making substantial investments in its reinforcement. However, this did not cover generation owned at the county level and below. With increasing efficiency of provincially dispatched generation, country level generation offers the greatest potential for efficiency improvement. Similarly, from the institutional viewpoint, sector reforms over the past two decades have left the county and locally owned generation virtually untouched, and there is considerable potential for reform.

**Bank Strategy for Transitioning the Power Sector.** Since 1993 the Government, with Bank assistance, has been actively engaged in overall restructuring of the power sector. In that year the Bank worked with the Government to carry out a study “Strategic Options for Power Sector Reform in China” which provided the basis for the Ministry of Electric Power strategy of “corporatized restructuring, commercialized operation and legalized regulation”. This was followed by a 1996 study “Power Sector Regulation in a Socialist Market Economy” which recommended staged implementation of regulatory reform over the period 1996 to 2005. In 1999, Government strategy began to shift towards competitive markets, and further studies over the 1999-2000 period, again assisted by the Bank culminated in the publication of “Fostering Competition in China’s Power Markets.” In 2000, SDPC was entrusted by the State Council to review alternative options and recommend the way forward, culminating in the issue of the sector reform strategy described above. The Bank assisted in this process by organizing a workshop “New Waves of Power Sector Reform in China” and published the proceedings in English and Chinese. A new study has also been launched to assist SPDC and SPC to devise a generation separation and divestiture strategy. With the move to competitive markets, an update of the regulation strategy is appropriate and the Bank intends to shortly issue a paper to guide the Government in formulating policies in this area.

Policy development at the central government level has been accompanied by piloted implementation of reforms at the provincial level, with implementation experience feeding back into new policy development. For example, the recent power market dialogue has drawn on studies and pilot implementation associated with the Tongbai Pumped Storage Project and the East China (Jiangsu) Power Transmission Project. The Tongbai project also includes transmission pricing, distribution pricing, generation planning and consumer pricing studies, the results of which will feed into government policy development. Similarly, the proposed Yi-Xing Pumped Storage Project will include market design and implementation, and distribution restructuring.

The Government is addressing the transmission infrastructure issue with large investments in high voltage transmission to transmit power from west to east, and the Bank has assisted in some of these investments (for example through the Sichuan Transmission Project and the Inner Mongolia Power Project) and in reinforcement of the 500 kV grids in East China, where power markets are piloted. The generation mix issue is currently being addressed through large hydropower development (and its transmission to coastal markets), development of combined cycle power plants based on natural gas and through development of pumped storage plants. While in the past the Bank has assisted with large hydropower development, current assistance is focusing on pumped storage development.

### **Conversion to Clean Fuels and Energy Efficiency**

**Clean Fuels.** China’s power sector has long been dominated by coal-fired generation with concomitant large emissions of SO<sub>2</sub>, NO<sub>x</sub>, particulates and greenhouse gases with consequent adverse impacts on health, agricultural production, and global warming. Recognizing this, the Government in recent years has (a) stepped-up the development of large scale hydropower; (b) mandated the retirement of about 10 GW of small, inefficient and polluting, coal fired units by 2000; (c) used SO<sub>2</sub> emission taxes and increased requirements for flue gas de-sulfurization on new power plants; and (d) planned increased usage of natural

gas by facilitating its transfer by pipeline from the far west, development of offshore reserves and import of LNG to coastal centers. In the 10th Five Year Plan (FYP), covering the period from 2001 to 2005, the energy sector objective is to change the structure of energy supply by shifting away from coal, developing clean energy sources and increasing efficiency. For the first time, greenhouse gas (GHG) emissions and climate change issues were addressed in the plan.

In addition to large hydropower development, Government also wishes to accelerate the development of small hydropower and non-traditional renewable energy sources (collectively referred to hereafter as “renewables”). A component of the 10th FYP is a plan to increase the share of renewables through the use of a “mandated market share” (MMS) policy and supporting measures such as tax incentives. Impediments to such development include the following:

**High Unit Energy Costs.** Mechanisms are needed to internalize costs of environmental externalities.

**High Transaction Costs.** Small capacities associated with renewables result in high unit transaction costs making them unattractive for developers and financiers.

**Weaknesses of Potential Developers.** Counties and local governments are very interested in developing their small hydropower resources because of the beneficial effect on economic development and fiscal revenues. However the local generation companies lack institutional and financial capacity and creditworthiness, as referred to earlier.

**Mismatch Between Debt Maturities and Asset Life.** This is particularly onerous for hydropower where new SPDC tariff policies assume loan maturity approaching asset life (18-25 years) whereas maturities available from commercial banks are typically only 10 years beyond construction period.

**Cost-based Pricing Formula with Low Allowable Returns on Equity.** This provides no incentive for development of even the most economical resources, particularly in view of other barriers to development.

**Weak Manufacturing and Service Industries.** Despite the large installed capacity of small hydropower (>20 GW), this is based on outdated technology and inefficient operational and management practices. For other renewables like windpower, commercial capacity is still in initial stages of development.

These impediments will be the target of government policies currently being developed under the upcoming Bank/GEF China Renewable Energy Scale-up Program (CRESP).

**Energy Efficiency.** Although energy consumption in China has increased at a rate of only about one-half as fast as overall economic growth over the last two decades, energy use in many applications remains far less efficient than in more developed industrial economies. In industry unit energy consumption in most standard industrial processes still remains some 20-100 percent higher than in advanced levels abroad. Residential buildings in China are estimated to consume 50-100 percent more energy for space heating as compared to buildings in similar cold climates in Western Europe or North America, and still provide far less comfort. From a macroeconomic viewpoint, investments to improve energy efficiency still remain by far the least-cost means to increase energy services, and the potential for such cost-effective investments remains huge.

To some extent, China’s current inefficiency in energy use results from the large energy consumption equipment and process stock developed under the previous economic framework of the planned industrial

economy and the previous energy pricing regime whereby energy was priced below production cost. With energy price reform during the 1990s and the shift to a market economy, the economic framework of most enterprises is now far more conducive to improving energy efficiency than previously. However, as shown in market economies across the world, development of an effective market framework and removal of energy price subsidies alone will not by itself promise sufficient investment in financially and economically attractive energy efficiency measures—additional market-based initiatives and regulatory efforts are required. Classic energy conservation investment projects in industrial or commercial establishments in China typically yield financial rates of return of 20-40%, p.a. Yet most of this investment potential remains untouched. The reasons for this paradox, also found in other countries, include:

***Inadequate information*** in relation to energy-saving investments, especially on financial aspects, implementation experiences and new technologies.

***Real or perceived insignificance of small projects***, which although yielding attractive internal rates of return may represent only in minor savings in total enterprise operating costs;

***High transaction costs*** resulting from skilled staff securing information, analyzing design options, arranging financing, identifying reliable suppliers, etc.

***Perceived Risk*** that a new technology may not work, could interrupt production, or take time to perfect;

***Technology transfer barriers***. In some cases, it may be difficult for enterprises to gain access to state-of-the-art technologies.

***Difficulties in arranging financing***. High loan transaction costs and lack of knowledge of technical areas make commercial lending for many energy conservation projects unattractive to most banks. Therefore, most enterprises give priority to other projects when requesting bank loans.

***Needs for regulatory support***. While specific, market-based interventions may help to overcome the above barriers, there is also a need to improve regulatory support, especially in the following areas:

- ***Air pollution regulations***. In China, simple and direct combustion of coal is often the least-cost option for consumers for heat or steam production, and enforcement of bans on coal use or increased taxes are necessary to provide incentives for use of more efficient, less-polluting energy use in densely populated areas;
- ***Energy efficiency standards for key equipment***. Development and enforcement of energy efficiency standards is an appropriate tool to foster energy efficiency for certain types of energy-consuming equipment to spur manufacturers to offer more efficient equipment.
- ***Building energy efficiency codes***. China needs to improve enforcement of its building energy efficiency codes, which have been proven elsewhere to be an efficient and cost-effective path to energy efficient buildings.

#### **Bank Strategy for Clean Fuel Transition and Energy Efficiency.**

The Bank, together with the Global Environmental Facility (GEF), is supporting the Government's efforts to increase the share of renewable energy in electricity supply through the upcoming (FY04) China

Renewable Energy Scale-up Program (CRESP). This is a long term, large scale programmatic effort to introduce policies required to create an enabling environment for large-scale development, improve technologies, open up competition in renewable electricity provision, and create an internationally competitive renewable electricity industry in China. In addition, the CRESP will provide assistance to the GOC to coordinate non-electricity renewable energy development. Through this effort, it is intended to create synergy and increase the impact of the efforts of Chinese government agencies and donor assistance.

Similarly, the Bank has supported a broad program on energy efficiency in China over the last ten years, in collaboration with the GEF, UNDP, the European Commission, and a series of bilateral donors. Following extensive sector work, including the China Energy Conservation Study (1993), China: Issues and Options in Greenhouse Gas Emissions Control (1994), project work has included the GEF China Efficient Industrial Boilers Project (1996), the IBRD/GEF/EC China Energy Conservation Project (1998), and components in various recent electric power projects. The China Energy Conservation Phase II Project is expected to be launched during 2002. Following the completion of an ASTAE study in 2001, "China: Opportunities to Improve Energy Efficiency in Buildings," a China Heat Reform and Building Energy Efficiency Project may also be undertaken in the future. Complementing this project work, the Bank has also sponsored a series of technical assistance and training projects, through ASTAE or independently, on specific policy topics or capacity building areas.

Much of the Bank's work has focused on the development of mechanisms to overcome the barriers to increased investment in energy conservation projects which are currently financially viable, especially in industry. The China Energy Conservation Project, and its Phase II both focus on the introduction, development and expansion of energy service companies (ESCOs), engaged in energy performance contracting, as a market mechanisms to expand investment. This project package also includes a major effort to package and disseminate improved information of energy conservation investment opportunities, and a series of activities engaging the Chinese banking system in expansion of energy efficiency investment.

### **Energy Resource Development in Western Areas**

The Government has embarked on a Western Region Development Program to reduce poverty and regional inequality that threaten social stability. Since a large proportion of China's energy resources, particularly large hydropower, gas and renewables, are located in western areas, assistance in development of these resources would support the government strategy. Development of hydropower and renewable resources would be particularly beneficial, since economical resources are usually located in mountainous terrain or remote areas. This type of terrain, which typically involves land shortages and difficult access, is also a primary determinant of poverty. Factors which inhibit such energy resource development or minimize its impact on poverty are the following:

**Impediments to Renewable Development.** Since renewables are largely located in western areas then the impediments to renewable development listed above also inhibit development of western energy resources.

**Inappropriate Benefit Sharing Mechanisms.** Development of energy resources does generate economic activity in the project area during the construction period, but there is little employment during the operating period. Income taxes could provide a continuing return to resource owning areas, but under the current fiscal system the level of government receiving income tax relates to the ownership of the developer. Since companies or governments in western areas generally do not have the financial resources to develop their energy resources and transfer them to markets in the east, they are discouraged from allowing others to do so since they do not receive tax benefits (or returns on equity). Revision of income tax sharing arrangements, which is under consideration, may partly deal with this problem. However, the appropriate

mechanism for providing resource owners with a return for their exploitation, is appropriate royalty arrangements. In the case of gas, royalties do accrue to the central government but there are no arrangements for sharing these with regional and local governments. In the case of economical development of hydropower, an energy cost less than that of thermal alternatives implies an economic rent which is normally captured by royalty impositions. However, while hydropower royalties and royalty sharing mechanisms are being introduced in other parts of the world, notably Canada and South America, they do not yet exist in China.

**Need for Targeting of Income to Poverty Programs.** While generation of fiscal or royalty income in resource owning areas will certainly generate economic development in those areas, it should ideally be accompanied by programs which devote a proportion of this income to residual pockets of poverty.

**Bank Strategy for Energy Resource Development in Western Areas.** Bank strategy for assisting the Government in these areas is under development. To start the process, a study to analyze the distributional impacts of energy development in western areas has been recently commenced. This will draw on the experiences of other countries in terms of creating incentives for such developments and maximizing development impacts to the undeveloped areas. The CRESPP project referred to above will also examine the mechanisms for pricing renewable energy to achieve the same objectives.

Consistent with the approach used for other energy sector objectives, proposed reforms will be piloted through lending operations involving GEF where appropriate. The current project is actually in piloting the implementation of such a strategy (refer to next section).

### **3. Sector issues to be addressed by the project and strategic choices:**

The project would directly address the following sector issues and poverty related linkages:

#### **Transitioning the Power Sector**

**Unreformed County and Locally Owned Generation.** County and locally owned generation accounts for most of the 51.25 GW of capacity regarded as “embedded” by the provincial grids, since it is dispatched by lower level control centers. This includes: some 35.11 GW of small (generally below 50 MW) thermal power plants, of which 26.31 GW are coal fired, characterized by low efficiency and high atmospheric emissions; and some 16.1 GW of small hydropower plants that were often developed at low cost with local resources and expertise, such that substantial output and efficiency increases could be expected with rehabilitation and uprating. Also, the county generation companies are generally responsible for developing the remaining 50 GW or so of small hydropower potential (less than 25 MW) and a large proportion of medium sized hydropower. As noted above, sector reforms over the past two decades have left the county and locally owned generation virtually untouched. While there is nominal corporatization, the corporate structures and responsibilities are unclear to say the least, and in practice the generation entities remain part of local government at various levels. This affects their ability to efficiently manage existing capacity, and to raise finance to carry out economically justified, rehabilitation, up-rating and expansion.

The four hydropower developments are located in the mountainous areas of western Hubei which contains most of Hubei's small and medium hydropower capacity and potential. There are currently some 2267 small and medium sized hydropower projects with a gross installed capacity of 1338 MW with some 1058 MW above 500 kW size. Each of the proposed developments is located in a separate county and is being developed by a new limited liability company whose sponsor is a county-owned generation company. Studies carried out during project preparation have already resulted in: (a) the corporate and financial restructuring and corporatization of county-owned generation in the four host counties; (b) changes in

sponsorship and ownership structure of the four project companies to ensure financial viability during project implementation; and (c) rigorous financial projections to ensure financial viability during operation. This restructuring of generation assets at the county level is expected to provide a model for replication throughout Hubei province.

### **Conversion to Clean Fuels and Energy Efficiency**

**Replacement of Coal Fired Generation.** The four hydropower developments will directly replace coal-fired generation. Moreover, studies carried out during project preparation in Enshi Prefecture, which contains two of the host counties, have also confirmed the considerable potential for rehabilitation potential for small hydropower, such that Hubei may be chosen as a pilot province for small hydropower development policies which will be developed under the CRESPP project.

**Weaknesses of Potential Developers, and High Transaction Costs.** The corporate and financial restructuring described above has directly addressed the weaknesses of the developers involved in the current project and is expected to provide a model for replication throughout Hubei Province. Moreover, project preparation studies have also led to an increased understanding of the issues faced in county and locally owned generation, which will assist in the formulation of an appropriate development model for small hydropower development and rehabilitation, to be addressed as part of the CRESPP project.

### **Energy Resource Development in Western Areas**

Hubei is not one of the provinces and regions designated as part of the Government's western development zone, understandably since the large eastern areas are composed of the rich agricultural areas of the middle Yangtze plains. However, the western part of the province, where the proposed hydropower developments are located, comprises mountainous areas that are topographically and culturally contiguous with the provinces of Sichuan, Guizhou and Shanxi all of which form part of the officially designated western zone. This contiguity has been partly recognized by the central government through its designation of Enshi Autonomous Prefecture (the location of two of the project counties), and the adjacent autonomous prefecture in Hunan as part of the officially designated western zone. However, whether officially designated or not, the entire western area of the province can be classified as a poverty area. It includes 25 national-level poverty counties (the poorest of the poor deserving the attention of the central government), and additional four provincial level poverty counties. Three of the four project counties are national-level poverty counties and the fourth is a provincial-level poverty county.

A study carried out during project preparation demonstrated that with support of central and provincial government programs, substantial progress has been made in alleviating poverty in the project counties, particularly over the past decade. However, it also indicated areas for improvement and better targeting of poverty alleviation funds. A study will be carried out as part of the project, to develop plans for enhancement of poverty alleviation efforts in the project areas of the proposed hydroelectric developments. Each of the project counties have agreed to devote twenty percent of the fiscal revenues accruing from the operation of their respective power plants for at least five years after commissioning to funding of the poverty alleviation plan.

### C. Project Description Summary

1. Project components (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

| Component  | Sector | Indicative Costs (US\$M) | % of Total | Bank financing (US\$M) | % of Bank financing |
|--|--------|--------------------------|------------|------------------------|---------------------|
| <p>1. Dongping Hydroelectric Power Station including:</p> <p>(a) Construction of a hydroelectric power station at Dongping, Xuan-en County, in Hubei, including: (i) a single purpose concrete arch dam 134 meter (m) high with a crest length of 268m; (ii) an underground power house with installed capacity of 110 (2x55) megawatts (MW); (iii) an associated step-up substation; and (iv) construction of a 220 kilovolt (kV) transmission line 36 km in length to connect the power station to the grid.</p> <p>(b) Carrying out of a program of institutional strengthening of Dongping Company, including: (i) development and implementation of appropriate organizational arrangements, staffing and information systems appropriate to the operational phase; and (ii) provision of training to Dongping Company staff in project management and hydropower station operation.</p> <p>(c) Development of a plan for enhancement of poverty alleviation efforts in Xuan-en County to be partially funded from fiscal revenues accruing to Xuan-en County as a result of the Project.</p> <p>(d) Compensation, resettlement and rehabilitation of approximately 3,047 Affected Persons.</p> | Hydro  | 86.19                    | 38.8       | 28.19                  | 26.8                |

|  |       |       |      |       |      |
|--|-------|-------|------|-------|------|
| 2. Najitan Hydroelectric Power Station including:  | Hydro | 42.40 | 19.1 | 25.16 | 24.0 |
| (a) Construction of a hydroelectric power station at Najitan, Laifeng County, in Hubei, including: (i) a single purpose 39 m high single purpose concrete gravity dam with a crest length of 106m; (ii) a surface power house with installed capacity of 36 (3x12) MW; (iii) an associated step-up substation; and (iv) construction of a 110 kV transmission line 32 km in length to connect the power station to the grid. |       |       |      |       |      |
| (b) Carrying out of a program of institutional strengthening of Najitan Company, including: (i) development and implementation of appropriate organizational arrangements, staffing and information system appropriate to the operational phase; and (ii) provision of training to Najitan Company staff in project management and hydropower station operation.   |       |       |      |       |      |
| (c) Development of a plan for enhancement of poverty alleviation efforts in Laifeng County to be partially funded from fiscal revenues accruing to Laifeng County as a result of the Project.  |       |       |      |       |      |
| (d) Compensation, resettlement and rehabilitation of approximately 2,565 Affected Persons.   |       |       |      |       |      |
| 3. Songshuling Hydroelectric Power Station including:  | Hydro | 42.22 | 19.0 | 25.11 | 23.9 |
| (a) Construction of a hydroelectric power station at Songshuling, Zhushan County, in Hubei, including: (i) a single purpose concrete gravity dam 65m high with a crest length of 128m; (ii) a surface power house with installed capacity of 50 (4x12.5) MW; (iii) an associated step-up substation; and (iv) construction of a 110 kV transmission  |       |       |      |       |      |



|   |       |       |      |       |      |
|---|-------|-------|------|-------|------|
| <p>line 45 km in length to connect the power station to the grid.</p> <p>(b) Carrying out of a program of institutional strengthening of Songshuling Company, including: (i) development and implementation of appropriate organizational arrangements, staffing and information systems appropriate to the operational phase; and (ii) provision of training to Songshuling Company staff in project management and hydropower station operation.</p> <p>(c) Development of a plan for enhancement of poverty alleviation efforts in Zhushan County to be partially funded from fiscal revenues accruing to Zhushan County as a result of the Project.</p> <p>(d) Compensation, resettlement and rehabilitation of approximately 465 Affected Persons.</p>   |       |       |      |       |      |
| <p>4. Xiakou Hydroelectric Power Station including:</p> <p>(a) Construction of a hydroelectric power station at Xiakou, Nanzhang County, in Hubei, including: (i) a multi-purpose concrete arch dam 85m high with a crest length of 195m; (ii) a surface power house with installed capacity of 30 (2x15) MW; (iii) an associated step-up substation; and (iv) construction of a 110 kV transmission line 65 km in length to connect the power station to the grid.</p> <p>(b) Carrying out of a program of institutional strengthening of Xiakou Company, including: (i) development and implementation of appropriate organizational arrangements, staffing and information systems appropriate to the operational phase; and (ii) provision of training to Xiakou Company staff in project management and hydropower</p> | Hydro | 32.54 | 14.6 | 15.33 | 14.6 |

|   |        |       |        |       |
|---|--------|-------|--------|-------|
| station operation.  |        |       |        |       |
| (c) Development of a plan for enhancement of poverty alleviation efforts in Nanzhang County to be partially funded from fiscal revenues accruing to Nanzhang County as a result of the Project. |        |       |        |       |
| (d) Compensation, resettlement and rehabilitation of approximately 1,043 Affected Persons.  |        |       |        |       |
| <b>Total Project Costs</b>  | 203.35 | 91.4  | 93.79  | 89.3  |
| Interest during construction  | 18.01  | 8.1   | 10.16  | 9.7   |
| Front-end fee   | 1.05   | 0.5   | 1.05   | 1.0   |
| <b>Total Financing Required</b>   | 222.41 | 100.0 | 105.00 | 100.0 |

**2. Key policy and institutional reforms supported by the project:**

The project will seek to: (a) establish efficient, commercially oriented, financially viable and creditworthy limited-liability companies (LLCs) to implement and operate the subprojects; (b) treat the resettlement arising from the subprojects as an opportunity to improve the living standards of the affected population; (c) treat the subprojects themselves and the fiscal revenues deriving therefrom as an opportunity to alleviate poverty in the beneficiary counties.

**3. Benefits and target population:**

The project will help underpin economic growth in Hubei province, thus benefiting the population of the province as a whole.

Although this project is not designed as a poverty-reduction development intervention, it will serve to stimulate the economic and social development in four poor counties: Xuan-en, Laifeng, Zhushan and Nanzhang, in which the annual average per capita net rural incomes in 2001 were Y 1,820, 1,491, 1,377 and 2,081, respectively. These net rural incomes compare with the provincial average of Y 2352 per capita. Since the hydropower developments are civil works-intensive, a major proportion of construction cost will be expended in the counties, promoting their economic development during the construction period. In addition, funds for land acquisition and resettlement will be used to provide new infrastructure, housing and income-restoration measures for the affected population from those areas. Experience in China has shown that if resettlement is treated as a development opportunity, the quality of life can be improved not only for the resettlers but also for other people in the region, particularly if opportunities are sought to design the project in a regional development context. Further, the fiscal revenues accruing to the counties due to power generation within their jurisdictions will be substantial. The project counties have agreed to develop poverty alleviation enhancement plans under the project and to earmark 20 percent of fiscal revenues accruing from the proposed hydroelectric developments for at least five years after commissioning to fund the plans. Further details of the expected benefits to the host counties and the impact on their poverty alleviation efforts are provided in Section E6 and Annex 16.

#### **4. Institutional and implementation arrangements:**

Power generation in China is now recognized to be a commercial rather than government responsibility and as such the four hydroelectric plants under the project are being developed by four, county registered, limited liability companies. However the Hubei Government recognizes that in the current state of development of the power industry at county level and below, and the close cooperation needed between developers and government for hydroelectric projects in undeveloped areas, projects of the contemplated size cannot be developed without strong government support. Therefore the Hubei Provincial Government has accepted the role of overall sponsor and executing agency for the project. The Hubei Provincial Planning Commission, in accordance with its role of promoting development in poor areas of the Province took the lead in obtaining central government support for a World Bank loan, and subsequently in project preparation. In June 2001, this lead role was taken over by the Hubei Provincial Finance Bureau, along with the Provincial Government decision to provide necessary counter guarantees to the Ministry of Finance for repayment of the World Bank Loan. The Provincial Government has approved the establishment of a provincial level Project Management Office (PMO) to oversee and coordinate the overall project implementation.

The World Bank loan will be onlent from Hubei via municipal and county governments to four joint stock limited liability project companies. These companies will have direct responsibility for implementation and will develop and ultimately own and operate the respective hydropower plants. The ownership of the power plants is diverse but, in general, shareholders are power generation or power financing companies owned by provincial, municipal and county governments.

In all cases, power will be sold to the provincial grid owned and operated by the State owned Hubei Provincial Power Company. The power tariff will be initially approved by the Hubei Province Pricing Bureau in accordance with principles established by SDPC. However, over time it is expected that such pricing arrangements will transition towards more market oriented arrangements.

The poverty alleviation offices of the provincial and county governments will coordinate and support the preparation of the poverty alleviation enhancement plans carried out under the project.

Elaboration of the institutional arrangements for implementation and operation is provided in Section E4 and Annex 18.

### **D. Project Rationale**

#### **1. Project alternatives considered and reasons for rejection:**

**Overall Project Design.** Since an ESMAP study carried out in the early 1990s, the Bank repeatedly expressed interest to the Chinese Government in an operation focused on county-level generation and distribution entities under the Ministry of Water Resources (MWR) to address the inefficiencies and opportunities identified by the ESMAP study. Central government restructuring, through which MWR no longer had responsibility for these grids, eliminated the possibility of such a project. In the meantime, the technical inefficiencies of the rural distribution system have been largely addressed by the massive investments carried out under the government's economic stimulus package over the 1998-2001 period, and the takeover of management of distribution and supply by the provincial power companies. While it is considered that the Bank still has a role in guiding the establishment of appropriate structures for distribution and supply, such guidance is more fruitful in the coastal provinces that are leading the reform process, and is being provided under the ongoing and planned projects in these provinces in which provincial power companies are the beneficiaries. A project focusing on county-level generation is

therefore considered to be appropriate in addressing remaining inefficiencies. Since most rural areas are now connected to provincial grids, the only county-level generation likely to represent economical expansion (without policy support aimed at recognizing externalities) is: (a) wind power in very specific topographical areas (such development is targeted under ongoing and planned renewable projects); and (b) small to medium hydropower in areas of rich hydropower potential.

Small and medium sized hydropower projects provide appropriate vehicles for Bank intervention since they provide clean, renewable energy while having relatively low impact, and often generate development in lagging areas; moreover with the commercialization of the power industry, they are largely being neglected by private and other non-utility investors. Several of the reasons for such neglect are common to those limiting private hydropower development internationally. For example: high proportion of civil costs that do not attract export credits; their capital-intensive nature with costs being recovered over a design life five times the maturities of commercial loans; the longer gestation and construction period; the higher cost estimate risk because of geological uncertainties and the high proportion of local costs that can rise rapidly in fast-changing political, economic and social environments; and environmental and resettlement implications that deter private developers and lenders. A few private hydropower plants of the size of the proposed subprojects have been developed internationally but generally not without a high degree of public involvement.

In China, there has been major non-utility development of large hydropower plants, although, in contrast to thermal power development, there has been no foreign private participation. Such non-utility development was initially carried out with the support of multilateral and bilateral funding agencies via the central government (for example the 3300 MW Ertan project financed by the World Bank). However, in recent years the need for such support has reduced, such that some large projects without a large foreign exchange component are being developed without direct government support (for example the 5400 MW Longtan project in Guanxi/Guizhou and the 4200 MW Xiaowan project in Yunnan). Equity investors in these projects are typically generation and financing companies owned by provincial governments, with limited participation by municipal and county owned partners, while for the very large projects national development financing companies such as the State Development Investment Company are involved. Debt financing for these developments is now generally provided by syndicated loans from Chinese commercial banks, although again for the very large projects China Development Bank financing may be involved.

Ideally, similar arrangements would be used for used to develop the hydropower plants proposed under the current project. However, most potential investment, institutional capacity for hydropower development, and commercial Bank funding is concentrated on the larger projects. Moreover, counties are reluctant to turn over development of their hydropower resources to others, since the current tax system (see Inappropriate Benefit Sharing Mechanisms Section C2) would not provide appropriate compensation for use of their resources.

Therefore, the project counties are attempting to develop their small and medium hydropower resources, which in many cases constitute their main export potential, on their own, utilizing county owned generation companies as sponsors in each case. However, while the prefecture and county owned companies are able to contribute appropriate amounts of equity from existing hydropower revenues, the main impediments to development of projects in the size range of those proposed under the project are project development institutional capacity and lack of creditworthiness with local commercial banks. The Bank can assist in establishment of the required institutional capacity and appropriate commercial arrangements which together with the "comfort" of Bank involvement will provide the necessary creditworthiness with local commercial banks who will cofinance the project.

While it is recognized that equity investment is not the preferred means for counties to generate benefits from their hydropower resources, it currently is the only mechanism for catalysing such benefits (project generated economic development and fiscal revenues in addition to returns on equity). Moreover, the projected returns on equity, varying between 15 and 25 percent (real) are probably more attractive than any other investment that the host counties might make, given their remoteness from the centers of economic development.

The fact that all four proposed hydropower developments are located in "poverty" counties is not a coincidence. Firstly, the factors that contribute to making the project areas rich in hydropower potential -- rugged topography, high rainfall and altitude -- also tend to be primary determinants of poverty since they imply lack of arable land, expensive infrastructure and remoteness. Secondly the projects and counties were specifically selected by the provincial government in line with provincial legislation and initiatives aimed at assisting poor counties to develop their hydropower resources. While it is clear that the proposed hydropower developments will attract considerable revenues to the host counties, the contribution to county poverty alleviation efforts is less well defined. Therefore, the preparation of poverty alleviation plans, conforming to new government guidelines promoting bottom-up development, and the commitment of the counties to allocate a proportion of their fiscal revenue from the project to help fund such plans, have been included in the project design.

**Alternative Generation Developments in the Context of the Hubei Provincial Grid.** Demonstration that the proposed hydropower developments are "least cost" developments in the context of the Hubei grid is provided in Section E1 and Annex 4.

**Consideration of Alternatives in the Integrated Basin Development Context.** The detailed river basin planning process which ultimately resulted in the current configurations of the proposed hydropower projects is described in Annex 2 Detailed Project Description. A summary of this process for each project follows:

The **Dongping** development is situated on the Zhongjian River, a tributary of the Qinjiang River, which joins the Yangtze upstream of Dongting Lake. The hydropower potential of the Zhongjian was surveyed in 1967 and re-evaluated in 1969 when the water resource development planning for the Qinjiang was carried out, with the conclusion that the Zhongjian should be developed in a cascade of three projects: Tongziying, Longdong and Dongping. This conclusion was re-affirmed in an overall evaluation of hydropower potential of Hubei, and again in 1992/1993 when detailed planning of the Zhongjian was carried out for the county government. The Longdong project, the first development of the cascade was commissioned in 1993. Dongping is the second project in the cascade. These planning studies considered all potential uses of the proposed storages: municipal water supply, irrigation, flood control and hydropower. They also considered potential impacts particularly resettlement. As a result, the Longdong project which was conceived primarily as a hydropower project provides important multipurpose benefits, guaranteeing municipal water supply for Xuan-en Town (population about 60,000) and raising the standard of flood protection from 10-year to 20/30-year. Also with the joint operation of Longdong, Dongping and the downstream Shuibuya project on the Qinjiang (now under construction), the flood control capability in the Qinjiang system will be greatly enhanced. The selected full supply level of Dongping is below the economic optimum but was chosen to avoid significant backwater inundation of Xuan-en Town under flood conditions, demonstrating the consideration of impacts in the planning process. The comprehensive consideration of all benefits and impacts continued into the pre-feasibility and feasibility studies, which included more explicit consideration of secondary benefits such as local economic development, aquaculture, navigation and tourism, together with more explicit consideration of environmental and social impacts. These studies also considered alternative dam locations within the general area indicated by the basin studies, alternative full supply levels and powerhouse capacities.

The **Najitan** development is located in Hubei Province on the Youshui River, which rises in Sichuan Province, and flows through Hubei Province into Hunan Province. The river is a tributary of the Yuanshui, which empties into Dongting Lake. Various cascade development planning studies have been carried out independently by each of the three provinces for the river reaches within individual provinces, but because this is a relatively small tributary an integrated basin development planning exercise has not been carried out. However, the planning work has involved interaction between affected provinces such that the resulting cascade development can be considered as reasonably optimum and acceptable to all provinces. The first planning study dates back to the 1950s. Later studies were carried out by Hubei in 1978 and Hunan in 1984. Arising from these studies and subsequent interactions between the provinces, were the Wantang Project in Hunan and the Tangkou project in Hubei both upstream of the proposed Najitan development, both of which have now been commissioned. The 1978 Hubei studies recommended a full supply level of 380 m for Najitan, but this was subsequently reduced to 370 m to avoid inundation of parts of Baifusi Town. The most recent development planning for Najitan considered benefits from local development (economic development, poverty reduction), hydropower and other water uses (minimum discharge to the downstream in dry seasons for ecological balance, and tourism) and major environmental and resettlement impacts. The reservoir inundation will extend into Hunan Province, and agreement for compensation and resettlement has been reached between the two provinces. The site chosen for the Najitan dam and power station is located near Baifusi Town. An alternative site for the powerhouse was investigated at Jilongtan, 5 km downstream from the dam site which would result in a gain of an additional 9 m of head; however the cost of constructing a 5 km long power tunnel was considered to exceed the additional power benefits..

The **Songshuling** development is located on the Guandu River, a tributary of the Duhe, the Han and ultimately the Yangtze. The earliest water resource survey and basin development planning for the Duhe dates back to 1954. This was updated in 1969 at which time a cascade of three projects was proposed: Songshuling, Pankou and Huanglongtan with the latter as the first project. Construction of Huanglongtan was commenced in 1969 and completed in 1974. The feasibility study for Pankou was carried out in 1970, but the preparation work was aborted because the reservoir would inundate major grain farmland in Zhushan County and the cost of protecting the farmland with a saddle dam was prohibitive. The basin development planning for the Duhe was reviewed again in 1983 and the resulting report recommended seven projects in cascade: Eping (560 m), Baiguoping (460 m), Longbeiwán (535 m), Songshuling (385 m), Pankou (360 m), Xiaoxuan (262 m) and Huanglongtan (247 m). The total capacity installation potential is 1400 MW. Up until the present, only Huanglongtan has been constructed. The adopted plan includes two relatively large projects that have an impact on Songshuling: Longbeiwán (200 MW) about 19km upstream and Pankou (510 MW) downstream. In effect, Songshuling is a relatively small run-of-river plant sandwiched between these two much larger projects - both of which include high dams & large reservoirs. The overall configuration of Songshuling was to a large extent dictated by these larger projects. The Pankou project is at an advanced planning stage (at lower full supply levels than originally planned), while the Longbeiwán project is in the preliminary planning phase. The Songshuling feasibility study was completed in 1995 and preparation work was restarted in 2000. The study considered benefits from local development (economic development, poverty reduction), hydropower and other water uses (flood control, water supply, irrigation and navigation), and major environmental and resettlement impacts (inundation, ecologic balance, soil erosion, pollution from project construction) and mitigation measures for the negative impacts. The chosen dam site at Yangyugou is the furthest downstream of two sites investigated, and was judged to be the best site taking into account all benefits and impacts.

The **Xiakou Project** is located on the middle reaches of the Juhe River, a tributary of the Juzhang, a major tributary of the Yangtze. The earliest survey carried out specifically for Xiakou dates back to the 1950s and a preliminary design was completed in 1960. In the 1970s, basin development planning studies were carried out twice for the Juzhang, the major impetus provided by frequent disastrous flooding in the lower reaches downstream of the confluence of the Juhe and Zhanghe tributaries with the main stem of the Juzhang. As a result of these studies, the Zhanghe Reservoir was constructed on the Zhanghe with a total capacity of 2.03 billion m<sup>3</sup>. Overall basin planning for the Juzhang was reviewed in 1989 with primary emphasis on flood control but also considering benefits to other water users including power generation and irrigation. The resulting Basin Planning Report recommended nine projects in cascade with a total power capacity of 4,385 MW, of which Xiakou and the existing Zhanghe reservoirs were allocated primary responsibility for flood control in the Juzhang, in conjunction with flood protection works in its lower reaches. The flood protection works are now nearing completion. The Xiakou feasibility study was completed in 1993 and updated in 1999 followed by a preliminary design in 2000. During these studies optimum full supply level was re-evaluated taking into account the actual development of flood control measures in the lower reaches of the Juzhang, resulting in a lowering from the 290 m level proposed in the basin planning studies to 262 m which enabled a substantial reduction of inundation of fertile farmland and urban areas and towns and resettlement impacts. The project still provides some flood control benefits including protection of the town of Yuanan (population about 38,000) about 50km downstream, as result of which the Province and County have provided grant funding equal to about 20 percent of estimated project cost from flood control funds. The river is currently used as a source of irrigation water supplied from a number of weirs including the Maduhe (10 m high) dam, located about 50 m downstream. The Xiakou design and proposed operating procedures includes provisions to ensure maintenance of existing irrigation flows. The chosen dam site is located at Xiakou which provides for the shortest dam axis, thereby optimizing the capital investment, while minimizing intrusion into nearby paddy lands. Two alternative dam sites, located upstream and downstream of the selected site, were investigated as part of the feasibility studies. The upstream one would require a smaller capital investment, but the site is more confined and has poorer access which would result in a longer construction period. The alternative downstream dam site is located in a wider valley area, where lower relief terrain and wider watercourse are favorable for project layout and construction. However this site would require a dam with a much longer axis, resulting in a higher capital investment to develop the project. Less electricity would be generated and more agriculture land would be submerged.

**2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).**

| Sector issue  | Project  | Latest Supervision (PSR) Ratings<br>(Bank-financed projects only) |                            |
|---|--|---|----------------------------|
|   |  | Implementation Progress (IP)                                      | Development Objective (DO) |
| Bank-financed<br>Hydropower development   | Shuikou Hydroelectric I & II (FY87/95, \$240 million)                              | HS  | HS                         |
| Hydropower development, and irrigation  | Daguangba Multipurpose (FY92, \$67 million)  | HS  | S                          |
| Hydropower development  | Ertan Hydroelectric I (FY92, \$380 million)  | HS  | HS                         |
| Flood and sediment control for the lower reach of Yellow River to reduce damage resulted from extreme floods and alleviate the sedimentation of river channel | Xiaolangdi Multipurpose I (FY94, \$460 million)                                    | HS  | HS                         |
| Livelihood and production development of resettlers from Xiaolangdi Multipurpose project  | Xiaolangdi Resettlement (FY94, \$110 million)                                      | S   | S                          |
| Completion of the Jiangya dam for flood control and power generation. Small independent hydropower producer.  | Yangtze Basin Water Resources Project (FY95, \$210 million)                        | HS  | HS                         |
| Flood and sediment control for the lower reach of Yellow River to reduce damage resulted from extreme floods and alleviate the sedimentation of river channel | Xiaolangdi Multipurpose II (FY97, \$430 million)                                   | HS  | S                          |
| Hydropower development; tariff and pricing issues; competitive generation market; regulatory framework; corporatization                                       | Tongbai Pumped Storage Project (FY00, \$320 million)                               | S   | S                          |
| Small independent power companies selling power to the grid   | Renewable Energy Development Project (FY00, IBRD \$100 million, GEF \$ 35 million. | S   | S                          |
| Flood control in the mid-Yangtze River  | Yangtze Dike Strengthening   | S   | S                          |



|   |   |   |   |
|---|---|---|---|
| in Hunan and Hubei provinces  | Project (FY00, \$210 million)                                 |   |   |
| Hydropower development  | Ertan Hydroelectric II (FY96, \$400 million)                  | S | S |
| <b>Other development agencies</b>   |   |   |   |
| German Ministry for Economic Cooperation and development (BMZ), German agency for Technical cooperation (GTZ) - Community based hydropower in minority areas. | Small Hydropower Project Tibet                                |   |   |
| Japan Bank for International Cooperation - three small/medium hydropower projects in Hubei province   | Hubei Hydropower Project effective 9/00, procurement underway |   |   |

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

### 3. Lessons learned and reflected in the project design:

Previous hydropower and other water resource development projects have been quite successful. The key lessons learned from past projects include:

- The need for full commitment and strong ownership of the Borrower, and strong support from local government at different levels;
- Affected people should be involved from the early stages of project preparation and throughout the implementation period, to gain and maintain their support;
- Key policy reforms, conforming to government reform objectives, should be incorporated into the project design;
- Project preparation should include development of detailed organizational and staffing arrangements for implementation;
- Counterpart funding should be committed before implementation, with the direct participation of the provincial planning commission and finance bureau;
- Projects should include institutional development support for the strengthening of the project implementing and management organizations;
- Implementation support to the executing agency should include a competent construction supervisory organization;
- Procurement for major civil works should be started early in the preparation period so that bid award will correspond with loan effectiveness in order to avoid delays and cost overruns;
- Power markets should be carefully assessed and periodically reassessed during project implementation to ensure a demand for output on project completion;
- The financing package must be appropriate to ensure that tariffs are competitive in the short term

as well as economical in the long term;

- Key principles of the power purchase agreement should be established before project appraisal, to ensure full realization of power sales benefits;
- With regard to resettlement, plans should be further advanced at appraisal stage particularly in regard to economic carrying capability, and cost estimates and funding proposals carefully assessed; where appropriate planning should involve professional town planners to identify opportunities for maximizing development impacts from the resettlement.

#### **4. Indications of borrower commitment and ownership:**

Hubei province legislation demonstrates its commitment to development of poor counties through a variety of programs including assisting them in development of their hydropower resources for sale to the provincial grid (refer to Annex 15). This commitment has been further demonstrated by their agreement, after serious deliberation, to provide counter-guarantees to the Ministry of Finance for repayment of the Bank loan. This commitment has been made despite the fact that they currently repay substantial sums annually in relation to early Bank loans for which subloans are currently non-performing.

The commitment has been further demonstrated by the wide representation on the provincial PMO which is headed by the Hubei Finance Bureau deputy director responsible for all foreign debt management. The office includes representatives from finance bureau, planning commission, pricing bureau, water resources department, audit administration, the provincial power company, poverty alleviation office, resettlement office, environmental protection bureau and land administration bureau. The beneficiaries are strongly committed as evidenced by the large expenditures already made for project preparation and their planned equity contributions. County and prefecture governments are strongly committed because of the anticipated benefits of the subprojects both in implementation and operation. Their commitment to the social objectives of the project has been demonstrated by their detailed participation during project preparation in preparation of very detailed resettlement plans, social assessments and poverty alleviation impact studies. They have also agreed to earmark a proportion of fiscal revenues accruing from their respective project components to enhancement of poverty alleviation efforts in their respective counties.

#### **5. Value added of Bank support in this project:**

The project will contribute to the Bank's three main objectives in the energy sector: transitioning the state owned energy sector to a diversely owned market based system; conversion to clean fuels and increasing energy efficiency; and raising incomes in poorer western areas by assisting them to develop and export their energy resources.

The rationale for the project and the reasons why the proposed hydropower developments, with concomitant benefits to the host counties, would not be developed without Bank support are described in Section D1 above. Specifically World Bank involvement would ensure that:

- The hydropower developments selected are economical and financially competitive with alternative means of power generation in the Hubei grid;
- The technical design is in accordance with leading international practice and standards;
- Environmental impacts of the projects are properly evaluated and appropriate management and mitigation measures are implemented;

- Resettlement arising from the subprojects and the project itself are treated as an opportunity for development of affected communities;
- The institutional arrangements for project implementation will result in high quality products and cost-effective and timely completion;;
- The institutional arrangements for operation will result in efficient and cost effective operation and maintenance;
- The companies developing the projects will be financially viable and profitable based on existing power pricing arrangements and remain competitive in a restructured market oriented power sector;
- The adopted project development framework will provide an appropriate model for similar future developments having less recourse to government and Bank support, and contribute to Bank sector development objectives.
- The proposed hydropower developments contribute to enhancement of poverty alleviation efforts in the host counties.

## **E. Summary Project Analysis** (Detailed assessments are in the project file, see Annex 8)

### **1. Economic (see Annex 4):**

- Cost benefit NPV=US\$44.6 million; ERR = 14.8 % (see Annex 4)
- Cost effectiveness
- Other (specify)

**Cost Effectiveness.** The four sub-projects will be connected to and dispatched by the Hubei Provincial Grid which, by the end of 2000 had a total installed capacity of 14,324 MW of which 44 percent was hydropower and 56 percent thermal (mainly coal). A least cost (cost effectiveness) analysis was therefore carried out to verify that the proposed hydropower developments form part of the least cost generation expansion program for the provincial grid. The generation planning study covered the period 2000 to 2050 (study period) with a focus on the years 2000 to 2020. Parallel analyses were carried out to determine least cost generation expansion sequences "with" and "without" the four hydropower developments. By comparing these two generation expansion sequences thermal generation costs avoided by the project could be calculated. Because of the relatively small size of the power stations, in comparison to the overall installed capacity of the grid, and the seasonality of their energy production they were lumped together as a single project in the analysis. However, components of avoided costs: capacity and energy by season (dry, wet and shoulder) were also calculated. Application of these avoided costs to the individual power plants enabled the economic competitiveness of each power plant to be calculated. Particular care was also taken to ensure that the alternative generation sequences compared were equal in terms of system reliability, to ensure the validity of the avoided cost calculation. A key issue identified at the PCD stage is the market for wet-season energy in light of planned commissioning of Three Gorges Project from 2003 to 2009. The planned power plants and Three Gorges are both highly seasonal with a large proportion of energy delivered in the wet season. However, developments since the PCD stage include an acceleration of power demand growth in Hubei, and plans to evacuate a proportion of Three Gorges energy to Guangdong. Considering these developments, the generation planning study showed that virtually all energy generated by existing, committed and proposed hydropower plants in Hubei (including those included in the current project), and Hubei's share of Three Gorges energy, can be absorbed by the Hubei system even in wet seasons of wet years.

The analysis showed that the proposed project, with a total capacity of 226MW would replace 116MW of 600MW supercritical coal-fired units and 122MW of gas turbine capacity. The lower plant auxiliary consumption rate and forced outage rate of hydropower in comparison with thermal alternatives accounts for the small increase in capacity replaced. With regard to energy, the project tends to replace supercritical coal fired generation in the wet season, combined cycle gas in the shoulder season and gas turbine distillate in the dry season when the sub-projects will only operate during peak load periods. The study also showed that average annual atmospheric emission reduction of SO<sub>2</sub>, TSP, NO<sub>x</sub> and CO<sub>2</sub> amounted to 4.4, 1.0, 2.2 and 704.9 thousand tons.

Comparison of the PVs of cost streams of alternative generation sequences demonstrates savings of US\$22.7 million (PV2000) through implementation of the proposed projects. Based on their externality cost, the NPV of local environment benefits (SO<sub>2</sub>, TSP and NO<sub>x</sub> reduction benefits) was calculated to be \$21.9 million and global environmental benefits (CO<sub>2</sub> reduction benefit) were calculated to be \$13.6 million. Equalizing discount rates (EDRs) were also calculated. For the base case, which includes local environmental benefits but not global benefits, the EDR of the overall project is 15.7 percent. For the individual sub-projects the EDRs of Dongping, Najitan, Songshuling and Xiakou were 16.4, 13.4, 15.8 and 17.0 percent respectively. The results of sensitivity analyses are reported in Annex 4.

**Cost Benefit Analysis.** The economic internal rate of return (EIRR) for the proposed project was calculated using prices currently being paid at the generation level for small and medium hydropower in the Hubei grid as a lower bound proxy for "willingness to pay". The calculation yielded an EIRR of 14.8 percent for the whole project (local environmental benefits included). The EIRRs for Dongping, Najitan, Songshuling and Xiakou power plants were 15.1, 14.9, 14.5 and 14.6 percent respectively. Sensitivity studies and risk analyses are included in Annex 4.

## **2. Financial (see Annex 4 and Annex 5):**

NPV=US\$ million; FRR = 10 % (see Annex 4)

**Financial Analysis.** Since 1983 when China introduced its "new power new price policy" the tariff to be charged by new power plants has been calculated in accordance with a debt repayment formula with the tariff subject to approval by the provincial pricing commissions and ultimately SDPC. Under this procedure, projected tariff is calculated at feasibility stage and the approval to proceed with the project based on the competitiveness of the projected tariff. Actual tariff is not calculated until the completion of the project taking into account current conditions including actual cost and debt servicing projections at the time of commissioning. If after initial approval of tariff, cost factors (operating cost inflation, fuel prices, foreign exchange rate adjustment) change significantly, then the power plant can apply for a tariff adjustment. Feasibility study projected tariffs of all the hydropower plants under the project were approved by the Hubei Pricing Commission based on this policy.

In 2000, SDPC began to apply an amended version of the policy, and after a period of trial operation issued a document setting out the principles of the tariff setting formula. The main features of the new tariff setting method are:

- Tariff set at the time of commissioning will be designed to yield a financial internal rate of return (FIRR) on equity of four percent higher than interest rates for long term loans, over an operating period approximating the design life of the project; for hydropower this is 30 years.
- Assumed loan terms are 20 year maturity (for hydro) current long term interest rate (local loans), actual interest rate foreign loans.
- Assumed operating costs are equal to the average operating costs of plants of similar type and size

- operating in the same grid.
- During the operating period, if cost fluctuation due to changes in fuel prices, interest rate or exchange rates exceeds five percent, tariff may be adjusted.
- Tariff structure reflecting time of day and season will be introduced in the future.

In principle, this procedure represents a cost plus approach with a reasonable return on equity considering the pass through of variations in major cost elements; however, the mismatch between assumed and actual loan terms and operating costs requires an assessment of financial viability of each project company.

Against the above background, China has decided on the introduction of competitive power markets (see Section B2 and Annex 11). The timing of the introduction will proceed at different rates depending on actual circumstances but is likely to proceed more quickly in the coastal provinces where pilots are underway rather than in Hubei which is relatively behind in the reform process. If competitive markets are introduced, then the model adopted in Zhejiang, in which power plants are initially provided with a contract for differences for a large proportion of their power, substantially alleviates market risk. Nevertheless, it is prudent to evaluate the competitiveness of the projected power prices with other forms of generation, in a market environment. The least cost analysis (Annex 4) demonstrated this on an economic basis, but not on a financial basis. The objectives of the financial analysis are therefore: (a) to project the tariff that would apply to the individual hydropower plants under existing pricing arrangements, and the likelihood that this would be approved; (b) determine the adequacy of the actual FIRR on equity for each power plant based on the projected tariff; (c) evaluate the financial viability of the four project companies; (d) verify the projected average tariffs would be competitive in a market environment.

Tariffs calculated by the formula (at 2000 price levels) were in the range of 34.0 and 38.4 fen/kWh (at 2000 price levels). In 2000, the Hubei Pricing Bureau approved tariffs of over 40 fen/kWh for small and medium hydropower projects of the type proposed. It is therefore considered that the projected tariffs are likely to be approved and that the power plants will be competitive as the transition to market based pricing arrangements occur. The Hubei Pricing Bureau concurs with this conclusion.

Considering actual loan maturities instead of the assumptions made in the calculation of projected tariff, real FIRR on total investment are calculated to be in the range of 9.3 and 10.5 percent, except for Xiakou which has flood control benefits (and corresponding grant funding from the provincial and county governments) where FIRR drops to 6.22 per cent. Real FIRRs on equity (excluding Flood Control grant for Xiakou) range from 15.2 to 25.0 percent. These rates are considered to be high in a regulated environment where significant changes in investment and operating costs are passed through.

Despite the attractive returns on equity, preliminary financial projections indicated that, because of the mismatch between asset life and commercial loan maturity, debt service ratios would be less than ideal in the early years until repayment of local bank loans. Therefore an important assumption of the financial viability study is that a Debt Reserve Account (DRA) will be established, which will be funded out of available cash flow until it is credited with an amount equal to the next six month's principal and interest payable on debt, and that dividends will not be paid unless this account is fully funded. Establishment of the DRA impacts the dividend distribution in the short term, but it considerably improves the security of being able to service long term debt.

Financial projections in Annex 5 show that Debt Service Coverage Ratio (DSCR) is maintained above 1.2 even in early operation years for all power plants (for Songshuling and Najitan above 1.3). These ratios are reasonable considering the highly capital intensive nature of hydropower plants. Also DSCR2 ( a formulation of DSCR which includes the DRA usually referred to as cumulative DSCR) remains

comfortably above 1.7 in all cases. While dividend distribution is impacted in initial operating years, distribution is still quite healthy after the first year of operations.

With the tariff setting and adjustment process generally defined (including pass through of major cost elements), it is considered that the two most important factors that could adversely affect financial viability are a reduction in power sales volume and construction delays resulting in a delay in commissioning of the power plants. The former may occur because of overestimated hydrology, or because surpluses of hydropower in the grid lead to less than full purchases of generated energy. On the other hand, since the tariff setting formula assumes average operating costs in the grid, the potential for increasing financial viability and profitability through reducing operating costs should be explored. Sensitivity analyses were therefore carried out assuming variations in these three factors.

For the case of reduced power sales, real rates of return on equity are in the range of 11.5 to 17.2 percent which is still quite reasonable. The minimum DSCR varies between 1.1 and 1.2 for the respective power plants; however the cumulative DSCR always stays comfortably above 1.6. For the case of delayed operation by one year, DSCR varies from 1.0 to 1.3 in the first operating year but in all cases cumulative DSCR builds up to 1.7 over a three or four year period. Since all project companies have the ability to survive these quite severe tests, it is considered that they are financially viable.

For the operating costs sensitivity study there was no change for Najitan and Songshuling since staff numbers were already close to the Chinese "efficient standard". There was a modest improvement for Dongping and a substantial improvement for Xiakou. However, the "efficient standard" seems quite generous implying a staffing of about 300 for the 110 MW Dongping. Therefore technical assistance will be provided under the project to review staffing arrangements and arrive at the minimum requirements to achieve economical efficient operation.

**Financing of IDC.** Upon request from the borrower, the Bank agreed to use the proceeds of the IBRD loan to finance Interest During Construction (IDC) comprising interest and commitment charges on the portion of the Bank loan. The IDC is calculated at the IBRD lending rate & commitment charge at the time of appraisal and is based on the expected funds disbursement schedule during the project construction period. Using the Bank loan to finance IDC is justified since the four beneficiary project entities are newly established financially autonomous enterprises that will not have any revenues until the commissioning of the project.

Fiscal Impact:

Refer to Annex 5 and Annex 16.

### **3. Technical:**

**See also Annex 18**

The project has been designed and will be implemented according to internationally accepted technical criteria and standards. The technologies involved are mainstream and within the capabilities of local as well as foreign contractors and suppliers. The project designer, Hubei Investigation and Design Institute (HIDI), is well experienced in projects of this size and type. Nevertheless, as part of project preparation, the Changjiang Water Resources Commission (CWRC) (the designers of the 18,200 MW Three Gorges project) were contracted to carry out a design review. In addition, a six-member (two foreign and four local) Panel of Experts (POE) was appointed to carry out expert independent technical review throughout the preparation and implementation phases (also satisfying the requirements of OP 4.37). The design review was completed and the POE had its first review meeting in November 2000 and the project

preliminary design was completed after notable changes were made following the recommendations of the POE meeting.

#### **4. Institutional:**

See also Annex 18

##### **4.1 Executing agencies:**

Primarily responsible agencies for project preparation and implementation are:

- HPPDC:** Hubei Provincial Planning and Development Commission (before June 2001);
- HPFB:** Hubei Provincial Finance Bureau (after June 2001)
- PPMO:** Hubei Provincial Project Management Offices (Since August 2001)
- CPMO:** County Project Management Office (four, one in each of the four host counties)

#### **Project Companies**

Hubei Xuan-en Dongping Hydroelectric Power Company Limited  
Hubei Laifeng County Najitan Hydroelectric Power Development Company Limited  
Hubei Zhushan Duhe Hydroelectric Power Development Company Limited  
Hubei Nanzhang Xiakou Electric Power Company Limited

#### **Project Preparation**

HPPDC was the lead agency for preparation of the project for Bank appraisal. In June 2001, this role was taken over by HPFB. Hosted by HPFB, a PPMO was established in August 2001 to oversee and coordinate the completion of project preparation and project implementation. Participating parties include all project related provincial government agencies and the future power purchaser. Similarly, CPMOs were set-up in the four host counties of the respective dams and power plants, with similar functions and responsibilities. For each dam and power plant, a limited liability project company was established as the owner, developer and operator for each of the four sub-projects. Substantial achievements were made during project preparation. All the above executing agencies were established, key staff appointed and played their respective roles in project preparation. The Environmental Assessments (EAs) and Resettlement Action Plans (RAPs) for the four hydropower plants and transmission lines were completed, as were poverty alleviation studies for all four counties and social assessments for Laifeng and Xuan-en. Laifeng County also reached agreement with Longshan County in Hunan Province for carrying out resettlement in that county associated with the Najitan project, and also for sharing of project benefits with Longshan County. With regard to legal and financing arrangements, shareholding proportions were agreed, shareholders' agreements were signed, project charters prepared and business licenses issued for all project companies. The first tranche of registered capital was injected and arrangements for domestic loans agreed with Chinese commercial banks by all project companies.

#### **Project Implementation.**

Hosted by HPFB, the PPMO was established in August 2001. Participating provincial government agencies include: HPPDC, Water Resources Bureau, Environment Protection Bureau, Resettlement Office, Pricing Bureau, Audit Bureau, and Poverty Reduction Office. Hubei Provincial Power Company (HPPC), a central government owned enterprise and the future power purchaser, is also a member of the PPMO. The PPMO has four departments, Project Engineering (including resettlement and environment protection

functions), Finance, Procurement and General Management. A deputy director general of HPFB was appointed as the director general of the PPMO and all key staff for the department was appointed.

The PPMO initially focused on the coordination of completion of project preparation for Bank appraisal, and on local approval procedures. The PPMO will continue to play a major role in future project implementation, including necessary coordination with central and provincial government agencies, overall monitoring, financing arrangements, procurement and financial management. It will also be responsible for maintaining, monitoring and reconciling the special account to be established for the project, and reviewing, verifying and approving withdrawal applications prepared by the project companies before submitting to the Bank for disbursement processing. As project completion approaches, the PPMO will organize tariff related studies, assist in processing tariff applications through the provincial pricing commission and SDPC, and coordinate and support the negotiation of power purchase agreements, which will be facilitated since both the pricing commission and HPPC are both represented in the PPMO.

HPFB, the PPMO lead agency, has had extensive experience with Bank and Asian Development Bank (ADB) projects, and is therefore very familiar with Bank policies and procedures; the project is the 32nd project financed by the Bank in Hubei Province, all of which were channeled through HPFB. It is concluded that the PPMO is fully capable of performing its functions and assuming its responsibilities.

**County Project Management Offices.** In each of the four host counties, the county government established a CPMO. The CPMO organization structure reflects that of the PPMO. Deputy county government leaders are appointed as the directors of the CPMOs and all key staff are now in position.

The CPMO assumes similar functions at the county level to those assumed by the PPMO at the provincial level, except for procurement and special account management, which are exercised at the provincial level. However, officials of finance bureaus of the municipal and county governments are appointed as supervisors for financial management during project implementation. In addition, the CPMO will be responsible for coordinating inputs to the Poverty Alleviation Planning studies carried out under the project. The key staff of the CPMOs are mainly from the respective county governments and county owned hydropower generation companies (sponsors of the four power plants). They have broad experience in monitoring and coordination of project implementation, resettlement and environment protection as per Chinese practice with a number of small hydro projects built in these counties, but they have no experience with Bank policies and procedures. In July 2001, the key staff of the CPMOs and the project companies attended a three-day training workshop, for procurement and financial management (including disbursement), conducted jointly by Bank procurement and financial management specialists as well as experts from the project procurement agent and other relevant Government departments.

*Considering the representation of governmental authorities and county power company officials in the CPMOs and their past experience, they are well positioned and fully competent to carry out their responsibilities to monitor implementation, particularly from the financial viewpoint, and coordinate the input of county government agencies particularly with respect to the implementation of the RAPs, EMPs and poverty planning studies.*

**Project Companies.** For each of the four hydropower plants, a project company was established, in the respective host county, as project owner, developer and operator. In each case, the sponsors are county owned generation companies while strategic shareholders at both provincial and prefecture levels have been brought in to enhance the project company's creditworthiness as well as capacity for the project implementation and future operation. In all cases the board of directors and top management staff have been appointed and these project companies have competently performed their roles in project preparation.



The staffing and capacity of each of the project companies to undertake their roles in project implementation are described in Annex 18. In summary, the key management staff of the project companies generally have 15 to 30 years of experience with a number of small, medium and even large-sized hydropower projects constructed as per Chinese practices, but generally they have no experience with Bank operations and procedures, ICB procurement, and have limited experience in NCB procurement, contract management and financial management. For the project implementation, specifically designed training courses for project and contract management are necessary and shall be conducted early in the implementation process. However, to manage relevant risks associated with the weakness of the project companies, the major functions and responsibilities for project construction management including project management, construction supervision and contract administration will be handed over to experienced firms employed as supervision engineers. The supervision engineers will also manage the contracts that the project companies reached with various parties for the Environmental Management Plan (EMP) implementation.

Local state owned enterprises have substantial equity positions in these project companies and the project implementation and future operation will support provincial and county objectives in developing poverty areas, including substantial supplementation of the fiscal revenues of the county governments. Therefore the project companies can expect strong support from the PPMO and CPMOs in project implementation, financing arrangement, and negotiation of electricity sales with HPPC and its subsidiaries at the prefecture level. With this government support, the synergy of shareholder experiences and capacity, the arrangements for sharing responsibility among the PPMO, CPMOs, supervision engineer and procurement agent, the project companies should have no difficulty in continuing to perform their function as owners and project implementation agencies and owners. Achievements to date include the attraction of strategic equity investors, the draft agreements for domestic loans achieved with Chinese commercial banks, the appointment of supervisory engineers and participation in bid evaluation for NCB contracts.

#### 4.2 Project management:

As mentioned above, the four project companies will be largely responsible for project implementation. But in this they will be heavily supported by experienced firms acting as Supervision Engineers (SEs) undertaking the functions of the "Engineer" under the ICB civil works contract documents and the "Project Manager" under the NCB civil works documents including management of the civil and erection contracts on behalf of the owner.

The detailed scope of work for SEs are specified in the TOR satisfactory to the Bank. The scope of work includes but is not limited to the following:

**Administration of the civil works contracts.** The SE will carry out the duties of the "Engineer" in ICB contracts and "Project Manager" in NCB contracts.

**Quality Control.** The SE will provide specialist staff to establish inspection procedures, train the Employer's personnel, direct and oversee the inspection work and review results.

**Schedule Control.** The SE will be responsible for monitoring schedule performance, identifying potential delays and proposing and discussing remedial actions with contractors.

**Cost Control** (relating to civil works and erection contracts). The SE will adopt an appropriate cost control software package or develop a suitable spreadsheet based program for cost control.

**Documentation Control.** The SE will set up a system to record and file information as specified in details in the TOR, to provide an accurate record.

**Responsibilities with Respect to Equipment Suppliers.** The SE will assist the Employer and Designer in administration of mechanical and electrical equipment contracts; detailed responsibilities are specified in the TOR.

**Reporting.** The SE will prepare all the reports to satisfied the needs of the POE, the Employer, the PPMO, the Borrower and the World Bank as specified in detail in the TOR.

**Translation Services.** The SE will provide necessary translation services (Chinese/English and English/Chinese ) as specified in details in the TOR.

Two local engineering firms, from a shortlist satisfactory to the Bank, were employed as independent Supervision Engineers (SEs). Sichuan Ertan International Engineering Consulting Co., Ltd. (ETI) and China Water Resources & Hydropower Construction Engineering Consulting Mid-South Co. (MS Co.) were selected as the SEs through a competitive process satisfactory to the Bank (these contracts are not Bank financed). ETI was selected for Songshuling and Najitan, while the MS Co. for Dongping and Xiakou. As described in Annex 18, these firms are highly experienced and have submitted very detailed technical proposals for carrying out the work, and have nominated highly qualified staff to undertake key management roles for construction of each of the four power plants.

Implementation of resettlement will be carried out by the local county governments, which have sufficient experience in resettlement. To ensure that resettlement follows the agreed RAPs, resettlement monitoring will be divided into two parts, internal and external. Internal monitoring will be organized by the Project Resettlement Offices and carried out by the township resettlement offices and village groups, while the external monitoring will be conducted by consultants who assisted in preparation of the RAPs in accordance with Bank requirements and who have extensive experience in external monitoring of resettlement in Bank projects. Detailed monitoring indicators and procedures are included in the respective RAPs.

Environmental management, monitoring and supervision will involve the project companies, their supervision contractors (primarily from research and design institutes), environmental representatives of the prime contractors, and existing government agencies and administrative department (local government environmental protection agencies). Each project company will set up an environmental management office. Detailed monitoring and inspection indicators and procedures are included in the respective EAs.

#### 4.3 Procurement issues:

A procurement capacity assessment has been carried out by the project team. The overall findings of the assessment in relation to organizational capacity are: an experienced international tendering company (ITC of CNTIC) has been appointed through a competitive process as the procurement agent; an experienced design institute (CWRC's Design Institute) has been engaged to prepare technical specifications for the bidding documents; the provincial finance bureau has extensive experience with disbursement of Bank loan; however, the PPMO and four project companies have little experience with procurement under Bank financed projects. On the regulation side, there is no integrated national public procurement law in China and there are some deviations in the internal National Competitive Bidding (NCB) procedures such as: (a) invitation for bids can be advertised through newspaper, information network or other media; (b) cost estimate is mandatory; (c) bracketing is used for evaluation; (d) the merit point system (scoring system) is used for bid evaluation; (e) time for preparation of bids can be 20 days which is shorter than 30 days required for NCB; and (f) bids for a contract for which there are less than three bidders should be rejected and rebid. In this connection, a side letter will be signed by the government at the time of signing of the loan agreement. Because of the inexperience of staff with procurement responsibility, the overall risk related to procurement is rated as high. Accordingly, an action plan has been proposed, including procurement capacity enhancement by appointing experienced staff dedicated for procurement activities and organizing appropriate training programs. The first training workshop was held in July 2001.

The above findings have been reflected in the Annex 6 (Procurement and Disbursement Arrangements), particularly in connection with establishing the various procurement thresholds.

The Bank task team is staffed strongly for procurement, with three procurement accredited members: Dawei Yang from the WBOB is responsible for the procurement capacity assessment, training of procurement staff in the project offices at provincial and county level, all NCB procurement, post review of below threshold procurement. He will also collaborate with regard to International Competitive Bidding (ICB) civil works. Yuling Zhou at HQ will be responsible for ICB procurement. Barry Trembath (TTL at HQ) will exercise overall quality assurance responsibility. In addition, Bertrand Ah-Sue at WBOB and Chander Ohri from COSU will act as advisors on specialized topics.

Six Chinese contractors were pre-qualified for NCB and civil works (Najitan and Xiakou). NCB bids for five contracts, the dams and power houses for Najitan and Xiakou, and the preparatory works for Songshuling, were opened on January 20, 2002 as scheduled. Due to schedule constraints, the Dongping Company decided to commence preparatory works for Dongping with local financing. With regard to ICB contracts for the dam and power house of Dongping and Songshuling, the Bank advised no-objection to the list of pre-qualified contractors on January 18, 2002 and final comments on bidding documents. The bid evaluation report for supervision engineers was submitted to the Bank on January 25, 2002 and the Bank provided its no objection in principle (these services are not Bank financed).

#### 4.4 Financial management issues:

The task team has conducted an assessment of the adequacy of the project financial management system of the Project (see Annex 12). The assessment, based on guidelines issued by the Financial Management Sector Board on June 30, 2001, has concluded that the project meets minimum Bank financial management requirements, as stipulated in BP/OP 10.02. In the project team's opinion, the project will have in place an adequate project financial management system that can provide, with reasonable assurance, accurate and timely information on the status of the project in the reporting format agreed with the project and as required by the Bank.

Funding sources for the project include Bank loan, equity contribution and domestic borrowing. The Bank loan will be onlent from the Ministry of Finance (MOF) to Hubei Province, and thence to the project companies through prefectures/municipalities and counties. In terms of disbursement technique, the project will be disbursing based on the traditional disbursement techniques and will not be using PMR-based disbursements, in accordance with the agreement between the Bank and MOF.

The Hubei Provincial Finance Bureau (HPFB) will maintain the special account, which will be established at a major commercial bank acceptable to the Bank. Disbursements will generally be made to the special account maintained by HPFB, and disbursements will be made out of the special account through the municipal and county finance bureaus and project companies to contractors or suppliers. In the case of special commitments, disbursement will be made directly by the Bank to the contractors or suppliers. Disbursements by HPFB will be made on the basis of withdrawal applications submitted by the beneficiaries, which pass through county and municipal finance bureaus. Equity contributions of beneficiary shareholders and commercial bank loans arranged by the beneficiaries will be disbursed directly to them. No outstanding audits or audit issues exist with any of the implementing agencies involved in the proposed project. The task team however will continue to be attentive to financial management matters and audit covenants during project supervision.

#### **5. Environmental:** Environmental Category: A (Full Assessment)

5.1 Summarize the steps undertaken for environmental assessment and EMP preparation (including

consultation and disclosure) and the significant issues and their treatment emerging from this analysis.

The four small/medium size hydropower developments will each consist of a concrete dam, above ground or underground power house, switch yards, ancillary facilities, and transmission lines. Because of their limited seasonal storage they will tend to operate on base load in the wet season and peak load in the dry season. Each project will exploit sections of tertiary rivers that are otherwise already dammed downstream, and in the case of Dongping, Najitan and Xiakou, upstream as well, to generate electricity or impound water for agriculture/municipal water supplies. The existing dams have already had a significant impact on eliminating migratory fish populations from the respective project areas, and reducing the level of productivity within these remaining reaches. Due to the steep mountainous geography of the region, the reservoirs will be long narrow bodies of water, with relatively little inundation of valuable land. The lower elevation valley areas in which each reservoir will be formed provide little in the way of forest resources and, thus, little in the way of suitable wildlife habitat. This is primarily due to the steep rocky terrain and thin soils that support primarily woody shrubland type vegetation. In those areas where terrain and soils are more conducive to forest growth, decades of human habitation have resulted in native forests being replaced by farmland, orchards, or cultivated commercial forests. The transmission lines will primarily extend across mountainous terrain, but will be designed and constructed so as to take advantage of topographic features so as to minimize the need to remove vegetation. Transmission lines will extend from substations that will be constructed at each damsite, and connect to existing substations on the outskirts of existing communities.

EAs and EMPs conforming to OP4.01 have been prepared and are summarized in **Annex 13**. A summary EA covering all four components has also been prepared. In addition, a Karst Biodiversity Assessment was completed as a supplementary report to the Summary EA, to evaluate the potential impacts on karst features within the project areas, in conformance with OP4.04. In addition, at the request of the Bank, the Hubei Government contracted the Institute of Hydrobiology – Chinese Academy of Sciences, to undertake an Aquatic Ecological Assessment of the four dams and power plants. The assessment report also forms a supplementary report to the EA. At this time, route selection and design for the relatively short transmission lines, connecting the projects to the grid, has yet to be finalized (except for Xiakou the preliminary design has been completed). A preliminary draft EA for the transmission lines project was prepared in late January 2002 and submitted to the Bank. The EA and EMP for the Xiakou component is acceptable to the Bank and for the other lines. There is sufficient information already available to conclude that there are unlikely to be highly significant or irreversible impacts enabling their clearance in principle. A final Transmission Lines EA covering all four components will be submitted to the Bank for clearance prior to commencement of construction of the lines, or disbursement of any funds relating to them.

The most important impacts are:

- loss of riverine aquatic environment for a distance of 32 km (Dongping), 33 km (Najitan), 19 km (Songshuling) and 18 km (Xiakou), and replacement with lacustrine environment;
- potential dewatering of short sections of river downstream of each dam during dry season operations when reservoirs are being recharged;
- potential dewatering of the Luxiawan Irrigation Canal immediately downstream of the Xiakou project;
- exposure of cut and fill slopes to the forces of erosion during construction of the hydropower projects, roads, and resettlement villages;
- short-term impact of large construction work forces moving into rural areas which have relatively sparse populations at present;
- some tree cutting and vegetation clearing along short sections of the transmission line rights-of-way,

- where clearance distances cannot be provided by tower siting on high points of land; and
- potential effects of noise and electro-magnetic flux (EMF) from transmission lines and substations.

#### 5.2 What are the main features of the EMP and are they adequate?

To minimize the effects of peaking operations on downstream riparian flows during the dry season, when there is no spilling, the EMP provides that minimum releases of 30 percent of the average driest month flows (i.e., January) to ensure the river channels downstream of the respective power houses and upstream of major tributaries that contribute augmentation flows, are able to sustain fish and other aquatic organisms. This only applies to operation of the Najitan and Songshuling projects, since Dongping will empty to the Shuibuya reservoir, and Xiakou will follow the existing status quo situation. However, for Xiakou, a constant  $0.3 \text{ m}^3/\text{s}$  supply of water will be provided to the Juxiawan Irrigation Canal throughout the construction and operation periods, to ensure the paddy lands presently irrigated by the canal are not adversely affected by the project.

With regard to cultural heritage, surveys carried out of each of areas to be inundated by the Hubei Provincial Antiquities and Archaeological Research Institute, identified nine sites of archaeological interest and tombs in The Xiakou area. One site was also identified for the Najitan project (above normal operating level but below flood level). The Provincial Antiquities Bureau has agreed with the project companies that these sites will be excavated by the Research Institute prior to inundation. This requirement is included in the EMP.

With regard to environmental management during construction, each project has identified measures for minimizing soil erosion and sedimentation of watercourses, treating aggregate and concrete process and domestic wastewater from the construction zone and camps, disposing of construction debris and domestic solid waste, controlling noise and dust, locating and constructing transmission lines so as to minimize impacts to vegetation, and minimizing impacts of EMF on local populations during operation. The program of environmental monitoring is adequate as is the institutional mechanism for overseeing the environmental protection and monitoring activities. A realistic budget for carrying out environmental management of each project, both during construction, and later during operation, has also been developed.

#### 5.3 For Category A and B projects, timeline and status of EA:

Date of receipt of final draft: 07/31/2001

An EA report was prepared for each subproject by the Hubei Environmental Protection Research Institute (HEPRI), as part of the feasibility studies, and these were submitted to the Hubei Environmental Protection Bureau (HEPB) between 1996 and 2000. The four projects were approved by HEPB during this period. Bank environmental specialists subsequently reviewed the EIA documents in early 2000, and provided critical review comments, as a result of which the Chinese Research Academy of Environmental Sciences (CRAES) was contracted to revise the EIA reports, in accordance with terms of reference provided by the Bank. CRAES carried out additional environmental investigations as part of the review exercise. Drafts of revised EAs for each project and a Summary EA were received in November 2000. Based on several rounds of Bank comments, a final draft summary EA was received in May 2001, and EAs for individual dams and powerplants in July 2001. As a result of Bank appraisal of these documents, the Bank requested an aquatic ecology assessment be carried out by a specialized research institute, and a supplementary report specific to the relatively short transmission lines. These reports were received in late January 2002 and April 2002. With regard to the transmission lines, the EA report is appropriate at this stage since three of the lines are not yet at preliminary design stage; however, with the exception of Xiakou, the project companies will prepare more detailed plans when preliminary designs are complete and before commencement of construction of the lines.

5.4 How have stakeholders been consulted at the stage of (a) environmental screening and (b) draft EA report on the environmental impacts and proposed environment management plan? Describe mechanisms of consultation that were used and which groups were consulted?

To obtain public opinions of the project and to strengthen environmental consciousness, four opinion and data surveys were carried out for each project, two during the development of the initial draft EA, and two when the draft EA was being revised to bring it into compliance with World Bank EA standards. The questionnaires, results and analyses are fully presented in the EA for each of the four projects.

Meetings were held with the local county peoples congresses, standing committees and consultative committees, the media, workers associations, farmers, and local residents. All organizations within the project affected areas indicated strong support for the respective projects, primarily because it is believed that the projects will contribute much needed economic development within each of the four counties, thereby helping to alleviate poverty.

In addition to the public consultations, project evaluation and review meetings were also held. These were attended by design institutes, academics, state and provincial project sponsors, local county environmental protection bureau staff, and staff from local county resource management agencies. The group systematically reviewed the project environmental impacts and proposed mitigation measures. The projects were subsequently approved by HEPB and State Power Corporation.

Public disclosure of the draft EA report for each project was carried out by providing the EA reports to the environmental protection bureau office of each project affected county in autumn 2000 (ranging from November 2, 2000 for Xiakou to November 21, 2000 for Dongping). Advertisements were placed in the local newspapers and notices broadcast on television, inviting members of the public to review the documents and provide comments to the project sponsors. The public disclosure activities are fully described in the respective EAs and in the Summary EA. (Actual in-country public availability dates were: November 2, 2000 for Najitan and Xiakou; November 7, 2002 for Songshuling; and November 21, 2000 for Dongping. They were received by Infoshop on January 1, 2001 and an Environmental Assessment (EA) Summary was circulated to the Board on November 12, 2001 {SECM2001-0645}).

5.5 What mechanisms have been established to monitor and evaluate the impact of the project on the environment? Do the indicators reflect the objectives and results of the EMP?

An environmental management organization will be established for each of the four projects. During the construction period, the each of the project environmental management organizations will be responsible for:

- regular monitoring of potentially harmful emissions including effluents and runoff, atmospheric and noise;
- supervision of the safety and health aspects during construction such as: sanitation, worker protection from job-related injury, prevention of epidemic disease, including control of insect and rodent pests;
- restoration work such as decommissioning access roads and quarries, placing soil over re-contoured land, and seeding/planting vegetation; and
- maintenance of environmental data, records and files, plus preparation of regular status reports.

Subsequent to construction, each of the project environmental management organizations will be retained,

but modified appropriately, to monitor environmental baseline conditions (primarily reservoir water quality) and environmental impacts during operation. The environmental monitoring activities are summarized in the table at the end of **Annex 13**. A substantial budget has been approved for the environmental management and monitoring component of each of the four projects.

## 6. Social:

6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

**Resettlement.** The land acquisition and resettlement will involve two provinces (Hubei and Hunan), five counties, 16 townships or towns, 44 villages and 128 village groups (or natural villages). A total of 7,425 people will be affected by land acquisition or physical relocation. Most affected people are classified as rural, with only 305 urban residents from Zhongjianhe Town requiring relocation for the Dongping development. Numbers affected by land loss, relocation or both are shown in the table below. In this table, the number requiring economic rehabilitation is calculated by dividing the area of land lost by the per-capita land area in the affected village. It is therefore reflective of the number of new livelihoods to be created which is a useful parameter for rural resettlement planning where restoration of livelihood is far more difficult than physical relocation.

| Sub-Project | Total Urban affected | Total Rural affected (household) | Affected by relocation and land loss (household) | Affected only by relocation (household) | Affected only by land loss (household) | Economic Rehabilitation Persons |
|-------------|----------------------|----------------------------------|--|---|--|---------------------------------|
| Dongping    | 305                  | 3047 (790)                       | 1059 (256)                                       | 0                                       | 1988 (534)                             | 1663                            |
| Najitan     | 0                    | 2565 (575)                       | 236 (49)   | 161 (35)                                | 2168 (491)                             | 640                             |
| Xiakou      | 0                    | 1043 (256)                       | 931 (228)  | 4 (1)                                   | 108 (27)                               | 957                             |
| Songshuling | 0                    | 465 (133)                        | 105 (26)   | 109 (26)                                | 251 (81)                               | 197                             |
| Total       | 305                  | 7120(1754)                       | 2331 (559)                                       | 274 (62)                                | 4515 (1133)                            | 3457                            |

The total number of affected people (7425) is substantially less than feasibility study numbers indicated at PCD stage (12,055). This has resulted from more detailed inundation surveys and careful resettlement planning, which took opportunities to reduce resettlement through construction of dykes etc. Moreover, numbers requiring rehabilitation of 3457 spread over 128 village groups are quite modest (in the context of China at least). Feasibility study estimates were already much lower than contemplated when basin planning studies were carried out because dam heights were reduced substantially in two cases specifically to reduce resettlement impacts. The Najitan dam height was reduced from 55 m (established in a 1984 basin planning study) to 35 m with substantial trade-off of power benefits to avoid social disbenefits. Similarly, the Xiakou project dam height was reduced from 112 m (in a 1978 planning study) to 84 m, substantially reducing hydropower and flood control benefits in the interests of reducing resettlement.

RAPs, conforming with OD 4.30 have been developed for the four sub-projects. These are summarized in **Annex 14**. The resettlement strategy for rural residents is land based except in a few cases where current primary source of income is not land based or where younger people or those with special skills have chosen to move near or into town areas. For Songshuling, resettlement is minor. For Najitan, it is also relatively simple since the relocation and land loss is spread over 62 village groups. It is therefore relatively easy to provide resettlement within affected village groups by developing new land and improving productivity of existing land. The main impacts are for Dongping and Xiakou where some village groups will need to be relocated. In both of these cases the basic strategy has been to find host villages with relatively large land areas and potential for developing new land and increasing production such that both

resettlers and host villages will benefit from the resettlement process. Selection of such host villages has largely been made by the affected village groups with the decisions mainly influenced by proximity to their existing locations, and expected economic benefits. The four RAPs developed include very detailed rehabilitation planning carried out for each of the 128 affected village groups, to demonstrate that each will be able to restore income within a short time of resettlement, after which it will increase in real terms. Where there is a time lag between resettlement and restoration of income (before new production systems fully develop), assistance will be provided in the transition period.

In developing the RAPs the planners have consistently attempted to treat the resettlement as a development opportunity. Examples are provided in **Annex 14** which also describes funds flow and auditing provisions, grievance procedures, and internal and external monitoring arrangements.

At this time, route selection and design for the relatively short transmission lines, connecting the projects to the grid, has yet to be finalized. A Resettlement Policy Framework (RPF) covering these lines was prepared in late January 2002 and submitted to the Bank, and revised based on Bank comments. This RPF is satisfactory to the Bank.

#### **Provisions for Minorities (See also Annexes 15 and 17)**

Two of the sub-projects (Dongping and Najitan) are located in Enshi Tujia and Miao Autonomous Prefecture which, at its request, was designated as such in 1982. The Najitan Project also involves some resettlement in Longshan County, which belongs to Xiangxi Tujia Autonomous Prefecture in Hunan Province. The social and economic survey carried out as part of the resettlement planning process indicated a high degree of acculturation within project counties as a whole and in affected communities. However, the presence of officially designated minorities in the project area flagged the potential application of OD 4.20 ("Indigenous Peoples"). Therefore, on a preliminary basis OD 4.20 was taken to apply and a social assessment (SA) focusing on the cultural status of the minorities in the project area was also carried out. **Annex 15** summarizes the historical and legal context, the results of the socio-economic analysis and the SA.

The socio-economic survey concluded that there were no significant differences in status between the minority nationalities and the Han majority with regard to political representation, economic activities and standard of living. The only area where a slight lag could possibly be detected was in educational achievements in the two counties as a whole. Certainly government programs towards minorities in recent years have emphasized education. According to information received from Laifeng County, they received a total of Y 1.9 million in 1999 earmarked for minority assistance. Of this about one quarter was for educational purposes including subsidies towards school fees. Moreover, the educational achievement figures represent the overall situation among older and younger people and probably do not fully reflect Government's overall achievements in education in the minority counties. Figures received from the education bureaus of Xuan-en and Laifeng County as part of the Poverty Alleviation Enhancement studies (**Annex 16**) show that for both Xuan-en and Laifeng Counties, the 1999 enrolment rate for primary school age children was 100 percent, while for middle school it reached 94.9 percent for Xuan-en (93.2 percent for girls) and 95.6 percent for Laifeng (95.0 percent for girls). These represent dramatic increases over the decade, particularly for Xuan-en where 1990 middle school enrolment was only 42.5 percent and 35.4 percent for girls.

However, in such matters, the views of the minorities concerned are of prime importance. Therefore, the project beneficiaries were requested to commission a SA focusing on ethnic minorities living in the project areas. A SA team headed by Dr. Zhang Haiyang, Professor of Ethnology from Central University of



Nationalities, conducted fieldwork with the participatory approach in the three affected minority counties. The overall methods adopted by the SA team were drawn from an anthropological toolkit, including PRAs (participatory rural appraisals) and questionnaire surveys. The SA team started its fieldwork with social mapping of local villages in the project affected areas and selected survey samples covering major representative ethnic groups and livelihood patterns. It then conducted focus group discussions (in absence of local officials), household case studies, structured interviews in these sample villages, and administered questionnaire surveys (anonymously with only respondent codes) covering all households to be affected by resettlement in the two counties. All project affected households were covered by the **questionnaire survey**, with a set of 30 questions in six to seven categories containing the usual demographic data in relation to all household members, as well as language, family life, kinship and marriage, social contacts, ethnic relations, religious beliefs, etc. The major objective here was to establish the correlation between ethnic status and education, occupation, and cross marriage. All data were input into spreadsheets and statistical analysis computer programs. **Structured Interviews** questions were attached to the questionnaire, but actual interviews by the SA group, with a 15 to 20 percent coverage, provided for more dynamic interaction, enabling the interviewers to diagnose people's attitudes towards the project and ethnic identity, based on their answers to a set of 30 questions. The SA team also organized 16 **Focus Groups** discussions in the sample villages involving about 200 people including all ethnic groups, women, local officials and project personnel, as well as village group meetings in both resettling and host villages. During group discussions and village meetings, the SA team employed a series of PRA tools included community mapping, resource diagramming, preference ranking, problem tree, historical events, seasonal calendars, daily activity charts, etc. These tools helped convey both etic and emic views, and built mutual understanding between the SA team and villagers.

The fieldwork was followed by comprehensive statistical analysis of collected data, and results are summarized in **Annex 15**. Overall conclusions were that while more than half of the project affected people were officially identified as Tujia, Miao, and Dong, they belonged to a cohesive local community with the same economic, social-cultural, and cognitive structure. Local people exhibited no ethnic consciousness, as evidenced by their physical and mental behaviors in community life, such as their daily practices, folk communication, random choosing of spouse, working sites, work partners, etc. It was evident that ethnic minority groups in and around the project areas had already entered into, and had considerable influence on, the mainstream of local society. In addition, at the grass-root level, no vulnerable ethnic groups were detected; rather the local social ecology, involving all ethnic groups was in healthy equilibrium.

A further conclusion of the SA was that, provided the RAP is carried out as designed, there should be no minority specific impact as distinct from general impact on the community as a whole. Areas where the RAPs have considered possible minority specific impacts are: (a) where village groups are merged, the merged groups have similar ethnic composition; (b) in construction of new housing, resettlers will have complete freedom to adopt traditional style and layout if they so choose, and village layout will accommodate this; (c) resettlement is land based, except in a few cases where people have specifically chosen to relocate close to or into towns; (d) extensive participation and consultation processes will continue throughout resettlement implementation; (e) there will be a special conflict resolution process for minorities with path through the county ethnic minority affairs bureau, and (f) certain buildings in the new Zhongjianhe town will be designed in traditional architectural style in order to promote cultural tourism in the future.

Following submission and review of the SA, a special mission consisting of two Bank social scientists and an international social science consultant visited the project area to verify SA findings and to provide specific evaluation as to whether the identifying characteristics of indigenous people listed in OD 4.20 were

present or significant. Their report is included as **Annex 17**. The mission concluded that:

- The findings and descriptions in the social assessment were generally valid. The mission agreed that ethnic identity in the area largely reflects only official designation; the people in the project area were found to be highly acculturated and more or less indistinguishable in living patterns or behaviors. In fact, the people in the project area do not live in accordance with distinctive cultural traditions, show evidence of cultural distinctiveness in dress or other physical manifestations, and cannot distinguish others by ethnicity.
- The five distinguishing characteristics listed in OD 4.20 are not significant in the project area: 1) the people do not speak distinctive languages; 2) they do not adhere to distinctive customary social, political, or economic institutions; c) they do not identify themselves, and are not identified by others in the project area, as members of distinctive groups; 4) they do not show evidence of any special affinity to the area, as an ancestral homeland or otherwise; and 5) they do not depend primarily on subsistence production. The mission also concluded that the people in question do not show any other distinctive characteristics that may make them particularly vulnerable to disadvantage in the development process.
- In essence, all of the people affected by the project are affected in similar ways. A separate Resettlement Action Plan provides remedies for impacts associated with land acquisition. No other potential adverse impacts have been identified. Because no ethnicity-specific measures are needed to avoid or mitigate adverse impacts, the mission recommended that preparation of any type of additional minority plan not be required, because it would not contain any "actionable" items and would not serve any substantive purpose.

Following review and discussion of mission and SA reports, it was agreed that the people within the project area were not the intended targets of OD 4.20, and that an Indigenous Peoples Development Plan was not required.

#### **Poverty Alleviation Impacts (See also Annex 16)**

The four project counties are all poverty counties, three of them nationally designated, with net rural incomes in the range of Y 1400 to Y 1800 per capita per annum (2001 figures), and the fourth provincially designated with an income of Y 2081 per capita. These compare with the provincial average of Y 2,352. The high incidence of poverty in the project areas is mainly attributable to the mountainous terrain in which they are located resulting in poor access and climate, limited farmland resources and lack of non-farm opportunities. However, they have made considerable strides over the last 15 years towards eliminating poverty. Over that period population below the poverty line reduced from 62 percent to 3.6 percent, villages without electricity from 732 to 19 and without road access from 482 to 74. Middle school enrolment rose from below 50 percent to 95 percent, including a jump in the enrollment of girls from 30 percent to over 90 percent (1999 figures).

These achievements largely result from the focus on poverty of central and provincial governments as part of the 8-7 poverty reduction plan launched in 1994. However, the Government recognizes that there are some weaknesses in current poverty alleviation efforts and has developed a new strategy entitled "Guidelines of China's Poverty Alleviation: 2001-2010" which was endorsed by a national conference, held in May 2001. The Government's new program, based on this strategy includes the following elements; (a) a multi-sector approach to rural poverty reduction; (b) reform of the social safety net system in rural and urban areas; (c) broadening of targeting to cover "relative poverty", i.e. the poorest ten percent of rural population including the absolute poor (below \$0.6 a day per capita income) and vulnerable poor (below \$1

a day per capita income), a total of about 100 million people; (d) decentralized implementation and greater stakeholder participation; (e) mainstreaming of poverty reduction within the Government system and increased participation of private sector and NGOs; (f) targeting of both income and non-income poverty (the latter includes education, health, housing, and environmental factors); and (g) more attention to emerging urban poverty. An important part of implementation of the new strategy is improvement of the current poverty planning process. Funded partly by ADB, the central government Leading Group on Poverty (LGOP) sponsored a study, carried out from April to August 2001, to develop a methodology and prepare guidelines for county poverty reduction planning incorporating the principles outlined above. The study team used a poverty county in Hebei Province as a model to develop and demonstrate the planning process, and worked closely with villages to prepare bottom-up poverty alleviation plans for 52 poverty villages, based on which, a county level poverty alleviation plan was developed covering a five year time frame.

For the current project, the PPMO employed consultants to specifically examine the impact on poverty of the proposed hydropower developments. They reviewed poverty status, current poverty alleviation efforts, impacts of the project and made suggestions as to how fiscal revenues from the power plants could enhance poverty alleviation in the project areas. Their report is summarized in **Annex 16**.

The study team confirmed the impressive progress made by the host counties towards eliminating poverty indicated above. They also concluded that the project will have significant economic impacts on the host counties during construction through: (a) road improvements benefiting a population of 176,000; (b) 5300 new jobs during the construction period, and 850 during operation; and (c) multipurpose benefits not considered in economic evaluation of some Y 6.5 million per year. The project will significantly impact county fiscal revenues during both construction and operation periods. Considered in relation to the current contribution of the counties to poverty alleviation programs the impact is very large. Returns would be much larger if the current power pricing formula were to be altered to an avoided cost approach, or if the tax regime were adjusted to provide for a resource tax which captured the economic rent of hydropower development, and/or if avoided emissions costs were to be included in the power price.

With regard to current poverty alleviation efforts, despite the impressive achievements the study identified some shortcomings in current programs; current performance evaluation system and performance indicators generally correspond to the shortcomings recognized by LGOP leading to the launching of the new strategy.

Therefore during appraisal, the Bank suggested using the opportunity of the project to prepare poverty alleviation plans for the host counties, using the planning process piloted in Hebei and being promoted by LGOP. All beneficiaries agreed to this proposal. The general methodology for preparing these plans is included in Annex 16. The planning study will be carried out under the leadership of the provincial poverty alleviation office and its counterparts in the four host counties, who will mobilize county, township and village resources to cooperate with consultants who will be engaged to carry out the studies.

To accelerate implementation of the county alleviation plans, each county undertook to establish a poverty alleviation enhancement fund and allocate at least 20 percent of fiscal revenues accruing to the county during at least the first five years of operations of their respective hydropower developments to this fund. The fund would help to finance projects included in the poverty alleviation plans described above. It is likely that the fund would support a range of on-farm agricultural investments at the village group and household level (including irrigation, development of wastelands, orchard development improvement, greenhouses and household livestock); improved market information and improved access, schools, clinics etc.

6.2 Participatory Approach: How are key stakeholders participating in the project?

| Participatory Approach                                 | Identification / Preparation | Implementation  | Operation   |
|--|------------------------------|-----------------|-------------|
| Project affected groups                                | IS, CON and COL              | IS, CON and COL | CON and COL |
| Local NGOs: Design / Research Institutes/ Universities | IS, CON and COL              | COL             | COL         |
| Local government                                       | IS, CON and COL              | IS, CON and COL | CON and COL |

*Note:* IS = sharing information; CON = consultation; COL = collaboration.

**Project Affected Groups**

**Resettlement.** During the planning phases, extensive consultation and community participation have been organized by the project resettlement offices in resettlement areas and host communities, as shown by the following examples. In Dongping, the choice of host village was largely determined by the resettlers themselves after discussions with the host villages and review of the economic opportunities presented. In Najitan, while all people could be resettled within existing village groups, based on consultations it was agreed that about 12 households and 55 persons with special skills will be resettled in township towns. In Xiakou, where some village groups need to relocate, the resettlement office staff arranged for the affected people to visit two proposed resettlement sites. One option was to resettle to villages within the same township, where fruit trees would be the main future source of income. The other option was near the county town, where the resettlers would have much better farming conditions and more opportunities for future development. In Songshuling relocated people from villages with poor access and little irrigation, were presented with three options: moving to another village in the same town maintaining their rural lifestyle but with much better farming conditions, moving to an existing fruit tree plantation where they would be allocated an area of existing fruit trees or moving to a shop-house in a retail market in the town center. Consultation and participation will continue throughout the implementation phase in areas such as ensuring fairness in allocating housing plots, and transparency and accountability in delivery and use of compensation funds. Land compensation will be delivered to affected village groups to be used for various economic rehabilitation activities according to the RAPs. All members of village groups will be informed about the planned usage of such funds and associated economic rehabilitation measures. The village groups will make a collective decision on the use of unused land compensation funds. Since January, 2000, the four counties have made considerable efforts to disclose the content of draft RAPs, and inform the affected people about resettlement impacts, compensation policies, rehabilitation options and grievance procedures. For example, in Dongping, the summary of draft RAP with detailed compensation policies and rehabilitation measures was distributed to the affected townships and villages. In Najitan, detailed impacts survey results and compensation rates were informed to all affected households. In Songshuling, the content of the RAP was summarized and published in the local newspaper and distributed to all affected villages. In Xiakou, resettlement impacts survey results were provided to all affected households, and the draft RAP was put in the county library for public review. Additional measures for public disclosure are being made by the project counties now that the final RAPs have been accepted by the Bank, including distributing a resettlement information booklet to all affected households, and publishing detailed resettlement implementation details to the public through TV, radio and newspapers.

**Minorities.** The social assessment involved a fully consultative and participatory process as described above in Section 6.1

**Environment.** Described in 5.4 above

**Poverty Alleviation Planning Studies.** As noted above and in Annex 16, a bottom-up planning methodology will be employed with full participation of individual villages, village groups and villagers.

**Local NGOs, Design/Research Institutes Universities.** All aspects of the project have been prepared by local organizations. The only foreigners that have been involved are two members of the Panel of Experts for technical aspects. Primary organizations that have been, and will be, involved are:

- Hubei Investigation and Design Institute: Technical design and initial environmental assessments
- Changjiang Water Resources Commission Design Institute: Design review, preparation of technical specifications
- China Research Academy for Environmental Sciences. Review and upgrading of environmental assessments
- Aquatic Biology Institute, China Academy of Science: Aquatic Ecology Assessment
- East China Investigation and Design Institute. Resettlement planning and independent monitoring and evaluation during implementation
- Central University of Nationalities. Social Assessment
- Rural Development Institute, China Academy of Social Sciences. Poverty alleviation enhancement studies
- State Power Economic Research Institute. Generation planning studies, economic and financial analyses
- Hydropower Construction Engineering Consulting Mid-South Co: Construction Supervision
- Sichuan Ertan International Engineering Consulting Co. Ltd: Construction Supervision

**Local Government.** The projects are being developed by county level generation companies with strong support from host counties. County governments will provide counter-guarantees on repayment of the Bank loan via prefecture/municipal and provincial governments to the central government. They have been heavily involved in project preparation and have freely provided statistical data and other unpublished information for all studies. County governments will be primarily responsible for resettlement implementation and environmental monitoring. Township and village governments have been fully involved in resettlement planning and will be heavily involved in resettlement implementation. All will participate in poverty alleviation enhancement studies.

6.3 How does the project involve consultations or collaboration with NGOs or other civil society organizations?

Review of the EAs involved project evaluation and review meetings attended by research institutes, academics, media, local community organizations, women's organization; etc. In addition, the projects have been heavily advertised in local print and broadcast media and comments invited and recorded.

6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

With regard to resettlement each PMO office will have social and resettlement specialists assigned to monitor implementation of the resettlement plans by county resettlement offices. Detailed procedures have been put in place for determining and notifying compensation and resettlement entitlements and expected funds flows. These will be audited. An independent agency will also be employed to carry out external

monitoring and evaluation as described in Annex 14. Dispute resolution arrangements have also been established with additional provisions for minorities.

The poverty alleviation enhancement study described in Section E6.1 will recommend any required adjustments to poverty alleviation institutional arrangements at the county level and below.

6.5 How will the project monitor performance in terms of social development outcomes?

The independent evaluation of resettlement will utilize several performance indicators, selected on the basis of experience in other hydroelectric projects in China. Since restoration of income is a primary objective, considerable emphasis will be given to correctly estimating total household income before, and at various times after moving. However, the evaluation will also include various other quality of life indicators, such as quality and quantity of housing, physical infrastructure (roads, water supply etc., and community infrastructure). The village level indicators developed as part of the poverty alleviation planning process (Annex 16) will also be used to monitor poverty status of affected villages and village groups before and after resettlement. These indicators will also be used to measure poverty status of poor villages of the host counties which will be the subject of the poverty alleviation plans prepared under the project.

7. Safeguard Policies:

7.1 Do any of the following safeguard policies apply to the project?

| Safeguard Policy   | Applicability   |
|--|---|
| Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)         | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| Natural Habitats (OP 4.04, BP 4.04, GP 4.04)                 | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Forestry (OP 4.36, GP 4.36)                                  | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Pest Management (OP 4.09)                                    | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Cultural Property (OPN 11.03)                                | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Indigenous Peoples (OD 4.20)                                 | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Involuntary Resettlement (OP/BP 4.12)                        | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| Safety of Dams (OP 4.37, BP 4.37)                            | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| Projects in International Waters (OP 7.50, BP 7.50, GP 7.50) | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)*      | <input type="radio"/> Yes <input checked="" type="radio"/> No |

7.2 Describe provisions made by the project to ensure compliance with applicable safeguard policies.

For environment, see Part E, Section 5.

For natural habitats, a special karst biodiversity assessment was carried out as a supplementary report to the Summary EA, to evaluate the potential impacts on karst features within the project areas. No potential impacts were identified.

For Indigenous People, see Part E, Section 6.

For Resettlement, see Part E, Section 6

For Safety of Dams, see Part E, Section 3 and Part G, Dam Safety.

## F. Sustainability and Risks

### 1. Sustainability:

Project benefits will result from the nonconsumptive use of a renewable natural resource--water. With little potential for consumptive exploitation of water quantities upstream of the project, this resource will not significantly diminish in quantity over time, and the project will include environmental provisions to control quality degradation. Sustainability is therefore primarily dependent on obtaining high-quality design and quality in construction of the dams and hydropower plants, and establishing properly trained and funded operations and maintenance entities to avoid having project investments deteriorate over time. Provisions described in Section E4 and Annex 18 are designed to achieve this. Financial sustainability is assured since financial projections based on approved tariffs demonstrate financial viability. Furthermore, tariffs needed to ensure financial viability are competitive in comparison with other types of generation. Environmental and social sustainability will be assured through implementation of environmental management and mitigation and resettlement action plans.

Factors critical for the sustainability of project benefits:

- High-quality design and implementation;
- Competent operations and management entities with appropriate management systems;
- Purchase of power by the grid at a price necessary to ensure financial sustainability;
- Successful resettlement of the affected population with full restoration of living standards; and
- Environmental management during construction and operation to ensure impacts are mitigated to the maximum practical extent.

### 2. Critical Risks (reflecting the failure of critical assumptions found in the fourth column of Annex 1):

| Risk   | Risk Rating | Risk Mitigation Measure  |
|--|-------------|--|
| From Outputs to Objective<br>Adequate transmission to main grid.   | N           | Transmission lines included in project   |
| Demand growth and other generation additions such that there will be demand for new energy generation when project commissioned. | M           | Power market and Hubei Province generation strategy study has been carried out during preparation, which verifies project output can be fully absorbed and projected tariffs are competitive with other forms of generation.   |
| Final costs make plant power prices non competitive  | M           | Cost estimates have been checked by independent reviewers who verify that unit rates used are consistent with other similar projects. Bids for main civil works have been received, for two of the four sub-projects, which are within cost estimates. Experienced supervisory engineers, who will be responsible for rigorous cost control, have been selected. |
| Poverty alleviation plans developed under the project not implemented.   | M           | Plans will be developed early during project implementation and financed during the  |

|  |                                     |   |
|--|-------------------------------------|---|
| Commercialization and corporatization of project companies does not lead to broader sector reform.   | M                                   | <p>implementation period from existing poverty alleviation funding. Counties have agreed to earmark 20 percent of fiscal revenues from first five years of operation towards implementation of the plans.</p> <p>Restructuring and commercialization fully in line with power sector reforms recently announced by State Council. Experience in Chinese power sector has shown that good models are widely replicated.</p>  |
| <p><b>From Components to Outputs</b></p> <p>Environmental Monitoring Plan not successfully implemented</p> <p>Resettlement plan not successfully implemented</p> <p>Project implementation does not take advantage of opportunities to alleviate poverty</p> <p>Results of Institutional development and efficiency improvement studies not acted upon</p> | <p>M</p> <p>M</p> <p>M</p> <p>M</p> | <p>EMP elaborated in detail by specialist Chinese institute environmental specialist on POE. Rigorous Bank Supervision</p> <p>Resettlement planning has fully internalized lessons from earlier Bank projects. Resettlement planning teams have been reinforced by experienced professionals from other Bank resettlement projects. Independent review of resettlement carried out periodically throughout implementation period. Rigorous Bank supervision</p> <p>Resettlement planning and project planning have taken full advantage of opportunities. Preliminary studies carried out during project preparation identified opportunities for using project fiscal revenues to enhance poverty alleviation impacts. These will be followed up by preparation of detailed plans during project implementation. Follow up poverty surveys</p> <p>Particular attention has been given to establishing full “ownership” of studies.</p> |
| <b>Overall Risk Rating</b>   | M                                   |   |

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible or Low Risk)



### **3. Possible Controversial Aspects:**

The four components each include dams.

## **G. Main Loan Conditions**

### **1. Effectiveness Condition**

Execution of the subsidiary loan agreements between the Government and Hubei and between Hubei and the respective project companies (through their respective prefecture and county governments), satisfactory to the Bank, is a condition for loan effectiveness.

### **2. Other [classify according to covenant types used in the Legal Agreements.]**

#### **Agreements Reached with the Government:**

##### **Flow and Utilization of Project Funds**

Onlend the proceeds of the loan to Hubei Provincial Government under a subsidiary loan agreement on the same terms and conditions as the Bank loan, with Hubei bearing the foreign exchange risk.

Maintain, or cause to maintain separate accounts relating to withdrawals on the basis of statements of expenditure.

Have records and accounts relating to statements of expenditure and the special account audited, and furnish reports of such audits to the Bank not later than six months after the end of each fiscal year.

##### **Involuntary Resettlement**

Cause Hunan to ensure that, not later than October, 2002, Hunan's Longshan County enters into an agreement satisfactory to the Bank, with Hubei's Laifeng County to carry out resettlement in accordance with the Najitan Resettlement Action Plan and in accordance with its agreement with Laifeng County.

#### **Agreements Reached with Hubei Province**

##### **Project Management**

Maintain throughout the implementation period a project management office, under terms of reference and with resources satisfactory to the Bank to be responsible for overall coordination.

##### **Flow and Utilization of Project Funds**

Onlend the proceeds of the loan to the four project companies (through their respective prefecture and county governments) under subsidiary loan agreements on the same terms and conditions as the Bank loan, with the project companies bearing the foreign exchange risk.

##### **Monitoring Review and Reporting**

Provide the Bank with semiannual progress reports integrating the reports of the project companies and any

other monitoring and evaluation reports in relation to respective parts of the project.

#### **Involuntary Resettlement**

Cause each of the project counties to enter into arrangements satisfactory to the Bank with the project company located in such county for the resettlement, compensation and rehabilitation of all persons affected by its respective part of the project in accordance with the respective RAPs and RPFs..

#### **Environment**

Cause each of the project counties to enter into arrangements satisfactory to the Bank with the project company located in such county for the mitigation of environmental impacts associated with its respective part of the project in accordance with the respective EMP and Transmission Line EMP..

#### **Poverty Alleviation Enhancement**

Assist each of the project companies, in cooperation with each project company's respective county to prepare, no later than December 31, 2003, Poverty Alleviation Enhancement Plans for each of the project counties

Cause each project county to establish a poverty alleviation enhancement fund and devote 20 percent of fiscal revenues accruing to the county from the operation of the project, for a period of at least five years after the commencement of operation of the project in the respective county, and to utilize the fund to help finance poverty alleviation activities identified in the Poverty Alleviation Enhancement Plans.

#### **Agreements Reached with the Project Companies**

#### **Monitoring Review and Reporting**

Provide the Bank, through Hubei, with semi-annual progress reports integrating the results of monitoring and evaluation reports in relation to respective parts of the project..

#### **Financial Reporting, Monitoring and Auditing**

Furnish to the Bank, through Hubei, audited financial statements for the project company within six months of the end of each fiscal year, and semi-annual unaudited financial monitoring reports within 45 days of each semester.

Prepare by November 30 of each year commencing November 30, 2002, a projected funds flow statement for the coming year, indicating anticipated project expenditures, sources of funding and commitments of respective financiers to provide such funding.

#### **Financial Performance**

Prepare, and by April 30 of each year commencing April 30, 2005 (2006 for Dongping) furnish to the Bank for review, a rolling long-term financial plan (including projected income statements, sources and uses of funds and balance sheets) covering a period of no less than eight years).

Commencing in fiscal year 2005 (2006 for Dongping): (a) not incur additional debt unless the rolling long term financial plan shows that debt service ratio will be not less than 1.2 for each year during the term of

the debt; and (b) take all necessary measures to maintain a debt service ratio of 1.2.

Commencing in fiscal year 2005 (2006 for Dongping): (a) not incur additional debt if after the incurrence of such debt, the debt equity ratio shall be greater than 80 to 20; and (b) take all necessary measures to maintain a debt service ratio of 1.2.

Commencing in fiscal year 2005 (2006 for Dongping) take all necessary measures to maintain a ratio of working expenses (i.e. excluding depreciation) to operating revenues of not higher than 20%.

Before commissioning of the first generating unit under its respective part of the project, establish a debt service reserve account and deposit into it all net revenues until the balance of such account is equal to the next six month's principal and interest payable on debt, and maintain a balance in such account equal to or greater than the project company's debt service requirements for the following six months.

Refrain from declaring dividends or making any other distributions of share capital, unless the debt service reserve account is fully funded, and unless after such dividend has been paid or other distribution made, the ratio of debt to equity is less than 80:20.

### **Institutional Development**

Carry out training programs as agreed with the Bank.

Prepare with the assistance of consultants employed under terms of reference acceptable to the Bank plans for operation and maintenance of the dams and power plants constructed under the project, including but not limited to organizational arrangements, staffing plans, management systems and operational procedures, and implement such plans in a manner satisfactory to the Bank.

### **Environment**

Carry out its respective part of the project in accordance with its respective EMP, in a manner satisfactory to the Bank.

Prepare or cause to be prepared, no later than December 31, 2003 detailed EAs and EMPs for transmission lines connecting the power plants to the grid, acceptable to the Bank and thereafter cause the transmission lines to be implemented in accordance with the EMP in a manner satisfactory to the Bank; not commence construction of the transmission lines under its respective part of the project until the EMP has been prepared and found acceptable to the Bank (Bank approval of such plans is also a condition of disbursement for the respective transmission lines).

### **Resettlement**

Carry out its respective part of the project in accordance with its respective RAP and RPF in a manner satisfactory to the Bank; and if required by the RPF, prepare or cause to be prepared a RAPs for the transmission line connecting the power plants to the grid, in accordance with the Resettlement Policy Framework.

If required to prepare a RAP under its respective RPF, obtain Bank approval of such RAP prior to any land acquisition or resettlement, or commencement of construction of the transmission lines.

### Poverty Alleviation Enhancement Plans

In coordination with Hubei, employ consultants, in accordance with terms of reference satisfactory to the Bank, no later than September 30, 2002, to assist in preparing Poverty Alleviation Enhancement Plans for its respective project county.

### Dam Safety

Continue to employ a panel of experts to review design and construction procedures relating to dams.

Prepare detailed plans for construction supervision and quality assurance, a plan for instrumentation, an operation and maintenance plan, and an emergency preparedness plan.

Continue to employ consultants for construction and quality assurance relating to dams.


Carry out periodic inspections of all dams after their completion.

### H. Readiness for Implementation

- 1. a) The engineering design documents for the first year's activities are complete and ready for the start of project implementation.
- 1. b) Not applicable.
- 2. The procurement documents for the first year's activities are complete and ready for the start of project implementation.
- 3. The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality.
- 4. The following items are lacking and are discussed under loan conditions (Section G):

### I. Compliance with Bank Policies

- 1. This project complies with all applicable Bank policies.
- 2. The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

  
\_\_\_\_\_  
Barry Trembath  
Team Leader

  
\_\_\_\_\_  
M. Farhandi  
Sector Manager/Director

  
\_\_\_\_\_  
Yukon Huang  
Country Manager/Director

**Annex 1: Project Design Summary**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

| Hierarchy of Objectives  | Key Performance Indicators  | Data Collection Strategy  | Critical Assumptions   |
|--|---|---|--|
| <p><b>Sector-related CAS Goal:</b><br/>           Transitioning Power Sector to market based system.</p> <p>Conversion to clean fuels</p> <p>Raising incomes in poorer western areas</p>   | <p><b>Sector Indicators:</b><br/>           Competitive power markets</p> <p>Proportion of coal-fired energy generation</p> <p>Indicators defining poverty used by national and provincial governments.</p>   | <p><b>Sector/ country reports:</b><br/>           Annual government reports on power sector</p> <p>Government statistics</p>  | <p><b>(from Goal to Bank Mission)</b><br/>           Distribution of fruits of economic growth to eliminate poverty throughout nation.</p>   |
| <p><b>Project Development Objective:</b><br/>           Facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner.</p> <p>Corporatization of County level generation companies in Hubei</p> <p>Contribute to poverty alleviation efforts in poor communities in Hubei.</p> | <p><b>Outcome / Impact Indicators:</b></p> <ul style="list-style-type: none"> <li>● Increased renewable generation capacity in Hubei of 604 GWh per year.</li> <li>● Successful completion of EMP.</li> <li>● Resettlers living standard improved</li> <li>● Legal arrangements of restructured companies</li> <li>● Financial statements of project companies</li> <li>● Standard of living indicators in poor villages of project counties defined in poverty alleviation plans developed under project</li> <li>● Increased proportion of poverty program funds to village group and households level</li> <li>● Increased proportion of county revenues devoted to poverty alleviation</li> <li>● Proportion of fiscal revenues generated by the project contributed to poverty alleviation enhancement fund</li> </ul> | <p><b>Project reports:</b></p> <ul style="list-style-type: none"> <li>● Beneficiary company reports</li> <li>● External monitoring reports</li> </ul> <p>Project company legal documents and audited financial statements</p> <ul style="list-style-type: none"> <li>● County and local government statistics. Poverty alleviation plan monitoring reports.</li> <li>● County government financial reports</li> </ul> | <p><b>(from Objective to Goal)</b></p> <p>Connection to grid by HPEPC.</p> <ul style="list-style-type: none"> <li>● Demand growth and other generation additions such that there will be demand for new energy generation when sub-projects commissioned.</li> <li>● Replication of arrangements piloted under the project to other county generation in Hubei</li> </ul> <p>Fiscal structure and sharing arrangements unchanged</p> |

| Hierarchy of Objectives   | Key Performance Indicators  | Data Collection Strategy   | Critical Assumptions               |
|---|---|--|------------------------------------|
| <p><b>Output from each Component:</b><br/> <b>For each of four hydropower plant components (Dongping, Najitan, Songshuling and Xlakou)</b><br/> Hydropower plant in service on time, within budget and to high quality</p> <p>Successful completion of EMP</p> <p>Resettlers living standard improved</p> <p>Commercialization of power companies</p> | <p><b>Output Indicators:</b></p> <p><b>Schedule</b><br/> Planned dates for construction progress according to Table A3 of PAD Annex 6</p> <p><b>Quality</b><br/> Acceptance by government dam safety authorities<br/> State Power corporation performance indicators for plant operations.</p> <p><b>Costs</b><br/> Costs within estimates</p> <p>As indicated in EMP summary table</p> <p>Acceptance by government authorities</p> <p>Indicators in independent monitoring reports</p> <p>Implementation of FMIS systems and organization operations</p> <p>Financial performance indicators</p> | <p><b>Project reports:</b></p> <p>Progress Reports</p> <p>Monitoring reports</p> | <p>(from Outputs to Objective)</p> |

| Hierarchy of Objectives  | Key Performance Indicators   | Data Collection Strategy                       | Critical Assumptions  |
|--|--|--|---|
| <b>Project Components / Sub-components:</b><br>Dongping Hydropower Plant<br><br>Najitan Hydropower Plant<br><br>Songshuling Hydropower Plant<br><br>Xiaokou Hydropower Plant | <b>Inputs: (budget for each component)</b><br>\$95.4 million<br><br>\$46.1 million<br><br>\$46.1 million<br><br>\$34.8 million | <b>Project reports:</b><br><br>Project Reports | <b>(from Components to Outputs)</b> <ul style="list-style-type: none"> <li>● EMMP not implemented as planned</li> <li>● Resettlement plan not successfully implemented</li> <li>● Project implementation does not take advantage of opportunities to alleviate poverty</li> <li>● Results of Institutional development and efficiency improvement studies not acted upon</li> </ul> |

**Annex 2: Detailed Project Description**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

**By Component:**

**Project Component 1 - US\$86.18 million**

***1. Dongping Hydroelectric Power Plant***

**Introduction**

The Dongping project is a single purpose hydropower project with an installed capacity of 110MW located in the western region of Hubei Province in the PRC. The project has been under investigation for some years, the Feasibility Study Report (FSR) produced by the design organization - HIDI - was approved by the Chinese authorities in 1997. In 1999 the Preliminary Design Report (PDR) was also approved.

**Basin Development**

The Dongping project is situated on the Zhongjian River, a tributary of the Qinjiang River, which joins the Yangtze upstream of Dongting Lake. The hydropower potential of the Zhongjian was surveyed in 1967 and was re-evaluated in 1969 when the water resource development planning for the Qinjiang was carried out. A conclusion of these studies was that the Zhongjian should be developed in a cascade of three projects: Tongziying, Longdong and Dongping. This conclusion was re-affirmed in an overall evaluation of hydropower potential of Hubei, and again in 1992/1993 when detailed planning of the Zhongjian was carried out for the county government by HIDI. The Longdong project, the first development of the cascade was commissioned in 1993. Although Longdong was conceived primarily as a hydropower project, it has also provided important multipurpose benefits. It improved the flood protection standard for Xuan-en county town from 10-year to 20/30-year. In the major flood of 1998 which affected the overall Yangtze basin, Longdong was used to retain flood peaks in the Zhongjian up to 2 m above its full supply water level thus contributing to flood control in the Qingjiang and the Yangtze. It also guaranteed municipal water supply for Xuan-en Town (population about 60,000) during the 2000/2001 drought period. With the joint operation of Longdong, Dongping and the downstream Shuibuya project (now under construction), the flood control capability in the Qingjiang system will be greatly enhanced.

The overall configuration (general location of the dam and full supply level) of Dongping emanates from the basin planning described above. It is the downstream-most development on the Zhongjian, 40 km downstream of the 26 MW Longdong and discharges into the reservoir of the 1600 MW Shuibuya Project, now under construction on the main stem of the Qinjiang. Its full supply level was chosen to avoid significant backwater inundation of Xuan-en Town under flood conditions.

The pre-feasibility study was completed in 1995, the feasibility study for a surface powerhouse configuration in 1997 and for an underground powerhouse configuration in 2001. The feasibility study considered potential benefits from local development opportunity (economic development, poverty reduction), hydropower and other water uses (flood control, water supply, irrigation, navigation, aquaculture and tourism), as well as major environmental and resettlement impacts. A dam at the chosen site, Zhongwudang creates a reservoir that is primarily confined within a steep narrow mountain gorge, thereby minimizing resettlement. The slopes of the bedrock dominated river gorge supports only a thin veneer of soil, which is of poor quality from an agriculture perspective. When inundated, the soil will have little influence on reservoir water quality. An alternative dam site was examined at Baimadi, seven km



upstream of the chosen site. The feasibility study indicates that this alternate dam site is not geologically stable, and karst structures in the area that would affect the ability of the reservoir to retain water. This would necessitate building a lower dam, with limited storage capacity. Moreover, the associated reservoir would inundate more agricultural land, thereby adversely affecting more people than would be the case with a reservoir created behind a dam at the selected site.

### **Site Conditions**

All of the main project facilities are located in the damsite area. Limited road access is already available to the damsite but considerable upgrading will be required to support construction. In general the area is quite mountainous with typically steep-sided valleys. At the damsite the river flows in a narrow gorge, about 40m wide at river level and still only about 250m wide at the crest of the 134m high dam. About 200m downstream of the dam axis the valley is a little wider and provides a convenient location for the surface powerhouse.

The climate is temperate with a pronounced rainy season from April to October and an average precipitation of about 1500mm – over 80 percent falling in the wet season. The river basin at the damsite has an area of 1420km<sup>2</sup> with an average flow of 46m<sup>3</sup>/s. Dry season low flows are in the order of 10m<sup>3</sup>/s, and at the other extreme annual flood peaks are about 1200m<sup>3</sup>/s. Sediment loads are relatively low and should have no significant impact on project performance.

The principal rock type is limestone. At the river level outcrops of fresh to slightly weathered rock are common. Although some karst conditions exist they are not such as to lead to substantial reservoir leakage and no special measures are required. There is one potential landslide area a short distance upstream of the dam but investigations show that the volume of material and risk of movement are relatively low and some measures to improve stability are planned. In effect, geological conditions are favorable.

### **Project Facilities**

The main feature is the concrete arch dam about 135m high with a crest length of 268m. It has a parabolic profile and section with a thickness of about 7m at the crest increasing to 28m at the base, the total volume of concrete is 410,000m<sup>3</sup>. The body of the dam incorporates a drainage gallery for drilling and grouting with adits extending into the abutments.

The dam also includes a spillway featuring three mid-level orifice outlets. The maximum (check) flood is a 1:1000 year event (as per Chinese standards) with a peak inflow of 5460m<sup>3</sup>/s. A moderate degree of attenuation (3.6m rise in the reservoir level) reduces the maximum outflow to 4580m<sup>3</sup>/s. A high level outlet is provided to discharge floating debris. In view of the height of the dam and size of the reservoir the performance under probable maximum flood (PMF) conditions was assessed. In summary, the dam would be overtopped by about 2.3m for a duration of about 12 hours. With the provision of measures to minimize erosion damage, this is considered acceptable.

River diversion during construction will be provided by a 900m long diversion tunnel on the right bank. This will divert the river past the complete working area including the powerhouse tailrace. The facility is sized to allow overtopping of the cofferdams and dam foundation area during the first wet season after diversion. There is also a possibility of overtopping during the second wet season at which time flow would be passed through low blocks in the dam. The main upstream cofferdam is a concrete arch dam resistant to overtopping.

The power facilities include a tower-type intake (maximum plant discharge is 139m<sup>3</sup>/s), a 205m long concrete lined power tunnel 6.5m in diameter, and an underground powerhouse with 2x55MW units with a rated head of 91.6m. The powerhouse is designed to allow for unusually high tailwater levels – attributable to the Shuibuya project downstream.

The transmission facilities include 36 km 220kV line, connecting the Dongping powerhouse substation to the existing 220kV Longfengba Substation.

### **Project Operation**

The reservoir provides a live storage of 191 million m<sup>3</sup>, equivalent to about 13 percent of the average annual runoff and provides a reasonable degree of seasonal flow regulation. The maximum drawdown is considerable at 34m and the operating head ranges from a maximum of about 112m down to an extreme low 55m. With the rated head set at 90m full plant capacity (110MW) would be available about 80 percent of the time; minimum plant capacity at the MOL is about 70MW. Given the fact that the plant discharges into the Shuibuya reservoir it is well placed to operate as a peaking power plant with minimal external constraints on operation.

The annual average energy capability is estimated at 322GWh and the firm monthly energy is 16.9MWe at a high 98+ percent reliability. Corresponding plant capacity factors are 33 and 15 percent respectively. It follows that apart from short periods during the wet season the plant would normally be operated for peaking. Only about 4 percent of the inflow is lost by spill.

Although the nature of the reservoir is such as to produce a small degree of flood attenuation, there is no specific flood control function or benefit assigned to the project. The only (small) non-power benefit is expected to come from an increase in tourism – largely from boats operating in the reservoir, as has been observed at Longdong.

### **Project Component 2 - US\$42.40 million**

#### **2. *Najitan Hydroelectric Power Plant***

##### **Introduction**

The Najitan project is a run-of-river hydropower project with an installed capacity of 36MW located in the western region of Hubei Province in the PRC. The project has been under investigation for some years, the Feasibility Study Report (FSR) produced by the design organization (HHDI) was approved by the Chinese authorities in March 2000.

##### **Basin Development**

The Najitan project is located in Hubei Province on the Youshui River, which rises in Sichuan Province, and flows through Hubei Province into Hunan Province. The river is a tributary of the Yuanshui, which empties into the Dongting Lake. Various cascade development planning studies have been carried out independently by each of the three provinces for the river reaches within individual provinces, but because this is a relatively small tributary an integrated basin development planning exercise has not been carried out. However, the planning work has involved interaction between affected provinces such that the resulting cascade development can be considered as reasonably optimum and acceptable to all provinces. The first planning study dates back to the 1950s. Later studies were carried out by Hubei in 1978 and

Hunan in 1984. Arising from these studies and subsequent interactions between the provinces, were the Wantang Project in Hunan and the Tangkou project in Hubei both upstream of the proposed Najitan development, both of which have now been commissioned. The dam site of Najitan is about 22 km downstream of the 15 MW Tangkou hydro project which was commissioned in 1994. In the 1978 Hubei planning studies a full supply level of 380 m was planned. However, this was subsequently reduced to 370 m to avoid inundation of parts of Baifusi Town and to match couple tail water levels of Tangkou and Wantang. The most recent development planning for Najitan considered benefits from local development (economic development, poverty reduction), hydropower and other water uses (minimum discharge to the downstream in dry seasons for ecological balance, and tourism) and major environmental and resettlement impacts. The reservoir inundation will extend into Hunan Province, and agreement for compensation and resettlement has been reached between the two provinces.

The chosen dam site for the Najitan Hydropower Station is located in the upper reaches of the Youshui River near Baifusi Town. This location was rated highly for hydraulic conditions, site geology and geography. It is situated close to existing road networks, enabling convenient transportation to areas outside the region. There is considerable space afforded at this site for project construction. An alternative site for the powerhouse was investigated at Jilongtan, 5 km downstream from the recommended powerhouse location adjacent to the Najitan dam site. Although an additional 9 m of head would be obtained if the downstream powerhouse site was chosen, the cost of constructing a 5 km long power tunnel was deemed to be prohibitive.

#### **Site Conditions**

All of the main project facilities are located in the dam site area. The area is readily accessible by the existing road network. The location of the dam site itself is largely governed by the local topography. The site features a narrow gorge leading to a wider and more open valley section downstream. As a result, a downstream site would be more costly and cause significant reservoir inundation at the nearby Baifu township community. The small reservoir extends back about 22km upstream to the existing Tangkou hydro project whose tailwater level thus controls the NPL.

The climate is temperate with a pronounced rainy season from April to October, with an average annual precipitation of about 1600mm – over 80 percent falling in the wet season. For a relatively small project the river is quite large with an average flow of 115m<sup>3</sup>/s from the 3369km<sup>2</sup> basin. Typical dry season low flows are in the order of 20 to 30m<sup>3</sup>/s, and at the other extreme, the average annual flood peak is about 2300m<sup>3</sup>/s. Tangkou has only a small reservoir which provides no significant flood attenuation.

The gorge is about 60m wide at the river banks and the valley sides extend upwards some 100m or more – well above the crest of the dam. The site is underlain by a mixture of limestone and shale rocks. The rocks are generally exposed with relatively thin overburden and are of adequate strength for the required structures. However, the permeability of the limestone in particular has produced a significant number of caves including a very large cavern (some 20m wide and over 100m long), known locally as the 'mother-in-law cave'. This cavern is on the right bank about 200m downstream of the dam axis. Despite these conditions, reservoir leakage should not be significant largely due to the prevailing high water table.

#### **Project Facilities**

The gorge is rather narrow in relation to the length required to accommodate a conventional spillway and powerhouse arrangement and largely for this reason the layout features a separate dam and a surface powerhouse. The dam is sited in a narrow section of the gorge and the powerhouse at the start of the more

open section about 300m downstream. This requires a power tunnel which extends through (below) the large 'mother-in-law' cavern, together with a surge chamber upstream of the powerhouse.

The dam is in effect a concrete gravity spillway structure with a crest length of 106m and maximum height of 39m. Foundation treatment is extensive and includes a substantial grout curtain and infilling of the many caves and fissures.

The maximum flood for design purposes is a check flood of 9430m<sup>3</sup>/s derived from a 1:500 year event, the standard design flood has a 1:50 year peak flow of 6710m<sup>3</sup>/s. The spillway is a conventional overflow gated structure with six radial gates. A bottom outlet is also provided to allow reservoir drawdown and sediment sluicing. River diversion during construction is based on a staged approach using longitudinal cofferdams to close off first the right bank and then the left bank portion of the river channel.

The power facilities include a side intake structure designed for a maximum plant discharge of 187m<sup>3</sup>/s, a 8.2m diameter concrete-lined tunnel about 250m long, a surge chamber (in the form of a surface concrete box or tank structure) and short individual penstocks to the 3x12MW unit powerhouse. The rated head of the Kaplan turbines is 23m.

The transmission facilities include 32 km 110kV line, connecting the Najitan powerhouse substation to the 110kV Jiusi Substation.

### **Project Operation**

The reservoir provides a live storage of only 9.7 million m<sup>3</sup>, equivalent to only about 24 hours of average inflow and less than 12 hours at maximum plant discharge. Normal operation will therefore be as a run-of-river plant with some limited daily regulation. The upstream reservoir at Tangkou is also too small to provide significant flow regulation. In order to provide this storage, the reservoir provides for 3.5m of drawdown which contributes to a significant range in head of 17 to 28 m - most of the variation in head is due to the high tailwater level under flood conditions. As a result, under these conditions the minimum plant capacity is only 23MW.

Due to the lack of reservoir flow regulation, the plant will frequently operate continuously at full capacity during the wet season and it is estimated that about 27 percent of the inflow will be lost as spill. The annual average energy capability is estimated at 149GWh and the firm monthly energy (>80 percent reliability) at 5.6MWe. The corresponding plant capacity factors are 48 and 15 percent. Under more extreme low flow conditions (<95 percent reliability) the plant factor will be less than 10 percent.

### **Project Component 3 - US\$ 42.22 million**

#### **3. *SONGSHULING Hydroelectric Power Plant***

##### **Introduction**

The Songshuling project is a run-of-river hydropower project with an installed capacity of 50MW located in the western region of Hubei Province in the PRC. The project has been under investigation for some years, the Feasibility Study Report (FSR) produced by the design organization (HHDI) was approved by the Chinese authorities in 1993. In 1995 the Preliminary Design Report (PDR) was also approved.

## **Basin Development**

The Songshuling project is located on the Guandu River, which is a tributary of the Duhe River. The Duhe joins the Yangtze in Wuhan via the Hanshui River. The earliest water resource survey and basin development planning for the Duhe date back to 1954. In 1969, the basin development planning for the Duhe was updated by Hubei Province and a cascade of three projects were proposed: Songshuling, Pankou and Huanglongtan with the latter as the first project. Construction of Huanglongtan was commenced in 1969 and completed in 1974. The feasibility study for Pankou was carried out in 1970, but the preparation work was aborted because the reservoir would inundate major grain farmland in Zhushan County and the cost of protecting the farmland with a saddle dam was prohibitive. The basin development planning for the Duhe was reviewed again in 1983 and the resulting Planning Report recommended seven projects in cascade: Eping (560 m), Baiguoping (460 m), Longbeiwan (535 m), Songshuling (385 m), Pankou (360 m), Xiaoxuan (262 m) and Huanglongtan (247 m). The total capacity installation potential is 1400 MW. Up until the present, only Huanglongtan was constructed and commissioned.

The adopted plan includes two relatively large projects that have an impact on Songshuling: Longbeiwan (200 MW) about 19km upstream and Pankou (510 MW) downstream. In effect, Songshuling is a relatively small run-of-river plant sandwiched between these two much larger projects - both of which include high dams & large reservoirs. The overall configuration of Songshuling was to a large extent dictated by these larger projects. The Pankou project is in an advanced planning stage, while the Longbeiwan project is in the preliminary planning phase.

The Songshuling feasibility study was completed in 1995 and preparation work was restarted in 2000. The study considered benefits from local development (economic development, poverty reduction), hydropower and other water uses (flood control, water supply, irrigation and navigation), and major environmental and resettlement impacts (inundation, ecologic balance, soil erosion, pollution from project construction) and mitigation measures for the negative impacts.

The chosen dam site at Yangyugou is the furthest downstream of two sites investigated. The geology, geography, ecology and construction conditions at the selected dam site location are conducive to project development. The alternative site is located upstream at Liangjia Bridge, where geological conditions are also conducive to project development, and there would be less agriculture land and fewer settlement areas inundated. However, the amount of power that could be produced from this location is only 11.2 GWh/year, which is substantially less than can be produced from the site selected for the Songshuling Project. Taking into consideration of overall benefits and impacts, the downstream site was chosen.

## **Site Conditions**

All of the main project facilities are located in the dam site area. Limited road access is already available to the dam site but considerable upgrading will be required to support construction. In general the area is quite mountainous with typically steep-sided valleys. At the dam site the river forms an S-shaped valley and flows in a narrow gorge, about 40m wide at river level. About 200m downstream of the dam axis the valley is a little wider and the surface powerhouse is located here – connected to the intake adjacent to the dam by a 300m long power tunnel.

The climate is temperate with a pronounced rainy season from April to October, with an average precipitation of about 1000mm – over 80 percent falling in the wet season. The river basin at the dam site has an area of 2447km<sup>2</sup> with an average flow of 58m<sup>3</sup>/s. Dry season low flows are in the order of 10 to 20m<sup>3</sup>/s, and at the other extreme annual flood peaks are about 1900m<sup>3</sup>/s.

The principal rock type is limestone. At the river level outcrops of fresh to slightly weathered rock are common. Although some karst conditions exist in the area they are not such as to lead to reservoir leakage and no special measures are required. In effect, geological conditions are reasonably favorable.

Sedimentation is a potential key issue in that the small reservoir cannot provide long-term storage for the expected sediment load. With Longbeiwan in operation sediment inflow to Songshuling will be minimal.

### **Project Facilities**

The main feature is the concrete gravity dam about 65m high with a crest length of 128m and a total volume of concrete of about 190,000m<sup>3</sup>. The body of the dam incorporates a drainage gallery for drilling and grouting. The spillway extends over the central section of the dam crest and features four overflow gated bays. The maximum (check) flood is a 1:500 year event (as per Chinese standards) with a peak inflow of 6760m<sup>3</sup>/s. A small degree of attenuation (4.2m rise in the reservoir level) reduces the maximum outflow to 6070m<sup>3</sup>/s. A low level outlet is provided to allow for sluicing of accumulated sediment (in the event that Longbeiwan is delayed). This outlet will also provide a riparian flow release during reservoir filling and subsequent operation.

One unusual feature is the provision of a permanent access tunnel from the powerhouse area up to the dam crest. This has been included because of the difficulty in incorporating an access road within the confines of the steep-sided valley.

River diversion during construction will be provided by a 180m long diversion tunnel which cuts across the sharp bend on the right bank. The facility is sized to allow overtopping of the cofferdams and dam foundation area during the first wet season after diversion with flow passed through low blocks in the dam.

The power facilities include an intake (maximum plant discharge is 166m<sup>3</sup>/s), a 300m long concrete lined power tunnel 8m in diameter, and the powerhouse with 4x12.5MW units with a rated head of 35m. Four units are installed – in preference to a lower-cost two or three unit plant – to provide flexibility and accommodate the large variation in available energy.

The transmission facilities include 45 km 110kV line, connecting Songshuling powerhouse substation to the 110kV Zhushan Substation.

### **Project Operation**

The reservoir provides a live storage of only 22.5million m<sup>3</sup>, equivalent to less than five days of average inflow and about 37 hours at maximum plant discharge. Normal operation will therefore be as a run-of-river plant with some limited daily regulation. *(Unless stated otherwise, values here do not reflect the potential impact of Longbeiwan and Pankou).* The maximum drawdown is considerable at 10m and the operating head ranges from a maximum of about 48m down to an extreme low (after Longbeiwan and Pankou) of 30m. With the rated head set relatively low at 35m full plant capacity (50MW) would be available almost all of the time; after the other two projects are built the minimum plant capacity is about 40MW.

The annual average energy capability is estimated at 154GWh and the firm monthly energy at 5.4MWe. Corresponding plant capacity factors are 35 and 11 percent respectively. About 15 percent of the inflow is lost by spill.

With Longbeiwan in operation the inflow to Songshuling is highly regulated and, despite the lower head, the firm energy is increased to 14.0MWe. Average energy remains almost the same with the reduction in spill offset by the lower head.

There are expected to be no significant non-power benefits.

#### **Project Component 4 - US\$32.54 million**

#### **4. *XIAKOU Hydroelectric Power Plant***

##### **Introduction**

The Xiakou project is a multi-purpose water resource development project with an installed capacity of 30MW located in the western region of Hubei Province in the PRC. The project has been under investigation for some years, the earlier studies had assumed a large reservoir which has ultimately abandoned due to concern on the amount of resettlement. The latest Feasibility Study Report (FSR) produced by the design organization (HHDI) was approved by the Chinese authorities in 1999.

##### **Basin Development**

The Xiakou Project is located on the middle reaches of the Juhe River, a tributary of the Juzhang River, which is a major tributary of the Yangtze. The earliest survey carried out specifically for Xiakou dates back to the 1950s and a preliminary design for Xiakou was completed in 1960. In the 1970s, basin development planning studies were carried twice for the Juzhang, with major impetus provided by frequent disastrous flooding in the lower reaches downstream of the confluence of the Juhe and Zhanghe tributaries with the main stem of the Juzhang. As a result of these studies, the Zhanghe Reservoir was constructed on the Zhanghe with a total capacity of 2.03 billion m<sup>3</sup>. Overall basin planning for the Juzhang was reviewed in 1989 with primary emphasis on flood control but also considering benefits to other water users including power generation and irrigation. The resulting Basin Planning Report recommended nine projects in cascade with a total power capacity of 4385 MW, of which Xiakou and the existing Zhanghe reservoirs were allocated primary responsibility for flood control in the Juzhang, in conjunction with flood protection works in the lower reaches of the Juzhang. The flood protection works are now nearing completion.

The recommended full supply level arising from the 1989 studies was 290 m. Subsequently, the Xiakou feasibility study was completed in 1993 and updated in 1999 followed by a preliminary design in 2000. During these studies optimum full supply level was re-evaluated taking into account the actual development of flood control measures in the lower reaches of the Juzhang. As a result the full supply level was lowered to 262 m which enabled a substantial reduction of inundation of fertile farmland and urban areas and towns and resettlement impacts. The project still provides some flood control benefits including protection of the town of Yuanan (population about 38,000) about 50km downstream. The river is used as a source of irrigation water supplied from a number of weirs including the Maduhe (10 m high) dam, located about 50 m downstream. Xiakou includes provisions to ensure maintenance of existing irrigation flows.

The chosen dam site is located at Xiakou. The site provides for the shortest dam axis, thereby optimizing the capital investment, while minimizing intrusion into nearby paddy lands. Two alternative dam sites were investigated as part of the feasibility studies. These are located upstream and downstream of the selected site. The alternative upstream dam site would require a smaller capital investment to develop. However,

the site has poorer access, and is more confined making construction more difficult. Together, these two factors would result in a longer period of construction. The alternative downstream dam site is located in a wider valley area, where lower relief terrain and wider watercourse are favorable for project layout and construction. However this site would require a dam with a much longer axis, resulting in a higher capital investment to develop the project. Less electricity would be generated and more agriculture land would be submerged.

### **Site Conditions**

All of the main project facilities are located in the dam site area. Limited road access is already available to the dam site but considerable upgrading will be required to support construction. In general the area is quite mountainous with typically steep-sided valleys. At the dam site the river forms a narrow gorge, about 40m wide at river level. About 200m downstream of the dam axis the gorge opens out into a relatively wide valley. With this topography the surface powerhouse has been located on the right bank of the wider valley and is supplied by a power tunnel about 370m long.

The climate is temperate with a pronounced rainy season from April to October, with an average precipitation of about 1000mm – over 80 percent falling in the wet season. The river basin at the dam site has an area of 1458km<sup>2</sup> with an average flow of 18m<sup>3</sup>/s. Dry season low flows only about 2 to 5m<sup>3</sup>/s and, at the other extreme annual flood peaks are about 900m<sup>3</sup>/s. Sediment yield is quite low and reservoir sedimentation should have no significant impact on performance.

The principal rock type is conglomerate. At the river level outcrops of fresh to slightly weathered rock are common. Although some karst conditions exist in the area they are not such as to lead to reservoir leakage and no special measures are required. In effect, geological conditions are favorable.

### **Project Facilities**

The main feature is the concrete arch dam 85m high with a crest length of 195m and a total volume of concrete of about 120,000m<sup>3</sup>. The body of the dam incorporates a drainage gallery for drilling and grouting which extends into the abutments. The spillway is provided by a combination of mid- and high-level orifice outlets. The maximum (check) flood is a 1:1000 year event (as per Chinese standards) with a peak inflow of 6070m<sup>3</sup>/s. A degree of attenuation (2.2m rise in the reservoir level) reduces the maximum outflow to 5720m<sup>3</sup>/s. A small gated overflow outlet is included at the dam crest to discharge floating debris. The performance was checked under PMF conditions and was found acceptable with only a moderate degree of short-term overtopping.

A small low level outlet is provided to supply irrigation water to the existing developed areas immediately downstream of the dam site.

River diversion during construction will be provided by a 350m long diversion tunnel on the right bank. The facility is sized to allow overtopping of the cofferdams and dam foundation area during the first wet season after diversion with flow passed through low blocks in the dam.

The power facilities include an intake (maximum plant discharge is 60m<sup>3</sup>/s), a 370m long concrete lined power tunnel 4.5m in diameter, and the powerhouse with 3x10MW units with a rated head of 59m.

The transmission facilities include 65.31 km 110kV line, connecting the Xiakou powerhouse substation to the 110kV Huazhuang Substation.



## **Project Operation**

The reservoir provides a live storage of 63million m<sup>3</sup>, equivalent to five weeks of average inflow and adequate to provide a degree of seasonal regulation. The maximum drawdown is considerable at 16m and is set so as to maximize firm energy. The operating head ranges from a maximum of about 71m down to 55m. Although flood control is an intrinsic requirement there is no specific flood control level (below NPL). The adopted policy is to restrict discharge to less than 2000m<sup>3</sup>/s (the 1:20 year flood flow) until the reservoir rises to about one meter above NPL and this is adequate to provide a significant degree of protection.

The annual average energy capability is estimated at 83GWh and the firm monthly energy (>98 percent reliability) at 3.9MWe. Corresponding plant capacity factors are 30 and 12 percent respectively. It follows that apart from short periods during the wet season the plant would normally be operated for peaking. Only about 7 percent of the inflow is lost by spill. At MOL the plant capacity is reduced to 25MW.

The flood control benefits have been assessed as equivalent to 25 percent of the capital investment.

**HUBEI SMALL HYDRO**  
 (Note: uncertain values are shown in bold)  
**KEY PROJECT STATISTICS**  
 (Note: values derived shown in italics)

| Project Summary              |  | Dongping   | Najitan  | Songshuiling   | Xiakou  |
|------------------------------|--|--|--|--|---|
|                              | Type<br>Average river flow (m <sup>3</sup> /s)<br>Installed Capacity (MW)<br>Non-Power Benefits<br>Other Hydro on River  | High dam<br>47<br>110<br>no<br>Longdong upstream   | ROR weir<br>115<br>36<br>no<br>Tangkou upstream  | medium ROR<br>58<br>50<br>no<br>Longbeiwán upstream<br><i>planned, also</i>  | medium<br>18<br>30<br>flood control<br>no   |
| Location                     | county<br>nearest town<br>population<br>river<br>access  | Xuanen<br>42km from Xuanen<br>~60,000<br>Zhong Jianhe<br>good, road nearby, 1.4 hrs<br>from Xuanen                           | Laifeng<br>Baifu<br><br>Youshui<br>good, road in walking<br>distance   | Zhushan<br>74km from county seat<br><br>Guandu<br>seems good   | Nanzhang<br><br><br>Juhe<br>seems good  |
| Background                   | source of data<br>previous studies<br>current status (Feb' 2000)   | PDR (1999)<br>1992, FSR 1997<br>PDR approved   | FSR (1999)<br>many<br>FSR approved   | PDR (1995)<br>FSR 1993<br>PDR approved   | FSR (1999)<br>many<br>FSR approved  |
| Hydrology                    | Basin area km <sup>2</sup><br>average annual runoff<br>(m <sup>3</sup> x10 <sup>6</sup> )<br>Equivalent Runoff mm<br>Average flow (m <sup>3</sup> /s)<br>Typical range of monthly<br>flows (m <sup>3</sup> /s)<br>Max. recorded flood (m <sup>3</sup> /s)<br>Max. check flood (m <sup>3</sup> /s)<br>Sediment yield t/km <sup>2</sup><br>Equivalent annual average t | 1420<br>1471<br>1090<br>46.5<br><br>2660<br>5460 (1:1000yr)<br>330<br>472000   | 3369<br>3630<br>1080<br>115<br><br>4470<br>9400<br>450<br>1523000  | 2447<br>1826<br>750<br>58<br><br>4760<br>6760 (1:500yr)  | 1458<br>570<br>390<br>18<br><br>~4000<br>6050<br>235<br>343000  |
| Geology                      | Principal Rock Types<br>No. Drill Holes<br>Problems  | limestone<br><br>potential landslide<br>in reservoir   | limestone & marl<br>11 (probably more)<br>caves  | limestone<br>24<br>none  | conglomerate<br>51<br>none  |
| Topographic Setting & Layout | at all sites the dam & power facilities<br><br>are relatively close together   | gorge ~40m wide at damsite<br><br>river el. 378m<br>arch dam with power tunnel<br>and underground<br>powerhouse on left bank | gorge ~60m wide at damsite<br><br>river el. 343m<br>gravity dam with power<br>tunnel & surface<br>powerhouse on right bank | gorge ~35m wide at damsite<br><br>river el. 346m<br>gravity dam with power<br>tunnel & surface<br>powerhouse on right bank | gorge ~45m wide at damsite<br><br>river el. 194m<br>gravity dam with power<br>tunnel & surface<br>powerhouse on right<br>bank |
| Dam                          | Type<br>Size<br>Volume (m <sup>3</sup> )   | double curvature arch<br>134hx268l<br>~400,000   | gravity (spillway)<br>39hx~200l<br>~100,000  | gravity<br>65hx128l<br>~190,000  | double curvature arch<br>85hx195l<br>~120,000   |
| River Diversion              | description<br><br>facilities  | partial overtopping (wet season)<br>right bank tunnel,<br>~8mdiax900l<br>upstream concrete arch<br>cofferdam                 | staged in river with<br><br>longitudinal cofferdams  | partial overtopping (wet season)<br>right bank tunnel,<br>~7mdiax180ml   | partial overtopping (wet season)<br>right bank tunnel,<br>~6mdiax350l   |
| Spillway                     | Design Flood discharge (m <sup>3</sup> /s)<br><br>Type<br>Gates  | 3880<br><br>mid-level orifice<br>3# 6wx8.5h  | 6610<br><br>gated overflow<br>6# 12wx15h   | 4350<br><br>gated overflow<br>4# 12wx13h   | 3750<br><br>mid-level orifice<br>5# 6.5wx7.5h   |
| Power Intake                 | Type<br>Max. plant discharge (m <sup>3</sup> /s)   | tower<br>139   | normal<br>187  | normal<br>166  | normal<br>60  |

| Project Summary        |                                  | Dongping        | Najitan                | Songshuling       | Xiakou                                  |
|------------------------|----------------------------------|-----------------|------------------------|-------------------|---|
| Power Tunnel           | dimensions (equiv. Dia & length) | 6.5dx286l       | 8.2dx316l              | 8dx300l           | 4.5dx370l                               |
| Powerhouse             | Units (no. x MW)<br>Type         | 2x55<br>surface | 3x12<br>surface        | 4x12.5<br>surface | 3x10<br>surface                         |
| Generating equip.      | turbine head range               | 112 to 51m      | 28 to 17m              | 48 to 30m         | 69 to 50m                               |
|                        | Rated Head m                     | 91.6            | 23                     | 35                | 59                                      |
|                        | Rated discharge (m3/s)           | 69              | 62                     | 41                | 20                                      |
|                        | generator rpm                    | 273             | 214                    | 214               | 375                                     |
|                        | power factor                     | 0.85            | 0.8                    | 0.85              | 0.85                                    |
|                        | generator rating MVA             | 65              | 15                     | 14.7              | 11.8                                    |
| Transmission           | Main voltage & length            | 220kVx132km     | 110kVx12km             | 110kVx40km        | 110kV & 35kV<br>(distance)<br>~2km only |
| Access Road (to build) |                                  | 15km            | None                   | None              |   |
| Reservoir & Regulation | NPL                              | 490             | 370                    | 394               | 262                                     |
|                        | Area @ NPL (km2)                 | 8.1             | 3.1                    | 2.3               | 4.5                                     |
|                        | Length @ NPL (km)                | 31              | 22 (back to Tangkou)   |                   |   |
|                        | Total storage at NPL (m3*10^6)   | 308             | 29                     | 48                | 116                                     |
|                        | Live Storage MCM                 | 206             | 10                     | 22.5              | 59                                      |
|                        | Equivalent Months @ Qav          | 1.7             | 0.03                   | 0.15              | 1.3                                     |
|                        | Effective Regulation             | seasonal        | minimal (run-of-river) | weekly            | seasonal                                |
| Plant Capability       | Average GWh/yr                   | 324             | 151                    | 154               | 80                                      |
|                        | Firm MWe                         | 17              | 5.6                    | 5.4               | 2.7                                     |
|                        | % reliability (monthly)          | ~98%            | 0.8                    | 98%               | >98%                                    |
|                        | Average CF                       | 0.34            | 0.48                   | 0.35              | 0.3                                     |
|                        | Firm CF                          | 0.15            | 0.16                   | 0.11              | 0.09                                    |
|                        | Capacity range                   | 110 to 70MW     | 23 to 36MW             | 50 to 40MW        | 30 to 24MW                              |
| Quantities             | Surface Excavation 10^3m3.       | 670             | 625                    | 570               | 217                                     |
|                        | Underground Exc. 10^3m3          | 19              | 24                     | 30                | 28                                      |
|                        | Fills 10^3m3                     | 15              | 60                     | 20                | 40                                      |
|                        | RCC 10^3m3                       |                 |                        |                   |   |
|                        | Concrete 10^3m3                  | 460             | 150                    | 250               | 188                                     |
|                        | Rebar t                          | 5600            | 3000                   | 3200              | 2400                                    |
|                        | Metals t                         | 1160            | 1250                   | 1020              | 1040                                    |
|                        | MW                               | 110             | 36                     | 50                | 30                                      |

Special Features

Dongping  
Songshuling  
Xiakou  
Najitan

The TWL will be raised by about 10m if the planned Shuibuya project (1600MW) is built downstream  
The NPL will be lowered by about 6m if the Longbeiwang project (200MW) is built upstream  
The project is intended to provide 1:20 year flood protection to a town downstream  
numerous caves are a special problem

### Annex 3: Estimated Project Costs

#### CHINA: Hubei Hydropower Development in Poor Areas Project

|                                 |               |               |                 |               |               |               |
|---------------------------------|---------------|---------------|-----------------|---------------|---------------|---------------|
| Dongping                        | 322.61        | 310.06        | 632.66          | 37.68         | 35.89         | 73.57         |
| Najitan                         | 146.43        | 165.14        | 311.57          | 17.17         | 19.33         | 36.50         |
| Songshuling                     | 135.89        | 174.70        | 310.60          | 16.02         | 20.52         | 36.54         |
| Xiakou                          | 125.71        | 113.24        | 238.95          | 14.15         | 13.86         | 28.01         |
| <b>Total Baseline Cost</b>      | <b>730.64</b> | <b>763.14</b> | <b>1,493.78</b> | <b>85.03</b>  | <b>89.60</b>  | <b>174.63</b> |
| <b>Contingencies</b>            |               |               |                 |               |               |               |
| Physical Contingency            | 81.71         | 66.07         | 147.78          | 9.55          | 7.75          | 17.30         |
| Price Contingency               | 40.43         | 58.01         | 98.44           | 4.65          | 6.77          | 11.42         |
| <b>Subtotal</b>                 | <b>122.14</b> | <b>124.08</b> | <b>246.22</b>   | <b>14.20</b>  | <b>14.51</b>  | <b>28.72</b>  |
| <b>Total Project Cost</b>       | <b>852.78</b> | <b>887.22</b> | <b>1,740.00</b> | <b>99.23</b>  | <b>104.11</b> | <b>203.35</b> |
| Interest During Construction    | 66.82         | 86.38         | 153.19          | 7.87          | 10.14         | 18.01         |
| On IBRD Loan                    | -             | 86.38         | 86.38           | -             | 10.14         | 10.14         |
| On Local Bank Loan              | 66.82         | -             | 66.82           | 7.87          | -             | 7.87          |
| Front-end Fee                   | -             | 9.03          | 9.03            | -             | 1.05          | 1.05          |
| <b>Total Financing Required</b> | <b>919.59</b> | <b>982.63</b> | <b>1,902.22</b> | <b>107.10</b> | <b>115.31</b> | <b>222.41</b> |

|                                 |               |               |                 |               |               |               |
|---------------------------------|---------------|---------------|-----------------|---------------|---------------|---------------|
| 1. Civil Works                  | 423.19        | 412.19        | 835.38          | 48.91         | 48.91         | 97.83         |
| 2. Goods                        | 27.02         | 339.07        | 366.09          | 3.13          | 39.30         | 42.43         |
| 3. Services                     | 74.21         | 11.88         | 86.09           | 8.74          | 1.39          | 10.13         |
| 4. Miscellaneous                | 206.21        | -             | 206.21          | 24.24         | -             | 24.24         |
| <b>Total Baseline Cost</b>      | <b>730.64</b> | <b>763.14</b> | <b>1,493.78</b> | <b>85.03</b>  | <b>89.60</b>  | <b>174.63</b> |
| <b>Contingencies</b>            |               |               |                 |               |               |               |
| Physical Contingency            | 81.71         | 66.07         | 147.78          | 9.55          | 7.75          | 17.30         |
| Price Contingency               | 40.43         | 58.01         | 98.44           | 4.65          | 6.77          | 11.42         |
| <b>Subtotal</b>                 | <b>122.14</b> | <b>124.08</b> | <b>246.22</b>   | <b>14.20</b>  | <b>14.51</b>  | <b>28.72</b>  |
| <b>Total Project Cost</b>       | <b>852.78</b> | <b>887.22</b> | <b>1,740.00</b> | <b>99.23</b>  | <b>104.11</b> | <b>203.35</b> |
| Interest During Construction    | 66.82         | 86.38         | 153.19          | 7.87          | 10.14         | 18.01         |
| On IBRD Loan                    | -             | 86.38         | 86.38           | -             | 10.14         | 10.14         |
| On Local Bank Loan              | 66.82         | -             | 66.82           | 7.87          | -             | 7.87          |
| Front-end Fee                   | -             | 9.03          | 9.03            | -             | 1.05          | 1.05          |
| <b>Total Financing Required</b> | <b>919.59</b> | <b>982.63</b> | <b>1,902.22</b> | <b>107.10</b> | <b>115.31</b> | <b>222.41</b> |

**Annex 4: Cost Benefit Analysis Summary**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

**Economic Justification**

Analysis by Mr. Peng Ximin of the State Power Economic Research Center

**Introduction**

The proposed project covers four medium and small hydropower plants: Dongping (2x55MW), Najitan (3x12MW), Songshuling (4x12.5MW) and Xiakou (2x15MW). While each of the four power plants are being developed by county level generation companies, they will be connected to and dispatched by the Hubei Provincial Grid which, by the end of 2000 had a total installed capacity of 14,324 MW of which 44 percent was hydropower and 56 percent thermal (mainly coal). A least cost (cost effectiveness) analysis was therefore carried out to verify that the proposed hydropower developments form part of the least cost generation expansion program for the provincial grid. A benefit cost analysis was also carried out to calculate the economic internal rate of return (EIRR) for the proposed project. Benefits for this analysis were based on the prices currently being paid at the generation level for small and medium hydropower energy by the Hubei Electric Power Company (HEPCO).

**Cost Estimates and Disbursement Schedule.**

Cost estimates at 2000 price level including physical contingencies (but excluding taxes) are shown in the following table.

Table 1: Cost Estimate and Its Disbursement Schedule Unit: million Yuan

|              | 2001        | 2002         | 2003         | 2004         | 2005         | 2006         | 2007        | Total         |
|--------------|-------------|--------------|--------------|--------------|--------------|--------------|-------------|---------------|
| Dongping     | -           | 131.5        | 102.7        | 108.7        | 143.3        | 121.0        | 20.7        | 627.9         |
| Najitan      | -           | 55.7         | 97.3         | 108.8        | 61.1         | -            | -           | 323.0         |
| Songshuling  | 10.5        | 83.6         | 89.2         | 114.4        | 34.5         | -            | -           | 332.1         |
| Xiakou       | 18.9        | 32.4         | 68.6         | 79.6         | 35.8         | -            | -           | 235.3         |
| <b>Total</b> | <b>29.4</b> | <b>303.2</b> | <b>357.8</b> | <b>411.6</b> | <b>274.6</b> | <b>121.0</b> | <b>20.7</b> | <b>1518.2</b> |

Source: Hubei Financial Department, July 2001

**Least Cost Analysis**

A generation expansion study of Hubei power grid was undertaken. This covered the period 2000-2050 (study period) with a focus on 2000-2020. The study was carried out using an optimization model, GESP, that determines the optimal capacity and generation mix to meet the demand with the minimum system cost (net present value of investment and operation cost). It concerned all potential candidates including (a) 300MW and 600MW subcritical and supercritical coal-fired units; (b) hydropower stations; (c) pumped storage power stations; and (d) 300MW combined cycle heat and power plants fueled by natural gas and 100MW gas turbines fueled by distillate (in view of limited availability of gas). The seasonal characteristics of energy generation were considered in the analysis.

Parallel analyses were carried out to determine least cost generation expansion sequences "with" and "without" the four hydropower developments. By comparing these two generation expansion sequences thermal generation costs avoided by the project could be calculated. Because of the relatively small size of the power stations, in comparison of the overall installed capacity of the grid, and the

seasonality of their energy production they were lumped together as a single project in the analysis. However, components of avoided costs: capacity and energy by season (dry, wet and shoulder) were also calculated. Particular care was also taken to ensure that the alternative generation sequences compared were equal in terms of system reliability, to ensure the validity of the avoided cost calculation.

### **Performance of the Proposed Project**

As a general rule, the proposed hydropower plants tend to operate to supply base load during wet seasons and peak load during dry seasons. However, depending on the amount of energy available in a particular month they may assume base load, shoulder load or peak load duty. The comparison of the two expansion sequences showed that the capacities replaced by the proposed project (with its total capacity of 226MW) were 116MW of 600MW supercritical coal-fired units and 122MW of gas turbine. The lower plant auxiliary consumption and forced outage rate of the proposed project in comparison with thermal alternative options accounts for the slightly increase in capacity replaced in comparison with installed capacity. From the energy point of view, the replaced energy by the proposed project consists of 600MW supercritical coal-fired thermal as base load, combined cycle gas as shoulder load and gas turbine burning distillate as peak load.

### **Energy Absorption Ratio**

A key issue identified during project identification was the market for wet-season energy in light of planned commissioning of Three Gorges Project from 2003 to 2009. The planned power plants and Three Gorges are both highly seasonal with a large proportion of energy delivered in the wet season. However, developments since project identification include an acceleration of power demand growth in Hubei, and plans to evacuate a proportion of Three Gorges energy to Guangdong. The analysis indicated that average energy absorption ratio of the proposed project in the wet, average and dry season in years immediately after commissioning are 98.5, 99.3 and 100.0 percent respectively, demonstrating that the Hubei system will be capable of absorbing most wet season energy.

### **Avoided Capacity Cost and Energy Cost**

The cost calculation was based on the operation mode of the proposed project (capacity and energy in different seasons) and the cost of the alternative case that can meet the same electricity demand at the same reliability level. The avoided capacity cost was derived at Y 744.0 Y/kW/year, and avoided energy costs in wet, average and dry season were 0.122, 0.140 and 0.184 Y/kWh respectively.

### **Avoided Emission Benefits**

Associated with avoided thermal generation, the study showed average annual emission reduction of SO<sub>2</sub>, TSP, NO<sub>x</sub> and CO<sub>2</sub> amounted to 4.4, 1.0, 2.2 and 704.9 thousand tons respectively. Based on calculated externality costs, the NPV of local environment benefit (SO<sub>2</sub>, TSP and NO<sub>x</sub> reduction benefits) of the proposed project was calculated at Y 182.0 million, and the NPV of global environmental benefit (CO<sub>2</sub> reduction benefit) was 112.8 million.

### **Equalizing Discount Rate**

Based on the avoided capacity cost and energy cost in different season, the equalizing discount rate

(EDR) of the proposed project can be calculated.

An important assumption in this analysis relates to the treatment of multipurpose benefits of the Xiakou project (irrigation, flood control and water supply). A study carried out by HIDI concluded that 25 percent of the capital cost of the dam and power plant could be allocated to multipurpose benefits, and on the basis of this study, provincial and county governments have undertaken to provide grants from flood control funds of Y 51.819 million. Although the HIDI benefit calculations have not been checked in detail, the willingness of the governments to provide a substantial contribution from flood control funds provides prima facie evidence of these multipurpose benefits, and therefore, in the base case, the cost allocated to multipurpose benefits has been deducted from total capital cost.

Results of the base case analysis and sensitivity analyses relating to the inclusion or exclusion of other benefits are presented in the following table.

Table 2: Summary of EDR Calculation Unit: %

| Case   | Whole Project | Dongping | Najitan | Songshuling | Xiakou |
|--|---------------|----------|---------|-------------|--------|
| Base Case  | 15.7          | 16.4     | 13.4    | 15.8        | 17.0   |
| No emission benefits                               | 13.8          | 14.6     | 11.4    | 13.9        | 15.2   |
| Local + global emission benefits                   | 16.8          | 17.5     | 14.6    | 17.0        | 18.2   |
| No cost allocation to multipurpose uses for Xiakou |               |          |         |             | 12.9   |

In all these cases equalizing discount rate remains above the 12 percent hurdle rate, except for Xiakou which falls slightly below it if local local emission benefits are not included.

### Economic Internal Rate of Return

The EIRR for the proposed project was calculated using prices currently being paid at the generation level for small and medium hydropower in the Hubei grid as a lower bound proxy for "willingness to pay. According to HEPC current power purchase prices for new small and medium hydropower stations range from 0.26 to 0.40 Y/kWh. However, tariffs were higher prior to the revisions of the power pricing formula that occurred in 2000 (See Annex 5). For example, the approved tariff for Xiangfan Baishuiyu hydropower station was 0.47 yuan/kWh and for Baokang Guoduwan's 0.497 yuan/kWh. For this study, the willingness to pay was conservatively taken as 0.40 Y/kWh.

Results of the base case analysis and sensitivity analyses relating to the inclusion or exclusion of other benefits are presented in the following table.

Table 3: Summary of EIRR Calculation Unit: %

| Case   | Whole Project | Dongping | Najitan | Songshuling | Xiakou |
|--|---------------|----------|---------|-------------|--------|
| Base case  | 14.8          | 15.1     | 14.9    | 14.5        | 14.6   |
| No emission benefits                               | 12.9          | 13.1     | 12.9    | 12.5        | 12.6   |
| Local + global emission benefits                   | 16            | 16.3     | 16.1    | 15.7        | 15.8   |
| No cost allocation to multipurpose uses for Xiakou |               |          |         |             | 11     |

In all these cases the EIRR remains above the 12 percent hurdle rate, except for Xiakou which falls slightly below it if there is no allocation at all to multipurpose benefits.

## Project Risk

To complement the above deterministic approach, risk analyses have been performed using a probabilistic method to assess the impact of the perceived risk factors that might affect the return of the project. The selected risk variables include: (i) capital cost, (ii) energy output, (iii) commissioning date, and (iv) willingness to pay. The results of 3000 Monte Carlo simulations are summarized in Chart 1 and in the following table.

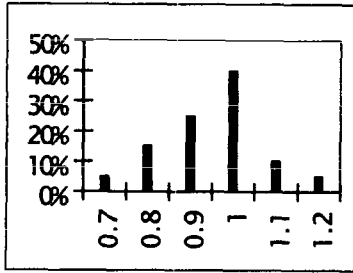
Table 4: Expected EIRR and Variance

|                          |       |
|--------------------------|-------|
| Expected Value           | 14.1% |
| Standard Deviation       | 2.4%  |
| Minimum                  | 7.3%  |
| Maximum                  | 24.4% |
| Coefficient of Variation | 0.170 |

The probability of EIRR of the overall project being below 12 percent is 17.0 percent.



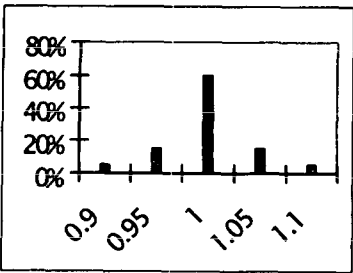
Chart 1 Risk Analysis of Hubei Hydropower Project



**Risk Variable No. 1**

*Generation*

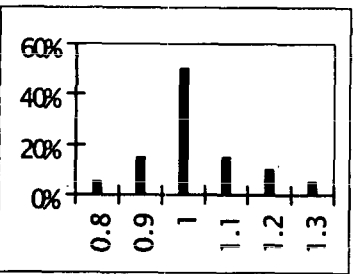
| Probability distribution: |     |     |     |     |     |
|---------------------------|-----|-----|-----|-----|-----|
| 5%                        | 15% | 25% | 40% | 10% | 5%  |
| 0.7                       | 0.8 | 0.9 | 1   | 1.1 | 1.2 |



**Risk Variable No. 2**

*Capital Cost*

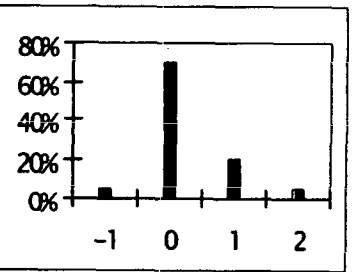
| Probability distribution: |      |     |      |     |  |
|---------------------------|------|-----|------|-----|--|
| 5%                        | 15%  | 60% | 15%  | 5%  |  |
| 0.9                       | 0.95 | 1   | 1.05 | 1.1 |  |



**Risk Variable No. 3**

*WTP*

| Probability distribution: |     |     |     |     |     |
|---------------------------|-----|-----|-----|-----|-----|
| 5%                        | 15% | 50% | 15% | 10% | 5%  |
| 0.8                       | 0.9 | 1   | 1.1 | 1.2 | 1.3 |

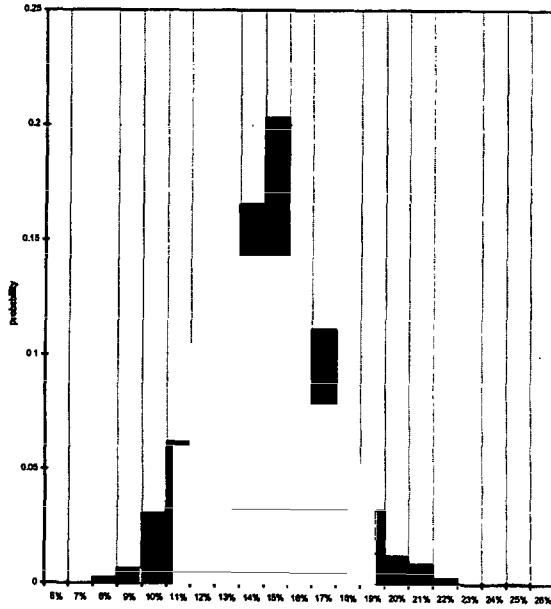


**Risk Variable No. 4**

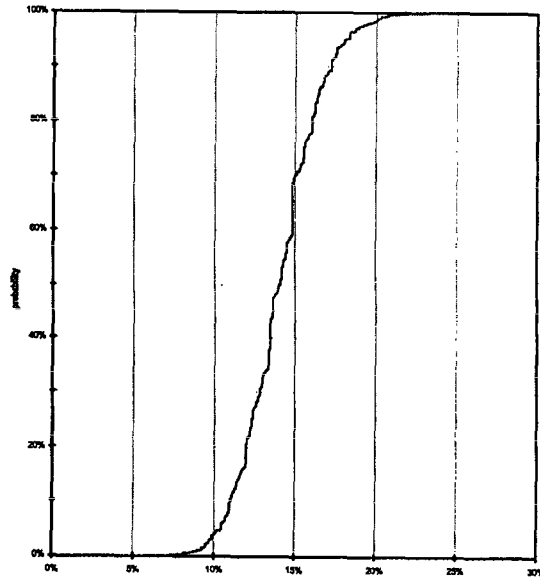
*Commissioning Date*

| Probability distribution: |     |     |    |
|---------------------------|-----|-----|----|
| 5%                        | 70% | 20% | 5% |
| -1                        | 0   | 1   | 2  |

Frequency Distribution of EIRR of Hubei Hydropower Project



Cumulative Distribution of EIRR of Hubei Hydropower Project



**Summary of Benefits and Costs:**

See above.

**Main Assumptions:**

See above.

**Sensitivity analysis / Switching values of critical items:**

See above.

**Annex 5: Financial Summary**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**  
**FINANCIAL ANALYSIS**

Analysis by Ms. Wang Wenjie of the State Power Economic Research Center

**Background**

Since 1983 when China introduced its “new power new price policy” the tariff to be charged by new power plants has been calculated in accordance with a debt repayment formula with the tariff subject to approval by the provincial pricing commissions and ultimately State Development Planning Commission (SDPC). Under this procedure, projected tariff is calculated at feasibility stage and the approval to proceed with the project based on the competitiveness of the projected tariff. Actual tariff is not calculated until the completion of the project taking into account current conditions including actual construction cost and debt servicing projections at the time of commissioning. If after initial approval of tariff, cost factors (operating cost, fuel prices, foreign exchange rate) change significantly, then the power plant can apply for a tariff adjustment. Feasibility study projected tariffs of all the hydropower plants under the project were approved by the Hubei Pricing Commission based on this policy.

In 2000, SDPC began to apply an amended version of the policy, and after a period of trial operation issued a document setting out the principles of the tariff setting formula. The main features of the new tariff setting method are:

- tariff set at the time of commissioning will be designed to yield a FIRR on equity of four percent higher than interest rates for long term loans, over an operating period approximating the design life of the project; for hydropower this is 30 years.
- assumed loan terms are 20 year maturity (for hydro) current government determined long term interest rate (local loans), actual interest rate foreign loans.
- operating costs shall be assumed equal to the average operating costs of plants of similar type and size operating in the same grid.
- during the operating period, if cost fluctuation due to changes in fuel prices, interest rate or exchange rates exceeds five percent, tariff may be adjusted.
- tariff structure reflecting time of day and season will be introduced in the future.

In principle, this procedure represents a cost plus approach with a reasonable return on equity considering the pass through of variations in major cost elements; however, the mismatch between assumed and actual loan terms and operating costs requires an assessment of financial viability of each project company.

Against the above background, China has decided on the introduction of competitive power markets (see Annex 11). The timing of the introduction will proceed at different rates depending on actual circumstances, but it is likely to proceed more quickly in the coastal provinces where pilots are underway rather than in Hubei which is relatively behind in the reform process. If competitive markets are introduced, then the model adopted in Zhejiang, in which power plants are initially provided with a contract for differences for a large proportion of their power, substantially alleviates market risk. Nevertheless, it is prudent to evaluate the competitiveness of the projected power prices with other forms of generation, in a market environment. The least cost analysis (Annex 4) demonstrated this on an economic basis, but not on a financial basis.

## Objectives of Analysis

The objectives of the financial analysis are therefore: (a) to project the tariff that would apply to the individual hydropower plants under existing pricing arrangements, and the likelihood that this would be approved; (b) determine the adequacy of the actual FIRR on equity for each power plant based on the projected tariff; (c) evaluate the financial viability of the four project companies; (d) verify the projected average tariffs would be competitive in a market environment.

## Tariffs Forecasting

Since some of the inputs to the tariff setting formula need to be determined based on actual conditions in the provinces, the appraisal team held discussions with the Hubei Provincial Pricing Bureau concerning these inputs, and the results of the tariff setting calculations which are as follows:

**Table 1: Tariffs for Operating Period of four subprojects**  
Unit: fen/kWh (including VAT)

|   | Dongping<br>Note 1 | Najitan | Songshuling | Xiakou<br>Note 2 |
|---|--------------------|---------|-------------|------------------|
| Base Case (10% FIRR on equity)            |                    |         |             |                  |
| Tariffs (at constant price level of 2000) | 34.06              | 38.80   | 37.03       | 38.39            |
| Tariffs (at constant price level of 2001) | 34.22              | 38.97   | 37.20       | 38.56            |
| Tariffs (at constant price level of 2005) | 37.39              | 41.75   | 39.85       | 41.31            |

Note:

1. The constant price level of tariffs of Dongping is 2006 rather than 2005, since 2006 is the first year of operation
2. The flood control cost sharing grant of Y 51.819 million is excluded from investment costs for calculating power tariff.

In 2000, the Hubei pricing bureau approved tariffs of over 40 fen/kWh for small and medium hydropower projects of the type proposed. It is therefore considered that the projected tariffs varying between 34.0 and 38.4 fen/kWh (at 2000 price levels) are likely to be approved and that the power plants will be competitive as the transition to market based pricing arrangements occur. The Hubei pricing bureau concurs with this conclusion.

## Financial Viability Study

In the financial viability study, real loan terms have been considered instead of the assumption used in average tariff calculation. Resulting FIRRs on assets and equity are summarized in the following table.

**Table 2: Main Financial Ratios of the Four Subprojects**

|                                     | Dongping | Najitan | Songshuling | Xiakou |
|-------------------------------------|----------|---------|-------------|--------|
| Average Tariffs in 2005 (fen/kWh)   | 37.39    | 41.75   | 39.85       | 41.31  |
| Real FIRR on Equity Investment      | 15.24    | 24.50   | 22.00       | 15.93  |
| Real FIRR on Total Investment       | 9.35     | 10.54   | 9.33        | 6.22   |
| Total Fiscal Revenue (million Yuan) | 1034.9   | 553.9   | 544.0       | 268.2  |
| Income Tax                          | 476.6    | 268.9   | 259.9       | 110.8  |
| Value-added Tax                     | 536.8    | 274.1   | 273.2       | 151.4  |
| Sales Taxes                         | 21.5     | 11.0    | 10.9        | 6.1    |

Note: the financial projections are carried out assuming no inflation after commissioning, since as noted above tariff can be adjusted to reflect significant cost variations. Thus calculated FIRRs are effectively real FIRRs.

It will be noted that the FIRRs on equity are considerably greater than the ten percent used as input to the pricing formula. This is mainly attributed to completion of the projects before the expiration of the loan grace periods allowing early returns on equity before loan repayment begins. Also in accordance with preferential policies for the Western Development Zone, Dongping and Najitan are allowed a partial income tax holiday. Based on advice from the pricing bureau, this is not reflected in the pricing formula, so that profits in early years are increased. The Songshuling Company also managed to obtain co-financing on preferential terms from a domestic commercial bank; again this is not reflected in the pricing formula.

Despite the attractive returns on equity, preliminary financial projections indicated that, because of the mismatch between asset life and commercial loan maturity, debt service ratios would be less than ideal in the early years until repayment of local bank loans. Therefore an important assumption of the financial viability study is that a Debt Reserve Account (DRA) will be established, which will be funded out of available cash flow until it is credited with an amount equal to the next six month's principal and interest payable on debt, and that dividends will not be paid unless this account is fully funded. Establishment of the DRA impacts the dividend distribution in the short term, but it considerably improves the security of being able to service long term debt.

The Debt Reserve Account (DRA) balance, Debt Service Coverage Ratios (DSCR) and Dividend Distribution assuming a DRA during the debt repayment period are shown in Table 3. This table shows, in addition to the conventional DSCR based on current year internal cash generation, a second ratio DSCR2 (sometimes referred to as cumulative DSCR) which adds the balance of the DRA into the top line of the debt service coverage ratio.

Table 3: Key Financial Performance Indicators

Amounts are in Y million

|                       | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Dongping</b>       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Needed            |      | 35.0 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Funded            |      | 35.0 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Used              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Balance of DRA        |      | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 |      |
| Dividend Distribution |      | 34.5 | 12.3 | 10.5 | 11.2 | 12.0 | 6.1  | 6.4  | 6.6  | 6.8  | 7.0  | 23.0 | 27.1 | 26.5 | 25.9 | 25.2 | 24.6 | 48.7 |
| DSCR-1                |      |      | 1.2  | 1.2  | 1.2  | 1.2  | 1.1  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  |      |
| DSCR-2                |      |      | 1.7  | 1.7  | 1.7  | 1.8  | 1.7  | 1.7  | 1.7  | 1.7  | 1.8  | 1.8  | 2.3  | 2.3  | 2.3  | 2.3  | 2.3  |      |
| <b>Najitan</b>        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Needed            | 10.8 | 5.5  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Funded            | 10.8 | 5.5  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Used              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Balance of DRA        | 10.8 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |      |
| Dividend Distribution | 6.4  | 15.2 | 10.0 | 10.2 | 10.4 | 9.4  | 6.5  | 6.5  | 6.5  | 6.5  | 6.4  | 11.8 | 12.9 | 12.6 | 15.9 | 16.4 | 11.5 | 28.2 |
| DSCR-1                |      | 2.2  | 1.4  | 1.4  | 1.4  | 1.4  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  |      |
| DSCR-2                |      | 2.7  | 1.9  | 1.9  | 1.9  | 1.9  | 1.8  | 1.8  | 1.8  | 1.8  | 1.9  | 1.9  | 2.2  | 2.2  | 2.2  | 2.2  | 2.2  |      |
| <b>Xiakou</b>         |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Needed            | 5.5  | 3.5  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Funded            | 5.5  | 3.5  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Used              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Balance of DRA        | 5.5  | 9.0  | 9.0  | 9.0  | 9.0  | 9.0  | 9.0  | 9.0  | 9.0  | 9.0  | 9.0  | 6.8  | 6.8  | 6.8  | 6.8  | 6.8  | 6.8  |      |
| Dividend Distribution | 3.7  | 2.3  | 1.7  | 2.0  | 2.3  | 2.6  | 2.7  | 2.6  | 2.5  | 2.4  | 2.4  | 4.5  | 4.9  | 4.7  | 4.5  | 4.3  | 4.0  | 13.2 |
| DSCR-1                |      | 2.0  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.2  | 1.4  | 1.4  | 1.4  | 1.4  | 1.4  |      |
| DSCR-2                |      | 2.5  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 2.0  | 2.0  | 1.9  | 1.9  | 1.9  |      |
| <b>Songshuling</b>    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Needed            | 6.4  | 5.5  | 2.5  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Funded            | 6.4  | 5.5  | 2.5  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DRA Used              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Balance of DRA        | 6.4  | 11.9 | 14.4 | 14.4 | 14.4 | 14.4 | 14.4 | 14.4 | 14.4 | 14.4 | 14.4 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |      |
| Dividend Distribution | 12.3 | 8.3  | 7.9  | 6.8  | 6.7  | 6.6  | 6.5  | 6.3  | 6.2  | 6.0  | 5.9  | 6.6  | 5.5  | 5.3  | 5.1  | 4.8  | 4.6  | 28.7 |
| DSCR-1                |      | 2.9  | 1.6  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  | 1.3  |      |
| DSCR-2                |      | 3.4  | 2.1  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.9  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  |      |

DRA=Debt Reserve Account,

DSCR-1=Debt Service Coverage Ratio without DRA,

DSCR-2= Debt Service Coverage Ratio with DRA

This table shows that DSCR is maintained above 1.2 in early operation years for all power plants (for Songshuling and Najitan above 1.3). These ratios are reasonable considering the highly capital intensive nature of hydropower plants. More importantly DSCR2 remains comfortably above 1.7 in all cases. While dividend distribution is impacted in initial operating years, distribution is still quite healthy after the first year of operations.

## Sensitivity Studies

With the tariff setting and adjustment process generally defined (including pass through of major cost elements), it is considered that the two factors that could have a significant adverse effect on financial viability are a reduction in power sales volume and construction delays resulting in a delay in commissioning of the power plants. The former may occur because of overestimated hydrology, or because surpluses of hydropower in the grid lead to less than full purchases of the power. On the other hand, since the tariff setting formula assumes average operating costs in the grid, the potential for increasing financial viability and profitability through reducing operating costs should be explored. Sensitivity analyses were therefore carried out assuming variations in these three factors.

With respect to power sales, the sensitivity analysis assumes a ten percent reduction in power sales income throughout the life of the project. This is quite a severe assumption. In the case of overestimated hydrology, a reduction of ten percent in average flows would not result in a corresponding reduction in revenue, since available energy would be used to maximize generation in peak periods. Under existing pricing arrangements, off peak power is valued at about half of average power price and one quarter of peak power price, and the SDPC document referred to above announced the intention to move to a tariff structure more reflective of avoided costs which would tend to increase the ratios of peak to off peak power prices. Therefore, it would take at least 20 percent reduction in average energy to result in the 10 percent reduction in revenue modeled. The second factor, inability of the grid to absorb energy, because of excess hydropower is only likely to occur in the wet season when power prices are lower, and moreover would likely be short term rather than over the life of the project. It is concluded therefore that a 10 percent reduction in revenue throughout project life is quite a severe test. Results of this analysis are summarized in Table 3 below.

**Table 3. Decrease in Energy Sales**

| Energy Sale Decrease 10 percent   | Dongping | Najitan | Songshuling | Xiakou |
|-----------------------------------|----------|---------|-------------|--------|
| Average Tariffs in 2005 (fen/kWh) | 37.39    | 41.75   | 39.85       | 41.31  |
| Average Tariffs in 2000 (fen/kWh) | 34.06    | 38.80   | 37.03       | 38.39  |
| Real FIRR on Equity Investment    | 11.48    | 17.19   | 15.79       | 11.70  |
| Real FIRR on Total Investment     | 8.05     | 9.11    | 8.11        | 5.17   |
| Lowest DSCR-1                     | 1.1      | 1.2     | 1.1         | 1.1    |
| Lowest DSCR2                      | 1.6      | 1.7     | 1.7         | 1.6    |

In this case real rates of return on equity are in the range of 11.5 to 17.2 percent which is still quite reasonable. The minimum DSCR varies between 1.1 and 1.2 depending on the project; however the cumulative DSCR always stays comfortably above 1.6.

The strategy of establishment of a DSRA as a cushion against unexpected events relies, to some extent, on completion of the projects on time, to enable the account to be funded during the loan grace period. High FIRRs on equity are also reflective of this early completion allowing early payment of dividends. It is therefore appropriate to check the effect of delay in commissioning on financial viability. For this analysis, it is assumed that the commissioning delay is one year. This refers only to construction delays, since procurement for main civil works is largely complete and preliminary works contracts have been awarded such that river closure in October, 2002 (which is key to on-time start of main contracts) is reasonably certain. The one year delay of actual construction time is quite severe in view of the fact that pre-qualified contractors are all highly experienced and have demonstrated their ability to complete much larger projects

on schedule. The results of this sensitivity analysis are shown in the following table.

**Table 4. Commercial Operation Delayed One Year (end of grace period unchanged)**

| One year delay                     | Dongping | Najitan | Songshuling | Xiakou |
|------------------------------------|----------|---------|-------------|--------|
| Average Tariffs in 2005 (fen/kWh)  | 37.39    | 41.75   | 39.85       | 41.31  |
| Average Tariffs in 2000 (fen/kWh)  | 34.06    | 38.80   | 37.03       | 38.39  |
| Real FIRR on Equity Investment     | 11.32    | 15.13   | 14.53       | 11.74  |
| Real FIRR on Total Investment      | 8.36     | 9.20    | 8.39        | 5.65   |
| Lowest DSCR-1                      | 1.1      | 1.0     | 1.3         | 1.2    |
| Lowest Debt Service Coverage Ratio | 1.1      | 1.0     | 1.8         | 1.3    |

The low DSCR for Dongping occurs only in the first year of operation. It rises to 1.3 in Year 2 and 1.2 thereafter. DSCR2 builds up to 1.7 over a four year period. Similarly for Najitan, the ratio of 1.0 applies only for the first operating year; it fully recovers in the next year and DSCR2 reaches 1.7 in the third year of operation. For Xiakou DSCR2 reaches 1.7 in the fourth operating year.

Based on the above analyses it is concluded that the financial viability of the four project companies is quite robust.

Possible reductions in operating costs through reducing staff numbers were tested in a third sensitivity study. Because the hydropower plants are relatively small, operating costs (which are primarily staff costs) make up a relatively large proportion of overall costs. According to Hubei Pricing Bureau, average operating costs (excluding financial costs) of hydropower plants in the Hubei grid are 5.02 fen/kWh for plants with unit size more than 25 MW and 8.72 fen per kWh for plants with unit size less than 25 MW. For the base case, actual operating costs for the four hydropower plants were based on actual staffing levels projected in the respective feasibility studies, but not greater than the average operating costs provided by the pricing bureau. In practice there was a large variation in staff numbers for similar power plants, and in all cases staff numbers seem quite high in comparison with recently completed large Bank financed hydropower plants in China. For the sensitivity analysis, it was conservatively assumed that all power plants were staffed at an "efficient standard" of 2.72 persons per MW, which was the lowest staffing projected from the four feasibility studies. The results are summarized in the following table

**Table 5: Main Results of Changes of Change of Staff Number**

| Reduction in Staff Numbers         | Dongping | Najitan | Songshuling | Xiakou |
|------------------------------------|----------|---------|-------------|--------|
| Average Tariffs in 2005 (fen/kWh)  | 37.39    | 41.75   | 39.85       | 41.31  |
| Average Tariffs in 2000 (fen/kWh)  | 34.06    | 38.80   | 37.03       | 38.39  |
| Real FIRR on Equity Investment     | 15.66    | 24.50   | 22.00       | 18.98  |
| Real FIRR on Total Investment      | 9.48     | 10.54   | 9.33        | 6.85   |
| Lowest DSCR-1                      | 1.2      | 1.3     | 1.3         | 1.2    |
| Lowest Debt Service Coverage Ratio | 1.7      | 1.8     | 1.8         | 1.7    |

There is no change for Najitan and Songshuling since staff numbers were already close to the "efficient standard". There is a modest improvement for Dongping, but a substantial improvement for Xiakou. However, the "efficient standard" seems quite generous implying a staffing of about 300 for the 110 MW Dongping. Therefore technical assistance will be provided under the project to review staffing arrangements and arrive at the minimum requirements to achieve economical efficient operation.



### **Financial Summaries for Base Case**

Financial Summaries extracting main parameters from projected financial statements of the four project companies are presented in Attachments 1 to 4. Principal assumptions used in calculation of tariffs and in financial viability studies are presented in Attachments 5 and 6.

## Attachment 1

| Financial Summary for Dongping Hydroelectric Power Station                    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Year Ending December 31: 2006-2036, At Price Level of 2006, In Million of RMB |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Year a/ b/  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Sales (GWh)   | 267  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  | 320  |
| Average Price (including VAT)   | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 | 37.3 |
| Revenues (excluding VAT)  | 85   | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  | 102  |
| Operating Expenses  | 35   | 49   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
| Operating Income  | 50   | 53   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   |
| Net Income  | 50   | 23   | 22   | 24   | 26   | 20   | 22   | 23   | 25   | 27   | 28   | 30   | 31   | 32   | 33   | 34   | 35   | 35   | 35   |
| Income Tax  |      |      | 2    | 2    | 2    | 10   | 11   | 12   | 12   | 13   | 14   | 15   | 15   | 16   | 16   | 17   | 17   | 17   | 17   |
| Value-added Tax   | 15   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   | 17   |
| Sales Tax   | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| Source of Funds:  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Internal Sources  | 77   | 86   | 83   | 82   | 82   | 74   | 74   | 73   | 72   | 71   | 70   | 70   | 69   | 69   | 68   | 68   | 67   | 67   | 67   |
| IBRD Loans  | 412  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Other Sources   | 198  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Equity Investments  | 200  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Total Sources   | 887  | 86   | 83   | 82   | 82   | 74   | 74   | 73   | 72   | 71   | 70   | 70   | 69   | 69   | 68   | 68   | 67   | 67   | 67   |
| Applications:   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Capital Expenditures  | 810  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Recurring Costs   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Working Capital Increase  | 2    | 0    |      |      |      |      |      |      |      |      |      | 0    |      |      |      |      |      |      |      |
| Debt Service  |      | 70   | 69   | 68   | 66   | 65   | 64   | 63   | 61   | 60   | 59   | 38   | 38   | 38   | 38   | 38   |      |      |      |
| Dividend Distribution   | 35   | 12   | 10   | 11   | 12   | 6    | 6    | 7    | 7    | 7    | 23   | 27   | 26   | 26   | 25   | 25   | 49   | 30   | 30   |
| Cash Increase (Decrease)  | 38   | 2    | 2    | 2    | 3    | 2    | 2    | 2    | 2    | 3    | -13  | 3    | 3    | 3    | 3    | 3    | 17   | 36   | 36   |
| Total Applications  | 884  | 85   | 81   | 81   | 81   | 73   | 72   | 72   | 71   | 70   | 69   | 68   | 68   | 67   | 67   | 66   | 65   | 65   | 65   |
| Balance Sheet Items   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Assets  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Current Assets  | 42   | 45   | 47   | 50   | 52   | 54   | 57   | 59   | 61   | 64   | 51   | 54   | 57   | 60   | 64   | 67   | 84   | 119  | 155  |
| Less Current Liabilities  | 42   | 44   | 44   | 45   | 46   | 47   | 49   | 50   | 51   | 52   | 34   | 35   | 36   | 38   | 39   | 3    | 3    | 3    | 3    |
| Net Current Assets or Working   | 0    | 2    | 3    | 4    | 6    | 7    | 8    | 9    | 11   | 12   | 17   | 19   | 21   | 22   | 24   | 64   | 81   | 117  | 152  |
| Net Fixed & Other Long Term   | 783  | 750  | 718  | 686  | 653  | 621  | 588  | 556  | 524  | 491  | 459  | 426  | 394  | 362  | 329  | 297  | 265  | 232  | 200  |
| Total Net Assets  | 783  | 752  | 721  | 690  | 659  | 628  | 596  | 565  | 534  | 503  | 476  | 446  | 415  | 384  | 353  | 361  | 345  | 349  | 352  |
| Debt and Equity   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Long Term Debt  | 570  | 529  | 488  | 445  | 402  | 357  | 312  | 265  | 217  | 168  | 137  | 105  | 71   | 36   |      |      |      |      |      |
| Equity  | 213  | 223  | 233  | 245  | 257  | 271  | 285  | 300  | 317  | 336  | 339  | 341  | 343  | 348  | 353  | 361  | 345  | 349  | 352  |
| Total L/T Debt and Equity   | 783  | 752  | 721  | 690  | 659  | 628  | 596  | 565  | 534  | 503  | 476  | 446  | 415  | 384  | 353  | 361  | 345  | 349  | 352  |
| Financial Ratios  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Operating Income as a % of  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Net Income as a % of Revenue  | 59   | 23   | 22   | 23   | 25   | 20   | 21   | 23   | 24   | 26   | 28   | 29   | 30   | 31   | 32   | 33   | 34   | 34   | 34   |
| Return on Equity  | 23.5 | 10.4 | 9.5  | 9.8  | 10.1 | 7.5  | 7.7  | 7.8  | 7.9  | 7.9  | 8.3  | 8.8  | 9.0  | 9.1  | 9.2  | 9.3  | 10.1 | 10.0 | 9.9  |
| Debt Service Coverage   |      | 1.7  | 1.7  | 1.7  | 1.8  | 1.7  | 1.7  | 1.7  | 1.7  | 1.8  | 1.8  | 2.3  | 2.3  | 2.3  | 2.3  | 2.3  |      |      |      |
| Current Ratio   | 1.0  | 1.0  | 1.1  | 1.1  | 1.1  | 1.1  | 1.2  | 1.2  | 1.2  | 1.2  | 1.5  | 1.5  | 1.6  | 1.6  | 1.6  | 23.4 | 29.2 | 41.7 | 54.3 |
| Total Debt as % of Total  | 74   | 72   | 70   | 67   | 64   | 60   | 56   | 51   | 46   | 40   | 33   | 29   | 24   | 18   | 10   | 1    | 1    | 1    | 1    |

## Attachment 2

| Financial Summary for Lajitan Hydroelectric Power Station                     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|------|------|
| Year Ending December 31: 2005-2035, At Price Level of 2005, in Million of RMB |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Year a/ b/  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021  | 2022 | 2023 | 2024 |
| <b>Income Statement Items</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Sales (GWh)   | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149  | 149   | 149  | 149  | 149  |
| Average Price (including VAT)   | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.75 | 41.7 | 41.7 | 41.7 |
| Revenues (excluding VAT)  | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53   | 53    | 53   | 53   | 53   |
| Operating Expenses  | 20   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22   | 22    | 22   | 22   | 22   |
| Operating Income  | 33   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31    | 31   | 31   | 31   |
| Net Income  | 18   | 15   | 16   | 17   | 16   | 13   | 14   | 15   | 15   | 16   | 17   | 18   | 18   | 19   | 19   | 20    | 20   | 20   | 20   |
| Income Tax  |      | 1    | 1    | 1    | 3    | 7    | 7    | 7    | 8    | 8    | 8    | 9    | 9    | 9    | 9    | 10    | 10   | 10   | 10   |
| Value-added Tax   | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9     | 9    | 9    | 9    |
| Sales Tax   | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4   | 0.4  | 0.4  | 0.4  |
| <b>Funds Flow Statement Items</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| <b>Source of Funds:</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Internal Sources  | 48   | 45   | 45   | 45   | 43   | 39   | 39   | 39   | 38   | 38   | 38   | 37   | 37   | 37   | 36   | 36    | 36   | 36   | 36   |
| IBRD Loans  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Other Sources   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Equity Investments  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Total Sources   | 48   | 45   | 45   | 45   | 43   | 39   | 39   | 39   | 38   | 38   | 38   | 37   | 37   | 37   | 36   | 36    | 36   | 36   | 36   |
| <b>Applications:</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Capital Expenditures  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Recurring Costs   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Working Capital Increase  | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Debt Service  | 22   | 32   | 32   | 32   | 31   | 31   | 30   | 30   | 30   | 29   | 29   | 22   | 22   | 22   | 22   | 22    |      |      |      |
| Dividend Distribution   | 15   | 10   | 10   | 10   | 9    | 7    | 7    | 7    | 6    | 6    | 12   | 13   | 13   | 16   | 16   | 12    | 28   | 17   | 17   |
| Cash Increase (Decrease)  | 10   | 1    | 2    | 2    | 2    | 1    | 1    | 1    | 2    | 2    | -4   | 2    | 2    | -2   | -3   | 2     | 7    | 17   | 17   |
| Total Applications  | 47   | 44   | 44   | 44   | 42   | 39   | 38   | 38   | 38   | 37   | 37   | 36   | 36   | 36   | 35   | 35    | 35   | 35   | 35   |
| <b>Balance Sheet Items</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| <b>Assets</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Current Assets  | 24   | 25   | 27   | 29   | 30   | 32   | 33   | 34   | 36   | 38   | 34   | 36   | 37   | 36   | 33   | 35    | 42   | 59   | 76   |
| Less Current Liabilities  | 19   | 20   | 20   | 21   | 21   | 22   | 23   | 23   | 24   | 25   | 19   | 20   | 20   | 21   | 22   | 1     | 1    | 1    | 1    |
| Net Current Assets or Working   | 5    | 6    | 7    | 8    | 9    | 9    | 10   | 11   | 12   | 13   | 15   | 16   | 17   | 14   | 11   | 34    | 40   | 58   | 75   |
| Net Fixed & Other Long Term   | 362  | 347  | 331  | 316  | 301  | 285  | 270  | 254  | 239  | 224  | 208  | 193  | 178  | 162  | 147  | 132   | 116  | 101  | 86   |
| Total Net Assets  | 366  | 352  | 338  | 324  | 309  | 295  | 280  | 266  | 251  | 237  | 223  | 209  | 195  | 177  | 158  | 165   | 157  | 159  | 161  |
| <b>Debt and Equity</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Long Term Debt  | 282  | 264  | 245  | 225  | 205  | 184  | 163  | 141  | 118  | 95   | 78   | 60   | 41   | 21   |      |       |      |      |      |
| Equity  | 84   | 88   | 93   | 98   | 104  | 110  | 117  | 124  | 133  | 141  | 146  | 150  | 154  | 156  | 158  | 165   | 157  | 159  | 161  |
| Total L/T Debt and Equity   | 366  | 352  | 338  | 324  | 309  | 295  | 280  | 266  | 251  | 237  | 223  | 209  | 195  | 177  | 158  | 165   | 157  | 159  | 161  |
| <b>Financial Ratios</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |      |      |      |
| Operating Income as a % of  | 62   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58   | 58    | 58   | 58   | 58   |
| Net Income as a % of Revenue  | 34   | 28   | 30   | 31   | 30   | 25   | 26   | 28   | 29   | 30   | 32   | 33   | 34   | 35   | 36   | 37    | 39   | 39   | 39   |
| Return on Equity  | 21.2 | 16.8 | 16.9 | 16.9 | 15.4 | 12.1 | 12.0 | 11.8 | 11.6 | 11.4 | 11.6 | 11.8 | 11.8 | 12.0 | 12.2 | 12.0  | 13.1 | 12.9 | 12.7 |
| Debt Service Coverage   | 2.7  | 1.9  | 1.9  | 1.9  | 1.9  | 1.8  | 1.8  | 1.8  | 1.8  | 1.9  | 1.9  | 2.2  | 2.2  | 2.2  | 2.2  | 2.2   |      |      |      |
| Current Ratio   | 1.2  | 1.3  | 1.3  | 1.4  | 1.4  | 1.4  | 1.5  | 1.5  | 1.5  | 1.5  | 1.8  | 1.8  | 1.8  | 1.7  | 1.5  | 25.3  | 30.1 | 42.6 | 55.1 |
| Total Debt as % of Total  | 78   | 76   | 74   | 71   | 69   | 65   | 61   | 57   | 52   | 46   | 40   | 35   | 28   | 21   | 12   | 1     | 1    | 1    | 1    |

| Financial Summary for Songshuling Hydroelectric Power Station                 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| Year Ending December 31: 2005-2035, At Price Level of 2005, In Million of RMB |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Year a/ b/  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |      |  |
| <b>Income Statement Items</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Sales (GWh)   | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  | 153  |  |
| Average Price (including VAT)   | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 |  |
| Revenues (excluding VAT)  | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   | 52   |  |
| Operating Expenses  | 25   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   | 26   |  |
| Operating Income  | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   | 27   |  |
| Net Income  | 10   | 9    | 10   | 10   | 11   | 11   | 12   | 12   | 13   | 13   | 14   | 14   | 15   | 16   | 16   | 17   | 18   | 18   | 18   | 18   |  |
| Income Tax  | 5    | 5    | 5    | 5    | 5    | 5    | 6    | 6    | 6    | 7    | 7    | 7    | 7    | 8    | 8    | 8    | 9    | 9    | 9    | 9    |  |
| Value-added Tax   | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 9    |  |
| Sales Tax   | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  |  |
| <b>Funds Flow Statement Items</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| <b>Source of Funds:</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Internal Sources  | 38   | 37   | 37   | 37   | 37   | 36   | 36   | 36   | 36   | 35   | 35   | 35   | 34   | 34   | 34   | 33   | 33   | 33   | 33   | 33   |  |
| IBRD Loans  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Other Sources   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Equity Investments  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Total Sources   | 38   | 37   | 37   | 37   | 37   | 36   | 36   | 36   | 36   | 35   | 35   | 35   | 34   | 34   | 34   | 33   | 33   | 33   | 33   | 33   |  |
| <b>Applications:</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Capital Expenditures  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Recurring Costs   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Working Capital Increase  | 0    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Debt Service  | 13   | 24   | 29   | 29   | 28   | 28   | 28   | 28   | 28   | 27   | 27   | 27   | 27   | 27   | 26   | 26   |      |      |      |      |  |
| Dividend Distribution   | 8    | 8    | 7    | 7    | 7    | 6    | 6    | 6    | 6    | 6    | 6    | 7    | 5    | 5    | 5    | 5    | 5    | 29   | 15   | 15   |  |
| Cash Increase (Decrease)  | 16   | 5    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 0    | 1    | 2    | 2    | 2    | 2    | 3    | 17   | 17   | 17   |  |
| Total Applications  | 37   | 37   | 37   | 36   | 36   | 36   | 36   | 35   | 35   | 35   | 34   | 34   | 34   | 33   | 33   | 33   | 32   | 32   | 32   | 32   |  |
| <b>Balance Sheet Items</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| <b>Assets</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Current Assets  | 32   | 37   | 38   | 39   | 40   | 41   | 42   | 43   | 44   | 46   | 46   | 48   | 49   | 51   | 52   | 54   | 58   | 74   | 91   | 91   |  |
| Less Current Liabilities  | 13   | 18   | 19   | 19   | 20   | 20   | 21   | 22   | 22   | 23   | 24   | 24   | 25   | 26   | 27   | 2    | 2    | 2    | 2    | 2    |  |
| Net Current Assets or Working   | 19   | 18   | 19   | 19   | 20   | 20   | 21   | 22   | 22   | 23   | 23   | 23   | 24   | 25   | 26   | 52   | 56   | 73   | 90   | 90   |  |
| Net Fixed & Other Long Term   | 351  | 336  | 321  | 306  | 291  | 276  | 260  | 245  | 230  | 215  | 200  | 185  | 170  | 154  | 139  | 124  | 109  | 94   | 79   | 79   |  |
| Total Net Assets  | 370  | 355  | 340  | 325  | 311  | 296  | 281  | 267  | 252  | 238  | 222  | 208  | 194  | 179  | 165  | 176  | 165  | 167  | 168  | 168  |  |
| <b>Debt and Equity</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Long Term Debt  | 286  | 270  | 253  | 235  | 217  | 198  | 179  | 159  | 139  | 117  | 96   | 73   | 49   | 25   |      |      |      |      |      |      |  |
| Equity  | 84   | 85   | 87   | 90   | 94   | 98   | 102  | 108  | 114  | 120  | 127  | 135  | 144  | 154  | 165  | 176  | 165  | 167  | 168  | 168  |  |
| Total L/T Debt and Equity   | 370  | 355  | 340  | 325  | 311  | 296  | 281  | 267  | 252  | 238  | 222  | 208  | 194  | 179  | 165  | 176  | 165  | 167  | 168  | 168  |  |
| <b>Financial Ratios</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| Operating Income as a % of  | 52   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   | 51   |  |
| Net Income as a % of Revenue  | 19   | 18   | 18   | 19   | 20   | 21   | 22   | 23   | 24   | 25   | 27   | 28   | 29   | 30   | 31   | 33   | 34   | 34   | 34   | 34   |  |
| Return on Equity  | 11.6 | 10.9 | 11.0 | 11.1 | 11.3 | 11.3 | 11.2 | 11.1 | 11.0 | 10.9 | 10.7 | 10.5 | 10.2 | 10.0 | 9.7  | 10.8 | 10.7 | 10.6 | 10.6 | 10.6 |  |
| Debt Service Coverage   | 3.4  | 2.1  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  | 1.8  |      |      |      |      |  |
| Current Ratio   | 2.5  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 31.2 | 33.2 | 43.0 | 52.8 | 52.8 |  |
| Total Debt as % of Total  | 78   | 77   | 76   | 74   | 72   | 69   | 66   | 63   | 59   | 54   | 48   | 42   | 34   | 25   | 14   | 1    | 1    | 1    | 1    | 1    |  |

## Attachment 4

| Financial Summary for Xiakou Hydroelectric Power Station                      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Year Ending December 31: 2005-2035, At Price Level of 2005, In Million of RMB |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Year a/ b/  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| <b>Income Statement Items</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Sales (GWh)   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   | 82   |
| Average Price (including VAT)   | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 | 41.3 |
| Revenues (excluding VAT)  | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   | 29   |
| Operating Expenses  | 17   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   | 18   |
| Operating Income  | 12   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   | 11   |
| Net Income  | 3    | 2    | 2    | 3    | 3    | 3    | 4    | 4    | 5    | 5    | 5    | 6    | 6    | 6    | 7    | 7    | 8    | 8    | 8    |
| Income Tax  | 1    | 1.0  | 1.2  | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 4    | 4    | 4    | 4    |
| Value-added Tax   | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    | 5    |
| Sales Tax   | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  |
| <b>Funds Flow Statement Items</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| <b>Source of Funds:</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Internal Sources  | 22   | 21   | 21   | 21   | 21   | 20   | 20   | 20   | 20   | 20   | 20   | 19   | 19   | 19   | 19   | 19   | 18   | 18   | 18   |
| IBRD Loans  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Other Sources   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Equity Investments  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Total Sources   | 22   | 21   | 21   | 21   | 21   | 20   | 20   | 20   | 20   | 20   | 20   | 19   | 19   | 19   | 19   | 19   | 18   | 18   | 18   |
| <b>Applications:</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| <b>Capital Expenditures</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| <b>Recurring Costs</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Working Capital Increase  | 0    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Debt Service  | 11   | 18   | 18   | 18   | 17   | 17   | 17   | 17   | 17   | 17   | 16   | 14   | 14   | 14   | 14   | 14   |      |      |      |
| Dividend Distribution   | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 2    | 2    | 5    | 5    | 5    | 4    | 4    | 4    | 13   | 6    | 6    |
| Cash Increase (Decrease)  | 8    | 1    | 1    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | -2   | 1    | 1    | 1    | 1    | 1    | 5    | 12   | 12   |
| Total Applications  | 22   | 21   | 21   | 21   | 20   | 20   | 20   | 20   | 20   | 19   | 19   | 19   | 19   | 19   | 19   | 18   | 18   | 18   | 18   |
| <b>Balance Sheet Items</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| <b>Assets</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Current Assets  | 16   | 17   | 18   | 19   | 19   | 20   | 20   | 21   | 21   | 22   | 20   | 20   | 21   | 22   | 22   | 23   | 28   | 40   | 51   |
| Less Current Liabilities  | 11   | 11   | 11   | 12   | 12   | 12   | 13   | 13   | 14   | 14   | 12   | 12   | 13   | 13   | 14   | 1    | 1    | 1    | 1    |
| Net Current Assets or Working   | 5    | 6    | 7    | 7    | 8    | 7    | 7    | 7    | 8    | 8    | 8    | 8    | 8    | 8    | 9    | 22   | 27   | 39   | 50   |
| Net Fixed & Other Long Term   | 307  | 296  | 285  | 274  | 264  | 253  | 242  | 231  | 220  | 209  | 198  | 187  | 176  | 165  | 155  | 144  | 133  | 122  | 111  |
| Total Net Assets  | 313  | 303  | 292  | 282  | 271  | 260  | 249  | 238  | 227  | 217  | 206  | 195  | 185  | 174  | 163  | 166  | 160  | 161  | 161  |
| <b>Debt and Equity</b>  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Long Term Debt  | 164  | 154  | 143  | 132  | 121  | 110  | 98   | 85   | 73   | 60   | 49   | 37   | 25   | 13   |      |      |      |      |      |
| Equity  | 149  | 149  | 149  | 150  | 150  | 150  | 151  | 153  | 155  | 157  | 158  | 158  | 159  | 161  | 163  | 166  | 160  | 161  | 161  |
| Total L/T Debt and Equity   | 313  | 303  | 292  | 282  | 271  | 260  | 249  | 238  | 227  | 217  | 206  | 195  | 185  | 174  | 163  | 166  | 160  | 161  | 161  |
| <b>Financial Ratios</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Operating Income as a % of  | 42   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   | 39   |
| Net Income as a % of Revenue  | 9    | 7    | 8    | 9    | 11   | 12   | 13   | 14   | 16   | 17   | 18   | 20   | 21   | 22   | 23   | 25   | 26   | 26   | 26   |
| Return on Equity  | 1.8  | 1.4  | 1.6  | 1.8  | 2.0  | 2.3  | 2.5  | 2.7  | 2.9  | 3.1  | 3.4  | 3.6  | 3.8  | 4.0  | 4.2  | 4.3  | 4.7  | 4.7  | 4.7  |
| Debt Service Coverage   | 2.5  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.7  | 1.9  | 1.9  | 1.9  | 1.9  |      |      |      |      |
| Current Ratio   | 1.5  | 1.6  | 1.6  | 1.6  | 1.6  | 1.6  | 1.6  | 1.6  | 1.6  | 1.5  | 1.7  | 1.7  | 1.7  | 1.6  | 1.6  | 28.4 | 34.5 | 48.8 | 63.2 |
| Total Debt as % of Total  | 54   | 52   | 51   | 49   | 47   | 45   | 42   | 39   | 36   | 32   | 28   | 24   | 19   | 14   | 8    | 0    | 1    | 1    | 1    |

## Note:

- All data is forecasted.
- Debt Service Coverage Ratio DCSR2 in the previous discussion i.e.  $DCSR2 = \frac{\text{internal sources before interest} + \text{debt reserve fund}}{\text{the principal repayment} + \text{interest}}$
- Debt Ratio (Total Debt as percent of Total Capitalization) is defined as the total debt (including current liability and long-term debt) divided by total debt and equity.
- There is a government grant of ¥ 51.819 million to Xiakou subproject for flood control benefits. It is included as "other assets" and therefore part of equity in Balance Sheet, which impacts the return on total equity (in an accounting sense).

### Main Assumptions on Calculation of Average Tariffs

#### Loan Terms

**World Bank:** front-end fee is 1 percent, interest rate is 4.35 percent, twenty year term of which the grace period is 5 years, equal annuity repayment

**Local loan:** interest rate is 6.21 percent, 30 years term.

#### Financing Plan

Unit: Thousand RMB Yuan

|                         | Dongping       | Najitan        | Songzhuling    | Xiakou         |
|-------------------------|----------------|----------------|----------------|----------------|
| World Bank Loan         | 411,729        | 233,770        | 227,144        | 146,292        |
| Local Loan              | 197,979        | 73,129         | 70,000         | 30,004         |
| Equity Investment       | 200,000        | 76,725         | 81,676         | 44,500         |
| Government Contribution |                |                |                | 51,819         |
| <b>Total Investment</b> | <b>809,708</b> | <b>383,624</b> | <b>378,821</b> | <b>272,614</b> |

Excludes transmission lines for Dongping, Songshuling and Najitan which are included as part of overall project costs (funded by project companies) but for which tariff will be calculated separately.

#### Operation Date and Energy Sales

The operation dates are based on construction schedules included in bid documents; energy sales are as provided by design institutes.

| Units Number                   | Dongping      | Najitan       | Songshuling   | Xiakou       |
|--------------------------------|---------------|---------------|---------------|--------------|
| 1                              | 2006.1.31     | 2005.5.27     | 2005.1.30     | 2005.4.30    |
| 2                              | 2006.3.31     | 2005.7.29     | 2005.2.28     | 2005.6.30    |
| 3                              |               | 2005.9.29     | 2005.3.30     |              |
| 4                              |               |               | 2005.3.30     |              |
| <b>Annual Operation Hours</b>  | <b>2928</b>   | <b>4147</b>   | <b>3078</b>   | <b>2763</b>  |
| <b>Energy Generation (GWh)</b> | <b>322.08</b> | <b>149.29</b> | <b>153.90</b> | <b>82.89</b> |

#### Operation Costs

The operation costs are provided by Hubei Province Pricing Bureau, which are average of existing power plants in grid. It is 5.017 fen/kWh (constant price in 2000) for hydropower plants with unit capacity above 25 MW, and 8.72 fen/ kWh for plants with unit capacity below 25 MW.

Operating costs are assumed to increase with local inflation rate until commissioning.

**Taxes**

|                         | Unit     | Dongping | Najitan | Songzhuling | Xiakou |
|-------------------------|----------|----------|---------|-------------|--------|
| Income Tax              | %        | 33       | 33      | 33          | 33     |
| VAT                     | %        | 17       | 17      | 17          | 17     |
| Urban Construction Fees | % on VAT | 1        | 1       | 1           | 1      |
| Education Tax           | % on VAT | 3        | 3       | 3           | 3      |

**Statutory Funds**

Public reserve fund 10 percent of net income after tax, the welfare fund is 5 percent of net income after tax.

## Notes to Financial Analysis

**(a) Loan Terms****World Bank**

Front-end fee 1 percent

Interest rate is 4.35 percent

Commitment fee is 0.85 percent on undisbursed balance for first 4 years, 0.75 percent thereafter Maturity 20 years of which, the grace period is 5 years, equal annuity repayment.

**Domestic Loans**

|                                      | Dongping                  | Najitan    | Songshuling  | Xiakou     |
|--------------------------------------|---------------------------|------------|--------------|------------|
| Type of Domestic Loan                | Commercial                | Commercial | Preferential | Commercial |
| Loan Term (years)                    | 15                        | 15         | 20           | 15         |
| Grace Period (included in loan term) | 5                         | 4          | 6            | 4          |
| Interest Rate                        | 6.1%                      | 6.21%      | 4%           | 6.21%      |
| Debt Repayment Method                | Equal Principal Repayment |            |              |            |

**(b) Operation Costs\***

|                                 | Unit      | Dongping | Najitan | Songshuling | Xiakou |
|---------------------------------|-----------|----------|---------|-------------|--------|
| Depreciation Rate               | %         | 4        | 4       | 4           | 4      |
| Material cost                   | Yuan/kW   | 5        | 5       | 5           | 5      |
| Reservoir Maintenance Cost      | Yuan/kWh  | 0.001    | 0.001   | 0.001       | 0.001  |
| Water Resources Charge          | Yuan/kWh  | 0.003    | 0.003   | 0.004       | 0.004  |
| Annual Wages                    | Yuan/Year | 7000     | 7300    | 7000        | 7000   |
| Staff Number                    | number    | 373      | 98      | 136         | 232    |
| Welfare                         | %         | 14       | 14      | 14          | 14     |
| Medical and Retirement          | %         | 29       | 29      | 29          | 29     |
| Repair cost (as % of cap. cost) | %         | 1        | 1       | 1           | 1      |
| Administration Cost             | Yuan/kW   | 24       | 24      | 24          | 24     |
| Others Cost                     | Yuan/kWh  |          |         | 0.015       |        |

Note: All prices are at price level of 2000.

It is assumed the wage will increase 2 percent per year above local inflation rate based on above 2000 level prices until the subprojects begin operation. Material cost and administration cost are assumed to escalate with local inflation rate until the subprojects begin operation.



**(c) Income Tax**

|            | Unit | Dongping | Najitan | Songzhuling | Xiakou |
|------------|------|----------|---------|-------------|--------|
| Income Tax | %    | 33*      | 33*     | 33          | 33     |

Since Dongping and Najitan subprojects are located in Enshi Autonomous Prefecture of Hubei Province, which is defined as part of Western China, a favorable income tax policy applies to these two projects. According to this policy, tax is levied at the rate of 15 percent from year 2001 to 2010. Also, the power companies are exempt from income tax for the first two years after commercial operation, and levied at half rate for the next three years.

**(d) Accounts Receivable** are estimated to be 15 days sales revenue (including VAT), and **Accounts Payable** are estimated at 45 days' cash operating expenses (including VAT).

**Annex 6: Procurement and Disbursement Arrangements**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

**Procurement**

**Procurement Organization**

1. The procurement will be conducted by the following parties:
  - CNTIC International Tendering Company (ITC): ITC was selected through a competitive process as the procurement agent for the project. It will be responsible for the overall administration of the procurement, including preparation of bidding documents (commercial part and integration with the technical part), advertising, handling the bidding process, organization of bid evaluation (including selection of evaluation committee members) and preparation of evaluation report, contract negotiations and execution;
  - Hubei Provincial PMO: to provide overall coordination of procurement;
  - Project Companies: as project owners, to participate in the procurement process, including review of bidding documents (particular the technical specifications), to participate in bid evaluation (as a member of evaluation committee); to be responsible for procurement through shopping procedures;
  - Design institutes: two design institutes are involved – the Hubei Investigation and Design Institute (HIDI) is responsible for project design and providing basic data for technical specifications; while the Design Institute of Changjiang Water Resources Commission (CWRC) is responsible for reviewing the data and preparing the technical part of the bidding documents.

**Summary of Procurement Capacity Assessment**

2. The Project is the 32nd project financed by the Bank in the Hubei Province. The provincial and county governments are fully supportive to the project through Provincial Financial Bureau (HPFB) and other provincial agencies. HPFB has accumulated disbursement experience on the Bank financed projects. But the Provincial PMO and the four project companies have little experience with the Bank financed procurement. As a temporary organization, staff of PMO are from existing government departments. Under assistance of the experienced procurement agent and design institutes and with support & supervision by provincial & county governments, the agencies are expected to fulfill its procurement function to meet the requirements. There is no integrated national public procurement law in China and there are some deviations in the internal NCB procedures, such as bracketing and merit point system used in prequalification and bid evaluation. To this end, a supplemental letter will be signed by the government together with the Loan Agreement. The risk associated with the procurement process is assessed as high.
3. The following local rules or NCB practices are not in line with the Bank's guidelines:
  - Invited bidding is used even for some large contracts. There are sector protection in some areas, such as railway contracts are always awarded to railway contractors.

- The construction units from outside a province are required to register in the Construction Market Management Office before they sign any contracts in the province. This stipulation mainly applies to building construction.
- The merit point system is used. Mostly local funded civil works contracts are awarded to so called reasonable bids which are those close to the Engineer's cost estimate.
- The bids of 5% higher or 8% lower than the Engineer's cost estimates will be rejected. Bracketing is widely used in the government internal procurement practices for civil works contracts.
- Short bid preparation periods (20 days are allowed in the Bidding Law). For example, advertisement for prequalification of underground power house of Longtan Hydropower Project in Guangxi (used to be a Bank financed project) appeared in Economic Daily on July 19, 2001. The closing date was August 2, 2001, only 14 days for applicants to response.
- Charging relatively high prices more than printing cost for bidding documents.
- Bidding advertising in TV, radio and other media are also accepted.
- Requesting bid security and performance security for procurement of consultant services.
- Pre-register in ministries are mandatory for bid.
- Some times bids are opened later than deadline of bid submission, although it is not allowed in the Bidding Law.

4. In order to help the implementing agencies to undertake the Bank financed procurement in an efficient and transparent way, there is a need to strengthen the capacity of the implementing agencies and overcome the weakness identified during the procurement capacity assessment, the following action plan is proposed to the agencies:

|   | Proposed Action Plan  | Due Date   |
|---|---|--|
| 1 | Individual implementing agencies would enhance procurement capacity by appointing experienced staff dedicated for procurement activities. Adequate qualified procurement staff at each level should be on board by appraisal.   | By appraisal (completed)                                     |
| 2 | The PMO would complete a detailed procurement plan including a detail procurement contract packaging, cost estimation, time table and equipment list for civil works, goods and consultant services to be procured under the project by the time of appraisal.  | By appraisal (completed)                                     |
| 3 | The PMO would complete a procurement manual for county implementing agencies describing all the procurement procedures to be followed and responsibility of each organization handling procurement for the easy reference of all procurement staff.   | By loan signing  |
| 4 | The PMO would organize periodically, procurement training seminars and workshops for procurement staff in the individual implementing agencies. On the job training shall be conducted for all staff from time to time to strengthen the agency's capacity to implement the procurement for the project.                          | First one in July 2001, more shall follow.                   |
| 5 | The individual implementing agencies would create a file management system to file all procurement information for the project until 2 or 3 years after loan closing.   | End of 2001 (completed)                                      |
| 6 | Key procurement staff shall have systematical training on procurement, English and computer etc. for 3 months or more in a local or international training program. These activities could be financed under the project.   | Find available training program                              |
| 7 | Since most bidders for civil works are expected from China and there are no handy indices available regularly in China, PMO shall identify source of price indices for those contracts more than 18 months long.  | Before bidding for contracts >18 months (completed)          |
| 8 | The construction schedule is related to the dry season and wet season. PMO shall complete the bidding documents for 4 power stations, particularly for 5 NCB contracts and send them to the Bank for review in September 2001, so that the river closure for river diversion works could be achieved in November 2002 as planned. | Send bidding documents to Bank in September 2001 (completed) |
| 9 | Supplemental letter for NCB procurement to be discussed and signed during Loan negotiation.   | Before & during negotiation (completed)                      |

### Procurement Arrangements

5. All goods, works and consultant services to be financed under the Bank loan will be procured in accordance with the Bank Guidelines ("Guidelines- Procurement under IBRD Loans and IDA Credits", January 1995, revised in January and August 1996, September 1997 and January 1999; and "Guidelines for Selection and Employment of Consultants by World Bank Borrowers", January 1997, revised in September 1997 and January 1999). Project costs by procurement arrangements are summarized in Table A below.

6. For procurement of civil works through International Competitive Bidding (ICB), Bank Standard Prequalification Document for Procurement of Works (September 1999, revised March 2000), the Chinese Model Bidding Documents for Civil Works (ICB) (MBD, May 1997) developed by MOF and approved by the Bank, and the Bank Standard Bid Evaluation Form for Procurement of Goods or Works (April 1996), will be used. In procurement of civil works through National Competitive Bidding (NCB), the Chinese MBD for Civil Works (NCB) (May 1997) will be used.

7. For procurement of goods through ICB, the Chinese MBD for Procurement of Goods (ICB) (May 1997) and Bank Standard Bid Evaluation Forms for Procurement of Goods and Works (April 1996) will be used. For major E/M equipment (such as turbines and generators), the Bank Standard Bidding Documents (SBD) for Supply and Installation of Plant and Equipment (November 1997, revised January 1999) will be tailored as Supply and Installation Supervision to suit the specific needs. In evaluation of the bids following ICB procedures, qualified domestic manufacturers of goods would be eligible for a margin of preference of 15 percent of the Cost, Insurance and Freight (CIF) price or the actual customs duty, whichever is lower. In procurement of goods through NCB, the Chinese MBD for Procurement of Goods (NCB) (May 1997) would be used.

8. For employment of consultants, the Bank's Standard Request for Proposals dated July 1997, Revised April 1998 and July 1999 will be used.

9. The invitation to bid for each contract estimated to cost US\$10 million equivalent or more shall be advertised in accordance with the procedures applicable to large contracts under paragraph 2.8 of the Bank's Procurement Guidelines. Advertisements inviting expressions of interest for consultancy contracts above US\$200,000 will also be published in Development Business according to the procedures applicable to large-value contracts under paragraph 2.5 of the Bank's Guidelines for Selection of Consultants.

10. **Civil Works and Goods:** The Bank loan will be mainly used to finance procurement of main civil works (dams, power houses) and equipment & materials for the hydro power plants and associated substations & transmission lines. Civil works contracts estimated to cost more than \$10 million will be subject to ICB and those contracts estimated to cost less than \$10 million will be subject to NCB. Goods contracts estimated to cost more than \$300,000 will be subject to ICB, while those contracts estimated to cost less than \$300,000 but more than \$100,000 will be subject to NCB; and those contracts estimated to cost less than \$100,000 (auxiliary equipment and materials) may be procured through national shopping procedures. Since the main electrical and mechanical equipment is still in the design stage, the associated auxiliary equipment and materials can not be defined with specifications and quantities at this stage. It is estimated that such auxiliary equipment should cost not more than \$100,000 per individual equipment (with majority of them cost much less) and the total cost should be below \$2.5 million. Given the nature of such equipment and materials, their much diversified types and low cost, as well as their availability from more than one source in the national market at high quality and very competitive prices, it is proposed that such equipment and materials will be procured through national shopping procedures. A preliminary list of such equipment and materials is included in Table A1.

11. Some preparatory civil works, well within the capability of the local contractors, will be financed by the implementing agencies and procured following local competitive bidding procedures. Based on the current cost estimates, two out of the four dams (Dongping and Songshuling, which account for about 50% of the total civil works value) will be procured through ICB. Other civil works will be procured through NCB. Prequalification has been carried out for ICB and the larger NCB contracts. For goods, ICB is expected to be used for most packages (about 90 percent of equipment and material value to be financed

under the Bank loan will be procured through ICB). Procurement packages for civil works and goods with estimated costs and procurement methods are summarized in Table A1.

12. **Services:** The Bank loan will be mainly used to finance consultant services related to quality assurance and dam safety, institutional development and poverty alleviation enhancement. These services include: (a) development of power plant operational procedures & systems (one contract); (b) study on preparation for operation (one contract); (c) poverty alleviation planning study (one contract); (d) individual consultants for poverty alleviation (2-3 expatriates); (e) independent evaluation for resettlement (one contract); (f) consultant services for training and study tours (4 contracts); (g) panel of experts (6-8 multi-year individual contracts); and (h) adjudicator for ICB/NCB civil works (1-2 multi-year individual contracts). In addition, the Bank loan will finance direct cost of training and study tours for the borrower's personnel. Selection of consultants for contract estimated to cost more than \$100,000 will be carried out through Quality and Cost Based Selection (QCBS). Other consulting services expected to cost less than US\$100,000 per contract may be procured following procedures for Selection Based on Consultants' Qualifications (appropriate qualifications and references from an established short list) or Single-Source Selection as defined under the Bank Guidelines.

13. In line with the above provisions, and based on the current cost estimates, it is expected that the consultant services for preparation for operations will be procured under QCBS procedures; while services for development of power plant operational procedures & systems and for poverty alleviation planning study may be procured through Single-Source Selection procedures given the necessity of continuity with earlier services (all were financed under the PHRD grant and procured through the Bank procedures) during the project preparation stage -- the development of power plant procedures & systems should be based on the preliminary design finished by consultants; and the poverty alleviation plan should also be developed on the basis of the survey & study on poverty alleviation in the project areas conducted by a local research institute. Independent consultant for resettlement evaluation would also be appointed through Single-Source Selection procedures because of the small contract value (less than \$80,000). Training & study tours would encompass various regions including both developed and developing countries to seek out best operational practice for plants of the size range covered by the Project. It is expected that a consulting firm would be appointed as a training manager for each region, and the appointment would be made based on Consultants' Qualifications, as each contract value will be small (less than \$50,000). The Panel of Experts have already been hired under PHRD grant during the preparation stage and their services will be continued during project implementation under the Bank loan financing (separate contract for each individual expert, each contract will cost less than \$50,000). Individual consultant for poverty alleviation (expatriates) and adjudicators for ICB/NCB civil works (local experts) would be appointed following the procedures for Selection of Individual Consultants. Consultant services with cost estimates and selection methods are summarized in Table A2.

14. Procurement schedules for main civil works (dams, power houses) & equipment (turbines and generators), as well as for key consultant services are summarized in Table A3.

15. **Prior Review Thresholds (Table B).** Prior review of draft prequalification & bidding documents, prequalification & bid evaluation reports and contract award recommendations will be carried out for all civil works contracts above \$2,000,000 and for all goods (equipment & materials) contracts exceeding US\$200,000. Such prior review will cover all the ICB and NCB civil works contracts and about 90 percent of all goods contracts. Selective post-review will apply to other contracts during supervision missions based on a ratio of one out of three contracts. For consultant services, prior review of the terms-of-reference, cost estimates, selection criteria, consultant shortlist, request for proposals, evaluation reports and contract award recommendations, as well as contracts, will be required for all consultant

contracts with an estimated cost exceeding US\$100,000 per contract for firms, and US\$50,000 per contract for individuals.

**Procurement methods (Table A)**

**Table A: Project Costs by Procurement Arrangements**  
(US\$ million equivalent)

| Expenditure Category                   | Procurement Method |                  |                  |                 | Total Cost         |
|--|--------------------|------------------|------------------|-----------------|--------------------|
|  | ICB                | NCB              | Other            | N.B.F.          |                    |
| <b>1. Works</b>                        | 58.00<br>(37.95)   | 41.91<br>(26.00) | 0.00<br>(0.00)   | 16.07<br>(0.00) | 115.98<br>(63.95)  |
| <b>2. Goods</b>                        | 29.28<br>(25.50)   | 0.65<br>(0.50)   | 2.75<br>(2.50)   | 14.62<br>(0.00) | 47.30<br>(28.50)   |
| <b>3. Services</b>                     | 0.00<br>(0.00)     | 0.00<br>(0.00)   | 1.62<br>(1.34)   | 10.19<br>(0.00) | 11.81<br>(1.34)    |
| <b>4. Miscellaneous</b>                | 0.00<br>(0.00)     | 0.00<br>(0.00)   | 0.00<br>(0.00)   | 28.26<br>(0.00) | 28.26<br>(0.00)    |
| <b>5. Interest during construction</b> | 0.00<br>(0.00)     | 0.00<br>(0.00)   | 18.01<br>(10.16) | 0.00<br>(0.00)  | 18.01<br>(10.16)   |
| <b>6. Front-end fee</b>                | 0.00<br>(0.00)     | 0.00<br>(0.00)   | 1.05<br>(1.05)   | 0.00<br>(0.00)  | 1.05<br>(1.05)     |
| <b>Total</b>                           | 87.28<br>(63.45)   | 42.56<br>(26.50) | 23.43<br>(15.05) | 69.14<br>(0.00) | 222.41<br>(105.00) |

<sup>1/</sup> Figures in parenthesis are the amounts to be financed by the Bank Loan. All costs include contingencies.

<sup>2/</sup> Includes civil works and goods to be procured through national shopping, consulting services, and training & study tours.

<sup>3/</sup> N.B.F. -- Not Bank Financed.

**Table A1: Procurement Packaging**

**1. Civil Works**

| Package No.                          | Description                                | Estimated Cost (C'000) | Procurement Method | Remark |
|--------------------------------------|--|------------------------|--------------------|--------|
| <b><i>Dongping Subproject</i></b>    |  |                        |                    |        |
| DPC1                                 | Preliminary works                          | 6,200                  | NBF                |        |
| DPC2                                 | Dam, powerhouse, installation              | 34,000                 | ICB                | PQ     |
| DPC3                                 | Diversion tunnel                           | 515                    | NBF                |        |
| DPC4                                 | Access road                                | 508                    | NBF                |        |
| <b><i>Najitan Subproject</i></b>     |  |                        |                    |        |
| NJTC1                                | Dam and metal structure erection           | 9,900                  | NCB                | PQ     |
| NJTC2                                | Power tunnel/house, equipment installation | 9,800                  | NCB                | PQ     |
| <b><i>Songshuling Subproject</i></b> |  |                        |                    |        |
| SSLC1                                | Dam, power house, installation             | 14,650                 | ICB                | PQ     |
| SSLC2                                | Preliminary works                          | 2,420                  | NCB                |        |
| SSLC4                                | Road re-route                              | 1,450                  | NBF                |        |
| SSLC5                                | Communication, power supply, temp house    | 265                    | NBF                |        |
| <b><i>Xiakou Subproject</i></b>      |  |                        |                    |        |
| XKC1                                 | Dam and metal structure erection           | 9,180                  | NCB                | PQ     |
| XKC2                                 | Power tunnel/house, equipment installation | 3,780                  | NCB                | PQ     |
| XKC3                                 | Preliminary works                          | 1,207                  | NBF                |        |



**2. Goods (main equipment and materials) – ICB (with exception of Dongping, who will procure all goods using its own financing)**

| Package No.   | Description                              | Estimated Cost (\$'000) | Procurement Method | Remark                                       |
|---|--|-------------------------|--------------------|--|
| <b>DPEM1 (Turbine &amp; Generator for Dongping)</b>     |  | <b>5,150</b>            | <b>NBF</b>         | Slice and packages, possible four contracts  |
| DPEM1-1   | Turbine, Generator (2 units)             | 4,350                   |                    |  |
| DPEM1-2   | Governor system (2 units)                | 115                     |                    |  |
| DPEM1-3   | Main valves (2 units)                    | 440                     |                    |  |
| DPEM1-4   | Exciter system (2 units)                 | 250                     |                    |  |
| <b>SSLEM2 (Turbine &amp; Generator for Songshuling)</b> |  | <b>6,230</b>            | <b>ICB</b>         | Slice and packages, possible four contracts  |
| SSLEM2-1  | Turbine, Generator (4 units)             | 4,850                   |                    |  |
| SSLEM2-2  | Governor system (4 units)                | 215                     |                    |  |
| SSLEM2-3  | Main valves (4 units)                    | 1,000                   |                    |  |
| SSLEM2-4  | Exciter system (4 units)                 | 165                     |                    |  |
| <b>XKEM3 (Turbine &amp; Generator for Xiakou)</b>       |  | <b>2,041</b>            | <b>ICB</b>         | Slice and packages, possible four contracts  |
| XKEM3-1   | Turbine, Generator (2 units)             | 1,510                   |                    |  |
| XKEM3-2   | Governor system (2 units)                | 97                      |                    |  |
| XKEM3-3   | Main valves (2 units)                    | 269                     |                    |  |
| XKEM3-4   | Exciter system (2 units)                 | 165                     |                    |  |
| <b>NJTEM4 (Turbine &amp; Generator for Najitan)</b>     |  | <b>4,328</b>            | <b>ICB</b>         | Slice and packages, possible three contracts |
| NJTEM4-1  | Turbine, Generator (3 units)             | 4,080                   |                    |  |
| NJTEM4-2  | Governor system (3 units)                | 190                     |                    |  |
| NJTEM4-3  | Main valves                              | Not needed              |                    |  |
| NJTEM4-4  | Exciter system (3 units)                 | 58                      |                    |  |
| <b>JDEM5 (Bridge cranes)</b>                            |  | <b>850</b>              | <b>ICB</b>         |  |
| JDEM5   | Bridge crane for Dongping                | 360                     | <b>NBF</b>         |  |
|   | Bridge crane for Songshuling             | 166                     |                    |  |
|   | Bridge crane for Xiakou                  | 158                     |                    |  |
|   | Bridge crane for Najitan                 | 166                     |                    |  |
| <b>JDEM6 (Electrical Equipment - I)</b>                 |  |                         |                    |  |
| JDEM6-1   | 220kV transformer for Dongping (2 units) | 1,080                   | <b>NBF</b>         |  |
| JDEM6-2   | 110kV transformers                       | <b>920</b>              | <b>ICB</b>         |  |
|   | -- for Songshuling (2 units)             | 410                     |                    |  |
|   | -- for Xiakou                            | 205                     |                    |  |
|   | -- for Najitan (2 units)                 | 305                     |                    |  |
| JDEM6-3   | 220kV HV GIS for Dongping                | 1,565                   | <b>NBF</b>         |  |

|  |                               |       |     |  |
|--|-------------------------------|-------|-----|--|
| JDEM6-4                                  | 110kV HV electrical equipment | 551   | ICB |  |
|  | -- for Dongping               | 168   | NBF |  |
|  | -- for Songshuling            | 135   |     |  |
|  | -- for Xiakou                 | 84    |     |  |
|  | -- for Najitan                | 164   |     |  |
| JDEM6-5                                  | Switchboard, etc.             | 1,036 | ICB |  |
|  | -- for Dongping               | 480   | NBF |  |
|  | -- for Songshuling            | 240   |     |  |
|  | -- for Xiakou                 | 138   |     |  |
|  | -- for Najitan                | 178   |     |  |
| JDEM6-6                                  | Transformer for own use       | 228   | ICB |  |
|  | -- for Dongping               | 100   | NBF |  |
|  | -- for Songshuling            | 36    |     |  |
|  | -- for Xiakou                 | 42    |     |  |
|  | -- for Najitan                | 50    |     |  |
| <b>JDEM7 (Electrical equipment – II)</b> |                               |       |     |  |
| JDEM7-1                                  | Computer control equipment    | 2,116 | ICB |  |
|  | -- for Dongping               | 730   | NBF |  |
|  | -- for Songshuling            | 380   |     |  |
|  | -- for Xiakou                 | 660   |     |  |
|  | -- for Najitan                | 346   |     |  |
| JDEM7-2                                  | Communication equipment       | 665   | ICB |  |
|  | -- for Dongping               | 265   | NBF |  |
|  | -- for Songshuling            | 60    |     |  |
|  | -- for Xiakou                 | 70    |     |  |
|  | -- for Najitan                | 260   |     |  |
| JDEM7-3                                  | Alarm system equipment        | 190   | ICB |  |
|  | -- for Dongping               | 95    | NBF |  |
|  | -- for Songshuling            | 25    |     |  |
|  | -- for Xiakou                 | 50    |     |  |
|  | -- for Najitan                | 20    |     |  |

|                                   |                    |              |     |  |
|-----------------------------------|--------------------|--------------|-----|--|
| <b>JDEM8 (Metal structures)</b>   |                    |              |     |  |
| JDEM8-1                           | Gate               | <b>5,911</b> | ICB |  |
|                                   | -- for Dongping    | 1,855        | NBF |  |
|                                   | -- for Songshuling | 1,135        |     |  |
|                                   | -- for Xiakou      | 1,146        |     |  |
|                                   | -- for Najitan     | 1,775        |     |  |
| JDEM8-2                           | Hoist              | <b>3,500</b> | ICB |  |
|                                   | -- for Dongping    | 1,290        | NBF |  |
|                                   | -- for Songshuling | 490          |     |  |
|                                   | -- for Xiakou      | 710          |     |  |
|                                   | -- for Najitan     | 1,010        |     |  |
| <b>JDEM9 (Transmission lines)</b> |                    | <b>2,826</b> | ICB |  |
|                                   | -- for Dongping    | 1,158        |     |  |
|                                   | -- for Songshuling | 962          |     |  |
|                                   | -- for Xiakou      | NBF          |     |  |
|                                   | -- for Najitan     | 706          |     |  |

### 3. Goods (auxillary equipment and materials) – NCB/Shopping

| Package No.        | Description   | Quantity | Estimated Cost (\$'000) | Remark       |
|--------------------|---|----------|-------------------------|--------------|
| <b>Dongping</b>    |   | Total    | <b>1,603</b>            | NBF          |
| <b>Songshuling</b> |   | Total    | <b>1,230</b>            |              |
|                    | Water system (valves, pumps, gauges)                  | 338      | 690                     | NCB/Shopping |
|                    | Oil system (valves, pumps, gauges)                    | 102      | 85                      | Shopping     |
|                    | Turbine oil, insulation oil                           | 92 (ton) | 35                      | Shopping     |
|                    | Air compressing equipment                             | 211      | 190                     | NCB/Shopping |
|                    | Ventilation and heating equipment                     | 28       | 34                      | Shopping     |
|                    | Machine tools   | 28       | 34                      | Shopping     |
|                    | Domestic water supply equipment                       | 1        | 6                       | Shopping     |
|                    | Environmental protection equipment                    | 1        | 48                      | Shopping     |
|                    | Monitoring/observation equipment (hydrology, regimen) | 1        | 48                      | Shopping     |
|                    | Transport equipment (vehicles)                        | 3        | 60                      | Shopping     |
| <b>Xiakou</b>      |   | Total    | <b>458</b>              |              |
|                    | Water system (valves, pumps, gauges)                  | 299      | 92                      | Shopping     |

|                |   |              |            |              |
|----------------|---|--------------|------------|--------------|
|                | Oil system (valves, pumps, gauges)                    | 134          | 56         | Shopping     |
|                | Turbine oil, insulation oil                           | 25 (ton)     | 7          | Shopping     |
|                | Air compressing equipment                             | 144          | 26         | Shopping     |
|                | Ventilation and heating equipment                     | 18           | 10         | Shopping     |
|                | Machine tools   | 34           | 23         | Shopping     |
|                | Electrical testing equipment                          | 13           | 32         | Shopping     |
|                | Fire fighting equipment                               | 18           | 48         | Shopping     |
|                | Environmental protection equipment                    | 1            | 13         | Shopping     |
|                | Monitoring/observation equipment (hydrology, regimen) | 1            | 52         | Shopping     |
|                | Transport equipment (vehicles)                        | 4            | 99         | Shopping     |
| <b>Najitan</b> |   | <b>Total</b> | <b>467</b> |              |
|                | Water system (valves, pumps, gauges)                  | 379          | 133        | NCB/Shopping |
|                | Oil system (valves, pumps, gauges)                    | 144          | 39         | Shopping     |
|                | Turbine oil, insulation oil                           | 35 (ton)     | 9          | Shopping     |
|                | Air compressing equipment                             | 171          | 68         | Shopping     |
|                | Ventilation and heating equipment                     | 36           | 25         | Shopping     |
|                | Machine tools   | 19           | 28         | Shopping     |
|                | Electrical testing equipment                          | 12           | 24         | Shopping     |
|                | Fire fighting equipment                               | 15           | 18         | Shopping     |
|                | Hydraulic measuring equipment                         | 45           | 48         | Shopping     |
|                | Monitoring/observation equipment (hydrology, regimen) | 1            | 15         | Shopping     |
|                | Transport equipment (vehicles)                        | 3            | 60         | Shopping     |

**Table A2: Consultant Services**

| <i>Consultant Services Description</i>  | <i>Estimated Cost (\$000)</i> | <i>Selection Method</i> |
|---|-------------------------------|-------------------------|
| 1. Development of power plant operational procedures & systems (one contract) | 80                            | SS                      |
| 2. Study on preparation for operation (one contract)                          | 120                           | QCBS                    |
| 3. Poverty alleviation planning study (one contract)                          | 80                            | SS                      |
| 4. Individual consultants for poverty alleviation (2-3 expatriates)           | 100                           | Individual              |
| 5. Independent evaluation for resettlement (one contract)                     | 80                            | SS                      |
| 6. Consultant service for training and study tours (4 contracts)              | 124                           | CQ                      |
| 7. Panel of Experts (6-8 multi-year contracts)                                | 260                           | Individual              |
| 8. Adjudicator for ICB/NCB civil works (1-2 multi-year contracts)             | 77                            | Individual              |

Note: 1/ Based on the latest agreement between the Bank and GOC, the Bank financing percentage for the above consulting services will be 91%;

2/ In addition to the above, an amount of \$467,000 has been estimated to cover the cost of training & study tours for the borrower, which the Bank loan will finance at 100%;

3/ All the above costs excluding contingencies, thus the aggregate amount is less than the corresponding Bank financing amount stated in Table A.

4/ SS – Single-Source Selection;  
 QCBS – Quality and Cost Based Selection;  
 CQ – Selection Based on Consultants' Qualifications

Table A3: Procurement Schedule

General

| Key Implementation Steps   | COMPLETION DATE |
|--|-----------------|
| Publication of GPN in UNDB #531                                    | 03/31/00        |
| Selection of consultant for preparation of bidding doc (technical) | 06/30/00        |
| Selection of procurement agent (CNTIC ITC)                         | 06/30/00        |

Dongping Subproject (main civil works & goods)

| Key Implementation Steps   | COMPLETION DATE |
|--|-----------------|
| <b><i>Prequalification for main civil works (dam, power house) - ICB</i></b> |                 |
| Completion of prequalification documents                                     | 07/30/00        |
| WB review and non-objection  | 08/16/00        |
| SPN in UNDB (#541)   | 08/31/00        |
| SPN in China Daily   | 09/15/00        |
| Issuance of prequalification documents                                       | 09/15/00        |
| Deadline for submission of applications                                      | 11/01/00        |
| Borrower evaluation & clarification  | 12/10/01        |
| WB review and non-objection  | 01/18/02        |
| <b><i>Procurement of main civil works (dam, power house) - ICB</i></b>       |                 |
| Completion of bidding documents  | 01/11/02        |
| WB review and non-objection  | 04/15/02        |
| Issuance of bidding documents to prequalified contractors                    | 04/22/02        |
| Bid submission   | 06/21/02        |
| Bid evaluation (including Government review)                                 | 07/15/02        |
| WB review and non-objection  | 07/31/02        |
| Contract award   | 08/15/02        |
| <b><i>Procurement of main E/M equipment (turbines, generators) - ICB</i></b> |                 |
| Completion of bidding documents  | 01/01/03        |
| WB review and non-objection  | 02/28/03        |
| SPN (UNDB & local newspaper)   | 03/15/03        |
| Issuance of bidding documents  | 03/15/03        |
| Bid submission   | 05/15/03        |
| Bid evaluation (including Government review)                                 | 07/31/03        |
| WB review and non-objection  | 08/31/03        |
| Contract award   | 09/30/03        |
| Equipment manufacturing & delivery   | 04/30/05        |
| <b><i>Construction Progress</i></b>  |                 |
| River Diversion  | 11/01/02        |
| Commencement of installation of main E/M equipment                           | 05/01/05        |
| <b><i>Commissioning and operation</i></b>                                    |                 |
| 1 <sup>st</sup> unit in service  | 01/31/06        |
| 2 <sup>nd</sup> unit in service  | 03/31/06        |
| <b><i>Final Completion</i></b>   | 12/30/06        |

**Najitan Subproject (main civil works & goods)**

| Key Implementation Steps   | Completion Date |
|--|-----------------|
| <b><i>Prequalification for main civil works (dam, power house) - NCB</i></b> |                 |
| Completion of prequalification documents                                     | 07/30/01        |
| WB review and non-objection  | 08/30/01        |
| SPN in China Daily   | 09/15/01        |
| Issuance of prequalification documents                                       | 09/15/01        |
| Deadline for submission of applications                                      | 10/15/01        |
| Borrower evaluation  | 11/20/01        |
| WB review and non-objection  | 11/21/01        |
| <b><i>Procurement of main civil works (dam, power house) - NCB</i></b>       |                 |
| Completion of bidding documents  | 11/28/01        |
| WB review and non-objection  | 12/11/01        |
| Issuance of bidding documents to prequalified contractors                    | 12/15/01        |
| Bid submission   | 01/20/02        |
| Bid evaluation (including Government review)                                 | 03/30/02        |
| WB review and non-objection  | 04/30/02        |
| Contract award   | 05/30/02        |
| <b><i>Procurement of main E/M equipment (turbines, generators) - ICB</i></b> |                 |
| Completion of bidding documents  | 05/15/02        |
| WB review and non-objection  | 06/25/02        |
| SPN (UNDB & local newspaper)   | 07/15/02        |
| Issuance of bidding documents  | 07/15/02        |
| Bid submission   | 09/15/02        |
| Bid evaluation (including Government review)                                 | 11/30/02        |
| WB review and non-objection  | 12/30/02        |
| Contract award   | 01/30/03        |
| Equipment manufacturing & delivery   | 06/30/04        |
| <b><i>Construction Progress</i></b>  |                 |
| River Diversion  | 11/01/02        |
| Commencement of installation of main E/M equipment                           | 10/29/04        |
| <b><i>Commissioning and operation</i></b>                                    |                 |
| 1 <sup>st</sup> unit in service  | 05/27/05        |
| 2 <sup>nd</sup> unit in service  | 07/29/05        |
| 3 <sup>rd</sup> unit in service  | 09/29/05        |
| <b><i>Final Completion</i></b>   | <b>06/30/06</b> |

**Songshuling Subproject (main civil works & goods)**

| <b>Key Implementation Steps</b>  | <b>Completion Date</b> |
|--|------------------------|
| <b><i>Prequalification for main civil works (dam, power house) - ICB</i></b> |                        |
| Completion of prequalification documents                                     | 07/30/00               |
| WB review and non-objection  | 08/16/00               |
| SPN in UNDB (#541)   | 08/31/00               |
| SPN in China Daily   | 09/15/00               |
| Issuance of prequalification documents                                       | 09/15/00               |
| Deadline for submission of applications                                      | 11/01/00               |
| Borrower evaluation  | 12/10/01               |
| WB review and non-objection  | 01/18/02               |
| <b><i>Procurement of main civil works (dam, power house) - ICB</i></b>       |                        |
| Completion of bidding documents  | 01/11/02               |
| WB review and non-objection  | 04/15/02               |
| Issuance of bidding documents to prequalified contractors                    | 04/22/02               |
| Bid submission   | 06/21/02               |
| Bid evaluation (including Government review)                                 | 07/15/02               |
| WB review and non-objection  | 07/31/02               |
| Contract award   | 08/15/02               |
| <b><i>Procurement of main E/M equipment (turbines, generators) - ICB</i></b> |                        |
| Completion of bidding documents  | 05/15/02               |
| WB review and non-objection  | 06/25/02               |
| SPN (UNDB & local newspaper)   | 07/15/02               |
| Issuance of bidding documents  | 07/15/02               |
| Bid submission   | 09/15/02               |
| Bid evaluation (including Government review)                                 | 11/30/02               |
| WB review and non-objection  | 12/30/02               |
| Contract award   | 01/30/03               |
| Equipment manufacturing & delivery   | 06/30/04               |
| <b><i>Construction Progress</i></b>  |                        |
| River Diversion  | 11/01/02               |
| Commencement of installation of main E/M equipment                           | 11/01/04               |
| <b><i>Commissioning and operation</i></b>                                    |                        |
| 1 <sup>st</sup> unit in service  | 02/28/05               |
| 2 <sup>nd</sup> unit in service  | 03/31/05               |
| 3 <sup>rd</sup> unit in service  | 04/30/05               |
| 4 <sup>th</sup> unit in service  | 05/31/05               |
| <b><i>Final Completion</i></b>   | <b>12/30/05</b>        |



**Xiakou Subproject (main civil works & goods)**

| <b>Key Implementation Steps</b>  | <b>Completion Date</b> |
|--|------------------------|
| <b><i>Prequalification for main civil works (dam, power house) - NCB</i></b> |                        |
| Completion of prequalification documents                                     | 07/30/01               |
| WB review and non-objection  | 08/30/01               |
| SPN in China Daily   | 09/15/01               |
| Issuance of prequalification documents                                       | 09/15/01               |
| Deadline for submission of applications                                      | 10/15/01               |
| Borrower evaluation  | 11/20/01               |
| WB review and non-objection  | 11/21/01               |
| <b><i>Procurement of main civil works (dam, power house) - NCB</i></b>       |                        |
| Completion of bidding documents  | 11/28/01               |
| WB review and non-objection  | 12/11/01               |
| Issuance of bidding documents to prequalified contractors                    | 12/15/01               |
| Bid submission   | 01/20/02               |
| Bid evaluation (including Government review)                                 | 02/15/02               |
| WB review and non-objection  | 04/30/02               |
| Contract award   | 05/30/02               |
| <b><i>Procurement of main E/M equipment (turbines, generators) - ICB</i></b> |                        |
| Completion of bidding documents  | 05/15/02               |
| WB review and non-objection  | 06/25/02               |
| SPN (UNDB & local newspaper)   | 07/15/02               |
| Issuance of bidding documents  | 07/15/02               |
| Bid submission   | 09/15/02               |
| Bid evaluation (including Government review)                                 | 11/30/02               |
| WB review and non-objection  | 12/30/02               |
| Contract award   | 01/30/03               |
| Equipment manufacturing & delivery   | 04/30/04               |
| <b><i>Construction Progress</i></b>  |                        |
| River Diversion  | 11/01/02               |
| Commencement of equipment installation                                       | 05/01/04               |
| <b><i>Commissioning and operation</i></b>                                    |                        |
| 1 <sup>st</sup> unit in service  | 04/30/05               |
| 2 <sup>nd</sup> unit in service  | 06/30/05               |
| <b><i>Final Completion</i></b>   | <b>12/30/05</b>        |

**Main Consultant Services (single-sourcing)**

| <b>Key Steps</b>                                  | <b>Plant Operational Procedures &amp; System</b> | <b>Poverty Alleviation Planning Study</b> |
|---|--|---|
| Completion of TOR preparation                     | 09/30/03   | 09/30/03                                  |
| WB non-objection to TOR & single-source selection | 10/31/03   | 10/31/03                                  |
| Submission of proposals by consultant             | 11/30/03   | 11/30/03                                  |
| Completion of contract negotiation                | 12/31/03   | 12/31/03                                  |
| WB review and non-objection to draft contract     | 01/31/04   | 01/31/04                                  |
| Contract signing                                  | 02/28/04   | 02/28/04                                  |
| Mobilization of consultants                       | 03/31/04   | 03/31/04                                  |
| Completion of assignment and final report         | 12/31/04   | 12/31/04                                  |

**Prior review thresholds (Table B)**

**Table B: Thresholds for Procurement Methods and Prior Review <sup>1</sup>**

| <b>Expenditure Category</b> | <b>Contract Value Threshold (US\$)</b> | <b>Procurement Method</b>  | <b>Contracts Subject to Prior Review (US\$)</b> |
|-----------------------------|--|----------------------------|---|
| <b>1. Works</b>             | >10,000,000<br><10,000,000             | ICB<br>NCB                 | >2,000,000                                      |
| <b>2. Goods</b>             | >300,000<br><300,000<br><100,000       | ICB<br>NCB<br>Shopping     | >200,000  |
| <b>3. Services</b>          | >100,000<br><100,000                   | QCBS<br>CQ, SS, Individual | 100,000 for firm<br>50,000 for individual       |
| <b>4. Miscellaneous</b>     |  |                            |   |

**Total value of contracts subject to prior review: > 90%.**

**Overall Procurement Risk Assessment**

**High**

**Frequency of procurement supervision missions proposed:** One every six months (includes special procurement supervision for post-review/audits)

Post review/audits ratio will be one in three contracts, which will be carried out together with SOE review. The review thresholds, ratio and frequency are selected based on the Bank's experience in other similar projects and findings of the procurement capacity assessments.

<sup>1</sup> Thresholds generally differ by country and project. Consult OD 11.04 "Review of Procurement Documentation" and contact the Regional Procurement Adviser for guidance.

## **Disbursement**

### **Allocation of loan proceeds (Table C)**

1. The Bank loan will be disbursed against : (i) 65 percent of civil works procured through ICB or NCB; (ii) 100 percent of the foreign expenditures for directly imported equipment and materials quoted on a CIF basis; (iii) 100 percent of local expenditures ex-factory for locally manufactured items; (iv) 75 percent of local expenditure for other items procured locally; and (v) 91 percent of the expenditure for consulting services, and 100 percent for study tours and training.
2. The estimated annual disbursement schedule is shown in the Project Financing Data in page 1 and detailed in the PIP (available in the project file). It was based on the project implementation schedule and is in line with Bank experience of hydro power projects. The disbursements are expected to be completed in six years from 2002 to 2008. The project completion date is expected to be June 30, 2008 and the loan closing date December 31, 2008.
3. Retroactive financing in an aggregated amount of \$10 million, or 9.5 percent of the loan amount, would be provided for anticipated expenditures (for preliminary civil works such as access roads and diversion tunnels) incurred after November 15, 2001 and before the signing of the loan.
4. Bank approval of the Environmental Management Plans for the respective transmission lines associated with the four project components is a condition of disbursement for the corresponding category (Categories 3(a), (b), (c) and (d)).

**Table C: Allocation of Loan Proceeds**

| Category |                                 | Amount of the Loan Allocated (US\$) | Disbursement %   |
|----------|---------------------------------|-------------------------------------|--|
| (1)      | Works                           |                                     |  |
|          | (a) Under Part A of the Project | 22,470,000                          | 65%  |
|          | (b) Under Part B of the Project | 12,810,000                          |  |
|          | (c) Under Part C of the Project | 10,870,000                          |  |
|          | (d) Under Part D of the Project | 8,200,000                           |  |
|          | Subtotal                        | 54,350,000                          |  |
| (2)      | Goods (other than T/L)          |                                     |  |
|          | (a) Under Part A of the Project | --                                  | 100% of foreign expenditures<br>100% of local expenditures (EXW)<br>75% of local expenditures for other items procured locally |
|          | (b) Under Part B of the Project | 8,100,000                           |  |
|          | (c) Under Part C of the Project | 9,430,000                           |  |
|          | (d) Under Part D of the Project | 4,750,000                           |  |
|          | Subtotal                        | 22,280,000                          |  |
| (3)      | Goods (T/L)                     |                                     |  |
|          | (a) Under Part A of the Project | 1,160,000                           | 100% of foreign expenditures<br>100% of local expenditures (EXW)<br>75% of local expenditures for other items procured locally |
|          | (b) Under Part B of the Project | 710,000                             |  |
|          | (c) Under Part C of the Project | 970,000                             |  |
|          | (d) Under Part D of the Project | --                                  |  |
|          | Subtotal                        | 2,840,000                           |  |
| (4)      | Consultants' services           |                                     |  |
|          | (a) Under Part A of the Project | 190,000                             | 91%  |
|          | (b) Under Part B of the Project | 190,000                             |  |
|          | (c) Under Part C of the Project | 290,000                             |  |
|          | (d) Under Part D of the Project | 190,000                             |  |
|          | Subtotal                        | 860,000                             |  |
| (5)      | Training and study tours        |                                     |  |
|          | (a) Under Part A of the Project | 120,000                             | 100%   |
|          | (b) Under Part B of the Project | 120,000                             |  |
|          | (c) Under Part C of the Project | 120,000                             |  |
|          | (d) Under Part D of the Project | 120,000                             |  |
|          | Subtotal                        | 480,000                             |  |
| (6)      | IDC and other charges           |                                     |  |
|          | (a) Under Part A of the Project | 3,490,000                           | 100%   |
|          | (b) Under Part B of the Project | 2,560,000                           |  |
|          | (c) Under Part C of the Project | 2,610,000                           |  |
|          | (d) Under Part D of the Project | 1,500,000                           |  |
|          | Subtotal                        | 10,160,000                          |  |

|     |                                 |                    |  |
|-----|---------------------------------|--------------------|--|
| (7) | Unallocated                     |                    |  |
|     | (a) Under Part A of the Project | 4,250,000          |  |
|     | (b) Under Part B of the Project | 3,230,000          |  |
|     | (c) Under Part C of the Project | 3,430,000          |  |
|     | (d) Under Part D of the Project | 2,070,000          |  |
|     | Subtotal                        | 12,980,000         |  |
| (8) | Front-end fee                   |                    |  |
|     | (a) Under Part A of the Project | 320,000            | Amount due under Section 2.04<br>of this Agreement |
|     | (b) Under Part B of the Project | 280,000            |  |
|     | (c) Under Part C of the Project | 280,000            |  |
|     | (d) Under Part D of the Project | 170,000            |  |
|     | Subtotal                        | 1,050,000          |  |
|     | <b>Grand Total</b>              | <b>105,000,000</b> |  |
|     | Part A -- Dongping              | 32,000,000         |  |
|     | Part B -- Najitan               | 28,000,000         |  |
|     | Part C -- Songshuling           | 28,000,000         |  |
|     | Part D -- Xiakou                | 17,000,000         |  |

**Use of statements of expenditures (SOEs):**

For expenditures pertaining to civil works contracts valued at less than \$2,000,000, goods contracts valued at less than US\$200,000, and consultancy contracts valued at less than US\$100,000 for firms and US\$50,000 for individuals and all training, reimbursement will be made on the basis of Statement of Expenditures. Supporting documents need not be submitted to the Bank but will be retained in the PMO office for review by the Bank supervision missions.

**Special account:**

To facilitate disbursement under this project, a Special Account will be established for all the four subprojects with an authorized allocation of \$10 million in US currency, representing approximately four months of project disbursements in the peak expenditure year. Applications for replenishment will be submitted in line with the provisions of Schedule 4 of the Loan Agreement.

**Annex 7: Project Processing Schedule**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

| <b>Project Schedule</b>                           | <b>Planned</b> | <b>Actual</b> |
|---|----------------|---------------|
| <b>Time taken to prepare the project (months)</b> | 16             | 28            |
| <b>First Bank mission (Identification)</b>        | 02/20/2000     | 02/20/2000    |
| <b>Appraisal mission departure</b>                | 02/26/2001     | 11/15/2001    |
| <b>Negotiations</b>                               | 04/12/2001     | 04/22/2002    |
| <b>Planned Date of Effectiveness</b>              | 09/30/2001     | 09/30/2002    |

**Prepared by:**

Hubei Government and Project Companies

**Preparation assistance:**

PHRD funds to Borrower

Canadian, Australian and Netherlands Trust Funds to Bank

**Bank staff who worked on the project included:**

| <b>Name</b>       | <b>Speciality</b>                                  |
|-------------------|--|
| Barry Trembath    | Power Engineering (TTL)                            |
| Jianping Zhao     | Energy Sector (co-TTL)                             |
| Yuling Zhou       | Project implementation, cost estimate, procurement |
| Dawei Yang        | Procurement  |
| Chau-Ching Shen   | Financial Management                               |
| Zong-Cheng Lin    | Social Development                                 |
| Clifford Garstang | Lawyer   |
| Simon Bradury     | Disbursements                                      |
| Scott Hanna       | Environment (consultant)                           |
| Youxuan Zhu       | Resettlement (consultant)                          |
| Ximing Peng       | Generation Planning (consultant)                   |
| Wenjie Wang       | Financial Analysis (consultant)                    |
| Dennis Creamer    | Hydropower Engineering (consultant)                |
| Teri Velilla      | Team Assistant                                     |
| Chungxiang Zhang  | Team Assistant                                     |
| Jie Tang          | Young Professional                                 |

**Annex 8: Documents in the Project File\***  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

**A. Project Implementation Plan**

Updated version May 2002.

**B. Bank Staff Assessments**

Detailed Cost Estimates.

**C. Other**

Economic Evaluation on Hubei Small Hydropower Project in Hubei Power Grid  
SP Power Economic Research Center, August 2001

The Impact of Small Hydropower Projects in Poverty Alleviation in Hubei Province  
Assessment Group of Rural Development Institute, Chinese Academy of Sciences, August 2, 2001

Financial Analysis on Hubei Province Generation Expansion Strategy Project,  
Weng Wenjie, State Power, Economic Research Center, August, 2001

Financial Analysis on Hubei Province Generation Expansion Strategy Project,  
Weng Wenjie, State Power, Economic Research Center, December, 2001

Financial Analysis on Hubei Province Generation Expansion Strategy Project,  
Weng Wenjie, State Power, Economic Research Center, January, 2002

Documents in Infoshop:

Summary Environmental Assessment  
Environmental Assessment Report (EIA) - 4 power plants  
Resettlement Action Plan (RAP) - 4 power plants  
Aquatic Ecological Assessment  
Resettlement Policy Framework - Transmission Lines  
EIA Report - Transmission Lines Component  
Social Assessment for Dongping and Najitan

\*Including electronic files

**Annex 9: Statement of Loans and Credits**  
**CHINA: Hubei Hydropower Development in Poor Areas Project**

| Project ID | FY   | Purpose                              | Original Amount in US\$ Millions |        |       |         | Difference between expected and actual disbursements* |        |           |
|------------|------|--------------------------------------|----------------------------------|--------|-------|---------|---|--------|-----------|
|            |      |                                      | IBRD                             | IDA    | GEF   | Cancel. | Undisb.   | Orig   | Frm Rev'd |
| P045915    | 2001 | URUMQI URB.TRANSP                    | 100.00                           | 0.00   | 0.00  | 0.00    | 99.00   | 14.05  | 0.00      |
| P058845    | 2001 | JIANGXI II HWY                       | 200.00                           | 0.00   | 0.00  | 0.00    | 200.00  | 0.00   | 0.00      |
| P047345    | 2001 | CH-HUAI RIVER POLLUTION CONTROL      | 105.50                           | 0.00   | 0.00  | 0.00    | 105.50  | 0.00   | 0.00      |
| P056596    | 2001 | SHIJIAZHUANG URBAN TRANSPORT PROJECT | 100.00                           | 0.00   | 0.00  | 0.00    | 100.00  | 12.13  | 0.00      |
| P056516    | 2001 | WATER CONSERVATION                   | 74.00                            | 0.00   | 0.00  | 0.00    | 72.54   | 6.14   | 0.00      |
| P056199    | 2001 | 3RD INLAND WATERWAYS                 | 100.00                           | 0.00   | 0.00  | 0.00    | 100.00  | 0.17   | 0.00      |
| P051859    | 2001 | CH-LIAO RIVER BASIN                  | 100.00                           | 0.00   | 0.00  | 0.00    | 100.00  | 0.00   | 0.00      |
| P058844    | 2000 | 3RD HENAN PROV HWY                   | 150.00                           | 0.00   | 0.00  | 0.00    | 142.50  | -2.17  | 0.00      |
| P058843    | 2000 | GUANGXI HWY Project                  | 200.00                           | 0.00   | 0.00  | 0.00    | 191.65  | 21.32  | 0.00      |
| P049436    | 2000 | CN-CHONGQING URBAN ENVIRONMENT       | 200.00                           | 0.00   | 0.00  | 0.00    | 198.00  | 10.57  | 0.00      |
| P064730    | 2000 | Yangtze Dike Strengthening Project   | 210.00                           | 0.00   | 0.00  | 0.00    | 198.90  | 39.32  | 0.00      |
| P056424    | 2000 | TONGBAI PUMPED STORA                 | 320.00                           | 0.00   | 0.00  | 0.00    | 320.00  | 24.73  | 0.00      |
| P045910    | 2000 | CH-HEBEI URBAN ENVIRONMENT           | 150.00                           | 0.00   | 0.00  | 0.00    | 142.52  | 6.19   | 0.00      |
| P045264    | 2000 | SMALLHLDR CATTLE DEV                 | 93.50                            | 0.00   | 0.00  | 0.00    | 81.54   | 27.02  | 0.00      |
| P042109    | 2000 | CH-BEIJING ENVIRONMENT II            | 349.00                           | 0.00   | 25.00 | 0.00    | 359.28  | 37.12  | 0.00      |
| P049665    | 1999 | ANNING VALLEY AG.DEV                 | 90.00                            | 30.00  | 0.00  | 0.00    | 72.66   | 6.34   | 0.00      |
| P003653    | 1999 | CONTAINER TRANSPORT                  | 71.00                            | 0.00   | 0.00  | 3.13    | 57.73   | 60.20  | 0.00      |
| P050036    | 1999 | ANHUI PROVINCIAL HWY                 | 200.00                           | 0.00   | 0.00  | 0.00    | 139.88  | 27.33  | 0.00      |
| P043933    | 1999 | CH-SICHUAN URBAN ENVIRONMENT         | 150.00                           | 2.00   | 0.00  | 0.00    | 100.88  | 17.22  | -0.33     |
| P051705    | 1999 | FUJIAN II HWY                        | 200.00                           | 0.00   | 0.00  | 0.00    | 168.21  | 64.46  | 0.00      |
| P046564    | 1999 | WESTERN POVERTY RED                  | 60.00                            | 100.00 | 0.00  | 0.00    | 122.63  | 29.65  | 0.00      |
| P046829    | 1999 | RENEWABLE ENERGY DEVELOPMENT         | 100.00                           | 0.00   | 35.00 | 0.00    | 13.00   | 40.00  | 0.00      |
| P046051    | 1999 | CN-HIGHER EDUC. REFORM               | 20.00                            | 50.00  | 0.00  | 0.00    | 32.21   | 25.36  | 0.00      |
| P041890    | 1999 | LIAONING URB TRANSP                  | 150.00                           | 0.00   | 0.00  | 0.00    | 107.15  | 50.42  | 0.00      |
| P042299    | 1999 | TEC COOP CREDIT IV                   | 10.00                            | 35.00  | 0.00  | 0.00    | 39.91   | -2.55  | 0.00      |
| P036953    | 1999 | CN-HEALTH IX                         | 10.00                            | 50.00  | 0.00  | 0.00    | 50.95   | 8.79   | 0.00      |
| P051856    | 1999 | ACCNTG REFORM & DEV                  | 27.40                            | 5.60   | 0.00  | 0.00    | 24.86   | 21.76  | 0.00      |
| P056216    | 1999 | LOESS PLATEAU II                     | 100.00                           | 50.00  | 0.00  | 0.00    | 113.34  | 44.31  | 0.00      |
| P057352    | 1999 | CN-RURAL WATER SUPPLY IV             | 16.00                            | 30.00  | 0.00  | 0.00    | 39.94   | 11.36  | 0.00      |
| P058308    | 1999 | CN-PENSION REFORM PJT                | 0.00                             | 5.00   | 0.00  | 0.00    | 4.36  | 4.18   | 0.00      |
| P063123    | 1999 | YANGTZE FLOOD EMERGY                 | 40.00                            | 40.00  | 0.00  | 0.00    | 7.00  | 7.95   | 7.95      |
| P060270    | 1999 | ENTERPRISE REFORM LN                 | 0.00                             | 5.00   | 0.00  | 0.00    | 4.64  | 6.66   | 0.00      |
| P041268    | 1999 | NAT.HWY4-HUBEI/HUNAN                 | 350.00                           | 0.00   | 0.00  | 0.00    | 256.75  | 39.42  | 0.00      |
| P051888    | 1999 | GUANZHONG IRRIGATION                 | 80.00                            | 20.00  | 0.00  | 0.00    | 76.99   | 25.39  | 0.00      |
| P045788    | 1998 | TRI-PROVINCIAL HWY                   | 230.00                           | 0.00   | 0.00  | 0.00    | 125.36  | 57.13  | 0.00      |
| P037859    | 1998 | EGY CONSERVATION PRO                 | 0.00                             | 0.00   | 22.00 | 0.00    | 10.87   | 19.97  | 0.00      |
| P003539    | 1998 | SUST COAST RES DEV                   | 100.00                           | 0.00   | 0.00  | 0.00    | 66.96   | 28.63  | 0.00      |
| P036949    | 1998 | NAT.HWY 3-HUBEI                      | 250.00                           | 0.00   | 0.00  | 0.00    | 118.19  | 8.19   | 0.00      |
| P003566    | 1998 | CN-BASIC HEALTH (HLTH8)              | 0.00                             | 85.00  | 0.00  | 0.00    | 56.11   | 19.41  | 0.00      |
| P035698    | 1998 | HUNAN POWER DEVELOP.                 | 300.00                           | 0.00   | 0.00  | 100.00  | 187.20  | 173.45 | -5.70     |
| P036414    | 1998 | CH-GUANGXI URBAN ENVIRONMENT         | 72.00                            | 20.00  | 0.00  | 0.00    | 82.70   | 36.26  | 0.00      |
| P040185    | 1998 | CH-SHANDONG ENVIRONMENT              | 95.00                            | 0.00   | 0.00  | 0.00    | 46.04   | 31.18  | 0.00      |
| P049700    | 1998 | IAIL-2                               | 300.00                           | 0.00   | 0.00  | 0.00    | 132.45  | 25.14  | 0.00      |
| P003606    | 1998 | ENERGY CONSERVATION                  | 63.00                            | 0.00   | 22.00 | 0.00    | 54.78   | 9.93   | 0.00      |
| P003619    | 1998 | 2ND INLAND WATERWAYS                 | 123.00                           | 0.00   | 0.00  | 0.00    | 105.66  | 65.75  | 0.00      |
| P051736    | 1998 | E. CHINA/JIANGSU PWR                 | 250.00                           | 0.00   | 0.00  | 0.00    | 186.46  | 180.95 | 146.10    |
| P046952    | 1998 | FOREST. DEV. POOR AR                 | 100.00                           | 100.00 | 0.00  | 0.00    | 131.08  | -6.94  | 50.68     |
| P003614    | 1998 | GUANGZ. CITY CRT.TRP                 | 200.00                           | 0.00   | 0.00  | 0.00    | 130.81  | 116.75 | 0.00      |
| P046563    | 1998 | TARIM BASIN II                       | 90.00                            | 60.00  | 0.00  | 0.00    | 99.12   | 52.02  | 0.00      |
| P003591    | 1998 | STATE FARMS COMMERC                  | 150.00                           | 0.00   | 0.00  | 80.91   | 8.45  | 51.63  | 8.24      |
| P036952    | 1997 | CN-BASIC ED. IV                      | 0.00                             | 85.00  | 0.00  | 0.00    | 4.07  | 2.51   | 0.00      |
| P036405    | 1997 | WANJIAZHAI WATER TRA                 | 400.00                           | 0.00   | 0.00  | 75.00   | 80.81   | 80.98  | 8.98      |
| P003635    | 1997 | CN-VOC. ED. REFORM PROJ              | 10.00                            | 20.00  | 0.00  | 0.00    | 2.88  | 3.18   | 0.00      |
| P035693    | 1997 | FUEL EFFICIENT IND.                  | 0.00                             | 0.00   | 32.80 | 0.00    | 10.97   | 32.81  | 0.00      |



| Project ID | FY   | Purpose                             | Original Amount in US\$ Millions |         |        |         |         | Difference between expected and actual disbursements <sup>a</sup> |           |
|------------|------|-------------------------------------|----------------------------------|---------|--------|---------|---------|---|-----------|
|            |      |                                     | IBRD                             | IDA     | GEF    | Cancel. | Undisb. | Orig  | Frm Rev'd |
|            |      |                                     |                                  |         |        |         |         |   |           |
| P003590    | 1987 | QINBA MOUNTAINS POVERTY REDUCTION   | 30.00                            | 150.00  | 0.00   | 0.00    | 92.09   | 78.17   | 0.00      |
| P003650    | 1997 | TUOKETUO POWER/INNER                | 400.00                           | 0.00    | 0.00   | 102.50  | 222.01  | 287.05  | 12.10     |
| P044485    | 1997 | SHANGHAI WAIGAOQIAO                 | 400.00                           | 0.00    | 0.00   | 0.00    | 337.94  | 141.94  | 42.49     |
| P003643    | 1997 | XINJIANG HWY II                     | 300.00                           | 0.00    | 0.00   | 60.00   | 98.33   | 143.33  | -6.67     |
| P003637    | 1997 | CH-NATIONAL RURAL WATER III         | 0.00                             | 70.00   | 0.00   | 0.00    | 38.08   | 28.20   | 23.32     |
| P003654    | 1997 | HUNAN/GUANG HWY2-NH2                | 400.00                           | 0.00    | 0.00   | 0.00    | 162.12  | 125.46  | 0.00      |
| P034081    | 1997 | XIAOLANGDI MULTI. II                | 430.00                           | 0.00    | 0.00   | 0.00    | 152.71  | 176.75  | 0.00      |
| P036988    | 1997 | HEILONGJIANG ADP                    | 120.00                           | 0.00    | 0.00   | 0.00    | 38.78   | 24.07   | 0.00      |
| P040513    | 1996 | 2ND HENAN PROV HWY                  | 210.00                           | 0.00    | 0.00   | 0.00    | 129.66  | 116.33  | 2.67      |
| P003646    | 1996 | CN-CHONGQING IND POL CT             | 170.00                           | 0.00    | 0.00   | 164.82  | 3.00    | 161.15  | -0.05     |
| P003569    | 1996 | SHANGHAI-ZHEJIANG HI                | 260.00                           | 0.00    | 0.00   | 53.34   | 19.12   | 72.46   | 3.33      |
| P003602    | 1996 | CH-HUBEI URBAN ENVIRONMENT          | 125.00                           | 25.00   | 0.00   | 28.32   | 69.85   | 97.73   | 28.61     |
| P003589    | 1996 | CN-DISEASE PREVENTION (HLTH7)       | 0.00                             | 100.00  | 0.00   | 0.00    | 21.00   | 31.98   | 0.00      |
| P003638    | 1996 | SEEDS SECTOR COMMER.                | 80.00                            | 20.00   | 0.00   | 9.40    | 28.90   | 29.77   | 0.00      |
| P003594    | 1996 | GANSU HEXI CORRIDOR                 | 60.00                            | 90.00   | 0.00   | 0.00    | 99.74   | 53.61   | 0.00      |
| P003599    | 1996 | CH-YUNNAN ENVIRONMENT PROJECT       | 125.00                           | 25.00   | 0.00   | 0.00    | 113.89  | 85.29   | 19.70     |
| P003563    | 1996 | ANIMAL FEED                         | 150.00                           | 0.00    | 0.00   | 127.50  | 2.70    | 130.20  | 1.52      |
| P003507    | 1996 | ERTAN HYDRO II                      | 400.00                           | 0.00    | 0.00   | 0.00    | 2.35    | 7.99  | 0.00      |
| P034618    | 1996 | CN-LABOR MARKET DEV.                | 10.00                            | 20.00   | 0.00   | 0.00    | 15.72   | 18.12   | 0.00      |
| P036950    | 1996 | CN-BASIC ED. POOR III               | 0.00                             | 100.00  | 0.00   | 0.00    | 0.29    | 8.17  | 0.00      |
| P003652    | 1996 | 2ND SHAANXI PROV HWY                | 210.00                           | 0.00    | 0.00   | 0.00    | 57.52   | 57.52   | 0.00      |
| P003649    | 1996 | SHANXI POVERTY ALLEV                | 0.00                             | 100.00  | 0.00   | 0.00    | 13.16   | 12.83   | 0.00      |
| P003648    | 1996 | CH-SHANGHAI SEWERAGE PROJECT II     | 250.00                           | 0.00    | 0.00   | 0.00    | 108.34  | 100.74  | 0.00      |
| P003603    | 1995 | CH-ENTERPRISE HOUSING & SOC SEC REF | 275.00                           | 75.00   | 0.00   | 20.00   | 116.86  | 135.73  | 5.59      |
| P003600    | 1995 | TECHNOLOGY DEVELOPME                | 200.00                           | 0.00    | 0.00   | 3.02    | 51.89   | 49.83   | 0.00      |
| P003598    | 1995 | CH-LIAONING ENVIRONMENT PROJECT     | 110.00                           | 0.00    | 0.00   | 0.00    | 29.08   | 29.08   | 1.67      |
| P003596    | 1995 | YANGTZE BASIN WATER                 | 100.00                           | 110.00  | 0.00   | 0.00    | 4.46    | 7.02  | 0.00      |
| P003585    | 1995 | SHENYANG IND. REFORM                | 175.00                           | 0.00    | 0.00   | 0.00    | 46.21   | 44.55   | 0.00      |
| P003571    | 1995 | RAILWAYS VII                        | 400.00                           | 0.00    | 0.00   | 29.00   | 197.24  | 193.08  | 117.45    |
| P003402    | 1995 | NATURE RESERVE MGMT                 | 0.00                             | 0.00    | 0.00   | 0.00    | 1.26    | 2.72  | 0.00      |
| P036041    | 1995 | FISCAL & TAX REF. &                 | 25.00                            | 25.00   | 0.00   | 0.00    | 6.13    | 8.65  | 4.45      |
| P003647    | 1995 | ECONOMIC LAW REFORM                 | 0.00                             | 10.00   | 0.00   | 0.00    | 4.76    | 5.65  | 0.00      |
| P003639    | 1995 | SOUTHWEST POV. REDUC                | 47.50                            | 200.00  | 0.00   | 0.00    | 34.02   | 58.28   | 0.00      |
| P003642    | 1995 | ZHEJIANG POWER DEVT                 | 400.00                           | 0.00    | 0.00   | 0.00    | 67.16   | 60.79   | 0.00      |
| P036947    | 1995 | SICHUAN TRANSMISSION                | 270.00                           | 0.00    | 0.00   | 65.00   | 45.35   | 110.35  | 25.35     |
| P003634    | 1995 | CN-MATERNAL CHILD HEALT(HLTH6)      | 0.00                             | 90.00   | 0.00   | 0.00    | 6.68    | 10.06   | 0.00      |
| P003593    | 1994 | SONGLIAO PLAIN ADP                  | 0.00                             | 205.00  | 0.00   | 0.00    | 7.61    | 2.39  | 0.00      |
| P003586    | 1994 | CH-SHANGHAI ENVIRONMENT PROJECT     | 160.00                           | 0.00    | 0.00   | 0.00    | 40.75   | 40.75   | 13.98     |
| P003641    | 1994 | YANGZHOU THERMAL POW                | 350.00                           | 0.00    | 0.00   | 0.00    | 16.85   | 16.85   | 6.19      |
| P003644    | 1994 | XIAOLANGDI RESETTLEMENT             | 0.00                             | 110.00  | 0.00   | 0.00    | 16.43   | 14.92   | 0.00      |
| P003609    | 1994 | SICHUAN GAS DEV & CONSERVATION      | 255.00                           | 0.00    | 10.00  | 0.00    | 58.97   | 58.97   | 0.00      |
| P003404    | 1994 | SICHUAN GAS DEV. CON                | 0.00                             | 0.00    | 10.00  | 0.00    | 0.20    | 0.96  | 0.00      |
| P003626    | 1994 | FUJIAN PROV HIGHWAY                 | 140.00                           | 0.00    | 0.00   | 0.00    | 32.02   | 32.02   | 28.07     |
| P003540    | 1994 | LOESS PLATEAU                       | 0.00                             | 150.00  | 0.00   | 0.00    | 4.12    | -5.47   | 0.00      |
| P003557    | 1994 | FOREST RESOURCE DEV                 | 0.00                             | 200.00  | 18.40  | 0.00    | 3.34    | 7.58  | -15.42    |
| P003595    | 1994 | RED SOILS II DEVELOP                | 0.00                             | 150.00  | 0.00   | 0.00    | 16.60   | 12.54   | 13.06     |
| P003473    | 1993 | CH-ZHEJIANG MULTICITIES DEVELOPMENT | 0.00                             | 110.00  | 0.00   | 0.00    | 6.42    | 6.80  | 5.62      |
| P003616    | 1993 | TIANHUANGPING HYDRO                 | 300.00                           | 0.00    | 0.00   | 17.00   | 22.87   | 37.61   | 0.00      |
| P003623    | 1993 | FINANCIAL SECTOR T.A                | 0.00                             | 60.00   | 0.00   | 0.00    | 18.89   | 13.65   | 13.65     |
| P003627    | 1993 | GRAIN DISTRIBUTION P                | 325.00                           | 165.00  | 0.00   | 0.00    | 77.08   | 77.92   | 42.92     |
| P003597    | 1993 | TAIHU BASIN FLOOD CO                | 100.00                           | 100.00  | 0.00   | 0.00    | 4.68    | 0.40  | 0.40      |
| P003632    | 1993 | CN-ENVIRONMENT TECH ASS             | 0.00                             | 50.00   | 0.00   | 0.00    | 6.56    | 7.62  | 7.30      |
| P003592    | 1993 | REF. INSTL.& PREINV                 | 0.00                             | 50.00   | 0.00   | 0.00    | 4.62    | 5.30  | 0.00      |
| P003624    | 1992 | CN-INFECTIOUS DISEASES (HLTH5)      | 0.00                             | 129.60  | 0.00   | 0.00    | 4.89    | 1.38  | 1.34      |
| Total:     |      |                                     | 14621.90                         | 3482.20 | 175.20 | 938.93  | 8264.75 | 4711.60   | 614.54    |

CHINA  
STATEMENT OF IFC's  
Held and Disbursed Portfolio  
May-2001  
In Millions US Dollars

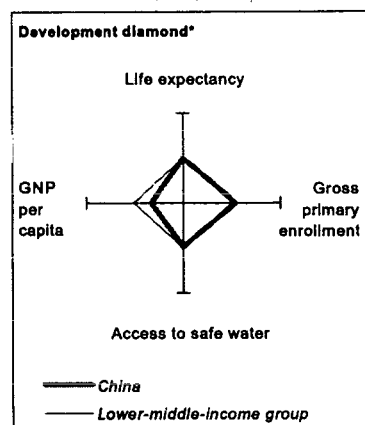
| FY Approval | Company                 | Committed     |               |             |               | Disbursed     |              |             |               |
|-------------|-------------------------|---------------|---------------|-------------|---------------|---------------|--------------|-------------|---------------|
|             |                         | IFC           |               |             |               | IFC           |              |             |               |
|             |                         | Loan          | Equity        | Quasi       | Partic        | Loan          | Equity       | Quasi       | Partic        |
| 1999/00     | Bank of Shanghai        | 0.00          | 3.84          | 0.00        | 0.00          | 0.00          | 3.84         | 0.00        | 0.00          |
| 1996        | Beijing Hormel          | 3.57          | 0.50          | 0.00        | 3.30          | 3.57          | 0.50         | 0.00        | 3.30          |
| 1998/00     | CIG Holdings PLC        | 0.00          | 3.00          | 0.00        | 0.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1996        | Caltex Ocean            | 21.00         | 0.00          | 0.00        | 40.91         | 21.00         | 0.00         | 0.00        | 40.91         |
| 1998        | Chengdu Chemical        | 7.40          | 3.20          | 0.00        | 0.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1998        | Chengxin-IBCA           | 0.00          | 0.36          | 0.00        | 0.00          | 0.00          | 0.36         | 0.00        | 0.00          |
| 1987/92/94  | China Bicycles          | 0.00          | 0.00          | 0.00        | 0.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1994        | China Walden JV         | 0.00          | 3.86          | 0.00        | 0.00          | 0.00          | 3.86         | 0.00        | 0.00          |
| 1994        | China Walden Mgt        | 0.00          | 0.01          | 0.00        | 0.00          | 0.00          | 0.01         | 0.00        | 0.00          |
| 1994        | Dalian Glass            | 0.00          | 2.40          | 0.00        | 0.00          | 0.00          | 2.40         | 0.00        | 0.00          |
| 1999        | Dujiangyan              | 25.59         | 0.00          | 0.00        | 30.00         | 0.00          | 0.00         | 0.00        | 0.00          |
| 1995        | Dupont Suzhou           | 17.13         | 4.15          | 0.00        | 26.00         | 17.13         | 4.15         | 0.00        | 26.00         |
| 1994        | Dynamic Fund            | 0.00          | 10.01         | 0.00        | 0.00          | 0.00          | 8.35         | 0.00        | 0.00          |
| 2000        | Elkem Carbon            | 6.30          | 1.70          | 0.00        | 6.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1999        | Hansom                  | 0.00          | 16.10         | 0.00        | 0.00          | 0.00          | 16.10        | 0.00        | 0.00          |
| 1996        | Jingyang                | 40.00         | 0.00          | 0.00        | 92.31         | 40.00         | 0.00         | 0.00        | 92.31         |
| 1998        | Leshan Scana            | 6.10          | 1.35          | 0.00        | 0.00          | 4.50          | 1.35         | 0.00        | 0.00          |
| 1996        | Nanjing Kumho           | 9.74          | 3.81          | 0.00        | 27.68         | 9.74          | 3.81         | 0.00        | 27.68         |
| 2001        | New China Life          | 0.00          | 30.70         | 0.00        | 0.00          | 0.00          | 23.32        | 0.00        | 0.00          |
| 1995        | Newbridge Inv.          | 0.00          | 2.13          | 0.00        | 0.00          | 0.00          | 2.13         | 0.00        | 0.00          |
| 1997        | Ningbo                  | 0.00          | 0.00          | 0.00        | 0.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1997        | Orient Finance          | 12.38         | 0.00          | 0.00        | 15.48         | 12.38         | 0.00         | 0.00        | 15.48         |
| 1997/00     | PTP Holdings            | 0.00          | 0.03          | 0.00        | 0.00          | 0.00          | 0.03         | 0.00        | 0.00          |
| 1997        | PTP Hubei               | 12.63         | 0.00          | 0.00        | 25.38         | 12.63         | 0.00         | 0.00        | 25.38         |
| 1996        | Pacific Ports           | 0.00          | 3.64          | 0.00        | 0.00          | 0.00          | 3.64         | 0.00        | 0.00          |
| 1998        | Rabobank SHFC           | 1.58          | 0.00          | 0.00        | 1.58          | 1.58          | 0.00         | 0.00        | 1.58          |
| 2000        | SSIF                    | 0.00          | 6.00          | 0.00        | 0.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1998        | Shanghai Krupp          | 30.00         | 0.00          | 0.00        | 68.80         | 0.00          | 0.00         | 0.00        | 0.00          |
| 1999        | Shanxi                  | 19.00         | 0.00          | 0.00        | 0.00          | 8.30          | 0.00         | 0.00        | 0.00          |
| 1993        | Shenzhen PCCP           | 3.76          | 0.99          | 0.00        | 0.00          | 3.76          | 0.99         | 0.00        | 0.00          |
| 1995        | Suzhou PVC              | 18.33         | 2.48          | 0.00        | 18.50         | 18.33         | 2.48         | 0.00        | 18.50         |
| 1998        | WIT                     | 5.00          | 0.00          | 0.00        | 0.00          | 0.00          | 0.00         | 0.00        | 0.00          |
| 1996        | Weihai Weidongri        | 3.03          | 0.00          | 0.00        | 0.00          | 3.03          | 0.00         | 0.00        | 0.00          |
| 1993        | Yantai Cement           | 10.39         | 1.95          | 0.00        | 5.54          | 10.39         | 1.95         | 0.00        | 5.54          |
| 1998        | Zhen Jing               | 0.00          | 2.00          | 0.00        | 0.00          | 0.00          | 2.00         | 0.00        | 0.00          |
|             | <b>Total Portfolio:</b> | <b>252.93</b> | <b>104.21</b> | <b>0.00</b> | <b>361.48</b> | <b>166.34</b> | <b>81.27</b> | <b>0.00</b> | <b>256.68</b> |

| FY Approval                      | Company          | Approvals Pending Commitment |              |              |              |
|----------------------------------|------------------|------------------------------|--------------|--------------|--------------|
|                                  |                  | Loan                         | Equity       | Quasi        | Partic       |
| 2000                             | SBCF I           | 0.00                         | 0.00         | 15.00        | 0.00         |
| 2001                             | Sino-Forest      | 25.00                        | 0.00         | 0.00         | 0.00         |
| 2000                             | Wan Jie Hospital | 15.00                        | 0.00         | 0.00         | 0.00         |
| 2000                             | CIG Zhapu        | 6.00                         | 5.00         | 0.00         | 0.00         |
| 2000                             | CIMIC Tile       | 15.00                        | 5.00         | 0.00         | 15.00        |
| 1997                             | Chinefarge       | 12.80                        | 0.00         | 0.00         | 20.00        |
| 2000                             | Jinfeng          | 9.00                         | 0.00         | 0.00         | 7.30         |
| 1998                             | Orient Fin A Inc | 3.33                         | 0.00         | 0.00         | 0.00         |
| 1998                             | PTP Hubei BLINC  | 0.00                         | 0.00         | 0.00         | 1.50         |
| <b>Total Pending Commitment:</b> |                  | <b>86.13</b>                 | <b>10.00</b> | <b>15.00</b> | <b>43.80</b> |

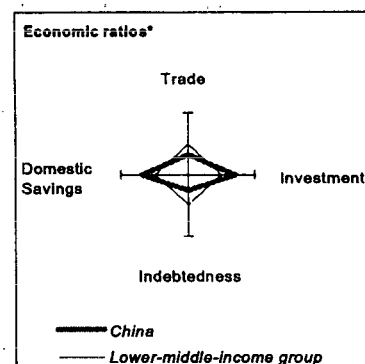
## Annex 10: Country at a Glance

### CHINA: Hubei Hydropower Development in Poor Areas Project

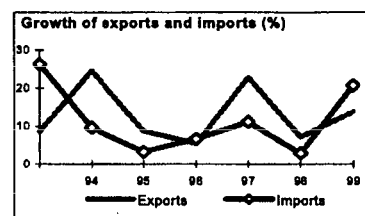
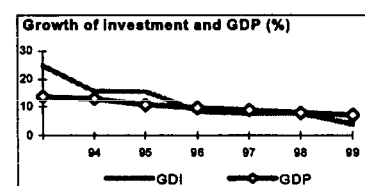
|  | China   | East Asia & Pacific | Lower-middle-income |
|--|---------|---------------------|---------------------|
| <b>POVERTY and SOCIAL</b>                                    |         |                     |                     |
| <b>1999</b>  |         |                     |                     |
| Population, mid-year (millions)                              | 1,253.6 | 1,837               | 2,094               |
| GNP per capita (Atlas method, US\$)                          | 780     | 1,000               | 1,200               |
| GNP (Atlas method, US\$ billions)                            | 977.8   | 1,833               | 2,513               |
| <b>Average annual growth, 1993-99</b>                        |         |                     |                     |
| Population (%)   | 1.0     | 1.2                 | 1.1                 |
| Labor force (%)  | 1.0     | 1.3                 | 1.2                 |
| <b>Most recent estimate (latest year available, 1993-99)</b> |         |                     |                     |
| Poverty (% of population below national poverty line)        | 5       | ..                  | ..                  |
| Urban population (% of total population)                     | 31      | 34                  | 43                  |
| Life expectancy at birth (years)                             | 70      | 69                  | 69                  |
| Infant mortality (per 1,000 live births)                     | 31      | 35                  | 33                  |
| Child malnutrition (% of children under 5)                   | 16      | 22                  | 15                  |
| Access to improved water source (% of population)            | 83      | 84                  | 86                  |
| Illiteracy (% of population age 15+)                         | 17      | 15                  | 16                  |
| Gross primary enrollment (% of school-age population)        | 123     | 119                 | 114                 |
| Male   | 123     | 121                 | 114                 |
| Female   | 123     | 121                 | 116                 |



|   | 1979 | 1989 | 1998  | 1999  |
|---|------|------|-------|-------|
| <b>KEY ECONOMIC RATIOS and LONG-TERM TRENDS</b> |      |      |       |       |
| GDP (US\$ billions)                             | 75.6 | 42.3 | 938.3 | 996.3 |
| Gross domestic investment/GDP                   | 36.5 | 36.0 | 38.8  | 38.3  |
| Exports of goods and services/GDP               | 6.4  | 12.7 | 21.9  | 22.1  |
| Gross domestic savings/GDP                      | 35.3 | 35.3 | 43.2  | 41.2  |
| Gross national savings/GDP                      | 35.5 | 35.4 | 41.9  | 39.9  |
| Current account balance/GDP                     | -1.4 | -0.9 | 3.1   | 1.6   |
| Interest payments/GDP                           | 0.0  | 0.7  | 0.6   | 0.6   |
| Total debt/GDP                                  | 1.2  | 13.1 | 16.5  | 12.8  |
| Total debt service/exports                      | 0.4  | 9.6  | 8.5   | 5.8   |
| Present value of debt/GDP                       | ..   | ..   | 14.4  | ..    |
| Present value of debt/exports                   | ..   | ..   | 63.3  | ..    |
| <b>(average annual growth)</b>                  |      |      |       |       |
| GDP   | 10.3 | 10.5 | 7.8   | 7.1   |
| GNP per capita                                  | 8.9  | 9.0  | 6.7   | 6.3   |
| Exports of goods and services                   | 19.6 | 14.0 | 7.3   | 13.9  |



|                                 | 1979 | 1989 | 1998 | 1999 |
|---------------------------------|------|------|------|------|
| <b>STRUCTURE of the ECONOMY</b> |      |      |      |      |
| <b>(% of GDP)</b>               |      |      |      |      |
| Agriculture                     | 31.2 | 25.0 | 18.6 | 17.3 |
| Industry                        | 47.4 | 43.0 | 49.3 | 49.7 |
| Manufacturing                   | 40.2 | 34.5 | 37.6 | 37.8 |
| Services                        | 21.4 | 32.0 | 32.1 | 32.9 |
| Private consumption             | 49.5 | 52.7 | 44.7 | 45.8 |
| General government consumption  | 15.2 | 12.0 | 12.1 | 12.9 |
| Imports of goods and services   | 7.5  | 13.5 | 17.5 | 19.1 |
| <b>(average annual growth)</b>  |      |      |      |      |
| Agriculture                     | 6.0  | 4.4  | 3.5  | 2.8  |
| Industry                        | 11.3 | 14.2 | 8.9  | 8.1  |
| Manufacturing                   | 10.5 | 13.6 | 8.7  | 7.7  |
| Services                        | 14.0 | 9.0  | 8.3  | 7.5  |
| Private consumption             | 10.1 | 8.7  | 6.2  | 6.3  |
| General government consumption  | 9.9  | 9.8  | 8.4  | 7.9  |
| Gross domestic investment       | 11.0 | 12.0 | 7.6  | 3.8  |
| Imports of goods and services   | 20.4 | 12.2 | 3.0  | 20.7 |
| Gross national product          | 10.5 | 10.2 | 7.8  | 7.3  |

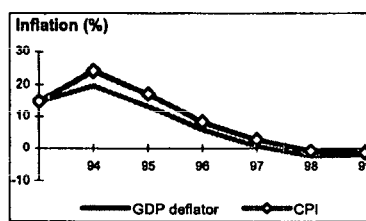


Note: 1999 data are preliminary estimates.

\* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

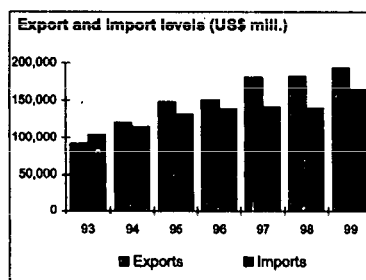
## PRICES and GOVERNMENT FINANCE

|                                     | 1979 | 1989 | 1998 | 1999 |
|-------------------------------------|------|------|------|------|
| <b>Domestic prices</b>              |      |      |      |      |
| (% change)                          |      |      |      |      |
| Consumer prices                     | ..   | 18.0 | -0.8 | -1.4 |
| Implicit GDP deflator               | 3.9  | 8.8  | -2.4 | -2.2 |
| <b>Government finance</b>           |      |      |      |      |
| (% of GDP, includes current grants) |      |      |      |      |
| Current revenue                     | ..   | 19.3 | 13.0 | 14.2 |
| Current budget balance              | ..   | 2.8  | 1.4  | 1.2  |
| Overall surplus/deficit             | -3.4 | -0.9 | -1.2 | -2.1 |



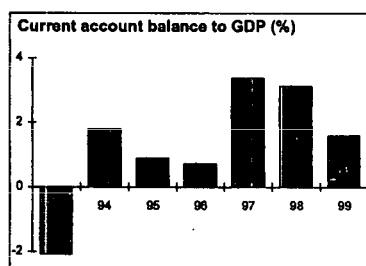
## TRADE

|                               | 1979   | 1989   | 1998    | 1999    |
|-------------------------------|--------|--------|---------|---------|
| (US\$ millions)               |        |        |         |         |
| Total exports (fob)           | 13,658 | 52,551 | 183,529 | 194,931 |
| Food                          | ..     | 6,145  | 10,619  | 10,459  |
| Fuel                          | ..     | 4,321  | 5,181   | 4,646   |
| Manufactures                  | ..     | 37,480 | 163,157 | 175,003 |
| Total imports (cif)           | ..     | 59,140 | 140,166 | 165,718 |
| Food                          | ..     | 4,192  | 3,793   | 3,618   |
| Fuel and energy               | ..     | 1,650  | 6,773   | 8,912   |
| Capital goods                 | ..     | 18,207 | 56,768  | 69,469  |
| Export price index (1995=100) | 25     | 38     | 88      | 81      |
| Import price index (1995=100) | 24     | 38     | 89      | 84      |
| Terms of trade (1995=100)     | 104    | 100    | 99      | 97      |



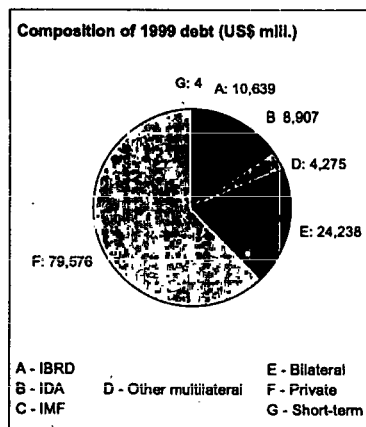
## BALANCE of PAYMENTS

|   | 1979   | 1989   | 1998    | 1999    |
|---|--------|--------|---------|---------|
| (US\$ millions)                         |        |        |         |         |
| Exports of goods and services           | 15,046 | 57,101 | 207,586 | 218,711 |
| Imports of goods and services           | 17,842 | 60,655 | 165,899 | 189,799 |
| Resource balance                        | -2,796 | -3,554 | 41,687  | 28,912  |
| Net income                              | -319   | 229    | -16,645 | -17,973 |
| Net current transfers                   | 626    | 381    | 4,278   | 4,943   |
| Current account balance                 | -2,489 | -2,944 | 29,321  | 15,882  |
| Financing items (net)                   | 2,489  | 2,386  | -23,073 | -7,377  |
| Changes in net reserves                 | 0      | 558    | -6,248  | -8,505  |
| <b>Memo:</b>                            |        |        |         |         |
| Reserves including gold (US\$ millions) | ..     | ..     | 149,811 | 158,337 |
| Conversion rate (DEC, local/US\$)       | 2.3    | 4.9    | 8.3     | 8.2     |



## EXTERNAL DEBT and RESOURCE FLOWS

|  | 1979  | 1989   | 1998    | 1999    |
|--|-------|--------|---------|---------|
| (US\$ millions)                          |       |        |         |         |
| Total debt outstanding and disbursed     | 2,183 | 44,932 | 154,603 | 127,639 |
| IBRD                                     | 0     | 2,330  | 9,644   | 10,839  |
| IDA                                      | 0     | 2,296  | 8,693   | 8,907   |
| Total debt service                       | 61    | 5,650  | 18,186  | 13,204  |
| IBRD                                     | 0     | 223    | 941     | 1,161   |
| IDA                                      | 0     | 14     | 97      | 118     |
| <b>Composition of net resource flows</b> |       |        |         |         |
| Official grants                          | -30   | 143    | 91      | 201     |
| Official creditors                       | 199   | 2,277  | 2,288   | 3,913   |
| Private creditors                        | 1,580 | 3,801  | 1,642   | -2,945  |
| Foreign direct investment                | 57    | 2,613  | 41,118  | 38,752  |
| Portfolio equity                         | 0     | -180   | -3,927  | -9,836  |
| <b>World Bank program</b>                |       |        |         |         |
| Commitments                              | 0     | 1,760  | 2,636   | 2,311   |
| Disbursements                            | 0     | 1,111  | 2,066   | 1,780   |
| Principal repayments                     | 0     | 62     | 434     | 558     |
| Net flows                                | 0     | 1,049  | 1,632   | 1,222   |
| Interest payments                        | 0     | 175    | 604     | 720     |
| Net transfers                            | 0     | 874    | 1,028   | 502     |



**Additional  
Annex 11**

**Energy Sector Issues and Bank Strategy  
CHINA: Hubei Hydropower Devt. in Poor Areas**

**Background**

China faces two major transitions: from a command economy to a market economy; and from a rural, agricultural economy to an urban society. The Bank's strategy for assisting China in these transitions focuses on development of the institutional framework to support a market economy; facilitating the rural-urban transition through development of environmentally sustainable infrastructure; and addressing the needs of disadvantaged peoples and regions.

The Bank's energy sector strategy contributes to these three objectives focusing on: transitioning the state owned energy sector to a diversely owned market based system; conversion to clean fuels and increasing energy efficiency; and raising incomes in poorer western areas by assisting them to develop and export their energy resources. The current status, major issues and Bank strategy in addressing these issues (with particular reference to the power sub-sector) are outlined in the following paragraphs.

**Transitioning the Power Sub Sector**

**Background:** Until the early 1980s, China's power systems were entirely government owned. For the most part, power was provided through a centralized government department with operating units at the province, prefecture (or municipality) and county levels. However, because not all rural areas were connected to main grids, local systems also grew up at county level and even at local government levels (township and village). Except for local government systems, investments were centrally decided and financed through budget allocations. Prices were centrally controlled and covered only a small portion of supply costs. Private ownership of power assets was illegal. Power shortages were endemic.

Over the two decades since 1980 there have been very great changes. The sector is now largely corporatized and its ownership is diverse, budget allocations have been phased out, subsidies eliminated and electricity prices are in line with or above marginal supply costs in most grids. This has enabled the sector to grow dramatically with installed capacity and generation quadrupling to over 300 GW and about 1250 TWh, such that China's power sector is by now the second largest in the world, and supply and demand are basically in balance.

The current power sector structure still reflects its history, but it has become much more horizontally integrated. Isolated systems have been largely interconnected into provincial grids with about 96 percent of all generation capacity so connected. These grids have in turn become increasingly integrated such that at present six multi-provincial grids and four large independent provincial grids have implemented hierarchical dispatch at central, regional, provincial, municipality and county levels. The provincial power companies, which form the core of the current system, have been fully corporatized and are subsidiaries of the State Power Corporation. They own and operate the main transmission grids and act as single buyers in the purchase of power from generators and its sale to distributors.

Ownership of generation is greatly varied. This trend began with the policies of the mid 1980s, whereby government began curtailing budget allocations for power investments, instead providing debt through

policy and commercial banks and encouraging non-utility investment in generation through the “new power new price” policy. In parallel, corporatization of generation assets at various levels of government resulted in increased diversity such that, in a single province, generation companies controlled by various (financially autonomous) levels of government might run into the hundreds. While a large proportion of generation is still owned by various organs of government, most new generation can be categorized as non-utility, and no government budget financing nor directed credit is involved. Moreover, private investment accounts for a significant share of new capacity. This was piloted in the late 1980s, legalized in the 1996 Electricity Law, and currently some 40 independent power producers have 28 GW of installed capacity while 37 companies listed on domestic and foreign stock exchanges account for an additional 25 GW.

The situation with respect to distribution is complex, and the following description should be considered as typical rather than general. In urban areas, power is generally delivered directly to consumers by the provincial power companies, typically through operating units at the municipal level. In rural areas, until recently, power was provided at wholesale prices to county level distributors who were responsible for distribution through their own grids. County power companies were either subsidiaries (or operating units) of the provincial power companies or independent entities owned by county governments. County distributors would in some cases deliver power directly to consumers but in other cases would simply deliver it to township or village “gates” where its distribution would be arranged locally. In contrast to transmission and provincial power company managed distribution, that has become increasingly efficient, local distribution was often very inefficient and costly. In 1998, as part of an economic stimulus package in the wake of the East Asia economic crisis, the Government began to on-lend the proceeds of \$--- billion of government bonds over a three year period to the provincial power companies to upgrade local networks. As part of this program the provincial power companies took over management of county power companies and invested in them to provide funds for the upgrading work.

In parallel, with the corporatization of the sector there have been some advances in regulation, but these have been less impressive. At the national level, with the transformation of the Ministry of Electric Power to the State Power Corporation in 1997, its government functions were transferred to State Economic And Trade Commission (SETC). However, investment approval and pricing responsibility largely remained with the State Development Planning Commission (SDPC). Similar separations have occurred at the provincial level, but with the degree of separation varying greatly among provinces.

Despite the impressive gains of the last two decades, the single buyer structure has showed strains in recent years. Some provincial power companies have abused the single buyer dual monopsony and monopoly power by breaching power purchase contracts (notably during the 1998-1999 slowdown in power demand growth), and engaged in discriminatory dispatch favoring their own power. In addition, the generally self-contained provincial power systems, which were appropriate in an era of shortages, are less appropriate with balanced supply and demand and as increasing system size and economies of scale favor larger energy transfers across provincial boundaries, whether from hydropower plants in the southwest, gas (by pipeline) from the far west or from large LNG plants on the coast.

Recognizing these problems, the government has initiated comprehensive reform to introduce and expand competition, starting with generation in the short term (over two years), extension to the wholesale level in the medium term (2-5 years) and to the retail level in the long term (5 to 10 years). As initial steps, the government mandated the separation of generation from transmission and distribution, selected six provinces to test competitive generation markets and started to revise the Electricity Law to provide a stronger legal basis for reform. This was followed in late 2000 by a government mandate to SDPC to investigate in detail the future direction of power sector reform. SDPC’s recommendations, which have

been recently substantively adopted by State Council include the following measures:

**Government Reform Objectives.** Break up monopolies and introduce competition to improve efficiency and reduce cost while optimizing resource allocation and promoting power development, through acceleration of grid integration and development of a fair, orderly and healthy power market system under appropriate government regulation.

**Restructure State-owned Assets In Power Sector.** Principles for this restructuring are as follows:

- Separate generation and network business at all administrative levels.
- Restructure State Power Corporation (SPC) owned generation assets into three or four independent generation enterprises each with an installed capacity of about 40GW. In principle, the capacity share of a generation company in a power market should not exceed 20 percent.
- Establish a national state-owned grid company and six regional grid companies; the latter will be formed as limited liability or shareholding companies with ownership shares of central and local governments based on existing asset value; restructure provincial grid companies into branch or subsidiary companies of the regional companies responsible for power transmission and distribution locally.
- The national grid company will construct and operate of inter-regional connections and coordinate operations and power trading among regional grids
- The regional grid companies will plan, develop and operate regional grids and develop regional power markets.
- The grid companies may retain both transmission and distribution business during the 10th plan period, but should achieve accounting separation. In case of multiple asset ownership within a county, limited liability or shareholding companies should be established based on net assets owned by each party. Distribution enterprises without SPC assets may remain unchanged.
- Non-core and service businesses owned by SPC should be separated, commercialized and, where appropriate, corporatized. Medical and education facilities should be transferred to local governments.
- After restructuring, the generation and grid enterprises may obtain funds through the capital markets; proceeds from the sale of state assets should be earmarked for power construction, environmental improvements and recovery of any stranded costs resulting from power sector reform.
- The issue of fiscal revenue redistribution between the central government and the local governments resulting from power sector reform will be addressed by MOF.

**Bid for Dispatch and New Pricing Mechanisms.** The following principles will apply:

- Power trading centers will be established and generators will bid for dispatch. Within the jurisdiction of each regional grid company, one or more dispatch centers will be established depending on local conditions, all managed by the regional grid companies with free trading between dispatch centers.
- Power purchase agreements signed between generators and grid companies should be gradually



terminated; for power plants with direct foreign investment, power purchase agreements could be renegotiated or continued.

- The issue of price difference relating to different historical costs should be managed by asset restructuring or merging and acquisition to form independent power plants with revalued assets able to compete fairly in the new market environment; a transitional approach with limited competition may be required; the detailed procedure for introduction of competition may be developed by each power dispatch and trading center.

- Environmental emission pricing standards are to be implemented along with the introduction of bidding for dispatch. In order to support the development of clean energy, preferential policies should be developed for newly commissioned hydropower and wind power projects; VAT should not exceed 8% and detailed methods will be developed by MOF.

- The precise timetable to introduce competition should be determined by the structure of the local industry, local management capability and adequacy of the technical support system. Regions with the needed conditions should establish trading centers and introduce bidding for dispatch as early as possible.

- A rational wholesale power pricing mechanism shall be developed. The electricity prices will be divided into generation, transmission, distribution price and consumer supply. The generation price will consist of a government determined fixed capacity price and competitive-market determined energy price. The government will determine the principles of transmission pricing and distribution pricing. The consumer price will be made up of the above prices and will fluctuate with generation price. The government will regulate and monitor the prices of each segment according to the principles of efficiency, incentive mechanisms, taking into consideration the need to attract investment and the absorption capability of society.

- In areas where conditions permit, direct electricity supply of generators to large energy consumers and distributors should be piloted. The generation price will be negotiated between the parties; the government will determine the transmission price.

**State Power Regulatory Agency.** A power regulatory agency will be established under the State Council. It will perform the regulatory duties and functions authorized by the State Council. The institutional framework of the regulatory agency will follow a vertical approach. The regulatory agency will have branch offices in areas with regional power grid companies and trading centers. The principle duties of the state regulatory agency include: development of power market rules and monitoring of market operations, ensuring fair competition, recommending price adjustment to the government, supervising the service quality of the power enterprises, issuing and supervising licenses, resolving market disputes and monitor the implementation of public access.

**Staged Power Sector Reform.** Highest priority should be given to the establishment of the state regulatory agency. The national grid company, regional grid companies and power generation companies should be established within about one year. Each regional grid company should start to deploy the necessary technical support systems for bidding and to implement monitoring facilities for environmental compliance. By the end of the 10th five-year plan period, all the main generation companies in each region should participate in the bid for dispatch. A new power pricing mechanism will be implemented nationally.

After completion of the above reform, separation of transmission from distribution should be gradually

piloted and implemented and retail competition introduced.

The goal of proceeding to retail competition, over a single decade, to a power sector as large and diverse as that existing in China, while at the same time ensuring at least 200 GW growth in capacity, is ambitious. However, this has been facilitated by the clear statement of the principles and timing now established by government. Clearly, the challenge now is clearly, to implement this strategy in accordance with principles laid down, without dilution that could occur through the influence of vested interests. **Impediments to widespread implementation** include the following:

**Regulation.** Implementation of a new regulation system appropriate to competitive markets will be key to implementation of competitive power markets. The current regulatory system is still reflective of a command economy and the challenge will be to change the mid-set of the regulators such that they allow the market to determine prices where appropriate. Power markets cannot function unless there is a clear and timely mechanism for passing variations in wholesale prices (as determined by the market) through to consumers, and procedures for timely licensing of new capacity according to needs signaled by the market. In addition, power market regulation involving matters such as market code development, ancillary services pricing, transmission pricing, and market monitoring, requires substantial institutional capacity and specialist skills. There is therefore an urgent need to develop the detailed principles of market regulation, followed by the related regulations. This will need to be paralleled by development of the necessary skills in regulation by personnel at various levels of government.

**Restructuring.** The Government has wisely recognized that a one-size-fits-all approach is not appropriate to a country of the size and diversity of China, and that restructuring models will vary from region to region. However, this does leave open the process open to entrenched interests, which will need to be resisted. The restructuring of existing generation owned by various levels of government to take into account diverse ownership and different historical costs, to create a level playing field for all new power companies also poses a major challenge.

**Competitive Markets.** The Government's reform plan recognizes that different strategies will be appropriate in each region. Development and implementation of detailed strategies for each region, faithful to the principles laid down by State Council is now a priority.

**Lack of Required Institutional Infrastructure.** Pilot provincial power markets, particularly the Zhejiang market sponsored by the Bank under the Tongbai Pumped Storage Project, have shown that Chinese power sector participants have the necessary understanding and technological capability to develop and operate power markets. However, in Zhejiang, establishment of the necessary institutions (on a temporary basis), market codes, trading and settlement systems, training of market participants occurred over an 18 month period with substantial Bank supported technical assistance. This was in a power company which had already undertaken comprehensive upgrading of management and information systems over the previous five years. While Zhejiang's experience could provide a head start for other implementing entities, the difficulties of widespread implementation of power markets throughout China, given the greatly varying degrees of institutional capacity should not be underestimated.

**Power System Infrastructure Weaknesses.** Effective markets involving adequate numbers of participants will, in many areas of China, require considerable reinforcement of transmission systems, and upgrading of other systems such as communications, metering etc. Moreover, generation mixes should initially be reasonably balanced providing appropriate proportions of base load, mid-merit and peaking capacity. Market based operation may be precluded or greatly limited in systems dominated by large base load

coal-fired capacity with inadequate load following capability. Such situations prevail in some coastal provinces where there is little hydropower capacity, and where, until recently, oil or gas based generation capacity was banned.

**Lack of Strategy for Distribution Restructuring.** Little consideration has yet been given to separation of distribution from transmission and the structure of distribution and supply. The need to consider this in detail has been precipitated by massive rural grid rehabilitation and reinforcement programs undertaken over 1998 to 2001, and the restructuring will need to be implemented before the second stage of market development.

**Unreformed County and Locally Owned Generation.** The rural rehabilitation programs, and the assumption of management responsibilities by the provincial power companies, related only to the distribution network, not to generation owned at the county level and below. With increasing efficiency of provincially dispatched generation, this segment of the power sector perhaps offers the greatest potential for reform and efficiency improvement. It includes most of the 51.25 GW of capacity regarded as “embedded” by the provincial grids, since it is dispatched by lower level control centers. It contains almost all of the 35.11 GW of small (mostly below 50 MW) thermal power plants of which 26.31 MW is coal, characterized by their low efficiency and high atmospheric emissions, which grew up in response to earlier endemic shortages lasting until the end of the 1990s. It also includes 16.14 GW of small hydropower plants that were often developed at low cost with local resources and expertise, such that substantial efficiency increases could be expected with rehabilitation. Moreover, installed capacities originally appropriate to isolated small systems are often no longer appropriate and there is substantial potential for increasing capacity to improve peaking capability and generate more energy. Moreover, they are generally responsible for developing the remaining 20 MW of small hydropower potential (less than 25 MW) and medium hydropower projects similar to those included in the current project. From the institutional viewpoint, sector reforms over the past two decades have left the county and locally owned generation untouched. While there is nominal corporatization, the corporate structures and responsibilities are unclear to say the least, and in practice the generation entities remain part of local government at various levels. This affects their ability to efficiently manage existing capacity, and to raise finance to carry out economically justified, rehabilitation, up-rating and expansion.

**Consumer Pricing Issues.** Along with distribution restructuring, regulators will also have to deal with distribution pricing and consumer tariff structures. The current electricity law provides for “all consumers in the same category on the same network paying the same price”. The intent of this provision was positive: the elimination of the “dual-track” pricing resulting from the “new power new price policy”. However, attempts by provincial power companies to apply it on a province wide basis have led to very complicated cross subsidization arrangements which are incompatible with the second stage of market reform. Accompanying the intervention of provincial power companies into county distribution, has been the substantial elimination of a proliferation of surcharges, largely resulting from local governments using the power tariff as a vehicle for tax collection. With the phasing out of the dual track pricing system and surcharges, revision of consumer tariff structure to more properly reflect the cost of supply now becomes feasible.

**Bank Strategy in Restructuring the Power Sector.** Bank strategy has focused on the promotion of policy reform at the central government level while piloting of implementation at the lower levels using appropriate investment vehicles.

With regard to policy reform, the Bank has been the primary player in assisting the Government in overhauling its power sector policies virtually since the commencement of the reform process. This

assistance intensified in 1993 when the Bank worked with the Government to carry out a study “Strategic Options for Power Sector Reform in China” which provided the basis for the Ministry of Electric Power strategy of “corporatized restructuring, commercialized operation and legalized regulation”. This was followed by a 1996 study “Power Sector Regulation in a Socialist Market Economy” which recommended staged implementation of regulatory reform over the period 1996 to 2005. With awakening of government interest in competitive markets, further studies over the 1999-2000 period culminated in the publication of “Fostering Competition in China’s Power Markets”, and when SDPC was entrusted by the State Council to further explore competitive market options, the Bank, in October 2000, organized a workshop “New Waves of Power Sector Reform in China” and published the proceedings in English and Chinese. Consultants have recently been selected and have commenced work on a new study to assist State Power Corporation in devising a generation separation and divestiture strategy. With the move to competitive markets an update of the regulation strategy is appropriate and this is planned for 2002.

The policy development at the central government level has been accompanied by piloted implementation of reforms at the provincial level, with implementation experience feeding back into new policy development. For example, the recent power market dialogue has drawn on studies and pilot implementation associated with the Tongbai Pumped Storage Project and the East China (Jiangsu) Transmission Project. The Tongbai project also includes transmission pricing, distribution pricing, generation planning and consumer pricing studies, the results of which will feed into government policy development. Similarly, the proposed Yi-Xing pumped storage project will include market design and implementation, and distribution restructuring.

In choosing appropriate projects to pilot and implement reforms, choice of an appropriate counterpart is essential. For overall sector restructuring and introduction of competition, the appropriate counterparts are reform minded provincial power companies with well-developed institutional capacity. However for reforms of lower levels of generation which are not state-owned, county level generation companies are more appropriate counterparts.

The choice of investment vehicles has taken into account increasing availability of capital for mainstream generation, and also the infrastructure constraints to market development. Projects which remove transmission bottlenecks and pumped storage projects which correct system imbalances towards base load plant fall into this category. In addition, both require foreign exchange and are not attractive to private investors. County developed hydropower is also appropriate, because of the inability of the county level companies to attract local debt finance due to factors described above.

## **Conversion to Clean Fuels and Energy Efficiency**

### **Clean Fuels**

China’s power sector has long been dominated by coal-fired generation with concomitant large emissions of SO<sub>2</sub>, NO<sub>x</sub>, particulates and greenhouse gases with consequent adverse impacts on health, agricultural production, and global warming. Until recently, this was exacerbated by government policies that, in the interests of self-sufficiency, banned oil or gas based generation. The government is committed to reducing negative environmental impacts of coal-fired generation and over recent years has (a) stepped-up the development of large scale hydropower; (b) mandated the retirement of about 10 GW of small, inefficient and polluting, coal fired units by 2000; (c) used SO<sub>2</sub> emission taxes, increased requirements for flue gas de-sulfurization on new power plants; and (d) planned increased usage of natural gas by facilitating its transfer by pipeline from the far west, development of offshore reserves and import of LNG to coastal

centers. In The 10th Five Year Plan (FYP), extending from 2001 to 2005, the energy sector objective is to change the structure of energy supply by shifting away from coal, developing clean energy sources and increasing efficiency. For the first time, greenhouse gas (GHG) emissions and climate change issues were addressed in the plan.

In addition to large hydropower development, Government also wishes to accelerate the development of small hydropower and non-traditional renewable energy sources (collectively referred to hereafter as “renewables”). A component of the 10th FYP is a plan to increase the share of renewables through the use of a “mandated market share” (MMS) policy and supporting measures such as tax incentives. Impediments to such development include the following:

**High Unit Energy Costs.** On a financial basis, a large proportion of renewable energy potential is uncompetitive with thermal generation for on-grid applications, unless mechanisms can be found to internalize environmental externalities; this becomes more urgent with the development of competitive markets. The MMS policy, that will address this issue, will be piloted during the 10th FYP period.

**High Transaction Costs.** Small capacities associated with renewable projects result in high unit transaction costs making them unattractive for developers and financiers. Transaction costs are especially high in China because of the lack of transparency in approval and pricing processes, and the lack of any requirement that power companies purchase power from small independent producers.

**Weakness of Potential Developers.** Counties and local governments are very interested in developing their small hydropower resources because of the effect on economic development and fiscal revenues. However the local generation companies lack institutional and financial capacity and creditworthiness, as referred to earlier.

**Mismatch Between Debt Maturities and Asset Life.** This is particularly stringent for hydropower where new SDPC tariff policies assume loan maturity approaching asset life (18-25 years) whereas maturities available from commercial banks are typically only ten years including construction.

**Cost-based Pricing Formula with Low Allowable Returns on Equity.** This provides no incentive for development of even the most economical resources, particularly in view of other barriers to development.

**Weak Manufacturing and Service Industries.** Despite the large installed capacity of small hydropower (>20 GW), this is based on outdated technology and inefficient operational and management practices. For other renewables like windpower, commercial capacity is still in initial stages of development.

These impediments will be the target of government policies currently being developed under the Bank/GEF China Renewable Energy Scale-up Program.

### **Energy Efficiency**

Although energy consumption in China has increased at a rate of only about one-half as fast as overall economic growth over the last two decades, energy use in many applications remains far less efficient than in more developed industrial economies. In industry unit energy consumption in most standard industrial processes still remains some 20-100% higher than in advanced levels abroad. Residential buildings in China are estimated to consume 50-100% more energy for space heating as compared to buildings in similar cold climates in Western Europe or North America, and still provide far less comfort. From a

macroeconomic viewpoint, investments to improve energy efficiency still remain by far the least-cost means to increase energy services, and the potential for such cost-effective investments remains huge.

To some extent, China's current inefficiency in energy use results from the large energy consumption equipment and process stock developed under the previous economic framework of the planned industrial economy and the previous energy pricing regime whereby energy was priced below production cost. With energy price reform during the 1990s and the shift to a market economy, the economic framework of most enterprises is now far more conducive to improving energy efficiency than previously. China's entry into the WTO also is increasing competitive pressure on Chinese enterprise to reduce costs and improve efficiency. However, as shown in market economies across the world, development of an effective market framework and removal of energy price subsidies alone will not by itself promise sufficient investment in financially and economically attractive energy efficiency measures—additional market-based initiatives and regulatory efforts are required. Classic energy conservation investment project in industrial or commercial establishments in China typically range from US\$50,000-1,000,000, with financial rates of return of 20-40%, p.a. Yet most of this investment potential remains untouched. The reasons for this paradox, also found in other countries, include:

***Inadequate information.*** Enterprises and individuals generally lack information about energy-saving investments, especially on financial aspects and the implementation experiences of others. Information of new and emerging technologies and project concepts is particularly difficult for many to obtain.

***Real or perceived insignificance of small projects.*** Many worthwhile energy conservation investments are relatively small (although the high number of such projects in many enterprises makes aggregate potential rewards large). Although they may yield very attractive internal rates of return as projects, the end result may represent only a percentage point or two savings on total enterprise operating costs, or even less

***High transaction costs.*** If a given enterprise has no experience with a certain type of energy conservation investment, the time required from skilled staff for securing information, analyzing design options, arranging financing, identifying reliable suppliers, etc., may make a small project not worthwhile.

***Risk.*** Unless clearly demonstrated otherwise, fears that a new technology may not work, could interrupt production, or take time to perfect, inhibit enterprise managers from adopting new energy-saving technologies.

***Technology transfer barriers.*** In some cases, it may be difficult for enterprises to gain access to state-of-the-art technologies.

***Difficulties in arranging financing.*** High loan transaction costs for such types of small projects make commercial lending for many energy conservation projects unattractive to most banks. Additional problems for banks may include lack of knowledge about the main technical areas and associated risk factors, reticence to lend for projects where projected operating cost benefits form the main revenue stream and which cannot readily be isolated, or less-than-average collateral values for the diverse, small-sized equipment generally associated with an energy conservation project. Therefore, most enterprises give priority to other projects when requesting bank loans.

***Needs for regulatory support.*** While specific, market-based interventions may help to overcome the above barriers, there is also a need to improve regulatory support, especially in the following areas:

- *Air pollution regulations.* In China, simple and direct combustion of coal is often the least-cost option for consumers for heat or steam production, and enforcement of bans on coal use or increased taxes are necessary to provide incentives for use of more efficient, less-polluting energy use in densely populated areas;
- *Energy efficiency standards for key equipment.* Development and enforcement of energy efficiency standards is an appropriate tool to foster energy efficiency for certain types of energy-consuming equipment to spur manufacturers to offer more efficient equipment.
- *Building energy efficiency codes.* China needs to improve enforcement of its building energy efficiency codes, which have been proven elsewhere to be an efficient and cost-effective path to energy efficient buildings.

**Bank Strategy for Clean Fuel Transition and Energy Efficiency.** The Bank, together with the Global Environmental Facility (GEF), is supporting the Government's efforts to increase the share of renewable energy in electricity supply through the China Renewable Energy Scale-up Program (CRESP). This is a long term, large scale programmatic effort to introduce policies required to create an enabling environment for large-scale development, improve technologies, open up competition in renewable electricity provision, and create an internationally competitive renewable electricity industry in China. In addition, the CRESP will provide assistance to the GOC to coordinate non-electricity renewable energy development. Through this effort, it is intended to create synergy and increase the impact of the efforts of Chinese government agencies and donor assistance.

Similarly, the Bank has supported a broad program on energy efficiency in China over the last ten years, in collaboration with the GEF, UNDP, the European Commission, and a series of bilateral donors. Following extensive sector work, including the China Energy Conservation Study (1993), China: Issues and Options in Greenhouse Gas Emissions Control (1994), project work has included the GEF China Efficient Industrial Boilers Project (1996), the IBRD/GEF/EC China Energy Conservation Project (1998), and components in various recent electric power projects. The China Energy Conservation Phase II Project is expected to be launched during 2002. Following the completion of an ASTAE study in 2001, "China: Opportunities to Improve Energy Efficiency in Buildings," a China Heat Reform and Building Energy Efficiency Project may also be undertaken in the future. Complementing this project work, the Bank has also sponsored a series of technical assistance and training projects, through ASTAE or independently, on specific policy topics or capacity building areas.

Much of the Bank's work has focused on the development of mechanisms to overcome the barriers to increased investment in energy conservation projects which are currently financially viable, especially in industry. The China Energy Conservation Project, and its Phase II both focus on the introduction, development and expansion of energy service companies (ESCOs), engaged in energy performance contracting, as a market mechanisms to expand investment. This project package also includes a major effort to package and disseminate improved information of energy conservation investment opportunities, and a series of activities engaging the Chinese banking system in expansion of energy efficiency investment.

### **Energy Resource Development in Western Areas**

The Government has embarked on a Western region Development Program to reduce poverty and regional inequality that threaten social stability. Since a large proportion of China's energy resources, particularly

large hydropower, gas and renewables, are located in western areas, assistance in development of these resources would support the government strategy. Development of large hydropower and renewable resources would be particularly beneficial, since economical resources are usually located in mountainous terrain or remote areas. This type of terrain, which typically involves land shortages and difficult access, is also a primary determinant of poverty. Factors which inhibit such energy resource development of minimize its impact on poverty are the following:

**Impediments to Renewable Development.** Since renewables are largely located in western areas then the impediments to renewable development listed above also inhibit development of western energy resources

**Inappropriate Benefit Sharing Mechanisms.** Development of energy resources does generate economic activity in the project area during the construction period, but there is little employment during the operating period. Income taxes could provide a return to resource owning areas, but under the current fiscal system the level of government receiving income tax relates to the ownership of the developer. Since companies or governments in western areas generally do not have the financial resources to develop their energy resources and transfer them to markets in the east, they are discouraged from allowing others to do so since they do not receive tax benefits (or returns on equity). Revision of income tax sharing arrangements, which is under consideration, may partly deal with this problem. However, the appropriate mechanism for providing resource owners with a return for their development, is appropriate royalty arrangements. In the case of gas, royalties do accrue to the central government but there are no arrangements for sharing these with regional and local governments. In the case of economical development of hydropower, an energy cost less than that of thermal alternatives implies an economic rent, normally captured by royalty impositions. However, while hydropower royalties and royalty sharing mechanisms are being introduced in other parts of the world, notably South America, they do not yet exist in China.

**Bank Strategy for Energy Resource Development in Western Areas.** Bank strategy for assisting the Government in these areas is under development. To start the process, a study to analyze the distributional impacts of energy development in western areas has been recently commenced. This will draw on the experiences of other countries in terms of creating incentives for such developments and maximizing development impacts to the undeveloped areas. The CRESPP project referred to above will also examine the mechanisms for pricing renewable energy to achieve the same objectives. Consistent with the approach used for other energy sector objectives, proposed reforms will be piloted through lending operations involving GEF where appropriate. The current project is actually piloting the implementation of such a strategy (refer to Section B3 of body of report).



**Additional  
Annex 12**

**Financial Management Assessment  
CHINA: Hubei Hydropower Devt. in Poor Areas**

**I. Executive Summary and Conclusion**

The task team has conducted an assessment of the adequacy of the project financial management system of the Hubei Hydropower Development Project. The assessment, based on guidelines issued by the Financial Management Sector Board on June 30, 2001, has concluded that the project meets minimum Bank financial management requirements, as stipulated in BP/OP 10.02. In the team's opinion, the project will have in place an adequate project financial management system that can provide, with reasonable assurance, accurate and timely information on the status of the project in the reporting format agreed with the project and as required by the Bank.

Funding sources for the project include Bank loan, equity contribution and domestic borrowing. Bank loan will be onlent from the Ministry of Finance (MOF) to Hubei Province, and thence to the project beneficiaries (project companies) through prefectures/municipalities and counties. In terms of disbursement technique, the project will be disbursing based on the traditional disbursement techniques and will not be using PMR-based disbursements, in accordance with the agreement between the Bank and MOF.

The HPFB will maintain the special account, which will be established at a major commercial bank acceptable to the Bank. **Disbursements will generally be made to HPFB who will then disburse through prefecture/municipal finance bureaus (MFB), county finance bureaus (CFB) and project companies to contractors or suppliers.** In the case of special commitment, disbursement will be made directly from the Bank to the contractors or suppliers. Disbursements by HPFB will be made on the basis of withdrawal applications submitted by the beneficiaries, which pass through CFB and MFB. Equity contributions of beneficiary shareholders and commercial bank loans arranged by the beneficiaries will be disbursed directly to them.

No outstanding audits or audit issues exist with any of the implementing agencies involved in the proposed project. The task team however will continue to be attentive to financial management matters and audit covenants during project supervisions.

**II. Summary Project Description**

The development objectives of the project are the following:

- expand electric power generation capacity in Hubei in an economically and environmentally sustainable manner in order to facilitate economic growth;
- enhance the efficiency of the electricity sector in Hubei by commercializing county level generation companies; and
- contribute to poverty alleviation efforts in poor communities in Hubei.

**The main components of the project include:**

- Dongping Hydroelectric Power Station
- Najitan Hydroelectric Power Station

- Songshuling Hydroelectric Power Station
- Xiakou Hydroelectric Power Station

### III. Country Issues

To date, no CFAA has been performed for China, though dialogue with the GOC in respect of the CFAA exercise has been initiated and currently underway and hopefully the exercise will be carried out in the near future.

However, based on observations of developments in the areas of public expenditures, accounting and auditing, and Bank experience with China projects for the past few years, it is concluded that substantial achievement in the aforementioned areas has been made and further improvement is expected in the next few years. As the economic reform program further unfolds, GOC has come to realize the importance of establishing and maintaining an efficient and effective market mechanism to ensure transparency and accountability, and minimize potential fraud or corruption.

Due to rather unique arrangement by the GOC, funding (in particular Bank loan) of Bank projects is controlled and monitored by MOF and its extension, i.e. finance bureaus at provincial, municipal/prefecture and county level. However, project activities are usually carried out by implementing agencies of a specific industry or sector. The above arrangement then usually requires more and closer coordination on the project, as the multi-level management of the funding and implementation mechanism sometimes works to the detriment of smooth project implementation.

### IV. Risk Analysis

The following risks with corresponding mitigating measures have been identified during assessment processes:

| <b>Risk</b>                           | <b>Risk Rating</b> | <b>Mitigating Measures</b>  |
|---------------------------------------|--------------------|---|
| I. Inherent project risk              | Low                |   |
| II. Control risk:                     | Moderate           | Constant monitoring by PMO and close follow-up by the task team   |
| a. Implementing entity                | Moderate           | Close monitoring by PMO and assistance from the task team   |
| b. Funds flow                         | Moderate           | Timely disbursement by HPFB and monitoring by the task team   |
| c. Staffing                           | Substantial        | Close monitoring and assistance by HPFB and the task team   |
| d. Accounting policies and procedures | Low                | Though established guidelines are available, close monitoring by PMO and task team is required to ensure compliance |
| e. Internal audit                     | N/A                | No internal audit at the construction phase   |
| f. External audit                     | Moderate           | Quality control by provincial audit bureau and China National Auditing Office (CNAO)                                |
| g. Reporting and monitoring           | Moderate           | Periodic review by PMO and the task team  |
| h. Information system                 | Moderate           | Monitor through periodic review and follow up during supervision missions   |

## V. Strengths and Weaknesses

**Strengths.** Due to the nature of project activities, accounting work is comparatively straight-forward. Consequently, a relatively simple project financial management system (either manual or computerized) will suffice. Project financial/accounting staff identified to work for the project have relevant work experience and educational background. In addition, management of the project will fall directly on the shoulders of PPMO comprising mainly HPFB, with active participation from HPPDC and Hubei Provincial Water Resources Bureau. To date, HPFB has managed 32 Bank financed projects and therefore has accumulated extensive experience and is familiar with Bank policies, procedures and requirements.

**Weaknesses.** Though project staff identified to assume financial and accounting work for the project have relevant academic background and work experience, they nonetheless have less exposure to internationally accepted standard practices and therefore would require closer monitoring and assistance from the Bank. Comprehensive training in project financial management has already been provided by the Bank for the project, and the task team will continue to provide assistance as and when needed throughout project implementation.

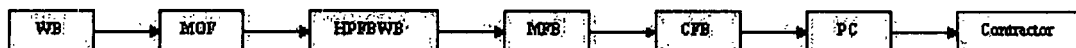
## VI. Implementing Entity

A project leading group comprising representatives from HPFB, HPPDC will provide guidance and monitor implementation of the project. A PPMO has also been established to assume overall implementation responsibilities. Direct implementation of the project will be carried out by the proposed four project companies (beneficiaries).

The Foreign Fund Division of HPFB will play a major role in the project implementation, including overall monitoring, financing arrangement, procurement, financial management, etc. HPFB will also be responsible for maintaining, monitoring and reconciling the special account to be established for the project, and reviewing, verifying and approving withdrawal applications prepared by proposed project companies before submitting to the Bank for disbursement processing. The Division has had prior experience with Bank projects and is familiar with Bank disbursement procedures.

## VII. Funds Flow

**Bank funds.** Bank funds will flow from the Bank to HPFB, MFB, CFB, project companies and contractors or suppliers. Bank loan agreement will be signed between the Bank and MOF, and on-lending arrangement for the Bank loans will be signed between MOF and HPFB and between the above finance bureaus at different levels and ultimate beneficiaries, i.e. project companies. Fund flows are as follows:



**Counterpart funds.** Counterpart funds include equity contributions by shareholders of respective project companies, and domestic bank loans. Shareholders for proposed project companies have been identified, shareholding arrangement finalized and companies formed and licensed. The plan of equity contributions has also been set. Domestic banks indicating interest in lending to the project have been identified by respective project companies and preliminary letters indicating terms and conditions have been received in all cases.

The project companies will be required to furnish to the Bank by November 30 of each year during project implementation, a projected funds flow statement for the coming year, indicating anticipated project expenditures, the sources of funding, and indicating commitments of respective financiers to provide such funding.

### **VIII. Staffing**

Adequate project accounting staff with educational background and work experience commensurate with the work they are expected to perform is one of the factors critical to successful implementation of project financial management. Based on discussions, observation and review of educational background and work experience of the staff identified for financial and accounting positions, the task team considers that the staff will be able to perform satisfactory work.

The task team participated in a four-day training seminar July 23-26, 2001 for the project's staff and addressed in detail the Bank's financial management policies and disbursement procedures. Further training will be provided as and when needed by the task team for the project.

### **IX. Accounting Policies and Procedures**

The administration, accounting and reporting of the project will be set up in accordance with the following accounting standards or circular issued by MOF:

- "Accounting Standards for Business Enterprises" issued by MOF in 1993 will be used by the project as a basis for bookkeeping and preparation of project financial statements and management reports. Accrual accounting and double-entry bookkeeping will be adopted by the project.
- Circular #12: "Regulation for the Submission of Withdrawal Applications" issued in December 1996 by MOF - includes detailed procedures for preparing and submitting withdrawal applications and retention of supporting documentation.
- The Bank and MOF have agreed to a standard set of project financial statements that applies to all Bank projects appraised after July 1, 1998 and includes the following:
  - Balance sheet
  - Statement of source and use of fund by project component
  - Statement of implementation of credit/loan agreement
  - Statement of special account

"Accounting Standards for Business Enterprises" are modeled after the principles of International Accounting Standards and provide guidelines for accounting treatment of business transactions such as the proposed project.

Each of the project companies will be managing, monitoring and maintaining respective project accounts. Original supporting documents for project activities will be retained by originating project companies. In addition, each project company will prepare respective financial statements and forward them to PPMO for review and approval before submitting by PMO to the Bank for reviews and comments on a regular basis.

## **X. Internal Audit**

There is no formal independent internal functions established in the PPMO or proposed project companies. However, during construction phase, there will be periodic checking or monitoring by PPMO or the financial and accounting department of project companies. The annual external audit and the Bank's SOE review will also serve similar purpose. Once construction phase is complete and the proposed project companies go into operation phase, there will be a separate internal audit department of a size commensurate with the complexity and scope of respective operations.

## **XI. External Audit and Audit Reports**

The Bank requires that project financial statements be audited in accordance with standards acceptable to the Bank. In line with other Bank financed projects in China, the project will be audited in accordance with the Government Auditing Standards of the People's Republic of China (the 1997 edition). The Hubei Provincial Audit Bureau has been identified as the auditors for the Project. Audit fieldwork will be carried out by respective county audit bureaus under the guidance and supervision of the Hubei Provincial Audit Bureau. Annual audit reports will be issued in the name of the Hubei Provincial Audit Bureau and subject to reviews by China National Audit Office (CNAO). The Bank currently accepts audit reports issued by CNAO or provincial audit bureaus for which CNAO is ultimately responsible.

Audit reports on annual financial statements (e.g. Balance sheet and Statement of Sources and Uses of Funds by Project Components) of each of the four project companies and project consolidated financial statements (e.g. Statement of Implementation of Loan Agreement and Statement of Special Account) will be due to the Bank within 6 months of the end of each calendar year, with a separate opinion on Statement of Expenditures and Special Account.

## **XII. Reporting and Monitoring and Format of Financial Statements**

Each project company will prepare its own project financial statements and PMO with assistance of HPFB will prepare financial statements that have impact on the project as a whole. It is noted that the staff member seconded from HPFB to serve as chief accountant of the PPMO and responsible for project reporting has had extensive involvement in prior Bank projects for the financial management aspects, is familiar with Bank reporting requirements and considered appropriate for the job responsibility.

The format and content of the following project financial statements represent the standard project reporting package agreed to between the Bank and MOF, and have been discussed and agreed with all parties concerned. The financial statements will be submitted to the Bank on a semi-annual basis (prior to October 1 and April 1 of the subsequent year) and include the following four statements:

### **Project companies**

#### ***Construction phase***

- Balance Sheet
- Summary of Sources and Uses of Funds by Project Component

### ***Operation Phase***

- Balance Sheet
- Income Statement
- Statement of Cash Flow

### ***PPMO (with assistance from HPFB)***

- Statement of Implementation of Loan Agreement
- Statement of Special Account

### **XIII. Information Systems**

PHRD grants executed by the project have been utilized to carry out by an independent consulting team (comprising Price Waterhouse Coopers and independent consultant, with participation from Bank task team) an assessment and design of a financial management information system for the proposed project companies. An assessment and design report produced by the consulting team proposed design of organizational structure, staffing plan, hardware and software required for the system and training needs.

During construction phase, an accounting software package developed by WBOB will be recommended for bookkeeping and financial reporting purposes, mainly due to the nature of construction work involved and the features of the software package. For operation phase, a more advanced and sophisticated but integrated information system will be in place to provide timely and reliable financial information for analysis and decision making. General design of such a system has been included in the report produced by the independent consulting team, and **further system development has been properly estimated and included as one of the project sub-components.**

### **XIV. Impact of Procurement Arrangements**

Impact of procurement arrangements of the project on financial management is considered to be minimal. Threshold set for procurement post-review will be consistent with that set for SOEs for disbursement purpose.

### **XV. Disbursement Arrangements**

The project will be disbursing on the traditional disbursement techniques and will not be using PMR-based disbursements, in accordance with the agreement between the Bank and MOF.

One special account will be established for the project and the Hubei Provincial Finance Bureau will be directly responsible for the management, monitoring, maintenance and reconciliation of the Special Account activities of the project. Supporting documents required for Bank disbursements will be prepared and submitted by respective project companies through various finance bureaus to HPFB for verification and consolidation before sending by HPFB to the Bank for further disbursement processing. Withdrawal application processing flow is as follows:



Disbursement methods, such as replenishment, direct payment and special commitment, will be available to the project. The SOE limits will be set in line with procurement post-review threshold, as follows:

- Civil works under contracts costing less than \$2,000,000 equivalent each;
- Goods under contracts costing less than \$350,000 equivalent each;
- Consulting services under contracts awarded to consulting firms costing less than \$100,000 equivalent each;
- Consulting services under contracts awarded to individual consultants costing less than \$50,000 equivalent

Special account for the project will be in US dollar, with an authorized allocation equivalent to about 4 months of eligible expenses reimbursable via special account.

#### **XVI. Action Plan**

The following proposed actions have no impact on project preparation and Board presentation, but should be adequately addressed by the project prior to implementation:

- Obtain domestic clearance for opening Special Account
- Open corresponding RMB bank account

#### **XVII. Conditions**

The following conditions will be set for the project:

**Board Presentation:** None

**Effectiveness:** Usual

**Disbursement:** Receipt of detailed EAs for transmission lines will be a condition for disbursement against these components.

#### **XVIII. Financial Covenants**

Financial covenants will be set as follows:

Prepare, and by April 30 of each year commencing April 30, 2005 (2006 for Dongping) furnish to the Bank for review, a rolling long-term financial plan (including projected income statements, sources and uses of funds and balance sheets) covering a period of no less than eight years).

Commencing in fiscal year 2005 (2006 for Dongping): (a) not incur additional debt unless the rolling long term financial plan shows that debt service ratio will be not less than 1.2 for each year during the term of the debt; and (b) take all necessary measures to maintain a debt service ratio of 1.2.

Commencing in fiscal year 2005 (2006 for Dongping): (a) not incur additional debt if after the incurrence of such debt, the debt equity ratio shall be greater than 80 to 20; and (b) take all necessary measures to maintain a debt service ratio of 1.2.

Commencing in fiscal year 2005 (2006 for Dongping) take all necessary measures to maintain a ratio of working expenses (i.e. excluding depreciation) to operating revenues of not higher than 20%..

Before commissioning of the first generating unit under its respective part of the project, power plant, establish a debt service reserve account and deposit into it all net revenues until the balance of such account is equal to the next six month's principal and interest payable on debt, and maintain a balance in such account equal to or greater than the project company's debt service requirements for the following six months.

Refrain from declaring dividends or making any other distributions of share capital, unless the debt service reserve account is fully funded, and unless after such dividend has been paid or other distribution made, the ratio of debt to equity is less than 80:20.

#### **XIX. Supervision Plan**

The four proposed project companies are new to the Bank requirements, and financial management capacity strengthening would require closer assistance and monitoring by the Bank, due to less exposure of project financial and accounting staff have to international standard practices. A financial management specialist or disbursement officer should participate in the supervision missions on a regular basis (semi-annually at the beginning stage and annually from the mid point onward) to ensure smooth proceeding of project financial related matters.



**Additional  
Annex 13**

**Environmental Summary  
CHINA: Hubei Hydropower Devt. in Poor Areas**

**Project Description**

The project consists of four individual hydropower developments: Dongping, Najitan, Songshuling, and Xiakou. Each of these is located in steep, narrow, rocky gorges in mountainous terrain of western Hubei Province. Each sub-project consists of a concrete dam, behind which a long narrow reservoir will be formed. Power will be produced from an underground or above ground powerhouse at each site (the configuration depending on the amount of space available and geology at each site), and transmitted to the main grid by high voltage transmission lines. The project parameters are summarized in Annex 2.

**Environmental Studies**

EA reports were prepared for each subproject by the Hubei Environmental Protection Research Institute (HEPRI), as part of the feasibility studies, and submitted to the Hubei Environmental Protection Bureau (HEPB) between 1996 and 2000. The four projects were approved by HEPB during this period. Bank environmental specialists reviewed the EA documents in late 2000, and provided critical review comments. In 2000, the Hubei Government contracted the Chinese Research Academy of Environmental Sciences (CRAES) to revise and upgrade the EA reports. CRAES carried out additional environmental investigations in 2000 and 2001, including a Karst Biodiversity Assessment, as part of this exercise. In late 2001, the Hubei Government contracted the Institute of Hydrobiology – Chinese Academy of Sciences, to undertake an Aquatic Ecological Assessment of the four sub-projects. The assessment report was submitted to the Bank in February 2002.

The relevant Chinese regulations and standards have been strictly adhered to, as have the Bank's own environmental safeguard policies. Each of the four sub-projects is classed as *Category A*, requiring a full environmental assessment (EA). Fieldwork has included monitoring of water quality; vegetation, fish and wildlife surveys; and land use assessments. Because each project involves resettlement a resettlement action plan (RAP) was prepared for each project. As part of this, a comprehensive survey of the affected population was also conducted and yielded data on public health, livelihood and attitudes towards the respective sub-projects. Full disclosure has ensured a wide awareness of each project within its respective area, with the vast majority of inhabitants showing positive support for the project in their area.

The Project EAs include only a cursory assessment impacts arising from construction and operation of the relatively short transmission lines that are needed to transmit power to the Hubei provincial grid. At this time, route selection and design for the transmission lines has yet to be finalized. A preliminary draft EA for this component of the Hubei Hydropower Project was prepared in late January 2002 by the East China Investigation and Design Institute (ECIDI), and submitted to the Bank. The draft Transmission Lines EA will be finalized once the alignments have been selected and designs completed for the four sub-projects. The final Transmission Lines EA will be submitted to the Bank for approval prior to commencement of construction of the lines, and prior to disbursement against the respective transmission line disbursement category.

## **The Existing Natural Environment**

**Climate.** The four proposed sub-projects are located in a region of China affected by the annual subtropical monsoon weather pattern. The area has an annual average temperature of 15.5°C to 15.9°C, the winters are cool and the summers are hot and humid. The coldest month is January with temperatures as low as -8.3°C (Najitan) to -13.5°C (Xiakou). The hottest month is July with temperatures as high as 38.9°C (Najitan) to 43.4°C (Songshuling). The average annual precipitation for the area ranges from 836 mm to 1536 mm, with higher precipitation south of the Yangtze River (i.e., Dongping and Najitan sites), than north of the Yangtze (i.e., Songshuling and Xiakou sites). Most of the rainfall occurs during the annual monsoon season, which commences in late-April and finishes in late September

**Geology, Soils and Landform Features.** The four proposed projects are located in what is generally referred to as the Three Gorges Area of the Yangtze River Basin. The bedrock geology is comprised primarily of a folded series of limestone deposits with inter-bedded sandstones and shales. These overlay older deposits of granite. Each of the dam sites is located in a river gorge where steep bedrock controlled mountainsides, sparsely covered by thin-layered deposits of limy soil, prevail. These conditions extend upstream through almost the entire reservoir reach for three of the four reservoirs, Najitan being the exception. At Najitan, only the lower few kilometers of the reservoir reach will be within a rocky gorge. Otherwise, for most of its length, the Najitan reservoir will be confined between a series of Quaternary river terraces and terrace remnants.

**Hydrology and Water Quality.** The rivers on which the four projects are proposed are all tertiary or quaternary tributary systems that form the upper reaches of larger sub-watersheds of the Yangtze Basin. The rivers are generally incised into steeply walled rocky gorges. The riverbeds are of relatively steep gradient and bedrock or boulder/cobble controlled, with gravel and sand deposits occurring on point bars. Flows within the rivers result from a combination of precipitation, karst springs and groundwater seepage in the wet season, and springs and groundwater seepage in the dry season. Water levels fluctuate significantly both seasonally and daily, and in areas of sparse vegetation or denudation, storm related fluctuations are amplified and accompanied by mass wasting.

The Zhongjian River, on which the Dongping Project is proposed, is a regulated river, which flows into the Qingjiang River, which is also regulated. The tail of the Dongping Reservoir will extend to the tailrace of the existing Longdong Hydroelectric Station, while the tailrace of Dongping will empty into the tail of the Shuibuya Reservoir (currently under construction), the last major development on the Qingjiang.

The Youshui River, on which Najitan is proposed, is regulated upstream by the Tangwan and Tangkou Hydroelectric Stations. The tailrace of Tangwan empties into the backwater of Tangkou, and the tailrace of Tangkou will empty into the backwater of the Najitan Reservoir. Downstream of Najitan, the Youshui River empties into the Yuanshing upstream of the 120 m high Wujiangxi hydropower dam.

The Guandu River, on which Songshuling is proposed, is not presently regulated upstream of the dam site. A dam is proposed upstream of Songshuling, the tailrace of which would discharge into the backwater of the Songshuling Reservoir. However, the 110 m high Huanglongtan hydropower dam blocks the Du River, into which the Guandu River flows, approximately 90 km downstream. Between Songshuling and Huanglongtan, the Pankou Hydropower Project is proposed.

The Ju River, on which the Xiakou Project is proposed, is regulated at the Xiakou site by an existing two-meter high weir that diverts virtually all the dry season flow into the Juxiawan Irrigation and Power Generation Canal. The water is distributed to approximately 10 km<sup>2</sup> of rice paddy, and the 625 kW Juxiawan Hydroelectric station, before returning to the Ju River approximately 10 km downstream of the weir. The Ju River is also regulated 50 km downstream by the 10 m high Maduhe irrigation dam.

Testing of the water in each of the rivers shows that water meets Chinese State Grade II water quality standard for most parameters throughout the year. There are presently no major industrial facilities in any of the four project development areas and, therefore, no industrial effluent discharges into the rivers. The primary sources of water pollution that could affect the reservoirs, once developed, are point-source municipal sewage discharges from the main county administrative centers (after which the counties are named), and non-point source agricultural runoff (fertilizer, pesticide residues, and soil) from farmlands. Since the four sub-projects will operate for much of their time as run-of-river facilities, no significant changes to water quality are expected once the project reservoirs replace the present river reaches.

**Flora.** The steep narrow river gorges, with their exposed bedrock and sparsely distributed shallow soils support undisturbed expanses of woody shrub land vegetation, comprised predominantly of stunted evergreen and deciduous broadleaf trees, shrubs, bamboo, cane grasses, ferns and other forbes and grasses. At higher elevations, where the steep river gorges and canyon walls give way to less steeply sloping mountain terrain and rounded mountain top features, thicker soils support native coniferous, evergreen and deciduous broadleaf, and bamboo forests. In areas closer to settlements, these forested slopes have been cleared to make way for vegetable gardens and upland grain fields. In areas where Quaternary river terraces have developed, human settlements have become established over the centuries. Human occupation of these areas has resulted in the removal of native evergreen and deciduous broad leaf forests along the river margins. These terraces have been reworked to create rice paddies, vegetable and orchard terraces. On lands not suited to agriculture, but which have sufficient soil cover to plant trees, orchards and commercial pine and fir plantations have been established.

**Fauna.** The lower elevations within the four reservoir areas, which are characterized by sparsely vegetated steep rocky river gorges and canyon walls, provide only minimal wildlife habitat, primarily for small mammals, amphibians, reptiles and birds. This is primarily due to difficult access presented by the near vertical walls, combined with the lack of suitable cover and food sources that larger animals require to sustain viable populations. Elsewhere, in the lower elevation areas where river terraces may have once supported riverine forests, the removal of this vegetation cover to make way for human settlements and farmland has eliminated habitat that may once have been used by larger mammals. In general, it is the upper slopes located well above the proposed construction zones and reservoirs, where native forests can still be found that are suitable for supporting species of wildlife, including larger mammals.

**Aquatic Organisms.** The rivers identified for project development presently support a variety of native fish species, the majority of which belong to various genera of carp. These rivers support a relatively high fish biodiversity, but low population abundance. All of the species found are endemic to these tertiary stream systems. Only one species, *Onychostoma macrolepsis*, is listed as a protected species. {Designated as a provincial (as opposed to national) protected species}. It is widely distributed in mountain rivers and streams in western Hubei Province. Although it is expected that its numbers will decline in the reservoir areas due to diminished availability of riverine habitat, its overall survival is unlikely to be threatened owing to the availability of suitable habitat in tributary streams that flow into the reservoirs.

The low population abundance is attributed to several factors including: (a) presence of existing downstream water control structures that block migration of fish into the upper reaches thereby reducing recruitment; (b) combined with the effects of downstream dams blocking upstream migration, is the effect that significant flows have on flushing many fish out of the upstream reaches during high water events; (c) limited availability of food organisms as a result of a trophic level that is relatively low in nutrients (i.e., oligotrophic); and (d) existing uncontrolled artisanal fisheries that remove all age classes, thereby reducing the ability of fish stocks in the project reaches to recover their numbers or produce fish of large enough size to maintain a robust breeding stock. Although each of the four sub-projects will result in loss of riverine habitat, suitable habitat for spawning, rearing and refuge of resident species of fish will still remain within the upstream reaches and tributary streams of the project-affected rivers.

All four project-affected rivers provide habitat for the Chinese Giant Salamander, a national Class II listed species. Each of the four proposed sub-projects will result in loss of some giant salamander habitat. However, suitable habitat will still be found in tributary streams that will remain unaffected by the project. At present, the populations of giant salamander are depressed within the proposed reservoir reaches, primarily as a result of illegal harvesting. The giant salamander is widely distributed throughout the region, and is being successfully propagated at a few research stations. A number of giant salamander conservation reserves have also been established within the region.

**Unique Natural Habitats.** There are no wetland areas located within or adjacent to the river reaches that would be threatened by flooding to create the hydroelectric reservoir for each sub-project. Likewise, there are no wetlands within the dam site or supporting facilities construction zones at any of the project locations. Although the Dongping and Najitan reservoir areas contain numerous karst structures, they do not appear to provide habitat for unique cave dwelling species.

### **Cultural Heritage**

Surveys of the four inundation areas have been carried out by the Hubei Archaeological and Antiquities Research Institute, on behalf of the Hubei Provincial Antiquities Bureau. For the Xiakou development ten sites of archaeological interest were identified and the Xiakou Company has agreed with the Antiquities Research Institute prior to disturbance as inundation. Similarly, agreement has been reached in the case of Najitan, where one grave which may be of interest has been identified. No sites of interest have been identified for the other two developments. The Antiquities Bureau has provided for all four developments written permission for construction start.

### **The Social Environment**

The counties within which the four hydropower developments are proposed are among the poorest counties in all of China. The average annual net rural income within the project areas ranges from Y 1,377 in the Songshuling project area to Y 2,081 in the Xiakou project area in 2001. These net rural incomes compare with the provincial average of Y 2,352 per capita.

The local economies depend primarily on agriculture. However, agriculture productivity is limited by the high relief topography that limits the availability of land suitable for agriculture, and generally produces poor quality, thinly layered soils. The exception is the limited amount of rich valley bottom paddy land, most of which has been developed on the Quaternary River terraces and terrace fragments.

The high relief terrain conditions make road building a very costly endeavor, which leads to these project affected areas being economically isolated from more productive areas of Hubei Province. There are no

major industrial manufacturing enterprises within the four project areas, although there are minor industries based on processing agriculture and forestry products. Difficult transportation and frequent power supply shortages combine to limit the region's productivity. The dependence on seasonal agriculture and minor manufacturing, in turn, provides for low employment, low average income levels and low standard of living. The communities within the four project areas generally have adequate communications, water, power, telephone, medical and education infrastructure. Areas and types of land inundated are provided in Annex 14.

### **Impact Areas**

The main impact areas are those areas inundated by each of the four reservoirs (8.12 km<sup>2</sup> for Dongping; 3.07 km<sup>2</sup> for Najitan; 2.74 km<sup>2</sup> for Songshuling; and 4.46 km<sup>2</sup> for Xiakou). Other impact areas include areas occupied by the hydropower stations, access roads and support facilities, transmission lines and substations, relocated roads and resettlement areas. Some temporary occupation is also required for construction purposes

### **Most Significant Impacts**

The most important impacts are:

- Loss of riverine aquatic environment for a distance of 32 km (Dongping), 33 km (Najitan), 19 km (Songshuling) and 18 km (Xiakou), and replacement with lacustrine environment;
- Potential dewatering of short sections of river downstream of each dam during dry season operations when reservoirs are being recharged;
- Potential dewatering of the Luxiawan Irrigation Canal immediately downstream of the Xiakou project;
- Exposure of cut and fill slopes to the forces of erosion during construction of the hydropower projects, roads, and resettlement villages; and
- Short-term impact of large construction work forces moving into rural areas which have relatively sparse populations at present.

These and some of the less significant impacts are discussed in more detail in the following sections together with the principal mitigation measures that will or have been adopted. The impacts and mitigation measures are also summarized in a table together with the related plans for environmental management and monitoring.

### **Impacts During Construction and Related Mitigation Measures**

**Excavation of Cut and Fill Slopes.** Most heavy construction activities for each of the four sub-projects will be concentrated in dam sites, quarry sites, and related ancillary service areas and substantial surface excavations will be required. However, if excavated slopes are properly designed and constructed, if proper consideration is given to disposal of excess material into suitable spoil disposal areas, soil erosion potential can be limited. The potential for soil erosion and mass wasting associated with improper earthworks construction is greater for road construction where side-casting, rather than end-hauling of the spoils results in overly steep slopes that are prone to failure, especially when they become saturated in heavy monsoon rains. Sound design and construction practices are the appropriate response, and have been

written into technical specifications for construction.

**Disruption of Social Structure and Degraded Health.** The influx of hundreds of workers to each of the four project construction sites has the potential to introduce infectious disease into the rest of the work force, as well as within the resident population. Regular medical examinations, appropriate waste processing and hygiene practices in construction camps (especially for dining areas and toilet facilities), and provision of basic medical facilities are effective control measures.

**Other construction impacts** relate to air pollution arising from dust from construction activities, construction equipment exhaust emissions and blasting products; degraded water quality due to effluents from construction camps and construction material processing; elevated noise levels; and additional traffic. These impacts are common to all large infrastructure construction projects and appropriate mitigation measures are well established. They are summarized in Attachment 1.

### **Impacts During Operation and Related Mitigation Measures**

**Reservoirs.** The four reservoirs will be long, narrow, steep-sided bodies of water with relatively large drawdown regimes. With the exception of Najitan, there is little in the way of flat valley bottomland or terrace land that will be inundated. The reservoir bottom and sides of the Dongping, Songshuling and Xiakou reservoirs will be dominated by rocky substrate that has little or no soil cover. The Najitan reservoir will be more of a run-of-river facility with a smaller drawdown range. For the most part the reservoir will be contained within the quaternary river terraces, which, for the most part have been developed as farmland. In some cases, the reservoir will spill over some lower elevation terraces. For all four projects it will be essential to minimize erosion of the soils within the catchment area. In this regard, all four catchment areas are included in the current central government program, commenced in 1999, to rehabilitate upper Yangtze catchment areas. Conservative estimates of potential reservoir sedimentation indicates that Songshuling reservoir will require low level outlets in the dam to enable sluicing of accumulated sediments.

**Downstream Flow Regime.** The most significant mitigation measure for the project involves the agreement to ensure that there is no channel dewatering downstream of Najitan and Songshuling powerhouses during initial reservoir filling and project operation, particularly in the dry season. Water releases in the amount of 30 percent of the average low flow for the driest month (i.e., January), will be provided to maintain riparian flows for fish and other aquatic organisms. For the Xiakou project, 0.3 m<sup>3</sup>/s of water will be constantly provided to the Juxiawan Irrigation Canal during project construction and operation. This will ensure that the paddy lands presently served by the canal are not adversely affected by the project.

**Tourism and Scenic Values.** The local authorities have some expectations that the projects in their respective jurisdictions will enhance tourism. The reservoirs will provide waterborne transportation routes that may be a draw for tourists who are interested in traveling by boat to view the steep rocky gorges (primarily Dongping, Songshuling and Xiakou), or pass through the Maodong Cave (Najitan).

**General Mitigation Measures.** All relevant Chinese standards that apply to design, construction and operation of the four hydropower projects developments, will be respected. Among the construction practices specified are: use of appropriate drainage, collectors and settling basins to intercept sediment laden waters and prevent surface water contamination; domestic wastewater treatment systems to process sewage and gray water generated by construction camps; decommissioning and reclaiming quarry sites; following state and provincial standards for reservoir clearing and sanitation; and prohibiting construction workers from hunting within the project area.

### Environmental Management and Monitoring

An environmental management organization will be established for each of the four projects. During the construction period, each of the project environmental management organizations will be responsible for:

- Regular monitoring of potentially harmful emissions including effluents and runoff, atmospheric and noise;
- (Supervision of the safety and health aspects during construction such as: sanitation, worker protection from job-related injury, prevention of epidemic disease, including control of insect and rodent pests;
- Restoration work such as decommissioning access roads and quarries, placing soil over re-contoured land, and seeding/planting vegetation; and
- Maintenance of environmental data, records and files, plus preparation of regular status reports.

Subsequent to construction, each of the project environmental management organizations will be retained, but modified appropriately, to monitor environmental baseline conditions (primarily reservoir water quality) and environmental impacts during operation.

The environmental monitoring activities are summarized in the table at the end of this annex. A substantial budget has been approved for the environmental management and monitoring component of each of the four projects. This is in addition to the funds allocated for resettlement activities. The budget (in RMB Yuan) for construction period environmental management and monitoring is as follows:

| Item  | Dongping                   | Najitan          | Songshuling       | Xiakou                                    |
|---|----------------------------|------------------|-------------------|---|
| Environmental Mitigation Works              | 920,000                    | 1,290,000        | 9,001,200         | 1,273,300                                 |
| Water Quality Protection                    | 540,000                    | 5,200,000        | 317,000           | Included in Envir. Mitigation Works above |
| Environmental Studies / Research (Subtotal) | 300,000                    | N/A              | 150,000           | N/A                                       |
| Environmental Supervision & Monitoring      | 1,110,000                  | 850,000          | 760,000           | 840,000                                   |
| <b>SUBPROJECT TOTALS</b>                    | <b>2,860,000</b>           | <b>7,340,000</b> | <b>10,228,200</b> | <b>2,113,300</b>                          |
| <b>PROJECT TOTAL</b>                        | <b>RMB Yuan 22,541,500</b> |                  |                   |   |

A training program will be implemented as part of the environmental management component of each project, to enhance environmental awareness amongst key personnel involved with construction and operation. Staff directly engaged in the assessment and monitoring of environmental conditions will be given additional specialized training.

### **Consultations with Public**

To obtain public opinions regarding the project and to strengthen environmental consciousness, four opinion and data surveys were carried out for each project, two during the development of the initial draft EA, and two when the draft EA was being revised to bring it into compliance with World Bank EA standards. The questionnaires, results and analyses are fully presented in the EA for each of the four projects.

Meetings were held with the local county peoples' congresses, standing committees and consultative committees, the media, workers associations, farmers, and local residents. Women and minority ethnic interests were well represented at the consultation sessions. All organizations within the project affected areas indicated strong support for the respective projects, primarily because it is believed that the projects will contribute much needed economic development within each of the four counties, thereby helping to alleviate poverty.

In addition to the public consultations, project evaluation and review meetings were also held. These were attended by design institutes, academics, state and provincial project sponsors, local county environmental protection bureau staff, and staff from local county resource management agencies. The groups systematically reviewed the project environmental impacts and proposed mitigation measures. The HPEB, HPFB and State Power Corporation subsequently approved the projects.

Public disclosure of the draft EA report for each project was carried out by providing the EA reports to the environmental protection bureau office of each project affected county in autumn 2000. Advertisements were placed in the local newspapers and notices broadcast on television, inviting members of the public to review the documents and provide comments to the project sponsors.



| Impacts                                    | Principal Location                            | Mitigation Measures   |                           | Monitoring, Acceptance, Inspection |   |   |                              | Cost (000s RMB)   | Supervising Unit  |
|--|---|---|---------------------------|------------------------------------|---|---|------------------------------|---|---|
|  |   | Content   | Unit                      | Frequency                          | Item  | Unit  | Time                         |   |   |
| <b>CONSTRUCTION PHASE</b>                  |   |   |                           |                                    |   |   |                              |   |   |
| <b>Major Impacts</b>                       |   |   |                           |                                    |   |   |                              |   |   |
| Loss of riverine aquatic habitat           | Within project reaches                        | Mitigation not possible   | N/A                       | N/A                                | N/A   | N/A   | N/A                          | N/A   | N/A   |
| Social and health due to influx of workers | Mostly at all four dam sites                  | Provision of camp, medical and other support facilities on site   | Contractor                | Monthly                            | Health examinations   | Local hygienic and epidemic prevention unit | On arrival and as required   | Dongping = 180<br>Lajitan = 300<br>Songshuling = 120<br>Xiakou = built into monitoring budget   |   |
| Construction of roads in rural areas       | Dam sites                                     | Decommission access roads when no longer needed   | Designer and contractor   | As required                        | N/A   | Construction unit                           | N/A                          | Built into project investment   | Local land bureau   |
| Irrigation water supply                    | Juxiawan Downstream of Xiakou                 | Supply 0.3 m <sup>3</sup> /s of water throughout construction   | Designer and contractor   | As required                        | N/A   | Local agricultural station                  | Monthly                      | Built into project investment   | Local agricultural station  |
| <b>Moderate to Minor Impacts</b>           |   |   |                           |                                    |   |   |                              |   |   |
| Excavation spoils disposal                 | Damsite and quarry sites                      | Use designated areas only; provide drainage and land restoration  | Contractor                | As required during construction    | N/A   | Construction unit                           | N/A                          | Dongping = 60<br>Lajitan = 40<br>Songshuling = 90<br>Xiakou = built into mitigation budget      |   |
| Increased traffic                          | All areas                                     | Minimize use at night and by heavy equipment  | Contractor                | As required during construction    | N/A   | Construction unit                           | N/A                          | Built into project investment   |   |
| Wildlife                                   | Mostly transmission                           | Restrict access outside immediate construction area; prohibit hunting   | Contractor                | As required during construction    | N/A   | Construction unit                           | N/A                          | Built into supervision budget   |   |
| Resettlement                               | All areas                                     | Adequate preparation and planning; pay compensation according to regulation; timing and proper implementation   | Local resettlement office | During implementation of RAP       | Environmental monitoring item and resettlement method to be decided | Local monitoring station                    | During implementation of RAP | Part of overall supervision budget  | Local government, people's congress and environmental protection bureau |
| Noise                                      | All areas                                     | Use low-noise equipment; stop using high-noise equipment; workers to be equipped with hearing protection; no construction work near villages at night | Contractor                | Monthly                            | Leq; Leqmax   | Local monitoring station                    | Construction peak period     | Dongping = 100<br>Lajitan = 100<br>Songshuling = 100<br>Xiakou = built into mitigation budget   | Local environmental protection bureau                                   |
| Air pollution                              | Mostly damsite                                | Proper equipment selection use and maintenance  | Contractor                | Quarterly                          | SO <sub>2</sub> , NO <sub>x</sub> , TSP, etc.                       | Local monitoring station                    | Construction peak period     | Dongping = 280<br>Lajitan = 350<br>Songshuling = 2,130<br>Xiakou = built into mitigation budget | Local environmental protection bureau                                   |
| Dust control                               | Mostly damsite and aggregate processing areas | Use enclosing fences and covers on trucks and stockpiles; spraying water periodically; equip workers with dust masks                                  | Contractor                | Monthly                            | Visual inspection   | Local monitoring station                    | Construction peak period     | Included as part of air pollution control budget  | Local environmental protection bureau                                   |

| Impacts                                       | Principal Location   | Mitigation Measures  |                           | Monitoring, Acceptance, Inspection      |  |                          |                            | Cost<br>(000s RMB)   | Supervising Unit                      |
|---|--|--|---------------------------|---|--|--------------------------|----------------------------|--|---------------------------------------|
|   |  | Content  | Unit                      | Frequency                               | Item   | Unit                     | Time                       |  |                                       |
| Sewage  | Mostly at construction camps, dining areas and toilet facilities | Setting temporary septic tank according to number of labor on site, and hauling out of site periodically | Contractor                | Monthly                                 | COD, BOD5, SS, coliform  | Local monitoring station | Construction peak period   | Dongping = 80<br>Lajitan = in overall water treatment budget (200)<br>Songshuling = 92<br>Xiakou = built into water quality protection budget  |                                       |
| Water quality due to wastewater and effluents | Dam sites, quarry sites and aggregate processing facilities      | Provide settling and collecting tanks, with treatment as required  | Contractor                | Bimonthly                               | Ph, SS, COD, and BOD   | Local monitoring station | Construction peak period   | Dongping = 80<br>Lajitan = in overall water treatment budget (200)<br>Songshuling = 160<br>Xiakou = built into water quality protection budget | Local environmental protection bureau |
| Land Erosion                                  | All areas  | Specify sound design and construction practice, notably drainage, slope protection, etc.                 | Designer and contractor   | N/A                                     | N/A  | N/A                      | Construction peak period   | Dongping = 300<br>Lajitan = 500<br>Songshuling = 65<br>Xiakou = included in mitigation works budget  |                                       |
| <b>OPERATION PHASE</b>                        |  |  |                           |   |  |                          |                            |  |                                       |
| <b>Major Impacts</b>                          |  |  |                           |   |  |                          |                            |  |                                       |
| Loss of land from inundation                  | All four project areas   | None possible  | N/A                       | N/A                                     | N/A  | N/A                      | N/A                        | N/A  |                                       |
| Flow regime                                   | Lajitan and Songshuling  | Provide 30% of average flows in driest month (January) for riparian releases                             | Designer and owner        | N/A                                     | N/A  | N/A                      | N/A                        | Built into project investment  |                                       |
| Loss of trees and other vegetation            | Mostly transmission  | Timely compensation to felling of any tall trees, tree planting at other locations                       | Local resettlement office | Construction                            | Acceptance survey  | Acceptance team          | Upon project acceptance    | Built into project investment  | Local environmental protection bureau |
| Electromagnetic field                         | Substations and transmission                                     | Proper siting and design; adopt shielding for equipment where necessary                                  | Designer and owner        | One time after operation                | Substation and representative transmission locations; electrostatic induction; electric and magnetic field | Local monitoring station | Initial stage of operation | Built into project investment  | Local environmental protection bureau |
| <b>Moderate to Minor Impacts</b>              |  |  |                           |   |  |                          |                            |  |                                       |
| Water quality                                 | Reservoirs   | Reservoir clearing   | Contractor and owner      | Bi-monthly                              | Standard properties  | Local monitoring station | During operation           | Built into project investment and operation  | Local environmental protection bureau |
| Land and erosion stability                    | Adjacent to reservoirs   | Minimize intrusion; provide drainage; slope protection; etc. if required; reforestation                  | Designer and contractor   | Twice yearly                            | Acceptance survey  | Local forestry station   |                            | Built into project investment  | Local environmental protection bureau |
| Tourism and scenic values                     | Reservoirs   | Consideration for tourism boat safety  | Owner                     | Yearly                                  | Tourism boats properly equipped with life jackets, etc.  | Local monitoring station |                            |  | Local water navigation bureau         |
| Line crossings                                | Transmission   | Traffic safety considered in all design; sufficient safety clearance of lines considered in design       | Owner                     | One time for inspection after operation | N/A  | N/A                      | N/A                        | Built into project investment budget   | Local traffic bureau                  |
| Noise   | All areas  | Adopt low-noise equipment, silencing materials, protection walls and greening                            | Owner                     | Yearly                                  | Substations and field; Leq, Leqmax   | Local monitoring station | Initial state of operation | Built into operation environmental budget  | Local environmental protection bureau |

**Additional  
Annex 14**

**Land Acquisition and Resettlement  
CHINA: Hubei Hydropower Devt. in Poor Areas**

The Resettlement Action Plans (RAPs) for the four sub-projects have been prepared in accordance with the relevant laws and regulations of the central and provincial governments and to comply with Bank OD 4.30 Involuntary Resettlement. The overall objective of the RAPs is that affected people will benefit from the project and improve or, at least, restore their living standard.

**Resettlement Impacts**

Resettlement impacts of the four sub-projects are summarized in the following table.

**Table 1. Land Acquisition and Structure Demolition Requirements**

| Sub-Project  | Total Land Area (mu) | Cultivated Land (mu) | Economic or Fruit Trees (mu) | Forest or Scrub (mu) | Removed structures (m2) | Temporary Occupation (mu) |
|--------------|----------------------|----------------------|------------------------------|----------------------|-------------------------|---------------------------|
| Dongping     | 9,879.6              | 2,565.2              | 400.9                        | 3,933.0              | 54,008.0                | 61.0                      |
| Najitan      | 1,710.5              | 692.5                | 13.7                         | 369.4                | 16,126.1                | 35.0                      |
| Xiakou       | 2,464.0              | 1,183.0              | 557.7                        | 608.7                | 56,484.0                | 80.0                      |
| Songsuling   | 667.0                | 345.8                | 74.5                         | 224.0                | 9,889.0                 | 133.6                     |
| <b>Total</b> | <b>14,721.1</b>      | <b>4,786.5</b>       | <b>1,046.8</b>               | <b>5,135.1</b>       | <b>136,507.1</b>        | <b>309.6</b>              |

Source: Four Project Offices.

Note: 15 mu = 1 ha

The land acquisition and resettlement will involve two provinces (Hubei and Hunan), five counties, 16 townships or towns, 44 villages and 128 village groups. A total of 7,425 people will be affected by land acquisition or physical relocation. Most affected people are classified as rural, with only 305 urban residents from Zhongjianhe Town requiring relocation for the Dongping sub-project. Numbers affected by land loss, relocation or both are shown in the table below. In this table, the number requiring rehabilitation is calculated by dividing the area of land lost by the per-capita land area in the affected village. It is therefore somewhat less than the total numbers affected by land loss, and is more a measure of equivalent livelihoods to be restored gives a better parameter for use in rural resettlement planning, where livelihood restoration is often more difficult than relocation.

**Table 2. Categories of Affected People**

| Sub-Project  | Total Urban affected | Total Rural affected (household) | Affected by relocation and land loss (household) | Affected only by relocation (household) | Affected only by land loss (household) | Economic Rehabilitation Persons |
|--------------|----------------------|----------------------------------|--|---|--|---------------------------------|
| Dongping     | 305                  | 3047 (790)                       | 1,059 (256)                                      | 0                                       | 1988 (534)                             | 1,663                           |
| Najitan      | 0                    | 2565 (575)                       | 236 (49)   | 161 (35)                                | 2168 (491)                             | 640                             |
| Xiakou       | 0                    | 1043 (256)                       | 931 (228)  | 4 (1)                                   | 108 (27)                               | 957                             |
| Songsuling   | 0                    | 465 (133)                        | 105 (26)   | 109 (26)                                | 251 (81)                               | 197                             |
| <b>Total</b> | <b>305</b>           | <b>7120(1754)</b>                | <b>2,331 (559)</b>                               | <b>274 (62)</b>                         | <b>4515 (1133)</b>                     | <b>3,457</b>                    |

Source: Four Project Offices.

In some affected villages land, and particularly paddy land, is very limited and therefore the impact of reservoir inundation will be substantial. For example, in Zhongjianhe Village, affected by Dongping, over 60 percent of cultivated land will be lost due to reservoir inundation with per capita cultivated land area reducing from 1.92 mu to only 0.74 mu. Similarly, paddy land will be reduced from 0.53 mu to only 0.16 mu per person. Tongchenghe Village (affected by Xiakou) and Shangping Village (affected by Songshuling) are similarly impacted. Therefore, detailed and realistic economic rehabilitation plans are needed to ensure full restoration of income and livelihood.

### Social Economic Condition of the Affected Areas

The four sub-projects are located in mountainous areas in western Hubei. Three project counties (Xuan-en, Laifeng and Zhushan) are national level poverty counties. The other (Nanzhang) is a provincial level poverty county. Poor transport conditions, limited cultivable land resources, and lack of non-farming opportunities are the main factors responsible for impoverishment. According to sample household surveys conducted among affected villages, most households still rely on agriculture as their main source of income. Their main crops include rice, wheat, corn, and potatoes. The average per capita income is about two thirds of the provincial average. The limited non-farm income is mainly from remittances from household members working outside the county, small trade, and transport activities (Table 3).

Table 3. Basic Economic Characteristics of Affected Households

| Project Counties | Number of Sample Families | Per Capita farmland (mu) | Per capita Grain (kg) | Labor in non-farm activities (percent) | Per Capita Income (Y) | Income from agriculture (percent) | Income from outside labor (percent) |
|------------------|---------------------------|--------------------------|-----------------------|--|-----------------------|-----------------------------------|-------------------------------------|
| Xuan-en          | 47                        | 1.52                     | 694                   | 32.9                                   | 1,351                 | 78.9                              | 16.2                                |
| Laifeng          | 54                        | 1.04                     | 494                   | 39.5                                   | 1,400                 | 57.3                              | 15.2                                |
| Nanzhang         | 54                        | 1.55                     | 640                   | 32.2                                   | 2,165                 | 64.3                              | 10.4                                |
| Zhushan*         | 51                        | 1.43                     | 545                   | 46.9                                   | 2,989                 | 23.4                              | 22.4                                |
| Total            | 206                       | 1.39                     | 593                   | 37.9                                   | 1,976                 | 56.0                              | 16.1                                |

Source: Resettlement Action Plans (1998 statistics).

Note: Because more than half of the sample households for Zhushan are in Liulin Township, where most affected people are retailers, the average income level is much higher than net rural income in the general area. The average per capita income in the eight affected villages in Zhushan is only Y 1,356.

### Legal Framework

The basic law governing land acquisition is the "Land Administration Law" (1998), and the 1991 regulations concerning resettlement for large and medium hydroelectric and irrigation projects, supplemented by provincial regulations including: "Hubei Provincial Implementation Measures of Land Administration Law" (1999).

In China, urban land is owned by the State, and rural land is owned by village collectives. All land to be acquired under the project is classified as rural. The State has the right to acquire rural land, and compensation is payable by the State organ which acquires it for land, crops and attached properties. Payment is also required for job rehabilitation also referred to as resettlement subsidy. Compensation is also payable to individuals for housing and other improvements on the land.

Under the law, land compensation shall be in the range of 6 to 10 times average annual output value per mu, in the three years preceding land acquisition. Job compensation shall be in the range of 4 to 6 times

average annual output per mu for each “affected person”, which is a calculated number determined by dividing area of acquired cultivated land by the existing ratio of per capita cultivated land for each affected village. In the case of lower per capita cultivated land ratios, the job compensation multiplier may be increased up to 15, and if proceeds of land and job compensation entitlements are still not adequate to guarantee income restoration, the total land and job compensation multiplier could be increased up to 30 times average annual output value.

Among the various items making up total land compensation, only young crop compensation and properties and improvements are paid directly to individuals. The remainder is paid to the affected villages, and is to be used for various economic rehabilitation measures including: land development, provision of irrigation, non-farm employment measures, and other income generating activities. With the approval of village members, it could also be used for improving community facilities or services and to assist those too old to work. By law, each affected village is required to maintain separate accounts on compensation funds. Financial reports must be provided annually to the next higher level of government.

As noted above, for hydropower projects, resettlement is also required to comply with additional sector specific policies. These regulations are being redrafted to conform with the new Land Administration Law; however, the basic principles and contents remain valid. They include:

**Resettlement with development.** By emphasizing development of new production capacity instead of cash compensation only, Chinese resettlement policy aims to provide PAPs a sustainable production base to restore their livelihood at least to the previous level and preferably beyond that.

**Compensation provided in the early stage of resettlement and rehabilitation assistance provided after displacement.** In general, up-front relocation and resettlement costs (including the costs of new production facilities) is financed by compensation funds which are included in the project budget, while additional rehabilitation assistance after the move comes from project revenues. Rehabilitation assistance is provided for up to 10 years after displacement since new economic and social systems may take considerable time to fully develop.

**Local governments have primary responsibility in implementation.** While the project owner funds the resettlement program, county governments have primary responsibility for implementation with the provincial government providing overall leadership.

**Preferential Policies.** Local governments should support resettlement with preferential policies and organize various government departments to support and facilitate resettlement implementation.

### **Compensation Standards**

Based on the law and regulations, and investment needs to replace land and livelihood, a set of land compensation standards have been adopted for each of the sub-projects. Compensation standards for cultivated land are summarized in the following table.

Table 4. Compensation Standards for Cultivated Land

| Project     | Average Unit Yield (Y/mu) | Multiple for Land Compensation | Multiple for Job Compensation | Average farmland per person in villages | Total Compensation (land and job) for different villages (Y/mu) |
|-------------|---------------------------|--------------------------------|-------------------------------|---|---|
| Dongping:   | 553 - 610                 | 6                              | 4                             | 1.39 - 2.02                             | 4,717 - 5,649   |
| Najitan     | 478 - 673                 | 7                              | 4                             | 0.62 - 2.07                             | 4,980 - 8,213   |
| Xiakou      | 483 - 689                 | 6                              | 4                             | 0.72 - 1.23                             | 5,257 - 8,371   |
| Songshuling | 294 - 574                 | 8                              | 5                             | 1.46 - 3.43                             | 2,779 - 6,463   |

Similar compensation standards are set for fruit trees (a total of nine times average yield), forested land (half the multiple of cultivated land plus separate compensation for trees), scrub land, housing plots and non productive land.

### Property Compensation

For each sub-project rates have also been set for compensation including buildings (by construction material and standard), and for household facilities such as stoves, cable television installations etc.

### Resettlement and Rehabilitation Plans

The basic resettlement strategy for each sub-project, in accordance with the wishes of the project affected people, is that economic rehabilitation where required will be land based. Based on analysis of current social economic conditions of the affected people, and regional economic development aspirations, a set of resettlement targets is developed. The main target is to ensure at least one mu of farmland per person, with no less than 0.5 mu of high yield paddy, so that 350 kg per person of grain (for food, seed and feed) could be guaranteed. This would serve to improve overall agricultural income. This is a basic performance indicator. Further income improvement may be realized through improved cropping patterns, crop diversification, agricultural sideline activities etc.

### Dongping Power Plant

Dongping will have the largest resettlement impacts, acquiring 2,565 mu cultivated land and relocating 256 households or 1,059 individuals, plus one township town with 305 persons. The land acquisition and resettlement will involve 7 townships, 17 administrative villages and 38 village groups, affecting 3,352 individuals. Of these 1,819 people will require "resettlement". That is a somewhat artificial number consisting of the sum of all those needing relocation and the rehabilitation numbers (as defined earlier) (while eliminating double counting).

Table 5. Distribution of Resettlement Population in Rural Areas for Dongping

| Types       | Total Resettlers | Relocation and Economic Rehabilitation | Only Relocation | Only Economic Rehabilitation |
|-------------|------------------|--|-----------------|------------------------------|
| Moving Out  | 702              | 656                                    | 46              | 0                            |
| Moving Back | 1117             | 332                                    | 58              | 727                          |
| Total       | 1819             | 988                                    | 104             | 727                          |

Most of these impacts will be concentrated in Zhongjianhe Village, which accounts for 77.5 percent of relocated population, 65.6 percent of acquired cultivated land and 52 percent of economic rehabilitation requirements. For the remaining 16 affected villages, a total of 908 mu farmland will be acquired, and economic rehabilitation will be required for 820 people, averaging 56.8 mu and 51 persons per village, or 32.4 mu and 29 persons per village group.

Two approaches have been adopted for relocation and economic rehabilitation. For Zhongjianhe Village, where resettlement impacts are concentrated, 74 percent of relocated people will be moved out of their existing villages. These 702 individuals belong to no. 3, 4, 6, 7, 8, and 9 village groups (Table 6).

Table 6. Distribution of Total Resettlers in Zhongjianhe Village

| Group | Total Population | Total Farmland | Acquired Farmland | Total Resettlers | Move out of Village | Remain in the Village |
|-------|------------------|----------------|-------------------|------------------|---------------------|-----------------------|
| 1     | 110              | 224            | 6.1               | 3                |                     | 3                     |
| 2     | 158              | 360            | 101.2             | 46               |                     | 46                    |
| 3     | 135              | 317            | 307.9             | 139              | 139                 |                       |
| 4     | 107              | 249.7          | 180.2             | 79               | 65                  | 14                    |
| 5     | 142              | 422            | 345.1             | 120              |                     | 120                   |
| 6     | 168              | 264            | 157.7             | 103              | 71                  | 32                    |
| 7     | 130              | 181            | 42.8              | 48               | 48                  |                       |
| 8     | 101              | 197.8          | 193.5             | 105              | 105                 |                       |
| 9     | 266              | 387.1          | 347.2             | 274              | 274                 |                       |
| 10    | 159              | 280            | 46.2              | 27               |                     | 27                    |
| Total | 1476             | 2883           | 1727.9            | 944              | 702                 | 242                   |

Note: Total resettlers include both physically relocated people and those needing economic rehabilitation due to land loss.

Since it considers growth until moving year (2004), the figure is larger than the current total population.

After extensive consultations with the affected people and prospective host communities, two host villages in the same township have been identified. They are Luluba Village, which will receive 637 resettlers, and Maocunzi Village, which will receive 65 resettlers. The basic criterion for selection of host villages was that they should have surplus farmland so that after resettlement (and development of some new farmland), there would be sufficient land for the entire community. For example in Luluba Village, the current per capita farmland is 2.12 mu, higher than the county average. But because of lack of irrigation, most farmland is not optimally utilized. In return for accepting resettlers, the host communities will receive a proportion of compensation funds enabling them to improve their overall income and living standards. For example, Luluba Village will be able to construct an irrigation canal significantly increasing irrigated farmland (650 mu), and provide safe drinking water for an additional 1,279 persons.

Relocated people will be resettled in 5 village groups in Luluba. After land development work, it is calculated that a total of 741 individuals could be received in these village groups (in comparison with the 637 planned to actually move). Similar calculations for Maocuzi Village indicate that it could accept 156 people individuals in comparison with the 65 that will actually move. After application of compensation funds for land development work, surplus funds will be available for improvement of community facilities, such as school, clinics, and roads for both resettlement and host villages.

For the remaining village groups in Zhongjianhe Village and other villages where land loss is limited, the basic approach is to resettle within the existing village groups. Under such approach, each affected village group will redistribute the remaining land resources, and develop new farmland in order to ensure that all households in the community will meet the basic land requirements. The planned situation after resettlement is summarized in the following table:

Table 7. Economic Rehabilitation for Moving Back Villages

| Villages    | Number of Resettlers | New Paddy (mu) | New Dryland (mu) | Converting paddy from dryland (mu) | New orchard (mu) | Per capita farmland after resettlement |
|-------------|----------------------|----------------|------------------|------------------------------------|------------------|--|
| Zhongjianhe | 239                  | 112            | 150              | 180                                | 324              | 1.24-1.95                              |
| Shangmu     | 84                   | 10             | 60               | 30                                 | 80               | 1.20-1.47                              |
| Yongdong    | 70                   | 25             | 60               | 50                                 | 40               | 1.15-1.23                              |
| Wanling     | 6                    |                | 15               | 10                                 | 10               | 2.95                                   |
| Xiaoba      | 121                  | 25             | 50               | 185                                | 160              | 0.97-2.17                              |
| Datuo       | 157                  | 55             | 105              | 110                                | 80               | 1.11-1.23                              |
| Qiliqiao    | 10                   |                |                  |                                    |                  | 1.49                                   |
| Shanhegou   | 137                  |                |                  |                                    |                  | 1.12-1.26                              |
| Lianhuaba   | 212                  |                |                  |                                    |                  | 0.83-0.98                              |
| Miaomu      | 23                   |                |                  |                                    |                  | 0.82                                   |
| Total       | 1059                 | 227            | 440              | 565                                | 694              | 0.82-2.95                              |

Note: For villages at the tail end of the reservoir, such as Shanhegou, Lianhuaba and Miaomu, due to geographic constraints, no new farmland will be developed. However, since these villages are situated near the county town, most people no longer rely on farming as their main source of income. Agricultural income only accounts for 40 percent of total income in the area. In order to replace the lost farm income, it is planned that they will use remaining farmland to develop greenhouse vegetables and fruit for sale in the nearby market, which will significantly increase their agricultural income.

While the approach described above indicates overall feasibility of resettlement, and adequacy of compensation funds at the Administrative Village level, rehabilitation planning has been carried out down to the individual village group level. This has included preparation of farm models for typical village groups and households to investigate potential improvements through changing cropping pattern and introducing more profitable cash crops. These analyses demonstrate that both moving out resettlers and moving back resettlers will be able to reach target incomes (about Y 2,000 to Y 2,200 per household) within three or four years after resettlement, and with improvement of cropping pattern and development of fruit trees, farm income will be significantly higher in the seventh year after displacement and beyond. To ensure that the proposed economic rehabilitation measures will be fully funded, careful comparison of total compensation funds to be received and total investment requirements has been carried out for each affected village group. This analysis also provides a basis for effective resettlement supervision and monitoring.

In order to ensure adequate grain during the transition period, each affected person will receive grain to the value of Y 300 per year for five years. In addition, in order to encourage fertilization of new land, a one-time payment of Y 2,000/mu for newly developed farmland, and Y 1,500/mu for newly developed fruit tree land will be provided. In addition to this basic land based rehabilitation program, the resettlers will be encouraged and assisted to develop non-farm based activities such as economic trees, cage fishing, tourism, industrial and service oriented activities.

Each relocated household will receive a new housing plot including an area for vegetable gardening.



Housing plots will be distributed to the relocated people in an open and fair manner. The resettlers will be responsible for building their own houses financed by cash compensation (based on replacement value) for their lost structures and property improvements. To facilitate the process of relocation and reconstruction, a one-time transition assistance (Y800 per person) will be paid for each relocated person.

The relocated Zhongjianhe Town will be rebuilt close to its existing site, along the proposed highway between the dam and Changtanhe Town. A total of 22 township institutions, and 261 associated people, will be relocated to the new town, including schools, town administration, medical facilities, and commerce, trade and retail facilities. In addition, 23 urban households or small shops (44 persons) will be relocated to the town center. The town will occupy 3.15 hectares of land area, and will be designed to accommodate 418 persons, which includes provision for expansion. A total of 21,160 m<sup>2</sup> of new structures will be constructed for various town functions, which will be a 25 percent increase compared to the old town. More importantly all infrastructure facilities will be greatly improved. With greatly improved access and potential for growth, the new Zhongjianhe Town will play a much greater role in local economic development.

In addition to the new town, the resettlement program will also provide an opportunity to improve infrastructure facilities and promote regional development in the project area. For example, under the resettlement program a total of 61 km of roads will be constructed or upgraded, which will directly improve access for 56,000 people in the reservoir area. As noted above in relation to Luluba, both resettlement and host communities will also benefit from improved irrigation and water supply. Other physical infrastructure, such as electricity supply and telecommunications, and community infrastructure (schools, clinics, libraries etc.) will also be significantly improved.

#### **Najitan Power Plant**

Impacts of Najitan Project will be much smaller, requiring acquisition of 692.5 mu of cultivated land and relocation of 84 households and 397 individuals. A total of 575 households and 2,565 individuals will be affected. Moreover, the limited impacts are spread over a much wider area, including two provinces, two counties, five townships, 14 villages and 62 village groups. In average, for each affected village group, only 11.2 mu farmland will be acquired, 10 persons need economic rehabilitation and 6 persons need physical relocation.

**Table 8. Distribution of Resettlement Population for Najitan Project**

| County       | Total Affected People (household) | Relocation and land loss (household) | Only Relocation (household) | Only land loss (household) | Economic Rehabilitation (persons) |
|--------------|-----------------------------------|--------------------------------------|-----------------------------|----------------------------|-----------------------------------|
| Laifeng      | 1933 (439)                        | 131 (27)                             | 103 (26)                    | 1699 (386)                 | 466                               |
| Longshan     | 632 (136)                         | 105 (22)                             | 58 (9)                      | 469 (105)                  | 174                               |
| <b>Total</b> | <b>2565 (575)</b>                 | <b>236 (49)</b>                      | <b>161 (35)</b>             | <b>2168 (491)</b>          | <b>640</b>                        |

Note: Economic rehabilitation numbers will rise to 806 by 2005, the moving year

As shown in the above table, About 25 percent of Najitan resettlement is in Longshan County in Hunan Province. The resettlement bureau of Longshan County and concerned townships and villages officials have been involved in the process of resettlement preparation, from census survey to resettlement planning, and will be responsible for the resettlement implementation. In addition, the social assessment focusing on minorities fully covered the affected people in Longshan.

Because of the limited impacts, the basic strategy for economic rehabilitation is resettlement within affected village groups. Each affected village group will redistribute the remaining land resources, and develop new farmland or orchard to reach minimum per capita farmland norms. Similarly, people requiring relocation will be relocated within existing village groups, except 11 households and 54 individuals who will be relocated in the Manshui Township Town. These individuals have been selected for their special non-farm skills, and their current village location close to the town center, such that their farmland and economic rehabilitation entitlements will remain with their village groups. According to the farm model analysis (based on a typical household in Sujiaping Village), lost agricultural income will be restored in the second year of resettlement.

### Xiakou Power Plant

The Xiakou sub-project will have the second largest resettlement impacts, acquiring 1,183 mu cultivated land and relocating 931 individuals as shown in the following table. It can be seen that the most important impacts are in Tongchenghe Village.

Table 9. Distribution of Resettlement Population for Xiakou Project

| County              | Total Affected People (household) | Relocation and land loss (household) | Only Relocation (household) | Only land loss (household) | Need Economic Rehabilitation |
|---------------------|-----------------------------------|--------------------------------------|-----------------------------|----------------------------|------------------------------|
| Tongchenghe Village | 857 (211)                         | 857 (211)                            |                             |                            | 845                          |
| Ganhe Village       | 182 (44)                          | 74 (17)                              |                             | 108 (27)                   | 112                          |
| Xiakou Village      | 4 (1)                             |                                      | 4 (1)                       |                            |                              |
| Total               | 1043 (256)                        | 931 (228)                            | 4 (1)                       | 108 (27)                   | 957                          |

Note: By the moving year 2005, economic rehabilitation numbers will increase to 1000.

Of the total population to be relocated, about 92 percent, all from Tongchenghe Village, will move out of their existing village. After wide consultation and comparison, five villages within the same township have been selected to receive these resettlers. These villages (including Ganhe and Xiakou with limited resettlement impacts) all have higher per capita income than that of Tongchenghe, due to better access and more developed fruit trees, and have relatively greater farmland or development potential. The exception is Xiakou Village, which includes the town center, which will have less farmland (0.72 mu per person), but will take resettlers who have special skills for non-farm activities.

Table 10. Economic Rehabilitation for Xiakou Sub Project

| Villages | Number of Resettlers | New Paddy (mu) | Change farm-land (mu) | New Dry-land (mu) | Converting paddy and upgrade low yield farmland (mu) | New orchard (mu) | Per capita farmland and orchard after resettlement (mu) |
|----------|----------------------|----------------|-----------------------|-------------------|--|------------------|---|
| Ganhe    | 259                  | 53             |                       | 180               | 210  | 270              | 1.66-2.79   |
| Hanshan  | 311                  | 100            | 200                   |                   | 170  | 693              | 2.40  |
| Yanluo   | 165                  | 100            |                       |                   | 70   | 300              | 2.38  |
| Baifu    | 188                  | 155            |                       |                   | 60   | 362              | 2.22 - 2.47   |
| Xiakou   | 77                   | 20             |                       |                   | 90   | 100              | 1.54  |
| Total    | 1,000                | 428            | 200                   | 180               | 600  | 1725             | 1.54-2.79   |

Note: For Hanshan village, 200 mu of changed farmland refers to the existing farmland to be purchased from host village group by providing newly developed fruit trees at price two to one (two mu fruit tree for one mu farmland). Given the success of fruit trees in the area, many people in host villages would like to expand their fruit tree holdings.

An economic rehabilitation program has been developed for each village group, and detailed farm model analysis has been carried for both moving back and moving out resettlers. For people remaining in Tongchenghe Village, due to increased per-capita farmland and other resources after others move out, average farm income is expected to increase by over 40 percent after resettlement. For the host village, after implementing improvements, such as development of new farmland and fruit trees, farm income (for both resettlers and local villagers) is projected to reach Y 4,000 per household in the second year of resettlement, exceeding the income level before resettlement.

### Songshuling Power Plant

Songshuling will have the least amount of resettlement impacts as summarized in the following table:

Table 11. Distribution of Resettlement Population for Songshuling Sub-Project

| Township | Total Affected People (household) | Relocation and land loss (household) | Only Relocation (household) | Only land loss (household) | Need Economic Rehabilitation |
|----------|-----------------------------------|--------------------------------------|-----------------------------|----------------------------|------------------------------|
| Liulin   | 100 (22)                          |                                      | 100 (22)                    |                            |                              |
| Guandu   | 358 (107)                         | 101 (25)                             | 6 (1)                       | 251 (81)                   | 187                          |
| Liangjia | 7 (4)                             | 4 (1)                                | 3 (3)                       |                            | 10                           |
| Total    | 465 (133)                         | 105 (26)                             | 109 (26)                    | 251 (81)                   | 197                          |

The impacts in Liulin township are mainly building demolition in Liuhe Village. Most of the affected households (22 households and 100 individuals) are small retailers located along the highway towards the end of reservoir. After consultation with the affected people, it was decided that a dike will be constructed to avoid reservoir inundation. The detailed design and cost estimate of the proposed dike is included in the RAP. After consultations with the remaining affected people, it was agreed that 13 households and 52 individuals will move out of their villages, with the others remaining within their villages. (See table 11 below).

Table 12. Distribution of Resettlement Population for Songshuling Project

| Villages  | Total resettlement population | Relocation and Economic Rehabilitation | Only Relocation | Only Economic Rehabilitation | Move out of villages | Move within villages |
|-----------|-------------------------------|--|-----------------|------------------------------|----------------------|----------------------|
| Liuhe     | 100                           |  | 100             |                              |                      |                      |
| Shangping | 61                            | 46                                     | 3               | 12                           | 27                   | 34                   |
| Yangpo    | 24                            | 10                                     | 6               | 8                            | 16                   | 8                    |
| Puxi      | 80                            | 38                                     |                 | 42                           | 9                    | 71                   |
| Taoyuan   | 31                            | 4                                      |                 | 27                           |                      | 31                   |
| Tianchiya | 10                            | 7                                      |                 | 3                            |                      | 10                   |
| Total     | 306                           | 105                                    | 109             | 92                           | 52                   | 154                  |

For those who have decided to move out, three different options have been provided: a fruit tree plantation near Guandu Town; a retail market in Guandu Town; and Puxi Village within the same township. At the fruit tree site, each relocated household will be allocated an area of developed fruit trees as its economic rehabilitation package. For those selecting the retail market option, each household will be relocated to the main street in the town center, to a shop-house (shop at ground floor level and residence at upper levels). Those households who want to move to Puxi Village are mainly from poor villages currently having only dry land. In Puxi, they will share farmland resources with host village groups. After land development and redistribution, per capita farmland will be 0.9 to 1.1 mu, plus another 1.1 mu yellow ginger per person.

The remainder will be resettled within their existing village groups. Similar economic rehabilitation measures, such as development of new farmland or economic trees, will be carried out in all affected village groups. As a result, the per capita farmland will reach 0.99 mu to 2.58 mu among affected village groups. In addition, a range of fruit trees and other economic trees will be developed to supplement the farming income. Based on a farm model analysis on Shangping Village, without the project per household farm income would be Y1,719 per year. With the project, after economic rehabilitation, projected household income will reach Y 1,773 yuan in the first year of resettlement. In the seventh year and beyond, average household incomes are projected to reach Y 2,624 per year.

### **Institutional Arrangements**

Several institutions share responsibility for resettlement implementation including the provincial project management office (PPMO), sub-project offices (of project owners) as well as the respective county governments. A Resettlement Leading Group (RLG) will be established by at the provincial level. The RLG is made of officials from relevant provincial departments and four county project offices. Its main responsibility is to strengthen the leadership of the project, formulate resettlement policies, facilitate resettlement implementation, and coordinate among departments. Under the RLG, a resettlement unit within the PMO will be set up, with responsibility for coordinating planning, implementation and monitoring activities among four counties. Their main responsibilities include: during the planning phase, employment of a consulting team to assist in inventory and social economic surveys and prepare RAPs; during implementation, overseeing management and disbursement of resettlement budget, coordinating and supervising implementation, reviewing internal monitoring; and co-ordinating external monitoring and evaluation.

Resettlement implementation will be managed by relevant project offices and county governments. A county level RLG has been set up in each county, composed of a county deputy governor and officials of relevant county departments, such as county electric power supply bureau, land administration bureau, labor bureau, and public security bureau. Its main responsibilities include: identifying resettlement and rehabilitation options; formulating resettlement preferential policies, supervising resettlement implementation and coordinating among different agencies. Under the county RLGs, resettlement units have been set up within the project offices, with staff seconded from relevant county departments.

The County Resettlement Offices are responsible for assisting in site surveys, keeping records, organizing consultation and community participation, developing and implementing RAPs, managing and allocating the resettlement funds, training resettlement staff at county and township levels, signing compensation agreements with affected families and villages, and being a main channel of grievance for the resettlers. In each affected township, a resettlement working team has also been established, which will work closely with the county resettlement office for carrying out resettlement implementation.

### **Compensation Fund flows**

Based on the compensation standards set out in the RAPs, the project offices will sign project land acquisition and resettlement agreements with concerned county land administration bureaus, which will in turn sign compensation agreements for land and attachments with concerned townships and villages. In addition, the project resettlement offices will sign compensation agreements on buildings and attachments with affected households, and will sign compensation agreements on relocation of township town and other special infrastructure facilities with concerned local government agencies. The delivery of land compensation funds will go from the project resettlement offices, through concerned township resettlement offices to affected villages and village groups. Compensation associated with land attachments (such as

standing crops) will be delivered from villages to affected individuals. The compensation funds for lost buildings and other land improvements will be paid directly from the project resettlement offices to the affected individuals. The funds for reconstruction of the new town and other infrastructures will be allocated from the project offices to the concerned local governments or special departments. To ensure that resettlement funds will be used effectively and exclusively, the different levels of governments will carry out auditing on the use of resettlement funds each year.

### **Consultation, Public Disclosure, and Grievance Procedures**

During the planning phases, extensive consultation and community participation have been organized by the project resettlement offices in resettlement areas and host communities. Consultation was enhanced for the two sub-projects located in Enshi Tujia and Miao Autonomous region (Dongping and Najitan), to determine whether any special provisions needed to be made for minorities in the resettlement program. See paragraph Annex 15. Examples of affected people selecting between alternatives are included in the foregoing summary. Others are included in the following paragraphs.

In Dongping, based on the discussion with the affected villages and individuals, two villages (within the same township) with similar ethnic composition, and social economic conditions have been selected as host villages. In addition, all relocatees from a particular village group will move to the same place so as not to disrupt existing social structures. In Najitan, after extensive consultation, it was agreed that about 12 households and 55 persons with special skills will be resettled in township towns, while the remaining 72 households and 346 individuals will be resettled within their existing villages. In Xiakou, during the planning process, the resettlement office staff arranged for the affected people to visit two proposed resettlement sites in order to allow their informed participation. One option was to resettle to villages within the same township, where fruit tree planting would be the main future source of income. The other option was Jiuji Township near the county town, where the resettlers would have much better farming conditions and more opportunities for future development. In Songshuling, as noted earlier relocated people from villages with poor access and little irrigation, will be given choice of moving to another village in the same town maintaining their rural lifestyle but with much improved farming conditions, moving to an existing fruit tree plantation where they would be allocated an area of existing fruit trees or moving to a shop-house in a retail market in the town center.

Consultation and participation will continue throughout the implementation phase in areas such as ensuring fairness in allocating housing plots, and transparency and accountability in delivery and use of compensation funds. Land compensation will be delivered to affected village groups to be used for various economic rehabilitation activities according to the RAPs. All members of village groups will be informed about the planned usage of such funds and associated economic rehabilitation measures. The village groups will make a collective decision on the use of unused funds.

**Disclosure.** Since January, 2000, the four counties have made considerable efforts to disclose the content of draft RAPs, and inform the affected people about resettlement impacts, compensation policies, rehabilitation options and grievance procedures. For example, in Dongping, the summary of draft RAP with detailed compensation policies and rehabilitation measures was distributed to the affected townships and villages. In Najitan, detailed impacts survey results and compensation rates were informed to all affected households. In Songshuling, the content of the RAP was summarized and published in the local newspaper and distributed to all affected villages. In Xiakou, resettlement impacts survey results were provided to all affected households, and the draft RAP was put in the county library for public review. Additional measures for public disclosure are being made by the project counties now that the final RAPs have been accepted by the Bank, including distributing a resettlement information booklet to all affected households, and publishing detailed resettlement implementation details to the public through TV, radio and newspapers.

**Grievance Processes.** A grievance procedure has been set up for each project county. If any projected affected person (PAP) is not satisfied with compensation amount or proposed rehabilitation measures, he or she should first complain to the administrative village or resettlement team in the concerned township. The village or township should document the complaint and resolve the matter within two weeks. If the affected person is dissatisfied with the decision, he can elevate his complaint to the county project resettlement office, which will respond within two weeks. If the PAP is dissatisfied with the resolution of the project resettlement office, he can appeal the case to the county civil court. For those counties where PAPs include minorities, in addition to the normal grievance procedure, a special grievance procedure involving the County Ethnic Minority Affairs Bureau will be set up. No fees shall be collected from PAPs from agencies accepting complaints. The PAPs will be informed of these procedures through meetings, information booklet and public notice.

#### **Culturally Sensitive Resettlement**

Dongping and Najitan sub-projects are located in Xuan-en and Laifeng Counties, both belonging to Enshi Tujia and Miao Autonomous Prefecture. The Najitan Project also involves some resettlement in Longshan County, which is part of Xiangxi Tujia Autonomous Prefecture in Hunan Province. In the affected communities, minority nationalities and the Han majority appear to be fully integrated (see Annex 15). Nevertheless, in arranging resettlement, the counties have been particularly careful not to disturb, or appear to disturb, existing social structures, and to take full account of the wishes of the minorities in the design of the resettlement program, as evidenced by the following examples.

**Community Consultation and Participation.** The social economic surveys and resettlement planning involved extensive consultation with affected and host communities. While this occurred in all project affected areas, it was particularly emphasized when minorities were involved because of their special status under the law. This consultation preceded that carried out by the social assessment team described in Annex 15. For example, in Dongping Project, several village groups from Zhongjianhe Village will be merged into host villages with better prospects for land development and increasing the productivity of existing land. In this case, the selection of host villages was largely made by the people themselves. While this selection appears to have been made based on proximity to their existing location and economic opportunities, the host villages have similar ethnic composition so the question of potential disturbance of social structure does not arise. For Najitan, a total of 18 consultation meetings were carried out in Laifeng and Longshan counties, with 380 people participating. Based on these consultations, several changes were made in the draft RAP, including location of new housing sites in Baifushi and Manshui townships. Consultation will be continuous throughout the implementation phase.

**New Housing.** While most houses in the affected areas are built in a non-traditional style using masonry and concrete, the resettlers will have complete freedom to adopt traditional style and layout if they so choose. Village layouts, and housing plot sizes will be designed to accommodate the traditional style.

**Land Based Resettlement.**

Most resettlement is land based, reflective of wishes of the majority of affected people, although as discussed in Annex 15, preferences in this area seem to depend more on age rather than ethnicity. People to be relocated in or close to towns will do so in accordance with their own preference and the availability of required skills to enable them to obtain work.

**Conflict Resolution Process.** In addition to the normal conflict resolution process described above, minorities may also appeal to the county ethnic minority affairs bureau.

**New Town Center.** For Dongping, in planning the new Zhongjianhe Town Center, some cultural facilities have been included, and in the design of the town, planners will endeavor to create and maintain the local traditional architectural style in order to encourage cultural tourism.

**Resettlement Cost and Implementation Schedule**

Based on the RAPs, the overall resettlement budget for the project will be Y 146.59 million, including Y 59.84 million for Dongping , Y 29.72 million for Najitan,, Y 39.83 million for Xiakou and Y 17.20 million for Songshuling. The resettlement cost estimate is included in the project budget and will be born by the sub-project owners. These cost estimates include five percent for administration, supervision, and monitoring and evaluation, and 10 percent for physical contingency.

The resettlement implementation schedule is closely related to the construction schedule which provides for first unit commissioning by 2006 for Dongping and 2005 for the other three sub-projects. The resettlement programs will aim at completing both relocation and, as far as practicable, rehabilitation by the end of 2004. To achieve this objective, the process of signing compensation contracts, delivering land compensation, redistributing and developing new farmland will start in 2002. The process of developing new farmland and redistributing farmland will continue until 2004. Housing site selection and land acquisition will also begin in 2002. Site preparation, allocation of housing plots, delivery of housing compensation, and construction of new houses will start between 2002 and 2004. All relocation and new farmland development as well as redistribution will be completed in 2004.

**Monitoring and Evaluation**

Both internal monitoring and external monitoring and evaluation will be employed during implementation. Internal monitoring will be carried out by the four county resettlement offices under the supervision of the four project offices. Township and village working teams will participate in the internal monitoring efforts. The main purposes of internal monitoring are to ensure that agreed RAPs are implemented in a timely and cost-effective manner and that the interests of resettlers are protected. The monitoring will cover all aspects of implementation, including delivery of compensation funds, allocation of housing plots, land development, and infrastructure construction. Once the process begins, a progress report will be submitted every three months from the village and township resettlement teams to the county resettlement office and project office, and to the Hubei PMO. This will be summarized in the progress report to the World Bank.

An independent agency will also be employed to regularly monitor resettlement implementation and to evaluate whether the overall resettlement objectives are being achieved. The independent monitoring will provide opinions as to whether income restoration is on track, suggestions for implementation improvement, an early warning system for project management, and a channel for transmitting comments and opinions of PAPs. Procedures employed will combine sample survey and rapid appraisal, detailed monitoring of implementation progress and evaluation of income changes among affected people. Main indicators will relate to (1) physical progress; (2) quality of facilities; (3) delivery of resettlement funds; (4) economic conditions before and after resettlement; (5) living environment before and after resettlement; (6) employment conditions before and after resettlement; and (7) resettler satisfaction. ECIDI (East China Investigation and Design Institute) has been selected to undertake the external resettlement monitoring and evaluation for the project. They have assisted the county resettlement offices throughout the very detailed resettlement planning process, and have successfully provided external resettlement monitoring and evaluation services for several World Bank projects.



**Additional  
Annex 15**

**Social Assessment  
CHINA: Hubei Hydropower Devt. in Poor Areas**

**BACKGROUND**

Two of the sub-projects (Dongping and Najitan) are located in Enshi Tujia and Miao Autonomous Prefecture which was designated as such in 1982. The social and economic survey carried out as part of the resettlement planning process indicated a high degree of acculturation within project counties as a whole and in affected communities. However, the presence of officially designated minorities in the project area flagged the potential application of OD 4.20 ("Indigenous Peoples"), since the OD provides that "Within their national constitutions, statutes, and relevant legislation, many of the Bank's borrower countries include specific definitional clauses and legal frameworks that provide a preliminary basis for identifying indigenous peoples." The Chinese legal framework relating to minority nationalities clearly falls into this category. Therefore, on a preliminary basis OD 4.20 was taken to apply, pending the results of a social assessment that would specifically focus on the cultural status of the minorities in the project area. To provide context to the social assessment, research was also carried out into the historical, cultural and legal context particularly as it relates to the subject minority area. Summaries of the two studies, both based on studies carried out and reports prepared by Dr. Zhang Haiyang, Professor, Department of Ethnology, Central University of Nationalities, Beijing, are included in this annex. Extracts from the Social Economic Survey from the Resettlement Action Plans for the two projects are also included in this annex.

**HISTORICAL, CULTURAL AND LEGAL CONTEXT**

**Historical and Cultural Context**

**Ethnic Situation in China.** Based on the 1995 census, about nine percent of Chinese are officially recognized as ethnic minorities. In general they live in the dry, cold or tropical mountainous areas in the western parts of China, whereas the Han majority mostly occupies the humid, warm plains. However, over the past 2,000 years there has been extensive ethnic intermingling. For example, people of Mongol and Manchu ancestry are found throughout China, and Muslim Hui who have strong merchant traditions are found in most major cities. Geographic distribution also tends to dictate livelihood. While the Hans generally engage in intensive agriculture, the livelihoods of minorities are diverse and strongly related to topography ranging from nomadism and reindeer hunting to paddy rice cultivation.

From the linguistic point of view it is generally accepted that there are over 70 languages and more than 20 different scripts in China. While some groups, particularly those in remote areas still use their own languages, most share Mandarin Chinese with the Han. Similarly while some ten ethnic groups have their own scripts, most share the Han Chinese written language even where their spoken languages are different, enabled by the Han Chinese character system which conveys meaning independent of pronunciation

With regard to religion, the most prominent fact is that all peoples in China share the worship of the male ancestor, believe in heaven, and practice shamanism in one way or another. Beyond this commonality, all major religions in the world except Judaism are strongly represented in various parts of the country. In terms of traditional social political organization, the general picture is that Chinese in the northern and western areas have stronger male lineage ties (tribes), sometimes complicated with religious attachment to

monastery or mosque. Those in the south and east have stronger territorial ties, and thus attachment to local village communities. Those with the lineage ties tend to have more developed and rigid social stratification while those with the territorial ties are more egalitarian.

The complicated ethnic situation can be further simplified as follows. Firstly, people with strong religious beliefs can be expected to have stronger ethnic identities tending to associate the two factors. The same can be said in relation to people who share a language with another country. Thirdly, people who live far from the central plains have had less assimilation into mainstream Chinese culture and can be expected to have maintained their cultural identity. Finally, each major region in China, northeast, northwest, southwest etc, has an overarching local culture and minority ethnic groups within this region tend to share it. Among them, Manchu and Mongol in the northeast, Uygur and Hui Muslim in the northwest, Tibetan, Yi and Dai in the southwest, and Miao in central south China are dominant. Their culture is often reflected in that of neighboring groups.

**Governing Framework of Ethnic Affairs in China.** In ancient China ethnic identification was much less rigid and systematic than in modern times, and prior to 1840, the traditional Chinese dichotomy was between the “civilized” and the “barbarian” (the Han versus the Yi). Most scholars believe that this dichotomy was based on a cultural, rather than racial, criterion, but whether this is true or not, it was not until 1840 that China began to systematically introduce the concept and ideology of nation, accompanied by the concept of minority ethnic groups.

The founding of the Republic of China in 1911 started an era of Chinese nation-building and integration. As soon as the revolutionaries came to power, they felt the double-edged effect of nationalism. Many ethnic groups wished to follow their example and form separate nations and the concept emerged of a Chinese Republic of Five Nations, the five nations being Manchu, Mongol, Muslim Chinese, Tibetan and Han. The Chinese Communist Party (CPC), founded in 1921, initially saw no threat from self-determination within this framework and made attractive promises to ethnic minorities even to the point of recognition of separate states, as occurred in the case of their recognition of the independence of Outer Mongolia under the Soviet umbrella. However, the Long March, which generally followed the demarcation line between China proper and the ethnic frontier, educated the CPC to the extent of ethnic diversity in China and they saw the need for a more cautious stance towards separatism. Thus in 1947, they turned away from the Soviet model of union republics and denied the Inner Mongolian request for a separate republic, proposing instead a framework of ethnic-regional autonomy. This laid the foundation for the current structure for governance of ethnic affairs. The system stresses national political integrity, i.e., military and diplomatic centrality, but provides a degree of autonomy to ethnic minority units. Ethnic-regional autonomy was originally provided at the provincial level, but has been progressively extended downwards to prefecture, county, and even township levels.

The first determinant as to the right of ethnic autonomy is the percentage of ethnic population, which involves ethnic identification, which basically occurred in three phases. The first of these covered the period 1949-1954, encompassing the first nationwide census in 1953. The CPC commenced its government of China with a commitment to practice ethnic equality, including a sufficient representation of minorities in the newly founded National People’s Congress. This excited the minorities and more than 400 groups applied for registration. After a year’s intense work, 38 groups, including the “authentic” Manchu, Mongol, Hui Muslim and Tibetan, were identified as official nationalities. This reduced the original 400 groups to a remaining 183 (100 groups were lumped into a single Yi nationality). The second period was from 1954 to 1964, encompassing the second national census. In this period, 74 groups from the 183 registered names were allocated to 15 additional nationalities, including the Tujia in western Hunan. During the third period from 1964-1982 only two further minority groups were identified, southern Tibet Loba in

1965 and Yunnan Jino in 1979. Since then, no new group has been identified but in compensation, numerous people are allowed to convert their status into the existing 55 minority groups, such as occurred in western Hubei allowing the formation of a new Tujia and Miao Prefecture. Currently, the Government admits there are several hundred thousands of people requesting further identification, but it is considered unlikely that further ethnic groups will be identified. This process provides a warning that in the southwest mountainous area, distinct cultures not having a separate ethnic status, may well exist.

### **Legal Regulatory Framework in Relation to Ethnic Minorities**

**Introduction.** Stipulations regarding ethnic minorities in Chinese laws, regulations, circulars etc. are numerous. According to a classification issued by the State Ethnic Affairs Commission there are some 412 legal documents dealing with the subject ranging from comprehensive laws, such as the constitution, to documents dealing with specific subjects such as political affairs, economic development, culture and religion, science and education, health marriage and family planning and personnel. The following treatment is therefore, by necessity, cursory and limited to the overall governing framework particularly as applicable to Western Hubei and Enshi Autonomous Prefecture, which encompasses the project areas of two of the sub-projects.

**The Constitution (1982).** The preamble to the Constitution provides that the People's Republic of China is a unified multi-ethnic nation founded by all the nationalities of China, and that relationships of equality, unity and mutuality will be promoted. In the interests of national solidarity, the state undertakes to strongly promote common prosperity of all ethnic groups. References to ethnic minorities are frequent throughout the body of the Constitution generally covering:

- Equal rights of minorities, the prohibition of discrimination and activities that undermine ethnic solidarity and encourage separatism.
- The right of minorities to elect, to be elected and be represented in the National People's Congress and the standing committee thereof; in addition the governor of an autonomous region, prefecture or county should be an ethnic citizen from the group implementing local autonomy.
- The right of ethnic autonomous localities to substantial legal and administrative autonomy, including the right to adjust national laws and regulations as appropriate to the local situation, manage finances accruing to the locality under the state financial system, administer the local undertakings of education, science, public health, public security, and culture including the protection of cultural heritage.
- The rights of minorities to utilize and develop their own oral and written languages as well as the freedom to retain or reform their customs; at the same time the state undertakes to assist minorities in their economic and cultural development, and promote their development as civil officials, professionals and skilled workers at all levels.

**Ethnic Regional Autonomy Law of the People's Republic of China (1984).** This law is the basic law for implementing the system of ethnic regional autonomy provided by the constitution. It provides for autonomous regions, prefectures and counties, the procedures for their formation, the status of the governing organ (as a level of the state political and administrative system), the obligation of the governing organ to ensure that the constitution and national laws are observed, and within this overall framework the right of the organ to adopt special policies and flexible measures to accelerate economic and cultural

development. The law defines the composition of the governing organ (local government and congress), provides that the governor should be an ethnic citizen from the group implementing local autonomy and that as far as possible government officials and the local people's congress should be drawn from the group implementing ethnic autonomy and other ethnic minorities. The law reiterates and elaborates the provisions of the constitution concerning the rights of minorities including: freedom of religion (with the proviso that religious organizations and religious affairs are "free from control or domination by foreign forces"); the right to establish educational systems appropriate to the minority area including teaching and the use of textbooks in local languages (while middle schools should also offer Mandarin Chinese language courses); encouragement of ethnic cultural development (literature, art, news, publications, broadcast, cinema) and observation of traditional customs, and the maintenance and protection of cultural heritage (ethnic literature, scenic and historical sites etc.). The law also includes provisions aimed at developing harmonious ethnic relations within autonomous localities including the requirement that such localities should assist local minor ethnic groups to set up lower level autonomous localities (down to township level) and care for the needs of other minorities living in diaspora.

**Hubei Implementing Regulations for the Ethnic Regional Autonomy Law (1988 and 1993).** These regulations elaborate on the provisions in the Constitution and the Law, particularly with regard to the affirmative action undertakings of the state heralded in the policy documents. The 1993 regulations generally update the 1988 ones with a little more specificity in some areas. Specific measures of preferential provincial government assistance and support to ethnic localities are identified including:

- Development of physical infrastructure including small hydropower stations, transport and communications, with the province providing materials, equipment and financial assistance through grants, low interest loans and tax holidays; development of community infrastructure such as cultural, physical cultural and medical facilities.
- Fixed asset investment in ethnic localities to be proportionally greater than in other localities; where conditions are similar large and mid-sized enterprises to be located in ethnic areas.
- Financial subsidies including funding of local government deficits, allocation of grant funds from central government targeted at minority areas (supplemented by matching funds from the provincial government) with distribution managed by Ethnic Affairs Commission; funding of allowances for college and vocational school graduates and government officials working in autonomous localities.
- Assistance to ethnic localities in obtaining foreign development assistance (both grants and loans), allowing them to retain foreign exchange earnings and facilitating their access to export opportunities.
- Support of scientific and technological development through appointment of highly qualified personnel as deputy county chiefs responsible for this aspect.
- Encouragement of education through development of educational facilities in ethnic areas including boarding and semi-boarding middle and primary schools to allow all students to benefit from the compulsory nine year education policy, management of the Western Hubei University, lowering the threshold for entry (and establishment of quotas) into higher learning institutions and vocational and technical schools; training of minority individuals to achieve proportional representation in government administration at all levels; and special attention to promotion of talented, dedicated

ethnic and female individuals to positions of responsibility including positions in upper levels of government administration.

**Hubei Provincial Government Notification on Accelerating the Economic and Social Development of Enshi Autonomous Prefecture (1994 and 1995).** The 1994 regulations were issued in response to the continued disparity in incomes between Enshi Autonomous Prefecture and the developed areas of Hubei, the preamble noting that “some ethnic people are still threatened by cold and hunger”. The regulations also note that nine of the ten Enshi counties are classed as poverty counties in accordance with national criteria and all ten are so classed in accordance with provincial criteria.

The regulations focus on acceleration of economic development and development of science and technology within the prefecture including development of human resources in these fields.

Economic development initiatives again include various financial measures including specific reference to assisting the communities in the prefecture in developing their natural resources, and incorporating such development in provincial long term development plans. They also include “geared support” from the ten wealthiest cities and counties in Hubei (led by Wuhan) to support Enshi city and the other nine counties. This section of the regulations concludes with the statement: “It [Enshi] is the major battleground for poverty alleviation; all funds earmarked for this purpose should be directed to this area in the coming years”.

Educational initiatives include: continuation of the development of boarding and semi-boarding ethnic middle and primary schools allowing all children to attain this level of education; reinforcement of vocational and technical education in the localities; enhancing the support to the Hubei Institute of Nationalities and the Ethnic Medical College in Enshi in provision of teachers, teaching aids and education funding; accelerating the promotion of ethnic personnel in government and enterprises into leading positions of scientific and economic management.

The 1995 regulations are specific to the ninth five-year plan. They generally elaborate on the 1995 regulations providing 35 specific measures with funding amounts and performance indicators. The “geared support” concept heralded in the 1994 regulations appears again in the 616 program whereby six provincial level units (two government departments, one bank, one major enterprise, one higher learning institution and one municipality under provincial administration) will each support a city or county in Enshi to complete six projects per year, the program to be managed by the Provincial Ethnic Affairs Commission and the Provincial Planning Commission.

It is worthy of note that one provision relates to acceleration of local hydroelectric resource development and promoting such development by raising the sale price of such power to the grid.

## **SOCIAL ECONOMIC SURVEY**

Social surveys of affected people were initially carried out as part of the resettlement planning process. These surveys gathered official statistics in relation to affected towns (and townships) and villages and carried out a census of project-affected households to determine their ethnic composition.

### **Ethnic Identification**

Ethnic identification is used primarily as a means of qualifying individuals and communities for ethnic status and the associated preferential policies provided in the laws and regulations as discussed above.

Ethnic identification in Hubei was last carried out on a large scale in the late 1970s when the region applied for ethnic autonomous status. This requires a minimum of 33 percent minority population. The identification was carried out by provincial and local governments under the supervision of the State Ethnic Affairs Commission and Ministry of Civil Administration. It was mainly accomplished by tracing ethnic status of certain surnames, and through tracing parental kinship. For example, a person could apply for ethnic status if one parent had ethnic status, which could in turn be obtained by the parent based on the ethnic status of one of his/her parents. Bi-ethnic parents choose the ethnic status of children until the child reaches 18, when between the ages of 18 and 20, the child makes his/her own decision. At that time it becomes fixed.

### Local Ethnic Minority Composition

The Enshi Tujia and Miao Autonomous Prefecture is the home of some 20 nationalities, of which Tujia and Miao nationalities form the great majority. Within Xuan-en and Laifeng, the ethnic minority composition is about the same with Tujia and Miao nationalities accounting for about two-thirds of the population. The project affected people (PAP) number 5,612 in total in 1,365 rural households, of whom 3,246, or about 58 percent are ethnic minorities (Tujia, Miao, and Dong). Tables 1 – 5 show the ethnic minority composition in the two counties and their project affected townships, as well as among the overall population and households affected by the two hydropower sub-projects.

Table 1: Ethnic Composition in Xuan-en County and Affected Townships by Dongping Scheme

| Names                | Population | Among |           |                 |                |        |
|----------------------|------------|-------|-----------|-----------------|----------------|--------|
|                      |            | Han   | The Tujia | Population Miao | (percent) Dong | Others |
| County wide          | 336642     | 35.1  | 39.2      | 12.0            | 13.1           | 0.6    |
| Zhongjianhe          | 13373      | 59.7  | 26.5      | 10.6            | 3.2            |        |
| Changtanhe           | 12135      | 62.4  | 24.2      | 9.3             | 4.1            |        |
| Huikou               | 11472      | 55.9  | 7.3       | 5.6             | 31.2           |        |
| Jiaoyuan             | 24156      | 56.7  | 28.8      | 13.7            | 0.8            |        |
| Zhushan              | 7513       | 60.2  | 26.1      | 13.5            | 0.2            |        |
| Tree seedling center | 332        | 62.1  | 25.9      | 12.0            |                |        |

Table 2: Ethnic Mix among the Affected Households by the Dongping Scheme

|                       | Total | All Han | Among                        | The                     | Total     | House    | -holds   | Others |
|-----------------------|-------|---------|------------------------------|-------------------------|-----------|----------|----------|--------|
|                       |       |         | Han & minority intermarriage | Minority inter-marriage | All Tujia | All Maio | All Dong |        |
| Resettlement affected |       |         |                              |                         |           |          |          |        |
| Households            | 790   | 266     | 286                          | 59                      | 118       | 24       | 37       | 0      |
| Taking percent        | 100   | 33.7    | 36.2                         | 7.5                     | 14.9      | 3.0      | 4.7      | 0      |

Table 3: Ethnic Composition in Laifeng and Longshan Counties and Affected Townships by Najitan Scheme

| Names           | Population | Among | The   | Population | ( percent) |
|-----------------|------------|-------|-------|------------|------------|
|                 |            | Han   | Tujia | Miao       | Others     |
| Laifeng County  | 300700     | 37.2  | 34.4  | 25.7       | 2.6        |
| Baifusi         | 28520      | 15.0  | 75.4  | 8.5        | 1.1        |
| Manshui         | 20590      | 22.4  | 68.3  | 8.0        | 1.3        |
| Longshan County | 519872     | 37.5  | 48.4  | 13.1       | 1.0        |
| Huoyan          | 5642       | 11.4  | 76.2  | 9.2        | 3.2        |
| Laoxing         | 9311       | 11.7  | 76.5  | 9.3        | 2.5        |
| Guitang         | 14250      | 14.5  | 73.4  | 9.8        | 2.3        |

Table 4: Ethnic Mix among the Affected Households by the Najitan Scheme

|                       | Total | All Han | Among                        | The                     | Total     | House    | Others |
|-----------------------|-------|---------|------------------------------|-------------------------|-----------|----------|--------|
|                       |       |         | Han & minority intermarriage | Minority inter-marriage | All Tujia | All Maio |        |
| Resettlement affected |       |         |                              |                         |           |          |        |
| Households            | 575   | 26      | 266                          | 49                      | 231       | 3        | 0      |
| Taking percent        | 100   | 4.5     | 46.3                         | 8.5                     | 40.2      | 0.5      | 0      |

Table 5: Ethnic Mix among the Project Affected People (PAP)

|          | Affected | Among | The   | Total | Affected | People |
|----------|----------|-------|-------|-------|----------|--------|
| Counties | People   | Han   | Tujia | Miao  | Dong     | Others |
| Xuan-en  | 3047     | 1680  | 1061  | 145   | 161      | 0      |
| Laifeng  | 2565     | 686   | 1730  | 149   | 0        | 0      |
| Total    | 5612     | 2366  | 2791  | 294   | 161      | 0      |

### Minority Representation in Government

Review of the official statistics revealed that individuals with minority status are well represented in county, township and village governments. Table 6 below summarizes the proportion of minorities among government officials in affected counties, townships and villages.

Table 6: Minority Representation in Government

| Sub-project | Government                  | No. of Officials | No. of Minority Officials | Percentage Minority Officials | Percentage Minority Population |
|-------------|-----------------------------|------------------|---------------------------|-------------------------------|--------------------------------|
| Dongping    | Xuan-en County              | 48               | 29                        | 60                            | 65                             |
|             | Towns and Townships         | 60               | 43                        | 72                            | 42                             |
|             | Villages                    | 24               | 14                        | 58                            | 42                             |
| Najitan     | Laifeng County              | 27               | 18                        | 67                            | 63                             |
|             | Towns, Townships, Districts | 60               | 49                        | 82                            | 72                             |
|             | Villages                    | 32               | 27                        | 84                            | 88                             |
|             | Longshan County             | 28               | 22                        | 79                            | 62                             |
|             | Towns and Township          | 32               | 25                        | 78                            | 87                             |
|             | Villages                    | 20               | 18                        | 90                            | 81                             |

Source: RAPs for Dongping and Najitan

One could conclude from this table that minorities are somewhat over-represented in government in comparison to proportional representation, confirming that the provisions of the law in this regard have been followed.

Table 7: Basic Social Economic Condition of Sample Households for Dongping Project

| Main Indicators   | Unit           | Total Sample Households | Minority Households | Han Households |
|---|----------------|-------------------------|---------------------|----------------|
| Persons per household                                       | persons        | 4.43                    | 4.38                | 4.48           |
| Percent of women  | %              | 45.19                   | 42.86               | 47.57          |
| Number of laborers per household                            | persons        | 2.98                    | 3.04                | 2.91           |
| Of which: percent of female labor                           | %              | 43.57                   | 45.21               | 41.79          |
| Housing space per household                                 | m <sup>2</sup> | 183                     | 197                 | 169            |
| Farmland per capita   | mu             | 1.52                    | 1.54                | 1.5            |
| Grain production per capita                                 | kg             | 194                     | 668                 | 721            |
| Annual net income per household                             | Yuan           | 10819                   | 10128               | 11540          |
| Percent of agricultural income as total income              | %              | 78.87                   | 75.44               | 82.02          |
| Income from working outside as percent of net family income | %              | 16.19                   | 21.44               | 11.38          |
| Per capital annual net income                               | Yuan           | 1351                    | 1279                | 1425           |

Table 8: Basic Social Economic Condition of Sample Households for Najitan Project

| Main Indicators   | Unit    | Total Sample Households | Minority Households | Han Households |
|---|---------|-------------------------|---------------------|----------------|
| Persons per household                                       | persons | 4.79                    | 4.52                | 4.89           |
| Percent of women  | %       | 51                      | 2.2                 | 2.67           |
| Number of laborers per household                            | persons | 2.38                    | 2.28                | 2.39           |
| Farmland per capita   | mu      | 4.15                    | 3.86                | 4.31           |
| Annual net income per household                             | Yuan    | 8813                    | 8330                | 8995           |
| Percent of agricultural income as total income              | %       | 57.00                   | 59.00               | 54.00          |
| Income from working outside as percent of net family income | %       | 16.00                   | 16.00               | 12.00          |
| Per capital annual net income                               | Yuan    | 1380                    | 1372                | 1392           |



### Basic Social Economic Parameters

Social economic indicators based on sample surveys carried out among project-affected households for Dongping and Najitan are presented in Tables 7 and 8 above. In these tables households are designated as Han or Minority, depending on the ethnic status of the head of the household.

These tables tend to indicate no significant difference between Han and minority headed households with respect to household size and composition, house size, land areas per capita, sources of income and overall income.

### Literacy and Education Levels

Table 9 below shows education and literacy levels among the population affected by the Dongping sub-project. Between Han and Tujia there is clearly no significant difference. Comparing Miao/ Dong to Han/Tujia there would appear to be some tendency towards lower education level but this is probably not statistically significant given the small sample size for these populations.

Table 9. Educational Level of 3047 Project Affected Persons with Different Ethnic Background for Dongping Sub-Project (percentage)

| Educational Level     |                                | Total | Of which |       |      |      |       |
|-----------------------|--------------------------------|-------|----------|-------|------|------|-------|
|                       |                                |       | Han      | Tujia | Miao | Dong | Other |
| Total Affected People |                                | 3047  | 1680     | 1061  | 145  | 161  | 0     |
| Percent               |                                | 100   | 100      | 100   | 100  | 100  |       |
| Of which              | Children below school age      | 3.5   | 3.7      | 3.9   | 2.1  | 0.6  | 0     |
|                       | Illiteracy and semi-illiteracy | 13.2  | 12.9     | 12.7  | 15.8 | 17.4 | 0     |
|                       | Elementary School              | 29.1  | 28.5     | 30.0  | 26.9 | 31.7 | 0     |
|                       | Middle School                  | 40.0  | 39.6     | 38.5  | 47.6 | 46.0 | 0     |
|                       | High School                    | 13.5  | 14.8     | 13.7  | 7.6  | 3.7  | 0     |
|                       | Above High School              | 0.7   | 0.5      | 1.2   | 0    | 0.6  | 0     |

Table 10. Education Level of 2575 Project Affected Persons with Different Ethnic Background among PAPs in Najitan Sub-Project (percentage)

| Educational Level     |                                | Total | Of which |       |      |      |       |
|-----------------------|--------------------------------|-------|----------|-------|------|------|-------|
|                       |                                |       | Han      | Tujia | Miao | Dong | Other |
| Total Affected People |                                | 2565  | 686      | 1730  | 149  | 0    | 0     |
| Percent               |                                | 100   | 100      | 100   | 100  | 0    |       |
| Of which              | Children below school age      | 9.3   | 9.6      | 9.0   | 10.8 | 0    | 0     |
|                       | Illiteracy and semi-illiteracy | 12.9  | 8.6      | 14.6  | 12.1 | 0    | 0     |
|                       | Elementary School              | 39.0  | 34.1     | 41.1  | 38.2 | 0    | 0     |
|                       | Middle School                  | 28.6  | 35.5     | 25.8  | 29.3 | 0    | 0     |
|                       | High School                    | 9.5   | 11.5     | 8.8   | 8.9  | 0    | 0     |
|                       | Above High School              | 0.70  | 0.73     | 0.69  | 0.64 | 0    | 0     |

Table 10 gives similar figures for the population affected by Najitan. This table tends to indicate close correspondence between Tujia and Miao with both of these minorities modestly lagging the Han in educational achievements but, without more detailed analysis, it is not clear whether these differences are statistically significant.

## **Conclusions of Social Economic Survey**

The social economic survey concluded that there were few, if any, significant differences in status between the minority nationalities and the Han majority with regard to political representation, economic activities, standard of living. The only area where a slight lag might be detected is in educational achievements in the population as a whole.

Certainly government programs towards minorities in recent years have emphasized education. According to information received from Laifeng County, they received a total of Y 1.9 million in 1999 earmarked for minority assistance. Of this about one quarter was for educational purposes including subsidies towards school fees which have been rising. Moreover, the educational achievement figures represent the overall situation among older and younger people and probably do not fully reflect Government's overall achievements in education in the minority counties. Figures received from the education bureaus of Xuan-en and Laifeng County as part of the Poverty Alleviation Studies (Annex 16) show that for both Xuan-en and Laifeng Counties, the 1999 enrolment rate for primary school age children was 100 percent, while for middle school it reached 94.9 percent for Xuan-en (93.2 percent for girls) and 95.6 percent for Laifeng (95.0 percent for girls). These represent dramatic increases over the decade particularly for Xuan-en where 1990 middle school enrolment was only 42.5 percent and 35.4 percent for girls.

## **SOCIAL ASSESSMENT**

### **Introduction**

From the preceding discussion of cultural context, strong ethnic identity would not be expected in western Hubei. In the project areas, Tujia and Miao minorities are not known for their strong religious beliefs nor separate languages. Moreover, they are located relatively close to plains areas. In addition, the social economic survey seemed to indicate a lack of ethnic consciousness with a high proportion of mixed marriages.

*However, in such matters, the views of the minorities concerned are of prime importance. Therefore, the project beneficiaries were requested to commission a social assessment (SA) as a tool to diagnose any impact on local society caused by the hydropower schemes, with a focus on ethnic minorities living in the project areas. A SA team consisting of Dr. Zhang Haiyang, Professor of Ethnology from UCN, and Mr. Bian Bingqian and other members from ECIDI (the resettlement planners) conducted fieldwork with the participatory approach in Xuan-en and Laifeng counties in Enshi Prefecture, the host counties for the Dongping and Najitan sub-projects as well as in Longshan County, Hunan since Najitan resettlement extends into this county. The team's report clarifies the social and ethnic context in the project areas, addresses the presence or otherwise of specific adverse impacts related to minorities, and the requirement for specific measures to avoid or minimize such impacts.*

### **Methodology**

In the second half of 2000, based on the social economic survey information collected by the RAP team and other statistical data, the project SA team, comprised of anthropologists and resettlement specialists and with the co-operation of the CPMOs, conducted further detailed social and cultural investigation and intensive consultation, closely interacting with affected ethnic minorities.

The overall methods adopted by the SA team were drawn from an anthropological toolkit, including PRAs (participatory rural appraisals) and questionnaire surveys. Professor Zhang, anthropologist, trained the SA

team on the qualitative social science methodologies appropriate to the field investigation and PRAs required for this project. At the project sites, the team also held briefings for CPMOs and local authorities on the procedures for conducting the SA, while requesting local cooperation and informant confidentiality. Training was also provided for local facilitators for questionnaire distribution and collection.

The SA team started its fieldwork with social mapping of local villages in the project affected areas in Xuan-en and Laifeng, and selected survey samples covering major representative ethnic groups and livelihood patterns. It then conducted focus group discussions (in absence of local officials), household case studies, structured interviews in these sample villages, and administered questionnaire surveys (anonymously with only respondent codes) covering all households to be affected by resettlement in the two counties. Because of time limitations, in some places where interviews and household case studies tended to merge, the team conducted household visits that were sometimes intermingled with questionnaire surveys. The fieldwork was completed in late August 2000, data were processed and analyzed in the following months, and the draft report was produced in late October, 2000.

**Questionnaire.** All the 1,365 PAP households, including 790 in Xuan-en and 575 in Laifeng, were covered by the questionnaire survey, with a set of 30 questions in six to seven categories containing the usual demographic data in relation to all household members, as well as language, family life, kinship and marriage, social contacts, ethnic relations, religious beliefs, etc. The major objective here was to establish the correlation between ethnic status and education, occupation, and cross marriage. All data were input into Window Excel spreadsheet and SPSS separately for processing so as to reveal the general picture in relation to all PAPs.

**Structured Interviews.** Structured interviews were mostly attached to the questionnaire, but more interactively in a dynamic manner with interviewees for diagnosing PAPs' attitudes towards the project and ethnic identity, based on their answers to a set of 30 questions. The SA team itself (four to seven members in different time and places) interviewed around 250 households, 15-20 percent of the total.

**Focus Groups.** The SA team organized 16 focus group discussions (nine in Xuan-en and seven in Laifeng) in the sample villages, including ethnic groups, women, local officials and project personnel, as well as village group meetings in both resettling and host villages. The village group meetings normally involved the middle aged and above, ethnic and female participants, while the young laborers (between 18-40 amounting to one-fifth of local population) were usually away from home at that time engaged in remunerative work outside the village. The ethnic group meetings were in fact always ethnically mixed with Tujia, Miao, Dong, and Han, grouped differently in different places, and there was no meeting with a single, self-contained minority, because no village group could be found where all inhabitants were from a single ethnic minority. In no village was residency demarcated by ethnicity, and all people would come for meetings freely. For other stakeholders' group discussions, such as with local official and project personnel (who themselves were mostly local ethnic minorities), the team usually held three meetings in each county, to explain the purpose and objectives of the SA, obtain a broad picture of local situations, and report and exchange results and views.

Normally, during group discussions or village meetings, a series of PRA tools was employed for systematic local diagnosis and analysis through farmer consultation and participation. The tools utilized, besides interviewing and discussing, included community mapping, resource diagramming, preference ranking, problem tree, historical events, seasonal calendars, daily activity charts, etc. These tools helped convey both etic and emic views, and built mutual understanding between the SA team and villagers. Besides questionnaire (100 percent coverage) and household interviews (15-20 percent coverage), about 200 people attended the focus groups meetings, of whom about 75 percent were male and 25 percent were female; Han

people accounted for 26 percent, Tujia 54 percent, Miao 11 percent, and Dong 9 percent.

## **Results**

Based on the intensive fieldwork and demographic statistics, final conclusions and recommendations were reached through comparatively analyzing and combining the summarized outcomes from each of the field survey methods as follows:

Analysis of the data from the **questionnaire surveys** revealed that that there was no significant correlation between ethnicity and education, occupation, and livelihoods. As for marriage, there were 45 percent ethnic exogamous marriage among the PAP in Xuan-en and about 53 percent in Laifeng. This indicated a very high percentage of multi-ethnic households, about 48 percent, among which about 40 percent were the Han-Minority marriage households. The statistical significance of inter marriage numbers is further discussed below (Multi Ethnic Marriage).

The **structured interviews** reinforced the conclusions of the questionnaire confirming that all respondents shared similar views concerning the irrelevancy of ethnicity to division of labor, education, marriage, social contacts, religious beliefs and wealth. In addition, there was no indication of specific adverse impacts the project would have on the minority component of the resettlement or host communities, as distinct from general impact on the communities as a whole.

The **focus groups** illustrated that the ethnic population here did not have distinctive languages, religions, and customs, but shared one overarching culture; that no ethnic consciousness was present since no remarkable expressive or latent ethnic identity could be detected; that no vulnerable ethnic group could be identified; that all the PAP enjoyed a common healthy social ecology in general and that all would bear the project impacts in the same sense; that all PAP fully understood the project and its impact, and they were eager to have it for their own interests (to grasp some opportunities to develop livelihoods, to be released from suspension of local construction under the inundation line, etc.) provided satisfactory resettlement were arranged. Of the issues raised in relation to resettlement, all could be considered as economic rather than social issues. In this there was some difference between older people who preferred land-based resettlement while younger people tended to prefer to be as close to town as possible.

### **Multi Ethnic Marriage**

While the social assessment clearly concluded that the people themselves were indifferent to ethnicity in choice of a marriage partner, some have questioned whether the ethnic mix among project affected households (Tables 2 and 4) support this conclusion. To examine this question, statistics were obtained from the Laifeng County Civil Administrative Bureau relating to marriages occurring in 1999, which are broken down by ethnicity of the partners. These indicate that the ethnicity of the 3846 marriage partners were as follows:: Han 39.6%, Tujia 38.6%, Miao 19.8% and others 2.0%. Table 11 below shows the actual breakdown of marriages between various ethnic groups. It also shows the breakdown, derived from probability analysis, if pairing were carried out on a completely random basis.

Table 11: Ethnic Composition of 1923 Marriages in Laifeng County 1999 (percent)

|                              | Han/<br>Han | Han/<br>Miao | Han/<br>Tujia | Tujia/<br>Tujia | Tujia/<br>Miao | Miao/<br>Miao | Others | Mixed | Homo-<br>geneous |
|------------------------------|-------------|--------------|---------------|-----------------|----------------|---------------|--------|-------|------------------|
| Expected if Random Selection | 15.7        | 15.7         | 30.6          | 14.9            | 15.3           | 3.9           | 3.9    | 65.4  | 34.5             |
| Actual                       | 19.4        | 10.2         | 30.2          | 13.1            | 21.0           | 4.2           | 2.0    | 63.3  | 36.7             |
|                              |             |              |               |                 |                |               |        |       |                  |

Considering the relatively small size of the sample, the correspondence is very good particularly for Tujia/Tujia and Miao/Miao. The overall prediction of homogeneous and cross ethnic marriages is excellent. It can therefore be concluded that the results of the social assessment are fully in line with statistics in relation to cross ethnic marriage.

### Social Assessment Conclusion

In summary, although more than half of PAP (58 percent) were officially identified as Tujia, Miao, and Dong, it did not alter the fact that they belonged to a cohesive local community involving Han and minorities alike, with the same economic, social-cultural, and cognitive structure. Local people exhibited no ethnic consciousness, as evidenced by their physical and mental behaviors in community life, such as their daily practices, folk communication, random choosing of spouse, working sites, work partners, etc. The ethnic identification since 1979 resulted from actions by local government and elite, and not from ethnic consciousness of the common people. It was evident that ethnic minority groups in and around the project areas had already entered into, and had considerable influence on, the mainstream of local society. In addition, at the grass-root level, no vulnerable ethnic groups were detected in the project areas; rather the local social ecology, involving all ethnic groups was in healthy equilibrium.

### Need for Special Measures

A further conclusion of the SA was that, provided the RAP is carried out as designed, there should be no minority specific impact as distinct from general impact on the community as a whole.

**Additional  
Annex 16**

**Poverty Alleviation Impacts**

**Background**

China is widely recognized for its achievements in reducing absolute poverty since the adoption of a broad program of rural economic reforms beginning in 1978. Official estimates indicate that rural poverty declined from roughly 260 million poor in 1978 to 42 million in 1998, or from one-third to about one-twentieth of total rural population. These official estimates are based on the government's austere poverty line equivalent to \$0.66 per day (in constant 1985 dollars). For cross-country comparisons, the World Bank uses an international poverty standard of \$1.00 per day (in 1985 dollars), and use of this standard indicates substantially greater numbers of absolute poor in China -- about 11.5 percent or some 106 million people --but confirms the continuing remarkable decline in poverty during the 1990s.

In the past, the broad incidence of poverty made it possible to achieve substantial reductions in poverty through general economic growth and through programs that were more broadly targeted. At present, the majority of the rural poor is concentrated in resource deficient areas, and comprises entire communities located mostly in upland sections of the interior provinces of northern, northwestern and southwestern China. Although these poor have land use rights, in most cases the land itself is of such low quality that it is not possible to achieve subsistence levels of crop production. Consequently, in most years the poorest of the poor consume grain and other subsistence foods beyond their own production levels.

Recognizing the need for targeted intervention to eliminate poverty, in 1986 the government established the State Council Leading Group for Poverty Reduction (LGPR) to provide greater coherence to existing poverty reduction initiatives and to expedite economic development in the poor areas. LGPR has emerged as the principal advocate of China's rural poor, and is now the key agency responsible for coordinating the nation's more than two billion dollars in annual funding for poverty reduction programs. This funding is organized under China's "8-7 Poverty Reduction Plan" established by the LGPR in 1994 with the goal of eliminating remaining absolute poverty in the nationally designated 592 poor counties, with a population of **80** million, over **7** years. Under this plan, the criteria set for graduation from poverty were that most households should have: per capita income level of Y 500 per year (1990 price), 0.5 mu per capita of high and stable yield farmland; one mu of fruit trees or other economic crop; at least one family member working in the non-farm sector or coastal developed area; and one animal husbandry or sideline activity.

In Hubei Province (based on latest figures available in April 2002), there are 29 poverty counties, 25 of which are so designated by the national government with the remainder by the provincial government. These are generally concentrated in mountainous areas in the four corners of the province. Since 1986 when the state and province began joint poverty alleviation efforts, considerable progress has been made. The population below the poverty line reduced from 7.16 million in 1986 to 3.94 million in 1993 (before the start of the 8-7 Plan) to 1.3 million in 2000. Of these 500,000 can be classified as "remaining" from earlier years while the remaining 800,000 were impoverished due to natural disasters in recent years (such as the widespread flooding in 1998). The above estimates are based on national criteria, currently Y 625 per person per year. However, based on local conditions, Hubei Province has adopted more elaborate and demanding provincial criteria. For a county to have graduated from poverty it should achieve the following: average per capita income of Y 1,700 with that for 98 percent of rural households exceeding Y

750 (1994 price level); 350 kg per capita of grain production in rural areas; 0.7 mu per capita of farmland; one mu of high yielding forest or other economic crop; 95 percent of rural population having access to safe drinking water; 90 percent of rural population having road access; 98 percent of rural population having electricity; over 70 percent of villages having a collective income above Y 50,000 per year; and all townships in the county reaching detailed poverty reduction standards. Detailed standards are also specified for townships, villages and households. These more demanding standards explain the difference between national and provincial poverty classifications.

### **The Government's New Strategy**

Despite the impressive achievements of the 8-7 plan, the Government recognizes that there are some weaknesses in current poverty alleviation efforts and has developed a new strategy entitled "Guidelines of China's Poverty Alleviation: 2001-2010" which was endorsed by a national conference, held in May 2001. The Government's new program, based on this strategy includes the following elements; (a) a multi-sector approach to rural poverty reduction; (b) reform of the social safety net system in rural and urban areas; (c) broadening of targeting to cover "relative poverty", i.e., the poorest ten percent of rural population including the absolute poor (below \$0.6 a day per capita income) and vulnerable poor (below \$1 a day per capita income), a total of about 100 million people; (d) decentralized implementation and greater stakeholder participation; (e) mainstreaming of poverty reduction within the Government system and increased participation of private sector and NGOs; (f) targeting of both income and non-income poverty (the latter includes education, health, housing, and environmental factors); and (g) more attention to emerging urban poverty.

### **Early Implementation Steps**

An important part of implementation of the new strategy is improvement of the current poverty planning process. Funded partly by Asian Development Bank, LGPR sponsored a study, carried out from April to August 2001, to develop a methodology and prepare guidelines for county poverty reduction planning incorporating the principles outlined above. The study team, consisting of one international and four domestic experts used a poverty county in Hebei Province as a model to develop and demonstrate the planning process. Working closely with county poverty alleviation officials, the study team prepared poverty alleviation plans for 52 poverty villages, based on which, a county level poverty alleviation plan was developed covering a five year time frame.

Following the completion of the study senior officials from Hubei Provincial Poverty Alleviation Office (HPPAO) participated in several poverty planning workshops arranged by LGPR, and since then HPPAO has started to introduce the new planning process into relevant counties with priority given to those still classified as poverty counties. By the end of October, 2001, pilot poverty planning experiments had been carried out in four counties in Hubei Province, one in each of Enshi Prefecture, Shiyan City, Yichang City and Huanggang Prefecture. Over 100 poverty alleviation officials from counties throughout the Province observed the experiments. Instructed by LGPR, HPPAO is planning to complete new county poverty alleviation planning exercise among all 38 national and provincial poverty counties by March, 2002. However, such a tight schedule will preclude a thorough bottom-up planning exercise, and plans prepared as part of this process can only be regarded as "preliminary".

### **Poverty Alleviation Status in Project Areas**

During project preparation, the project beneficiaries employed the Rural Development Institute of the China Academy of Social Science to specifically examine the impact on poverty of the proposed

hydropower developments. Their terms of reference included: a review of the poverty status in the four counties and current poverty alleviation efforts; the projected direct and indirect impacts of the proposed hydropower developments on the economies of the host communities; and suggestions as to how fiscal revenues accruing to the county from the proposed power plants might be used to enhance poverty alleviation efforts in the project areas. The study team visited the four counties, held extensive discussions with relevant officials from four county governments, and made selective field visits to the project areas and poverty villages. Their findings are summarized in the following sections.

### Poverty Status in Project Counties

The four host counties of the project are all poverty counties. Three of them are nationally designated poverty counties: Xuan-en (location of Dongping), Laifeng (location of Najitan), Zhushan (location of Songshuling), with net rural incomes of 1,820, 1,491, 1,377 Yuan/capita respectively (2001 figures). The other county Nanzhang (location of Xiakou) is a provincially designated poverty county with an income of Y 2,081 per capita. These net rural incomes compare with the provincial average of Y 2,352 per capita.

The high incidence of poverty in the project areas is mainly attributable to poor access due to rugged terrain, mountainous climate, limited farmland resources and lack of non-farm opportunities. However, all four counties have made considerable strides over the last 15 years towards eliminating poverty. In 1986 when the poverty definition was first established, about 62 percent of their total population was below the poverty line, ranging from 80 percent in Xuan-en to 40 percent in Nanzhang. By 1999, the overall proportion had reduced to 3.6 percent. Other indicators of poverty also improved dramatically over a similar period. Between 1984 and 1999, the number of villages without electricity reduced from 732 to 19, villages without road access went from 482 to 74, population without safe drinking water from 497,000 to 107,500. Moreover, investment in schools led to gains in overall enrollment for middle school from below 50 percent to 95 percent, including a jump in the enrollment of girls from 30 percent to over 90 percent. Statistics relating to assets in the four counties also illustrate a great improvement as shown in the following table:

Table 1: Assets per 100 Households in the Four Counties

|      | Savings Account | Bicycle | Electric Fan | B&W TV | Color TV | VCR | Washing Machine |
|------|-----------------|---------|--------------|--------|----------|-----|-----------------|
| 1987 | 19              | 28      | 1            | 6      | 0        | 3   | 0               |
| 1999 | 118             | 56      | 44           | 71     | 7        | 21  | 7               |

### Existing Poverty Alleviation Programs in the Project Areas

Many of the above gains have been achieved since 1986, through four main poverty alleviation programs: "Yigong Daizhen" - basically a Food for Work Program that focuses on infrastructure; a low (or no) interest loan program to assist poor households with income producing investments; development grants for poor areas to establish enterprises and improve infrastructure; and limited construction funds available to old revolutionary areas. Funds received by the four counties since 1993 broken down by source of funds and by county are shown in the following tables.



Table 2: Poverty Alleviation Funds--1993 to 1999

|       | Funds (million Yuan) |               |                 |                   |                     |
|-------|----------------------|---------------|-----------------|-------------------|---------------------|
|       | Total                | Food for Work | Discount credit | Development funds | Funds for old areas |
| Total | 559                  | 149.7         | 316.5           | 78.3              | 14.5                |
| 1999  | 136.9                | 30            | 83.2            | 22                | 1.7                 |
| 1998  | 101                  | 24.5          | 60              | 14.9              | 1.6                 |
| 1997  | 90.2                 | 23.4          | 54.1            | 11.1              | 1.6                 |
| 1996  | 66.6                 | 21.1          | 36.3            | 7.6               | 1.6                 |
| 1995  | 44.8                 | 13.1          | 24.6            | 5.5               | 1.6                 |
| 1994  | 36.1                 | 11.5          | 17.4            | 5.7               | 1.5                 |
| 1993  | 34.6                 | 10.8          | 18.7            | 3.6               | 1.5                 |

Table 3: Poverty Alleviation Funds by County (1995~1999) (Y million)

|       | Total  | Nanzhang | Xuanen | Laifeng | Zhushan |
|-------|--------|----------|--------|---------|---------|
| Total | 598.47 | 111.03   | 157.2  | 148.26  | 181.98  |
| 1999  | 137.04 | 15.43    | 43.11  | 35.47   | 43.03   |
| 1998  | 101.12 | 14.09    | 24.84  | 26.86   | 35.33   |
| 1997  | 90.39  | 12.35    | 23.34  | 25.19   | 29.51   |
| 1996  | 66.73  | 11.4     | 17.25  | 17.75   | 20.33   |
| 1995  | 44.84  | 8.59     | 11.23  | 11.68   | 13.34   |

These figures show the dramatic growth in poverty alleviation funding, a four fold increase in six years. Inflation since 1993 accounts for only about 15 percent of this increase. Most dramatic is the increase during the period since 1995 when inflation averaged only a few percent per year. The trends also show a direct relationship between amount of funding and income, with Zhushan the poorest receiving the most and Nanzhang which has graduated from national level status, receiving the least.

The above discussion and figures illustrate the determination of China to alleviate residual poverty through targeted interventions and the effectiveness of these programs. However, it is also clear that the job is not yet finished with three of the counties still not achieving the central governments austere standard, and the other not meeting the provincial government standard. Moreover, income disparity between wealthier and poorer counties in the province appears to be widening in recent years.

### Shortcomings of Current Poverty Alleviation Efforts

Despite the apparent effectiveness of current poverty alleviation efforts, the study team identified four main shortcomings in current programs, which strongly correlate with weaknesses identified by LGPR leading to development of their new strategy.

The current performance evaluation system and performance indicators are not very scientific; there are few cases where poverty alleviation funds have directly resulted in increased income for rural farmers.

Public goods investment, accounted for a relatively small proportion of overall funding. Farmers have the resources to earn income but lack services such as adequate road access to market, transportation services, and market information.

Finally, more funding is directed to collective projects than to rural households to allow them to finance their own initiatives.

### **Development Impacts of the Project**

**Potential Negative Impacts.** Resettlement obviously has the potential to result in negative impacts. For example, in 1984 at the start of large-scale poverty alleviation efforts, it was estimated that some 30 percent of the total population below the poverty line in Laifeng County and 26 percent in Zhushan County resulted from resettlement arising from reservoirs constructed in the 1970s.

The study team acknowledged the vast difference between the treatment of resettlement in current projects in comparison with that of the past. Firstly it describes the "historic progress" in resettlement philosophy. Prior to the 1980s, the philosophy was that individuals had to subvert their own interest to that of the collective or the state. In the current projects, all affected people have been fully consulted in the planning process and made their own choices as to type of resettlement, and can expect to improve their living standard after resettlement. Moreover, resettlement has been treated as a development opportunity. Associated with this change in philosophy, has been meticulous planning to ensure that compensation funds will be sufficient to restore income, while the choice among a variety of income producing alternatives relies heavily on specific choices made by village groups and individuals. The report also praises other advances in the current projects in comparison with past county developed projects: the thorough assessment of environmental impacts, the connection of the new power plants to the provincial grid, and the careful market assessment and financial projections.

**Direct Benefits from Project Construction.** Improvements in roads in the project areas due to project construction will be substantial since an all-weather road will be constructed to each damsite. Experience has shown that road access is one of the most important infrastructure requirements to allow communities to improve their living standard. Private bus and truck operators respond as soon as a serviceable road is opened. People are more inclined to go for off-farm work when the bus service is cheap and frequent. Lower trucking costs give incentives to grow new crops for the market, and middle men are more likely to visit villages to pick up cash crops. Schoolteachers are more willing to work in a village if it easily accessible, and older students have access to schools of higher level. A frequent benefit cited by villagers is easier access to hospitals.

In Nanzhang, the Xiakou project will build and upgrade 53 km of roads, in comparison with the 40 km of roads constructed in the project areas in the last five years. Similar figures for Xuan-en are 61 km and 53 km and for Laifeng 58 km and 57 km, respectively. The population benefiting from road construction and upgrading is estimated at 111,280 in Nanzhang, 57,873 in Xuan-en, and 7,100 in Laifeng. Road quality is probably a better measure of improvement. In the past few years, the average cost for township and village road construction (mostly earth roads less than three meters in width) was only Y 16,000 per km. In contrast, the roads constructed under the projects will be Class 2-4 roads, with average investment of Y 150,000 per km.

**Employment.** While the mechanization of hydropower project construction has reduced the need for labor in actual construction, these numbers will be supplemented by substantial employment created in local industries providing construction materials. According to estimates by relevant counties, the project will create 1,000 employment opportunities in Nanzhang,, 1,300 in Xuan-en, 1,000 in Laifeng and 2,000 in Zhushan. Wage income alone (at Y 10 per day) is estimated at Y 3 million for Nanzhang, Y 4 million for Xuan-en, Y 3 million for Najitan and Y 6 million for Zhushan.

**Other Benefits.** Other benefits (beyond those considered as required for income restoration of resettlers) stem from increased irrigation (due to conversion of land, upgrading of canals, reduced pumping costs, increased reliability of flows etc), increased cage fishing, reduced flood damage, and reducing municipal and industrial water supply costs. These benefits are estimated by the project counties to bring in Y 11.5 million for Nanzhang, Y 1.07 million for Xuan-en, Y 2.34 million for Laifeng, and 1.31 million yuan for Zhushan. The Nanzhang benefits are primarily flood control for which the provincial and county governments will contribute Y 51.82 million in grant funds for the Xiakou project.

### Impact of Proposed Power Plants to County Fiscal Income

The proposed hydropower plants will increase revenues for the counties during both construction and operation periods. Estimates of fiscal revenues, assuming current tax structure and sharing arrangements are shown in Table 4.

Table 4. Annual Fiscal Revenue to project counties (Y million)

| County                | 1999 Revenue | Existing Hydro power | Construction Period Annual | Operating Period Levelized (12% discount) | Operating Period Levelized (6% discount) | Cumulative until Bank Loan Closing (2008) | Existing Total Poverty Alleviation Funding | Existing County Contribution to Poverty Alleviation |
|-----------------------|--------------|----------------------|----------------------------|---|--|---|--|---|
| Xuan-en (Dongping)    | 106.65       | 5.790                | 5.323                      | 13.33                                     | 14.01                                    | 18.25                                     | 43.44                                      | 0.604   |
| Laifeng (Najitan)     | 148.08       | 4.410                | 2.476                      | 7.00                                      | 7.52                                     | 10.15                                     | 35.47                                      | 0.497   |
| Zhushan (Songshuling) | 69.95        | 1.769                | 2.730                      | 8.72                                      | 8.20                                     | 32.00                                     | 43.03                                      | 0.604   |
| Nanzhang (Xiakou)     | 118.10       | 1.200                | 2.941                      | 9.47                                      | 9.30                                     | 30.30                                     | 15.43                                      | 0.602   |

**Sources:**

Project counties except for operating period.

County revenues do not include central and provincial government support, particularly in relation to funds earmarked for poverty alleviation programs, for which see Tables 2 and 3, and minority programs.

Operation Period revenues extracted from financial analyses carried out by SPERC based on tariffs calculated by the SDPC pricing formula.

This table show that contribution to overall county fiscal revenues will be significant, and for Dongping substantial because of the greater size of the project (110 MW). They do not include returns on equity invested by county owned generation companies which, financial analyses in Annex 5 showed, would be in the range of 15 to 25 percent per year in real terms. Returns to the counties would be even larger if the current power pricing formula were to be altered to an avoided cost approach, or if the tax regime were adjusted to provide for a resource tax which captured the economic rent. For all projects, calculated tariffs are below SDPC guidelines on avoided cost by as much as six fen in the case of Dongping. If the counties were to receive this surplus, rather than passing it on to consumers, it would add to their revenue; for example this would add Y 19 million per year (136% increase) to Xuan-en's revenue from Dongping. Further increases of similar size could be expected if the cost of avoided emissions, whether local or global, were to be included in the power price. The value of these in economic terms is calculated in Annex 4.

Even if the current pricing formula and tax regime remain unchanged, fiscal revenues from the project have the potential to substantially augment poverty alleviation programs in the project areas. Operating period fiscal revenues amount to 20 to 61 percent of total funds directed to poverty alleviation in the four counties. This proportion could be expected to increase if central and provincial government support reduces as the

counties “graduate” from officially designated poverty status. Comparison of the operating period fiscal revenues to current self-help, i.e. county’s own contribution to poverty alleviation programs indicates a much greater potential for increase. Operating period revenues are between 14 and 23 times current county contributions to poverty alleviation programs. The study team report notes that there is a likelihood that in future a larger proportion of county fiscal revenues will be available for poverty alleviation efforts because a large proportion of county costs are salaries and wages, including those teachers, nurses, doctors as well as technical and administrative personnel. This trend is noticeable in the revenue and expenditure figures provided in the study team’s report as is the trend from fiscal deficits to surpluses. In 1999, only Zhushan was in deficit.

### **Poverty Alleviation Enhancement Component**

The project will clearly boost revenue in the affected counties, and past results demonstrate the capability of the counties to effectively utilize poverty alleviation funding. However, the studies in the project area do indicate the potential for improvement of poverty alleviation efforts in line with the new strategy being initiated at the central government level. The project therefore includes a component to prepare for each of the four host counties poverty alleviation enhancement plans using similar methodologies to those developed for the pilot counties in Hubei. The scope of the proposed component is outlined in the following section.

The study will be carried out under the leadership of HPPAO and the poverty alleviation offices in the four host counties, who will mobilize county, township and village resources to cooperate with consultants who will be engaged to carry out the studies.

Two teams of consultants will be formed, each consisting of one international and four domestic experts. Each of these teams will be responsible for two of the project counties. The two teams will work in parallel although some activities such as general orientation and dissemination activities may be combined. Studies under the responsibility of each team will generally be carried out consecutively although some overlap would be expected. The overall timeframe of the study would be six months carried out in the 2002/2003 dry season period.

Poverty alleviation plans will be developed for every poverty village in each county, based on which four county level poverty alleviation plan will be developed covering a five year time frame. The detailed steps involved in this process are as follows:

The first step of the planning process will be to identify poverty villages. To this end all county officials and village officials will be asked to rank all poor villages in the county with reference to a set of poverty indicators which will be developed based on careful analysis and consultation among participating officials and the subject population. The eight indicators selected in Hubei will be used as a starting point: three relating to basic livelihood, three to village infrastructure and two to social development. The three livelihood indicators are cash (per capita income), grain (per capita production), and housing (size and quality indicators). The three infrastructure indicators are drinking water, electricity, and road access. The two social indicators are education (children in school and drop-out rate) and health (percent of women with disease).

Once the targeted poverty villages are selected, village level poverty alleviation plan will be developed. These plans will be prepared using a bottom-up approach with full participation of all village members to identify the poorer people in the village, the basic causes of poverty and measures likely to be effective in eliminating poverty. During the planning process, the poverty people in the village will have four basic

rights: the right to be informed of the planning content; the right to observe the planning process; the right to speak and participate in the process, and the right to make planning decisions for the poverty villages. The county and township officials will work closely with these villagers in identifying appropriate projects and activities for poverty reduction based on actual conditions and available skills among the concerned villagers.

The village level plans will comprise an analysis of: (i) economic opportunities for poor people to generate income (i.e. agriculture and rural industries); (ii) economic infrastructure needs of the poor (rural roads, irrigation and soil conservation, drinking water facilities, rural electrification, and communication); (iii) access to social services (education, health, social protection) and its impact on poverty; and (iv) the institutional and governance-related setting in the area. Detailed cost estimate and funding arrangement will be developed based on projected poverty alleviation funding in the county. Once these plans are prepared, they will be publicized in the concerned villages and to be used as a basis to measure actual implementation.

The village level plans will be aggregated into county level poverty reduction plan. From this will be developed a poverty project list. Individual projects will then be prioritized taking into account the availability of funding from all sources, reasonable distribution of funding among villages, and the need to specifically target the poorest villages in the county.

An important requirement is to monitor and supervise the full implementation of county poverty reduction plan. The consultants will prepare procedures for monitoring implementation based on a participatory process. As a basis for such monitoring, key poverty plan information, such as planned projects, estimated investment and benefited population will be included in poverty information booklet to be distributed among poverty population. Every year, the implementation progress of each poverty project in terms of investment made and number of people benefited will also be published among poverty households, villages, and township and county governments.

#### **Poverty Alleviation Enhancement Fund**

To accelerate implementation of the county alleviation plans, the host counties have agreed to allocate 20 percent of the fiscal revenue received from hydro power plants located in their respective counties for at least five years commencing with first sale of power from such.

## Additional Annex 17

### Social Assessment Appraisal Mission Report CHINA: Hubei Hydropower Development in Poor Areas Project

Thomas Rhys Williams, Daniel Gibson, Zong-cheng Lin

#### Executive Summary

It is the conclusion of the members of the Social Assessment Mission, based upon examination of relevant documents and field visits and interviews at locations of the Project Affected Peoples (PAP), that World Bank Operational Directive 4.20 is not activated and that no Indigenous Peoples Development Plan (IPDP) will be required in the proposed China: Hubei Hydropower Development in Poor Areas project.

This conclusion is based upon the following facts:

- There is no special vulnerability on the part of members of the Tujia, Miao and Dong ethnic minority groups who are included in the PAP. The five indicative characteristics of vulnerability contained in OD 4.20 are not present or relevant among the PAP;
- Field visits to selected sites in Xuan-en (Dongping hydropower project) and Laifeng (Najitan hydropower project) Counties in Western Hubei Province have determined that individuals included in the PAP who are classified by the Government of China as members of ethnic minority groups (Tujia, Miao, Dong) do not fall into the category of the intended people under OD 4.20 and will not be affected adversely, or become vulnerable, in either their classification as ethnic minority group members or in their cultural and social life since there are no significant differences between Tujia, Miao and Dong individuals in the PAP and their local area Han neighbors with regard to political representation, economic activities and standards of living which would require an IPDP;
- There is no discernable identification by Tujia, Miao and Dong individuals among the PAP as belonging to distinct ethnic minority groups. Individuals included in the PAP do not speak the Tujia, Miao and Dong languages, have no special dress or body ornaments and decorations, housing styles or house locations, modes of production, special symbols, patterns of religious belief, ceremonies, rituals, world views or self-identification that distinguishes them from one another or from their local area Han neighbors. There is wide-spread agreement among PAP Tujia, Miao and Dong individuals interviewed that they cannot identify another person as being Tujia, Miao, Dong or Han based on language since all use putongua or the national language of China; and
- Tujia, Miao and Dong individuals included among PAP did not express any reasons in the course of interviews why they or the China: Hubei Hydropower Development in Poor Areas project might benefit from making ethnic minority group membership distinctions in either planning or implementing the project. Thus, ethnic minority group persons interviewed and who are included in the PAP are informed and participating in decisions affecting them and have not stated concerns that the project would affect or impair their official classification as Tujia, Miao or Dong persons.

Thus, it is our judgement that the China:Hubei Hydropower Development in Poor Areas project which includes Tujia, Miao and Dong individuals in the PAP will not result in these persons becoming specially vulnerable under OD 4.20 and that they will not have their human dignity, political representation, economic activities, standard of living or social and cultural life diminished, abridged or curtailed by the proposed project.

## Social Assessment Appraisal Mission Report

October 22, 2001  
Washington, D.C.

### Introduction

China's population of 1,246,871,951 persons (July, 1999 estimate) consists of approximately 91% of individuals classified as Han, while about 9% of the population are categorized under relevant sections of China's national law as members of one of 55 named ethnic minority groups, for example Zhuang, Yi, Dai, etc. (See, *Law of the People's Republic of China on Regional National Autonomy*. Beijing: The Ethnic Publishing House, 2001. See also, Wu Shimen (ed.) *A Survey of China's Policies Regarding the National Minorities*. Beijing: Zhong Guo Minzu Zhengce Gailan, 1995.) These groups speak some 70 languages and have about 20 different written scripts.

Today, these ethnic minority groups (minzu) are located in nearly all of China's 23 provinces (sheng), 4 municipalities (shi) and 5 autonomous regions (zizhiqui). In general, these groups are concentrated in the dry, cold or tropical mountain areas of western, southern and northern China, while the Han population lives for the most part on the warm humid plains and deltas in eastern and southern China. (Zhang Haiyang, *The Framework of China's Governance of Ethnic Affairs Focusing on Western Hubei (Enshi Prefecture)*. Washington, D.C.: The World Bank, 2001.)

The ways ethnic minority groups in China gain their living varies widely, with members of one group (Hui) working in towns and cities as merchants and small shop keepers, while other groups, for example the Yi of southwestern China, practice swidden ("slash and burn") agriculture on the flanks and tops of high mountains supplemented by gathering and some hunting activities. The members of other ethnic minority groups make their living as pastoral nomads (Kazak, Mongol) or as reindeer hunters (Ewenki). In contrast, China's Han population historically has cultivated irrigated rice crops on the warm, humid plains and deltas of eastern and southern China.

Thus, China's 9,596,960 square kilometer land area, which is very diverse in topography and climate, is occupied and used by humans in quite different ways. Through a long period of time, at least the past 3,000 years, this has resulted in the Han population and ethnic minority populations becoming separated from yet at the same time intermingling with one another in various and complex forms.

While it generally has been true historically that Han and ethnic minority populations were separated on a, "lower elevation" (Han) or "higher elevation" (ethnic minority groups) basis, this broad distinction based on the elevation of natural communities has been breaking down rapidly in the past century as modernization has taken place in China, so that once quite separate social groups now intermingle and live side by side in communities in many parts of China.

This intermingling process also has been fostered since 1949 by China's national policy of granting equality to members of all 55 ethnic minority groups as both a fact in law and as an individual right. The intermingling process also has been promoted since the Chinese revolution by the teaching of a national spoken and written language (or, putonghua) in a compulsory system of primary and middle school education; the national language, based on the Beijing dialect, now is spoken by the Han population and also by all ethnic minority group social elites.

Intermingling of the Han and ethnic minority populations also has taken place in the past two centuries as natural population increases among ethnic minority peoples have created pressures to seek new and additional land for agricultural and pastoral activities. Some ethnic minority groups have moved out of their traditional home locations into adjacent and unoccupied areas, often at lower mountain elevations, to cultivate new crop or pasture lands. Individuals and entire households also have migrated to areas outside their traditional locations to begin occupying new lands for farming and herding. At times in the past two centuries the migration of ethnic minority populations has been seasonal and close-by with migrants staying in new locations only so long as necessary to plant and later harvest new crops or to graze animals in more lush pastures. In other instances, individuals and households, sometimes entire villages, moved some distances seeking, then cultivating new farm lands or herding animals onto new pastures.

This kind of “population increase pressure” for migration by ethnic minority peoples to new crop lands and pastures has resulted through a long period of time in natural communities of both Han and ethnic minority people living in local areas as neighbors sharing the same ecological settings.

Following the revolution of 1949 in China, another type of intermingling process began in which Han and some ethnic minority individuals and households, seeking new and unoccupied crop and pasture lands began migrating to the same areas in China, thereby creating a new kind of natural community, one in which Han and ethnic minority group populations were intermixed as neighbors. This last type of pioneering migration took place mostly during the ten years following the 1949 revolution in China. Today, because of laws granting the ownership of all land to the State and with increased administrative presence in rural and remote areas of China such pioneering movements of individuals and households seeking new lands is much less common than in the time just following the 1949 revolution.

#### **The Tujia, Miao and Dong Ethnic Minority Populations in China**

There are large populations of Tujia, Miao and Dong peoples in China. Thus, the total population of members of the Tujia ethnic minority group in China is reported to be approximately 5,704,223 persons, mostly living today in Hunan Province in the Xiangxi-Tujia-Miao Autonomous Prefecture. The remainder of the Tujia ethnic minority group is reported to live in scattered communities in Shizhu, Xiushan, Youyang and Qianjiang counties of Sichuan Province. (See, *China's Minority Peoples*, Edited by the State Nationalities Affairs Commission. Beijing: China Pictorial Publishing House, p. 42, 2000.)

The reported total population of the Miao ethnic minority group is approximately 7,398,035 persons, mostly concentrated in Guizhou, Hunan and Yunnan Provinces and in the Guangxi Zhuang Autonomous Region. (*op. cit.*, p.17.)

The total population of the Dong ethnic minority group in China is 2,514,014 persons in an area where Guizhou, and Hunan Provinces and the Guangxi Zhuang Autonomous region meet, specifically in Qiandongnan, Yuping, Xinhuang, Tongdao, Zhijian and Sanjiang Counties (See Appendix One). (*op. cit.*, p.32)

The Tujia, known historically and variously to Han peoples as “wulingman,” and “wuximan” along with other minority peoples, also were described in Song Dynasty literature as the “Tuding” or “Tumin” people. It has been reported that Tujia have described themselves through use of the descriptive Tujia term, “bizica” or “native.” Following the revolution of 1949 in China this population officially was designated by the State as the, “Tujia Nationality.”

The Tujia language, which has been classified as belonging to the “Tibeto-Burman” group of the



Sino-Tibetan language family, was in wide use in Tujia communities until the early 1900's; today the Tujia language is spoken in only a few areas, particularly in Longshan, Yongshun and Guzhang Counties of Hunan Province. It appears that the Tujia did not develop or use a script for writing their language.

The Tujia ethnic minority in China traditionally has made their daily living by farming, principally rice crops, and the raising of domestic animals. The Tujia became widely known among their Han neighbors for producing in western Hunan Province a golden tung oil and lacquers and for weaving of materials with intricate designs. Tujia communities historically have set themselves apart from the Han through use of distinctive costumes, decorations, symbols, ceremonies and rituals, including animistic and shamanistic activities and through use of special world views.

The Miao ethnic minority population traditionally has made their living by practicing swidden rice cultivation and gathering, with some hunting, in their mountainous homelands. Miao groups living on the lowlands of the warm and humid Miaoling and Wuling Mountain ranges have also cultivated irrigated rice crops and some maize, wheat, cotton, tobacco, millet and rape seed crops and the planting, care and harvesting of tung oil trees. Miao groups living in mountain areas also have traditionally extracted and used forest products and some minerals, particularly silver.

The Miao ethnic minority is said to have their origins some 3,000 years before the present in the "Chi You" peoples living in the Central Plains area of China; there is no documentary or archaeological evidence to support this contention. However, by the Shang and Zhou historic periods Miao groups had established the "Three Miaos State" in the middle and lower reaches of the Changjiang River, where they cultivated irrigated rice crops.

In the time that followed these early historic periods, beginning sometime in the Western Chou and lasting through the Eastern Chou historic eras in China and for unknown reasons Miao groups began a series of migrations into present day Hunan, Guizhou and Yunnan Provinces. Following 1949 the Miao ethnic minority population officially was designated by the State as the, "Miao Nationality."

The Miao language is classified as belonging to the Miao-Yao group of the Sino-Tibetan language family. There was no written form of the Miao language, although in the 1950's an attempt was made to introduce the Miao to a romanized alphabet; for a variety of reasons this effort was largely an unsuccessful one.

The Miao ethnic minority population also have historically set themselves apart from their Han neighbors through use of distinctive costumes, decorations, symbols, animistic and shamanistic ceremonies and rituals and the use of distinctive world views. The Miao were known to their Han neighbors for finely made cross-stitch embroidery products and the production of batik and brocade cloths and a wide range of silver body ornaments. Traditionally, Miao groups have used a variety of complicated dance, musical and song forms as part of long ceremonies celebrating important events in Miao life and history. The Han neighbors of the Miao ethnic minority population often were familiar with some of these ritual practices, including "New Year's Day," the "Eighth Day of the Fifth Month of the Lunar Year" and the "Dragon Boat" ceremonies. The manufacture and use in ceremonial events of various sized gourd and bamboo reed pipes has been a notable part of Miao life. *(The traditional costumes and decorations of the Tujia, Miao and Dong ethnic minority groups are described in, Ethnic Costumes and Clothing Decorations from China. Printed in Hong Kong: Hai Feng Publishing Company for The Sichuan People's Publishing House, Chengdu, Sichuan Province, n.d. See, pp. 232-241 (Miao), 248-257 (Dong) and 288-293 (Tujia).)*

The Dong ethnic minority population traditionally has made their living cultivating swidden and irrigated rice crops, raising fish in paddy fields and small ponds and cultivating trees for the manufacture of wood

products. Historical documents of the Song dynasty describe the Dong population as “Yilings,” while documents in the Ming and Qing dynasties describe the Dong as, “Dongman,” “Dongmiao,” “Dongren” and “Dongjia.” Today, members of the Dong population often describe themselves through use of the term “Dongjia.” Following 1949 the Dong ethnic minority population officially was designated by the State as the, “Dong Nationality.”

The Dong ethnic minority population speak a language belonging to the Dong-Shui branch of the Zhuang-Dong group of the Sino-Tibetan language family. This language did not have a written form until a romanized alphabet was developed in the mid-1950's; this script has not been used widely among the Dong population.

The Dong ethnic minority population traditionally possessed a distinctive architecture which used wood, bamboo and other forest products to construct large houses, bridges, “drum” towers, and pavilions; distinctive colors were used to decorate pavilions. The Dong also traditionally manufactured silk embroidered cloth, cross-stitch decorated cloth, wove fine cloth and brocades, and cast silver body ornaments of a variety of types, including “neck rings” and bracelets worn ceremonially by Dong women.

Music and song traditionally have been an integral part of Dong daily life. Songs are composed and sung in a close rhyming form, often improvised for the occasion and said to express deep inner feelings. Musical forms traditionally employed by the Dong also include the “drage,” an a capella presentation by a large group singing many verses.

Dong communities historically have set themselves apart from their Han neighbors through use of very distinctive costumes, decorations, symbols, ceremonies and rituals, including animistic and shamanistic activities and through use of distinctive world views. (*Animism is a belief in the existence of in-dwelling spirit beings and forces. Shamanistic activities include all of the ritual practices and ceremonies performed by a specialist, male or female, who serves as an intermediary between the human and non-human worlds.*)

### **Tujia, Miao and Dong Among the Project Affected Peoples**

Documents prepared by the East China Design Institute (ECDI), by Professor Zhang Haiyang, Department of Ethnology, Central University of Nationalities, Beijing, The People’s Republic of China, and by competent officials of the affected Counties of Xuan-en (Dongping hydropower project) and Laifeng (Najitan hydropower project), including Resettlement Action Plans and Social Assessment statements, indicate that approximately 5,612 individuals are to be resettled under the China: Hubei Hydropower Development in Poor Areas project. This total number of Project Affected Peoples (PAP) includes 2,791 Tujia, 294 Miao and 161 Dong individuals; the remaining 2,366 persons are Han. The 5,612 total PAP reside in 1,365 households. Thus, approximately 3,246 individuals, or 58 percent of the PAP, are ethnic minority group members.

### **Classification of Ethnic Minorities in Western Hubei Province**

A detailed study by Professor Zhang Haiyang notes the development of the procedures and laws relating to the classification of ethnic minority groups in China following the 1949 revolution. (*Zhang Haiyang, The Framework of China’s Governance of Ethnic Affairs Focusing on Western Hubei Province (Enshi Prefecture). Washington, D.C.: The World Bank. 2000.*) Professor Zhang Haiyang also notes in this work that about 1954, for political and economic reasons, some of the educated elite leaders of the Tujia, Miao, Dong and other ethnic minority groups living in Western Hubei Province began seeking formal recognition and permission from the central government to have their counties designated as an autonomous area centered

upon the town of Enshi in Xuan-en County. Two decades later, in 1984, formation of the, "Enshi Tujia-Miao Autonomous Prefecture" brought a wide number of social, economic and political benefits from the central government to this poor area of western Hubei province. This also meant that individual state identity cards would describe the ethnic minority group affiliation of all Tujia, Miao and Dong persons within the Enshi Tujia-Miao Prefecture. Professor Zhang also notes that in 1994 and again in 1995 the Hubei Provincial Government issued special regulations to seek to alleviate the disparities in income between the Enshi Tujia-Miao Autonomous Prefecture and the more developed areas in eastern Hubei Province.

It should be noted that in 1979-1980 the population of Western Hubei province was reclassified through government administrative decisions which affected the total number of Tujia, Miao and Dong persons listed in official census records. As a consequence of these administrative decisions the Tujia population grew from 5,688 individuals in the 1953 census to 1,487,758 persons in the 1982 census. This increase in Tujia population in a period of twenty nine years is approximately 260 times the 1953 Tujia census figure. A similar startling increase over a twenty nine year period (1953-1982) is recorded for the Miao population; the officially reported growth of the total number of Miao individuals between the 1953 and 1982 census enumerations is approximately 106 times the 1953 official figure for Miao individuals. The census of 1953 and of 1983 does not record either the total number, or the increase, of Dong ethnic minority group individuals in Western Hubei province.

These official data suggest that a large number of Han and other persons were reclassified through administrative decisions as being members of the Tujia and Miao ethnic minority groups. These data also possibly could account for data derived during field interviews indicating an almost random pattern of intermarriage between individual Tujia, Miao and Dong ethnic minority group members and individuals officially classified as Han. In addition these data also may indicate a reason for the nearly random distribution of Tujia, Miao and Dong households and individuals in the PAP affected communities observed in the course of field visits. And, it should be noted, these data also may provide an insight concerning the question of why the ethnic minority group peoples included among the PAP do not appear to have links today to the historical and traditional patterns of Tujia, Miao and Dong culture and society described in the second section of this report.

#### **Field Investigation of Tujia, Miao and Dong in the PAP**

A field investigation of the social, cultural, economic and political situation of Tujia, Miao and Dong individuals represented in the PAP took place from Wednesday, October 17 through Saturday, October 20, 2001.

Standard ethnographic field investigation techniques, including direct observation, interviews with key informants and participation in the local community, using the language spoken in the community, were employed in the course of the field investigation. (*For a description of standard ethnographic methods and their use see, Thomas R. Williams, Field Methods in the Study of Culture. New York: Holt, Rinehart and Winston, 1967. It should be noted that standard ethnographic methods usually are employed in the course of a year or more of continuous residence in one or more local communities.*) The PAP communities visited and the schedule of work conducted during the course of the field investigation are described in Attachment 1 of this report.

In the course of the field investigation specific information was gathered on the following topics: (1) language, (2) dress and body ornaments and decoration, (3) housing styles and house locations, (4) modes of production, (5) use of special symbols, (6) patterns of religious belief, (7) ceremonies, (8) rituals, (9)

world views and, (10) self-identification. *(The discussion in this section of the report is set in the context of historical and ethnological knowledge summarized in Sections 1 through 4 of this report.)*

The results of the field investigation are summarized below under these ten headings.

- **Language** - The field investigations among Tujia, Miao and Dong individuals included in the PAP clearly indicate that the Tujia, Miao and Dong languages are not spoken by individuals in the ethnic minority groups included in the PAP; without exception informants questioned on the use of language noted that they could not speak and did not use the Tujia, Miao or Dong language. All informants also noted that they spoke and used the national language of China, or putonghua. It should be emphasized that in the course of interviews with informants a consistent response to questions concerning use of ethnic minority group languages among the PAP was that informants did not know of any person in their communities or in the vicinity who spoke the Tujia, Miao or Dong languages.
- **Dress, Body Ornaments and Decorations** - The field investigation among Tujia, Miao and Dong individuals included in the PAP reveal that there are no distinctive styles of dress for men or women in use today. Too, there are no special uses of body ornaments or decoration in use today by Tujia, Miao and Dong individuals which are employed to indicate their specific ethnic minority group status. Informants also indicated that they did not store or keep any items of dress, ornaments or decoration for use at times of ceremony or rituals.
- **Housing Styles and Locations** - The field investigation did not reveal any distinctive house construction styles that have been associated with the Tujia, Miao and Dong ethnic minority groups elsewhere in China. Houses occupied by individuals who are classified as Tujia, Miao and Dong and who are included in the PAP were constructed of materials used by Han individuals included in the PAP. Too, the location of houses, with reference to elevation, presently occupied by Tujia, Miao and Dong included in the PAP show no significant differences from the location of houses occupied by the Han persons included in the PAP.
- **Modes of Production** - The field investigation did not indicate that the modes of production, including agriculture, raising of animals, the making of implements for household use, and the growing and raising of cash crops ( for example, various fruit crops and fish raised in ponds) employed by Tujia, Miao and Dong individuals included in the PAP differ in any measurable way from the modes of production in use among the Han individuals also included in the PAP.
- **Use of Special Symbols** - The field investigation did not indicate that Tujia, Miao and Dong individuals used any special symbols to distinguish themselves as members of ethnic minority populations.
- **Patterns of Religious Belief** - Individuals from the Tujia, Miao and Dong ethnic minority peoples included in the PAP all indicated that they did not know of or use any major or distinctive patterns of religious belief that differed in form from the patterns found among the Han included in the PAP. Questions asked in the field investigation of Tujia, Miao and Dong individuals who are part of the PAP indicated that animistic belief and shamanistic activities traditionally used by Tujia, Miao and Dong ethnic minority peoples elsewhere in China either are not known to or unused by ethnic minority individuals included in the PAP.
- **Ceremonies** - The field investigation revealed that Tujia, Miao and Dong individuals included in the PAP are unaware of or generally do not employ the ceremonial forms reported in ethnographic literature to be a distinctive part of the culture of Tujia, Miao and Dong ethnic minority populations in other parts of China. However, it should be noted that there are a few scattered remnants of some traditional Tujia cultural forms, for example, in Wachangba hamlet, Meiziao village, Lafeng County, a “waving hands” dance form is said by informants to be used around the eighth day of the fourth lunar month as a way of expressing, “ personal happiness.” A similar dance form is performed on the eighth

day of the fourth lunar month in some Tujia communities in other parts of China. It should be noted that Miao, Dong and Han individuals included in the PAP are said by informants to also use this dance form to express personal "happiness" around the eighth day of the fourth lunar month of the year and to consider the dance form to be part of their own cultural heritages. (/ The existence of some cultural traits or trait complexes which historically have been part of a larger cultural pattern as "cultural survivals" is not uncommon in situations of major change in culture and society. Thus, it is not surprising that some traditional Tujia cultural traits exist today in Western Hubei province.)

- **Rituals** - On the basis of the field investigation it may be concluded that Tujia, Miao and Dong individuals included in the PAP are unaware of or do not use rituals said to be a distinctive part of the traditional life of Tujia, Miao and Dong ethnic minority peoples elsewhere in China.
- **World Views** - Tujia, Miao and Dong individuals included in the PAP did not indicate during questioning that they possessed or were aware of the traditional body of beliefs and values concerning the universe and its make-up and origin, or a world view, that is reported to be held and expressed traditionally by Tujia, Miao and Dong ethnic minority populations in other parts of China and are expressed by these peoples in myths, folk tales, special ceremonies, distinctive rituals and basic values.
- **Self-Identification** - The field investigation indicates that Tujia, Miao and Dong individuals included in the PAP do not think of themselves to be distinctive or specially set apart from the Han individuals who also are part of the PAP, particularly with regard to access to or use of political, economic or social and cultural activities in their natural communities. Data derived from interviews with Tujia, Miao and Dong individuals included in the PAP indicate that they did not see any ways they or the China: Hydropower Development in Poor Areas project might benefit from making ethnic minority group membership distinctions in either planning or implementing the project.

These data also indicate that Tujia, Miao and Dong individuals included in the PAP have been informed and are participating actively in decisions affecting them and generally have concluded that the project will not affect or impair their official classification as ethnic minority group members. The overall outlook on the part of Tujia, Miao and Dong individuals included in the PAP is that they are part of larger natural communities which also incorporates their Han neighbors.

It should be noted here that in the course of field investigations informants consistently indicated that they could not identify the ethnic minority group status of other persons by their appearance, dress or mannerisms and that, in fact, mission members interviewed individuals who were uncertain of their own official ethnic minority group identification and engaged in debates with family members concerning ways to offer identification of themselves as Tujia, Miao or Dong individuals.

It may be concluded on the basis of a field investigation of the ten factors noted above that the Tujia, Miao and Dong individuals included in the PAP do not differ in significant ways from the Han individuals who are part of the PAP. It also may be concluded that the Tujia, Miao and Dong individuals included in the PAP have abandoned, discontinued or forsaken the major patterns of culture and social life which are reported to be a part of Tujia, Miao and Dong traditional life in other parts of China.

#### **Vulnerability of Ethnic Minority Individuals Among the PAP**

Operational Directive 4.20 notes five factors which may be used to identify indigenous peoples: (1) close attachment to ancestral territories and natural resources in an area, (2) self-identification and identification by others as members of a distinct cultural group, (3) an indigenous language, often different from the national language, (4) the presence of customary social and political institutions and, (5) primarily subsistence-oriented production. The Tujia, Miao and Dong individuals included in the PAP do not fall under the Bank definition of indigenous peoples: these persons do not claim and do not have an

identification with any ancestral territories or natural resources, do not identify themselves and are not identified by others as members of a distinct cultural and social group, do not speak any indigenous language, do not possess and use traditional and customary indigenous forms of social and political behavior or institutions and share fully with their Han neighbors in the economic activities and life of their natural communities.

Thus, it may be concluded that the Tujia, Miao and Dong individuals included in the PAP are not “indigenous peoples,” “indigenous ethnic minorities,” “tribal groups,” or “scheduled tribes” under the terms employed in Operational Directive 4.20. The field investigation of ten factors, noted above, fully confirms this fact.

Therefore, it may be said that no Indigenous Peoples Development Plan is required in the China: Hubei Hydropower Development in Poor Areas project.

It also can be concluded on the basis of an examination of relevant documents, including Social Assessments and Resettlement Action Plans and on the basis of a careful field examination that Tujia, Miao and Dong individuals included in the PAP will not have their human dignity, political representation, economic activities, standard of living or social and cultural life diminished, abridged or curtailed by the China: Hubei Hydropower Development in Poor Areas project. This conclusion is based on the fact that Tujia, Miao and Dong ethnic minority persons included in the PAP share in, and are included within, the same social and cultural realm, or milieu, of daily life of the Han individuals who are their neighbors and who also are included in the PAP for the project.

In other words, the 3,246 ethnic minority group persons ( 2,791 Tujia, 294 Miao and 161 Dong) who are included in the PAP essentially share with the 2,366 Han individuals who also are part of the PAP the same chances for success in resettlement. Thus, if the Han included in the PAP are not vulnerable to an assault upon their human dignity, political representation, economic activities, standard of living and social and cultural life as a consequence of the China: Hubei Hydropower Development in Poor Areas project, then it follows that Tujia, Miao, and Dong individuals included in the PAP also will not be vulnerable since these persons, classified officially as members of ethnic minority populations, are for all intents and purposes generally indistinguishable from their Han neighbors in language, dress and body ornaments and decoration, housing styles and house locations, modes of production, use of special symbols, patterns of religious belief, ceremonies, rituals, world view and self- identification.

### **Conclusions**

An examination of relevant documents, an intensive field investigation and a study of historical, ethnographic and ethnological data provides an answer to the question:

“Are individuals from the Tujia, Miao and Dong ethnic minority populations included the PAP similar to Tujia, Miao and Dong ethnic minority peoples found elsewhere in China?” The answer to this question clearly is, “No” based on a field investigation of ten factors of traditional Tujia, Miao and Dong social and cultural life examined here (see pages, 3-5 above). A very important corollary to this answer is that, in fact, the Tujia, Miao and Dong individuals comprising 58% of the PAP appear to live comfortably and are peacefully intermingled among and generally are indistinguishable from their Han neighbors who make up the remainder of the PAP.

Thus, the Tujia, Miao and Dong persons included in the PAP do not fall under the category of the intended people under OD 4.20 and will not be affected adversely, or become vulnerable, due to the project either in

their classification as ethnic minority persons or in their social and cultural life, including economic activity, political representation or standards of living, all of which are shared with their Han neighbors who are part of the PAP.

A general conclusion to this report is that World Bank Operational Directive 4.20 is not activated in the China:Hubei Hydropower Development in Poor Areas project and that no Indigenous Peoples Development Plan (IPDP) will be required for the project.

Thomas Rhys Williams, PhD  
Professor of Anthropology

Daniel Gibson, PhD  
Senior Social Scientist

Zong-cheng Lin, PhD  
Social Development Specialist  
October 22,2001

**Field Agenda  
The Social Assessment Appraisal Mission  
October 13-22, 2001**

- October 13:  
Evening: Professor Williams arrived in Beijing
- October 14:  
Morning and afternoon: Professor Williams read project documents
- October 15:  
Morning: Mission internal discussion meeting at WBOB;  
Afternoon: Meeting with Professor Zhang Haiyang;
- October 16:  
Morning: Meeting at the National Commission of Ethnic Affairs  
(with Ms. Hu Jingping, Deputy Chief of Division of Ethnic Policy  
Ms. Sui Qing, Deputy Chief of Division of Legal Management  
Mr. Shen Lin, Chief of Division of Scattering Ethnic Groups)  
Afternoon: Meeting with Professor Zhang Haiyang;
- October 17:  
Morning: Departed for Enshi, Hubei, through Wuhan – arrived in Wuhan in noon;  
Afternoon: Departed from Wuhan to Enshi (capital of Enshi Tujia and Miao  
Autonomous Prefecture in western Hubei, arrived at 5:00 pm.);  
Evening: Arrived at Xuan-en county seat (from Enshi airport)
- October 18:  
Morning: Meeting with Xuan-en Dongping Project authorities (Mr. Wan Kaixing,  
Tujia ethnicity, deputy general manager of the Dongping Corporation, Mr. You,  
Chief of the Comprehensive Office of the Corp., and other staff);  
Departed for field visit to Zhongjianhe Township (three-hours drove), a main area  
to be affected by Dongping resettlement (where were concentrated by ethnic  
groups, mostly Tujia);  
Visited Tujia households in Tianjiafang group (64 households in total,  
of which 57 Tujia all with surname Tian, and 7 han with surname Li),  
Zhongjianhe Village (in Zhongjianhe township);  
Afternoon: Visited Luiluiba village (designed to be a resettlement host site),  
Changtanhe township (78% of population here are ethnic minorities),  
Interviewed some farmers who were themselves confused with  
their own ethnicities (in one household, named Duan, the son said  
himself was a Han while his mother and grandma were Miao ethnicity; but his  
mother (surname Luo) said that she herself was Han and her mother (surname Yi)  
should be also Han since her matrilineal uncle from another household was Han,  
as identified by himself);  
Interviewed a Han household;  
Interviewed a Miao household head;  
Evening: Met with Mr. Zhang Ruqian (Miao ethnicity), Chairman of the People's  
Congress of Xua-en County, who was in charge of Xuan-en resettlement  
as a whole and just came back from other trip;  
Drove to Lafeng county, accompanied by deputy county governor of  
Lafeng, Mr. Wei, and Lafeng resettlement office chief, Mr. Chen;



Arrived about 10:30 pm, met county governor Mr. Yang and other staff

October 19:

Morning: Drove five hours from Laifeng county seat to Baisifu township;  
Afternoon: Visited Wachangba villager group, Meiziao village;  
Interviewed households: two Miao men headed households while their wives were Han;  
Visited also Zhangjiacao village in Huoyan township, Longshan county (on the way back);  
Interviewed a Tujia household, and also had a brief talk with some farmers (Tujia and Han) from the neighborhood;  
Evening: Drove to Longshan county seat;

October 20:

Morning: Drove 7 hours to Dayong/Zhangjiajie airport, accompanied by Messer. Chen and He from Lafeng County Resettlement Office;  
Afternoon: Took off at 2:00 pm to Beijing;

October 21:

Morning: Report preparation and writing-up;  
Afternoon: Meeting with Professor Zhang for further discussion;

October 22:

Morning: Professor Williams departed for USA (United Airlines flight 852, left Beijing at 9:25 am, arrived in San Francisco at 9:00 am local time on the same day; then flew from San Francisco to Washington next day).

## Additional Annex 18

### Institutional Arrangements for Implementation and Operation CHINA: Hubei Hydropower Development in Poor Areas Project

#### Executing Agencies

Primarily responsible agencies for project preparation and implementation are:

|               |  |
|---------------|--|
| <b>HPPDC:</b> | Hubei Provincial Planning and Development Commission (before June 2001);       |
| <b>HPFB:</b>  | Hubei Provincial Finance Bureau (after June 2001)                              |
| <b>PPMO:</b>  | Hubei Provincial Project Management Offices (Since August 2001)                |
| <b>CPMO:</b>  | County Project Management Office (four, one in each of the four host counties) |

#### Project Companies

Hubei Xuan-en Dongping Hydroelectric Power Company Limited  
Hubei Laifeng County Najitan Hydroelectric Power Development Company Limited  
Hubei Zhushan Duhe Hydroelectric Power Development Company Limited  
Hubei Nanzhang Xiakou Electric Power Company Limited

This annex generally focuses on the institutional arrangements relating to design, construction and operation of the dams and power plants. The institutional arrangement for the execution of EMPs and RAPs are described in the corresponding reports and summarized in Annexes 13 and 14.

#### Project Preparation

HPPDC was the lead agency for preparation of the project for Bank appraisal. In June 2001, this role was taken over by HPFB. Hosted by HPFB, a PPMO was established in August 2001 to oversee and coordinate the completion of project preparation and project implementation. Participating parties include all project related provincial government agencies and the future power purchaser. Similarly, CPMOs were set-up in the four host counties of the respective dams and power plants, with similar functions and responsibilities. For each dam and power plant, a limited liability project company was established as the owner, developer and operator for each of the four sub-projects. An experienced international tendering company (ITC of CNTIC) was appointed as the procurement agent. Hubei Investigation and Design Institute (HIDI), an experienced design institutes, carried out the design; however, to provide additional comfort, the Design Institute of Changjiang Water Resource Commission (CWRC) was engaged to carry out an independent review of the project design and preparation of technical specifications for bidding documents. A Panel of Experts was also appointed to provide high level review and to meet the Bank's requirements for a dam safety review panel.

Substantial achievements were made during project preparation. All the above executing agencies were established, key staff appointed and played their respective roles in project preparation. The EAs and RAPs for the four hydropower plants and transmission lines were completed, as were poverty alleviation studies for all four counties and social assessments for Laifeng and Xuan-en. Laifeng County also reached agreement with Longshan County in Hunan Province for carrying out resettlement in that county associated with the Najitan project, and also for sharing of project benefits with Longshan County.

The design review was completed and the POE has had its first review meeting in November 2000 and the project preliminary design was completed after notable changes were made following the recommendations of the POE meeting. Six Chinese contractors were prequalified for NCB civil works (Najitan and Xiakou). NCB bids for five contracts, the dams and power houses for Najitan and Xiakou, and the preparatory works for Songshuling, were opened on January 20, 2002 as scheduled. Due to schedule constraints, the Dongping Company decided to commence preparatory works for Dongping with local financing. With regard to ICB contracts for the dam and power house of Dongping and Songshuling, the Bank advised no-objection to the list of pre-qualified contractors on January 18, 2002. ICB bidding documents are in the final stages of review by the Bank. The bid evaluation report for supervision engineers was submitted to the Bank on January 25, 2002 and the Bank provided its no objection in principle (these services are not Bank financed).

With regard to legal and financing arrangements, shareholding proportions were agreed, shareholders' agreements were signed, project charters prepared and business licenses issued for all project companies. The first tranche of registered capital was injected and draft agreements for domestic loans achieved with Chinese commercial banks by all project companies.

### **Project Implementation**

**Provincial Project Management Office.** Hosted by HPFB, the PPMO was established in August 2001. Participating provincial government agencies include: HPPDC, Water Resources Bureau, Environment Protection Bureau, Resettlement Office, Pricing Bureau, Audit Bureau, and Poverty Reduction Office. Hubei Provincial Power Company (HPPC), a central government owned enterprise and the future power purchaser, is also a member of the PPMO. The PPMO has four departments, Project Engineering (including resettlement and environment protection functions), Finance, Procurement and General Management. A deputy director general of HPFB was appointed as the director general of the PPMO and all key staff for the department was appointed.

The PPMO initially focused on the coordination of completion of project preparation for Bank appraisal, and on local approval procedures. The PPMO will continue to play a major role in future project implementation, including necessary coordination with central and provincial government agencies, overall monitoring, financing arrangements, procurement and financial management. It will also be responsible for maintaining, monitoring and reconciling the special account to be established for the Project, and reviewing, verifying and approving withdrawal applications prepared by the project companies before submitting to the Bank for disbursement processing. As project completion approaches, the PPMO will organize tariff related studies, assist in processing tariff applications through the provincial pricing commission and SDPC, and coordinate and support the negotiation of power purchase agreements, which will be facilitated since both the pricing commission and HPPC are both represented in the PPMO.

HPFB, the PPMO lead agency, has had extensive experience with Bank and ADB projects, and is therefore very familiar with Bank policies and procedures; the project is the 32nd project financed by the Bank in Hubei Province, all of which were channeled through HPFB. It is concluded that the PPMO is fully capable of performing its functions and assuming its responsibilities.

**County Project Management Offices.** In each of the four host counties, the county government established a CPMO. The CPMO organization structure reflects that of the PPMO. Deputy county government leaders are appointed as the directors of the CPMOs and all key staff are now in position.

The CPMO assumes similar functions at the county level to those assumed by the PPMO at the provincial

level, except for procurement and special account management, which is exercised at the provincial level. However, officials of finance bureaus of the municipal and county governments are appointed as supervisors for financial management during project implementation. In addition, the CPMO will be responsible for arranging and managing the Poverty Alleviation Planning studies carried out under the project. The key staff of the CPMOs are mainly from the respective county governments and county owned hydropower generation companies (sponsors of the four power plants). They have broad experience in monitoring and coordination of project implementation, resettlement and environment protection as per Chinese practices with a number of small hydro projects built in these counties, but they have no experience with Bank policies and procedures. In July 2001, the key staff of the CPMOs and the project companies attended a three-day training workshop, for procurement and financial management (including disbursement), conducted jointly by Bank procurement and financial management specialists as well as experts from the project procurement agent and other relevant Government departments.

Considering the representation of governmental authorities and county power company officials in the CPMOs and their past experience, they are well positioned and fully competent to carry out their responsibilities to monitor implementation, particularly from the financial viewpoint, and coordinate the input of county government agencies particularly with respect to the implementation of the RAPs, EMPs and poverty planning studies.

**Project Companies.** For each of the four hydropower plants, a project company was established, in the respective host county, as project owner, developer and operator. In each case, the sponsors are county owned generation companies; strategic shareholders at both provincial and prefecture levels have been brought in to enhance the project company's creditworthiness as well as capacity for the project implementation and future operation. In all cases the board of directors and top management staff have been appointed and these project companies have competently performed their roles in project preparation. The staffing and capacity of the project companies to undertake their roles in project implementation are described in the following paragraphs.

**Dongping.** Shareholder agreement was reached and Hubei Xuan-en Dongping Electric Power Development Company Ltd. was established as the project company in compliance with the Company Law of PRC. The company was registered in Xuan-en County, such that the county government is entitled to relevant tax revenues. The shareholders are:

- Xuan-en Zhongjian River Development Company (25 percent), a county owned generation company responsible for: exercising ownership rights of county owned or county invested hydropower generation; promotion of new hydropower development within the county including commissioning and management of preparation studies and associated investigations.
- Hubei Provincial Power Development Company (HPPDC) (50 percent), a provincially owned power generation company that is a major investor/owner of non-utility generation in Hubei.
- HPPC (10 percent), the state owned grid company and power purchaser
- Enshi Prefecture Power Company (10 percent), a subsidiary of HPPC.
- Gezhoubu Hydropower Construction Corporation (5 percent).

The Dongping Company has seven departments incorporating functions of: chief engineer office; project engineering (including resettlement); contract and budget management; procurement; financial management; safety and environment protection; general manager office. The proposed Chairman of the

Board is a senior economist and a registered accountant with a thermal power engineering background, a vice-president of HPPDC, and formerly responsible for all infrastructure construction, investment and science and technology applications. He has 23 years of experience in the energy sector in thermal power plant design, turn-key contract management and was in charge of design review for two hydro projects, Baishuiyu (45 MW) and Suojinshan (45 MW). The president of Dongping Project Company has a hydropower engineering background with 17 years of experience in river cascade development planning, hydropower project design and transmission project construction management with Huanglongtan (340 MW), Pankou (510 MW) and three 220 kV transmission line projects. The chief engineer has a master's degree in hydraulics and is currently the deputy chief design engineer in charge of hydraulic design at the Mid-South Design and Research Institute for Hydroelectric Projects (MSDI), a prestigious design institute engaged in projects in central and south China. He has 18 years of experience including cascade project planning and design, river flood protection works design and was the chief design engineer and the chief site design representative for Tiantang Pumped Storage (2 x 35 MW) commissioned recently. Other management staff generally have more than 15 years of experience in engineering, construction management, plant operation and financial management with small and medium-sized hydro projects.

The capacity of Dongping Project Company for project implementation has been greatly enhanced by introduction of powerful shareholders. Gezhouba Corporation is the strongest among 15 major hydropower construction company of this type in terms of staffing, equipment and turnover. It was the sole contractor for the civil works, metal structure erection and generating unit installation for Gezhouba (2715 MW) and Danjiangkou (900 MW) in the Yangtze valley, and is currently the major contractor for both civil works construction and generating equipment erection of Three Gorges (26 x 700 MW). The board member, representing Gezhouba, is a vice president of the Corporation who has 17 years of experience in hydropower construction management and was the deputy project manager for all of the corporation's contracts for Three Gorges. In addition, the Dongping Project Company will be backed up by MSDI's resources for technical assistance through the link of the chief engineer. Equity participation of the two provincial and prefecture level grid companies brings in rich experience for power plant operation and the tacit knowledge in electricity sales to provincial and local power grids. The management staff of Dongping Project Company have strong capacity in small hydro project construction management as per local practice, but have no experience with Bank operations and procedures and limited experience in ICB procurement and associated contract management, EMP implementation and financial management as per international practice.

**Najitan.** Shareholder agreement has been reached for Najitan project and Hubei Laifeng Najitan Hydropower Development Company Ltd. was established as the project company in compliance with the Company Law of PRC. The company was registered in Laifeng County, such that the county is entitled to relevant tax revenues. Shareholders are as follows:

- Laifeng Youshui River Hydropower Development Company (45 percent), a county owned generation company responsible for: exercising ownership rights of county owned or county invested hydropower generation;
- Laifeng County Investment Company (35 percent);
- Enshi Prefecture Power Company (15 percent) a subsidiary of HPPC; and
- Enshi Hongyuan Power Development Company (5 percent), a prefecture owned power investment company.

Najitan Project Company has eight departments incorporating functions of office of the president; project engineering; mechanical and electric engineering; planning, financial and auditing; procurement; safety and security; resettlement and environment protection; and general administration.

The Board Chairman and President of the project company is a senior engineer, who has 17 years of experience including construction and operation management of Tangkou (15 MW) commissioned in 1994. He was the president of Tangkou power plant after commissioning and is the chairman and is president of the sponsor company. The two vice president appointed have similar experience with construction and operation management of Tangkou, and one holds a master degree in power systems and has 17 years of experience with hydropower development. The chief engineer of Enshi Prefecture Power Company has been appointed as chief engineer of the project company. He has 34 years experience in the energy sector, including the construction of Chaoyangsi (45 MW), Longdong (26 MW) and Changshun (30 MW). The financial manager has 18 years experience including the financial management for the construction and operation of Tangkou. Other department managers have generally about 20 years of experience in small hydropower project construction and operation, mainly with Tangkou. The management personnel of Najitan Project Company have capacity in plant operation management and small hydro project construction management as per local practice, but have no experience with Bank operations and procedures and limited experience in ICB and NCB procurement, contract management, EMP implementation and financial management as per international practice.

**Songshuling.** Shareholder agreement was reached for Songshuling project and Hubei Zhushan Duhe River Hydropower Development Company Ltd. was established as the project company in compliance with the Company Law of PRC. The company was registered in Zhushan County, such that the county government is entitled to relevant tax revenues.

Shareholders are as follows:

- Zhushan Hydropower Development Company (60 percent), a county owned generation company responsible for exercising ownership rights of county owned or county invested hydropower generation;
- Hubei Local Hydropower Development Company (40 percent), a provincially owned company under the Water Conservancy Department, whose business is development and ownership of small hydropower.

The Songshuling Company has eight departments incorporating functions of: chief engineer office; procurement; project engineering; project supervision; contract management; financial management; resettlement and environment protection coordination; and general managers office.

The sponsor company, Zhushan Hydropower Development Company, has built and owns several small hydropower plants in the Duhe River basin, including Qiujiabang (10.2 MW), Hehe (12.85 MW), Matihe (2.5 MW) and Xiaohe (1.6 MW).

The chairman of the board and president of the project company is an economist, who has 21 years of experience including construction and operation management of five small hydro projects totaling 20 MW, and management of local power distribution networks. The vice-president has 27 years of experience including construction of three small hydropower plants and five substations, and management of power

distribution networks. A retired professor in hydraulics has been employed as the chief engineer; in his 40 year professional career he has participated in more than 10 water resources and hydropower projects (including Three Gorges) with responsibilities covering preliminary design, construction design, construction supervision, testing and research. He is the author of several books on hydraulic structures, cut-offs for embankment dams, and strain and stress deformation of rock-fill dams. The financial manager of the project company is an accountant with 21 years of experience in financial management for hydropower project construction and power plant operation.

The management staff of Songshuling Company have relatively strong capacity in plant operation management and small hydro project construction management as per local practice, but have no experience with Bank operations and procedures and limited experience in ICB and NCB procurement, contract management, EMP implementation and financial management as per international practice. The project company plans to hire individual experts with more project implementation experience for technical and procurement issues, including another professor, who was a consultant for the construction of Gezhouba (2715 MW), Danjiangkou (900 MW) and Tianshengqiao (130 MW) hydropower plants.

**Xiakou.** Shareholder agreement has been reached for Xiakou project and Hubei Nanzhang Xiakou Electric Power Development Company Ltd. was established as the project company in compliance with the Company Law of PRC. The company was registered in Nanzhang County, such that the government is entitled to relevant tax revenues. Shareholders are the following:

- Nanzhang State-Owned Assets Operation Company (46.1 percent)
- HPPC (44.9 percent),
- Xiangfan Electric Power Group Company (4.5 percent), a subsidiary of HPPC
- Nanzhang Jinchang Electric Power Company (4.5 percent).

Xiakou Project Company has four departments incorporating functions of: material supply; project engineering; financial management, and general administration.

The Board Chairman is a deputy county leader. One of the board members from Xiangfan Power Group Company has more than 30 years of experience including chief construction manager for construction of Shimen (2.71 MW) and deputy construction manager for Baishuiyu (45 MW) during 1994 to 1998. The president of the project company is a senior engineer, who has 31 years of experience in the energy sector including 23 years in hydropower. He has past experience in construction and operation of small hydropower plants, including Baishuiyu (45 MW) and Wangfuzhou (109 MW). He was the deputy chief economist of Xiangfan Municipal Electric Power Company, a subsidiary of Xiangfan Power Group Company. Two vice-presidents have been appointed, one with 12 years of experience in hydro power project construction before moving into power network operation management, and another with 13 years experience in small hydro project design.

The management staff of Xiakou Project Company have capacity in small hydro project construction management and hydro plant operation as per local practice, but have no experience with Bank operations and procedures and limited experience in ICB and NCB procurement, contract management, EMP implementation and financial management as per international practice.

**Summary.** The key management staff of the project companies generally have 15 to 30 years of experience with a number of small, medium and even large-sized hydropower projects constructed as per Chinese practices, but generally they have no experience with Bank operations and procedures, ICB procurement, and have limited experience in NCB procurement, contract management and financial management. For the project implementation, specifically designed training courses for project and contract management are necessary and shall be conducted early in the implementation process. However, to manage relevant risks associated with the weakness of the project companies, the major functions and responsibilities for project construction management including project management, construction supervision and contract administration will be handed over to experienced firms employed as supervision engineers. The supervision engineers will also manage the contracts that the project companies reached with various parties for the EMP implementation. The procurement of major works, goods and services is centralized for economy of scale and efficiency, and is being coordinated by the PPMO and the procurement agent (ITC-CNTIC). However, procurement of minor equipment and works may be handled at the project company level.

Local state owned enterprises have substantial equity positions in these project companies and the project implementation and future operation will support provincial and county objectives in developing poverty areas, including substantial supplementation of the fiscal revenues of the county governments. Therefore the project companies can expect strong support from the PPMO and CPMOs in project implementation, financing arrangement, and negotiation of electricity sales with HPPC and its subsidiaries at the prefecture level. With this government support, the synergy of shareholder experiences and capacity, the arrangements for sharing responsibility among the PPMO, CPMOs, supervision engineer and procurement agent, the project companies should have no difficulty in continuing to perform their function as owners and project implementation agencies and owners. Achievements to date include the attraction of strategic equity investors, the draft agreements for domestic loans achieved with Chinese commercial banks, the appointment of supervisory engineers and participation in bid evaluation for NCB contracts.

### **Project Design**

The project has been designed and will be implemented according to internationally accepted technical criteria and standards. The technologies involved are mainstream and within the capabilities of local as well as foreign contractors and suppliers. HIDI was chosen as the project design institute. Nevertheless, as part of project preparation, CWRC was contracted to carry out a design review and preparation of technical specifications of bidding documents. In addition, six experts, two foreign and four local, were appointed as the members of the POE.

**HIDI** was established in 1956. As of 2000, it has 603 employees, including about 220 engineers. It is the largest institute under the jurisdiction of Hubei Provincial Government for design, engineering consulting, and construction supervision of water resource and hydropower projects, and is well experienced in projects of similar sizes and types. HIDI has successfully designed many projects in Hubei and other provinces, including but not limited to: more than 30 large- and medium-sized dams, 10 large pump stations, 30 flood gate structures, 40 medium- and small-sized hydropower stations, 30 basin and regional water resources planning projects, 50 industrial and residential structures, as well as supervised construction of more than 20 hydropower projects. Over the years, it has accumulated extensive experience in design and construction of hydropower stations. HIDI has also provided technical assistance to a number of African and Asian countries for water resources projects. It was accredited ISO9001 in 2000. HIDI are competent as project designers. HIDI had some difficulty in the timely delivery of drawings during the project preparation due to the diversion of its resources to other projects in Hubei, including the Bank financed Yangtze Dike Enhancement Project. The top management of HIDI was informed of this issue by



the task team were assured that full resources will be provided for project implementation. In addition, the management of design contract is covered by the TOR for supervision engineers to assure timely delivery of drawings in the project implementation process.

**CWRC** was established in 1950 mainly for the development planning and project design for the Yangtze River basin. It is a subsidiary of the Ministry of Water Resources, exercising also part of the Ministry's administrative functions for water resources in the basin and other river basins in south-west China. CWRC has more than 10,000 professional and technical staff members including highly experienced engineers and economists in a full range of disciplines for survey, planning, design, construction management and supervision, as well as dispatch and operation of multi-purposes hydro projects. It has planned and designed many major water resources and hydropower projects in China, including Three Gorges (18,200 MW), Gezhouba (2715 MW), Danjiangkou (900 MW), Geheyan (1212 MW) and has a rigorous engagement in the construction management and supervision of these projects. CWRC is one of the strongest institutions of its kind in China and has all the necessary capacity in supporting **HIDI**, reviewing the project design and preparing technical specifications for bidding documents. The task team is impressed with the quality of technical specifications prepared by CWRC for the ICB bidding documents for civil works for Dongping and Songshuling.

The **POE** has six members, two foreign and four local. **Mr. Michel LINO**, a French expert, has 25 years of professional experience on dam engineering, earthquake engineering, monitoring and computer science. He was called as expert for the computerized engineering analysis of many projects and was project manager with assignments covering more than 40 projects (new dams, rehabilitation and strengthening projects, hydropower projects). He has been involved as dam expert on several boards of consultants, in France and abroad. Mr. LINO belongs to several professional associations and has published more than 20 technical papers in the field of dam engineering. Mr. LINO is currently involved in various French research programs. **Mr. Fabio VILLEGAS**, a Columbian expert, has been a full time staff member of **INTEGRAL S.A.** in Colombia since 1965, working mainly in the fields of geotechnical studies; design and construction aspects of tunnels; hydrological and hydraulic studies; design and rehabilitation of hydraulic structures, embankment, concrete and RCC dams; general layout of hydroelectric projects; review of cost estimates and schedules for construction of hydroelectric and hydraulic projects; and civil design of mining works. Mr. Villegas has been technical manager or consultant expert for 36 projects inside Columbia and expert of boards of consultants for 14 projects outside Columbia. Mr. Villegas has worked for the World Bank as a special consultant for a number of dam projects. Mr. Villegas has published more than 23 technical papers in the field of dam engineering. **Mr. Cheng Kunhuang**, formerly a vice-president of the Design Institute of CWRC and now the vice-chief engineer of CWRC, is an expert in geotechnical engineering. He has nearly 40 years of professional experiences in planning, survey, concept design, dam safety monitoring and verification, and construction supervision and management for hydropower projects, and has taken a leading position in designs of more than 10 major hydro power projects in China and abroad, including the design of a dam safety monitoring system for Three Gorges (18,200MW), Yangtze Dike Protection Project, hydraulic structures for Geheyan (1200 MW), etc. From 1994 to 2000, Mr. Cheng was in charge of the planning, survey, design and scientific research for Shuibuya, a 233 m high concrete faced rock-fill dam (the highest of its kind in the world) with an underground powerhouse (1600MW). He was also the project manager from the Chinese party in the JV undertaking the Yangtze Dike Protection Project in 1999. **Mr. Xu Ruichun**, vice-chief engineer of the Geological Survey and Investigation Institute of CWRC, has more than 40 years of experience in geological survey for hydropower projects. Mr. Xu has participated in or has led geological surveys, site investigations and design reviews for more than 30 hydropower projects mainly on the main stem and tributaries of the Yangtze River, including Three Gorges and Gezhouba. He was the chief geological engineer for Gezhouba (2705 MW) and was awarded a gold medal by the State.

From 1995 to 1998, Mr. Xu was in charge of the geological surveys for Shuibuya (mentioned above). He has completed geological surveys for more than 10 medium and small sized dams in recent years and six of them (50 to 120 m high) are pending for construction. He is one of only three senior engineers in CWRC who are qualified by the State for verification of dam safety and has participated in panels of experts for safety verification of several large-sized dams in China including Gezhouba, Shuikou, Geheyan. Mr. Xu has published three books in geological survey. **Mr. Chang Xiaolin**, a university professor, has a PhD in hydraulic engineering. He studied in France from 1996 to 1998 and was selected by the Ministry of Electric Power as one of the leading professors for academic research in 1988, for which he obtained the status of professor. He has 15 years of experience in hydraulic structures and design of RCC dams, concrete-faced rock-fill dams and high arch dams. He has led or participated in more than 30 scientific research projects including those in the National 8th-Five and 9th-Five Years Science and Technology Breakthrough Projects involving more than 10 large-sized hydro power projects in China including the Three Gorges, Longtan, Xiaowan, Shuibuya, Xiluodu, Xiangjiaba, Xiaolangdi, Dachaoshan, etc. Mr. Chang has also led four scientific research projects, been awarded prizes for four scientific research works from ministries, and published 20 papers both at home and abroad. **Mr. Wang Xianru**, a senior engineer and now the vice-president of the implementing agency for the Bank financed Xiaolangdi project (earth and rock fill dam with an underground power house of 1800 MW), has about 40 years of professional experience in research and design for hydraulic structures and project construction management and supervision. For Xiaolangdi, he was design chief for the underground works and concrete structures during the Sino-US joint design in 1984 to 1985, and the project manager and deputy chief design engineer in 1985 to 1988. Mr. Wang was a visiting scholar to an American university and worked in the US bureau of Reclamation in USA for structural analysis using dynamic finite element approaches for concrete gravity dams. Mr. Wang had conducted structural mechanics analyses for more than 10 projects in China when working as the deputy chief engineer of the Scientific Research Institute of YRCC. Mr. Wang belongs to several professional associations and has published about 20 papers both at home and abroad.

The POE was employed to carry out expert independent technical review throughout the preparation and implementation phases (also satisfying the requirements of OP 4.37). The POE had their first meeting in November, 2000. As a result of the two reviews, several design revisions were made, the most notable being the change of powerhouse type at Dongping from surface to underground. In addition, Probable Maximum Floods (PMFs) were calculated for each project in accordance with current international practice and the safety of the four dams verified under these floods. The POE will convene at regular intervals to review the status of work in progress. Extraordinary meetings of the POE may be called in critical situations. At the end of each meeting, the POE will prepare and submit written findings, conclusions and recommendations.

### **Supervision Engineer**

The Supervision Engineers undertake the functions of the "Engineer" under the ICB civil works document and the "Project Manager" under the NCB civil works documents including management of the civil and erection contracts on behalf of the owner.

The SE's primary responsibility will be in relation to the civil works and erection of equipment contracts, and in this respect the SEs will need to coordinate closely with the Employer and the Designer. The Employer will have primary responsibility for procurement and management of the design contract, equipment contracts and delivery of equipment, while the SE will have primary responsibility for management of the civil and equipment erection contracts, as well as arranging and overseeing on-site testing of equipment on behalf of the Employer. The SE will also conduct training of the Employer's management and professional personnel in such areas as modern procedures for all aspects of project

management and civil engineering contract management, and of inspection personnel in routine testing and inspection procedures relating to the project. The detailed scope of work for SEs are specified in the TOR satisfactory to the Bank. The scope of work includes but is not limited to the following:

- **Administration of the civil works contracts.** The SE will carry out the duties of the “Engineer” in ICB contracts and “Project Manager” in NCB contracts.
- **Quality Control.** The SE will provide specialist staff to establish inspection procedures, train the Employer’s personnel, direct and oversee the inspection work and review results.
- **Schedule Control.** The SE will be responsible for monitoring schedule performance, identifying potential delays and proposing and discussing remedial actions with contractors.
- **Cost Control** (relating to civil works and erection contracts). The SE will adopt an appropriate cost control software package or develop a suitable spreadsheet based program for cost control.
- **Documentation Control.** The SE will set up a system to record and file information as specified in details in the TOR, to provide an accurate record.
- **Responsibilities with Respect to Equipment Suppliers.** The SE will assist the Employer and Designer in administration of mechanical and electrical equipment contracts. Detailed responsibilities of SE are specified in the TOR
- **Reporting.** The SE will prepare all the reports to satisfied the needs of the POE, the Employer, the PPMO, the Borrower and the World Bank as specified in details in the TOR.
- **Translation Services.** The SE will provide necessary translation services (Chinese/English and English/Chinese ) as specified in details in the TOR.

Two local engineering firms, from a shortlist satisfactory to the Bank, were employed as independent Supervision Engineers (SE). Sichuan Ertan International Engineering Consulting Co., Ltd. (ETI) and China Water Resources and Hydropower Construction Engineering Consulting Mid-South Co. (MS Co.) were selected as the SEs through an LCB process satisfactory to the Bank (these contracts are not Bank financed). ETI was selected for Songshuling and Najitan, while the MS Co. for Dongping and Xiakou.

ETI is a joint venture established between Chengdu Hydropower Investigation and Design Institute (CHIDI) and Sichuan International Engineering Consulting Co. Ltd in 1995 with 95 percent shares from CHIDI. CHIDI was the designer for Ertan Hydroelectric Project implemented in 1991 – 2000 with Bank loans of US\$ 780 million and Bank guarantee of US\$ 150 million. Most of the engineers of ETI are from CHIDI and have been working on project consulting and supervision since 1985. ETI has provided consulting and supervision services for dozens of hydropower projects and power transmission, transportation and housing projects both in China and abroad. ETI is a member company of FIDIC and has the experience in administration of more than 10 major international contracts with FIDIC conditions for projects including Ertan (3300 MW), Wanjiashai, Zipingpu and Xiaolangdi (1800 MW) in China and in design consulting service for projects in Pakistan, Philippine, Malaysia and Algeria. ETI was awarded ISO 9002 certificate and first-grade qualification for construction supervision by the Ministry of Construction, Ministry of Electric Power and SDPC of Chinese Government.

ETI has proposed detailed tasks and procedures, equipment and instruments, staffing, and organization chart with detailed descriptions of responsibilities for each position for performing the SE responsibilities under this contract. ETI proposed 625 and 517 man-months for Songshuling (42 months of construction duration) and Najitan (46 months construction duration) respectively. The inputs were adequate and satisfactory to the bid evaluation board. The team for the Project is well staffed. For **Songshuling**, the Chief supervision engineers proposed has 20 years of experience in hydropower construction and 11 years of supervision and was the deputy chief supervision engineer for several major hydropower project

including Longtan (5400 MW) and Hongye I. He has two assistants who both worked as chief project supervision engineers for Ertan and have 12 and 14 years of supervision experience respectively. The supervision engineers for contract management, scheduling and cost control have corresponding experience in supervision of Ertan and have about 12 years of supervision experience. For Najitan, the Chief supervision engineers proposed has 40 years of experience in hydropower construction and 11 years of supervision and was the chief supervision engineer for the arch dam project of Ertan, the consultant for commercial and contract management for Wanjiashai, and the chief of panel of experts for a hydropower project in an overseas country. He has two assistants who both worked as chief project supervision engineers for large sized hydropower projects including Ertan and Xiaowan, and have 11 and 13 years of supervision experience respectively. The supervision engineers for contract management, scheduling and cost control have corresponding supervision experience in Ertan and have about 13 years of supervision experience. The other supervision engineers usually have 6 to 30 years of experience in contract management, scheduling and cost control in similar projects.

**MS Co.** is a subsidiary of MSDI. Since 1988, MS Co. has 76 supervision contracts completed or in execution for hydropower projects ranging from 48 to 18,200 MW, including the Guangzhou Pumped Storage II (1200 MW), Three Gorges (18,200 MW), Wuqiangxi (1200 MW), Longtan (5400 MW), Dachaoshang (1350MW) etc. MS Co. has accumulated experience in administration of international contracts with its engagement in supervision of Guangzhou Pumped Storage Project, Wuqiangxi and others. MS Co. was awarded ISO 9000 certificate and first-grade qualification for construction supervision by the Ministry of Construction, Ministry of Water Resources and SDPC of Chinese Government.

MS Co. has proposed detailed tasks and procedures, equipment and instruments, staffing, and organization chart with detailed descriptions of responsibilities for each position for performing the SE responsibilities under this contract. MS Co. proposed 855 and 405 man-months for Dongping (53 months of construction duration) and Xiakou (41 months construction duration) respectively. The inputs were adequate and satisfactory to the bid evaluation board. The supervision team for this contract is well staffed and supported by MSDI with a designated internal panel of experts. The panel of experts consists of 10 prestigious experts in MSDI, including the vice-president, chief engineer, and vice-chief engineer of MSDI, and most of the experts have about 40 years of experience in water resources and hydropower construction. For **Dongping**, the proposed chief supervising engineer has 31 years of experience in hydropower construction including eight years as supervising engineer, and was the supervision engineers for the shiplock project of Three Gorges and the deputy chief design engineer for several other hydropower projects including Gudongkou and Shimo hydropower projects. The deputy chief supervision engineer has 32 years of experience in hydropower construction including eight years of supervision and was the supervision engineer and chief engineer for quality assurance for the shiplock project of Three Gorges. For **Xiakou**, the proposed chief supervision engineer has 20 years of experience in hydropower construction including eight years of supervision and was a supervision engineers for the shiplock project of Three Gorges and the deputy chief supervision engineer for Doulingzi (70.5 MW). The deputy chief supervision engineer has 15 years of experience in hydropower construction including 10 years of supervision was also a supervision engineer for the shiplock project of Three Gorges. The other proposed supervision engineers have 10 to 30 years of experience in contract management, scheduling and cost control in similar projects.

#### **Arrangements for future operation**

No detailed institutional arrangement for future plant operation have been made at present; however the project companies have taken into consideration future plant operation in the selection of equity investors,

and the experience of management staff. As noted earlier, management personnel of the four project companies have quite a lot experience in hydropower plant operation and management. There is also a proven practice for new hydro power plant operation in China, which has been noted in the ICRs for Shuikou and Ertan (under preparation). For example, EHDC, the owner of Ertan Hydropower Station (3300 MW), recruited both experienced operation staff and a group of new college graduates about 18 months before commissioning of the power plant. Agreements were reached with existing hydropower plants for on-the-job training for about 6 to 12 months, a follow-up comprehensive training for 1 month in EHDC and examinations to select qualified operation staff before the commissioning, and supervision and training for the first two years of operation after commissioning. Through this process, Ertan power plant is now in smooth operation now with its own operation staff.

This process has proved successful and is currently being adopted in new large hydropower plants in China. But over staffing and low management efficiency continue in older and smaller hydropower plants. For the smaller power plants, salaries account for the large majority of operation cost, and since the tariff setting formula ( Annex 5) uses average operating costs for similar sized power plants in the grid as an input to tariff determination, staffing levels and management efficiency will play an important role in the financial sustainability and profitability of the four hydropower plants. Therefore technical assistance will be provided under the project (utilizing both international and domestic non-utility hydropower companies as consultants) to assist in determining appropriate organizational and staffing arrangements, to establish appropriate management systems and to train management personnel in efficient, economical operation of small and medium hydropower plants.



# CHINA HUBEI HYDROPOWER DEVELOPMENT IN POOR AREAS PROJECT

## RED HYDROPOWER PLANTS (Existing and Future)

- |                  |                      |                      |
|------------------|----------------------|----------------------|
| 1 Tangkou        | 45 Shimaozi          | 89 Huaitan           |
| 2 Xiwara         | 46 Qingqiang         | 90 Huiwawan          |
| 3 Lashudang      | 47 Yapingguan        | 91 Fengjiuguan       |
| 4 Chaoyangzi     | 48 Yangjiahe         | 92 Huashan           |
| 5 Dingzhai       | 49 Yaokou            | 93 Feishuhe          |
| 6 Dunningzi      | 50 Huohetou          | 94 Jiepai            |
| 7 Dahebian       | 51 Huohe             | 95 Fangtan           |
| 8 Changshun      | 52 Xiaoxuan          | 96 Xiaojiasi         |
| 9 Fubaoshan      | 53 Huangjiayingtan   | 97 Tangshuang        |
| 10 Langdong      | 54 Qiyuanhe          | 98 Yantaozi          |
| 11 Gaojiesha     | 55 Huohe             | 99 Fuguohe           |
| 12 Chaba         | 56 Tahe              | 100 Daotao           |
| 13 Tianlouzhai   | 57 Langhe            | 101 Mingshan         |
| 14 Xuezhaohe     | 58 Dongjiaokou       | 102 Biluhe           |
| 15 Dahebian      | 59 Wangqizhou        | 103 Sanhekou         |
| 16 Longwangtang  | 60 Huiyuan           | 104 Tianlangshan     |
| 17 Lashudang     | 61 Renshuayu         | 105 Zhenheyan        |
| 18 Baoyuanhe     | 62 Guodawan          | 106 Bailinhe         |
| 19 Tashuoshan    | 63 Luokou            | 107 Baizhanhe        |
| 20 Jiangpinghe   | 64 Sanhai            | 108 Datang           |
| 21 Suojishan     | 65 Shaxian           | 109 Longping         |
| 22 Xiaokou       | 66 Maoyuan           | 110 Caifan           |
| 23 Shuheba       | 67 Maoyuan           | 111 Fushui Reservoir |
| 24 Yeshuhe       | 68 Yangyuan          | 112 Jiaogangshan     |
| 25 Lianghekou    | 69 Langtanzi         | 113 Qingshan         |
| 26 Huanglongdong | 70 Sandaofe          | 114 Baizhongtan      |
| 27 Jiangyuan     | 71 Nantashan         | 115 Zizhiguan        |
| 28 Xizhai        | 72 Yangyuan          | 116 Lushui           |
| 29 Xiangji       | 73 Tianmuqiao        |                      |
| 30 Nianghe       | 74 Xibeikou          |                      |
| 31 Gaobazhou     | 75 Xiangjiacoba      |                      |
| 32 Gehayan       | 76 Huangjiawan       |                      |
| 33 Dongshansi    | 77 Zhangshuiku       |                      |
| 34 Grezhouba     | 78 Zhanghe           |                      |
| 35 Jiuwanzi      | 79 Changqiao         |                      |
| 36 Wanfajie      | 80 Niangpanshan      |                      |
| 37 Tanlou        | 81 Wenqiao           |                      |
| 38 Guojiaokou    | 82 Shimen            |                      |
| 39 Honghuaping   | 83 Shilong           |                      |
| 40 Qianjiang     | 84 Hailing           |                      |
| 41 Pingtan       | 85 Guoguan           |                      |
| 42 Longbiwan     | 86 Jietangshan       |                      |
| 43 Daxia         | 87 Xuhaihe Reservoir |                      |
| 44 Baisha        | 88 Daxiangshan       |                      |

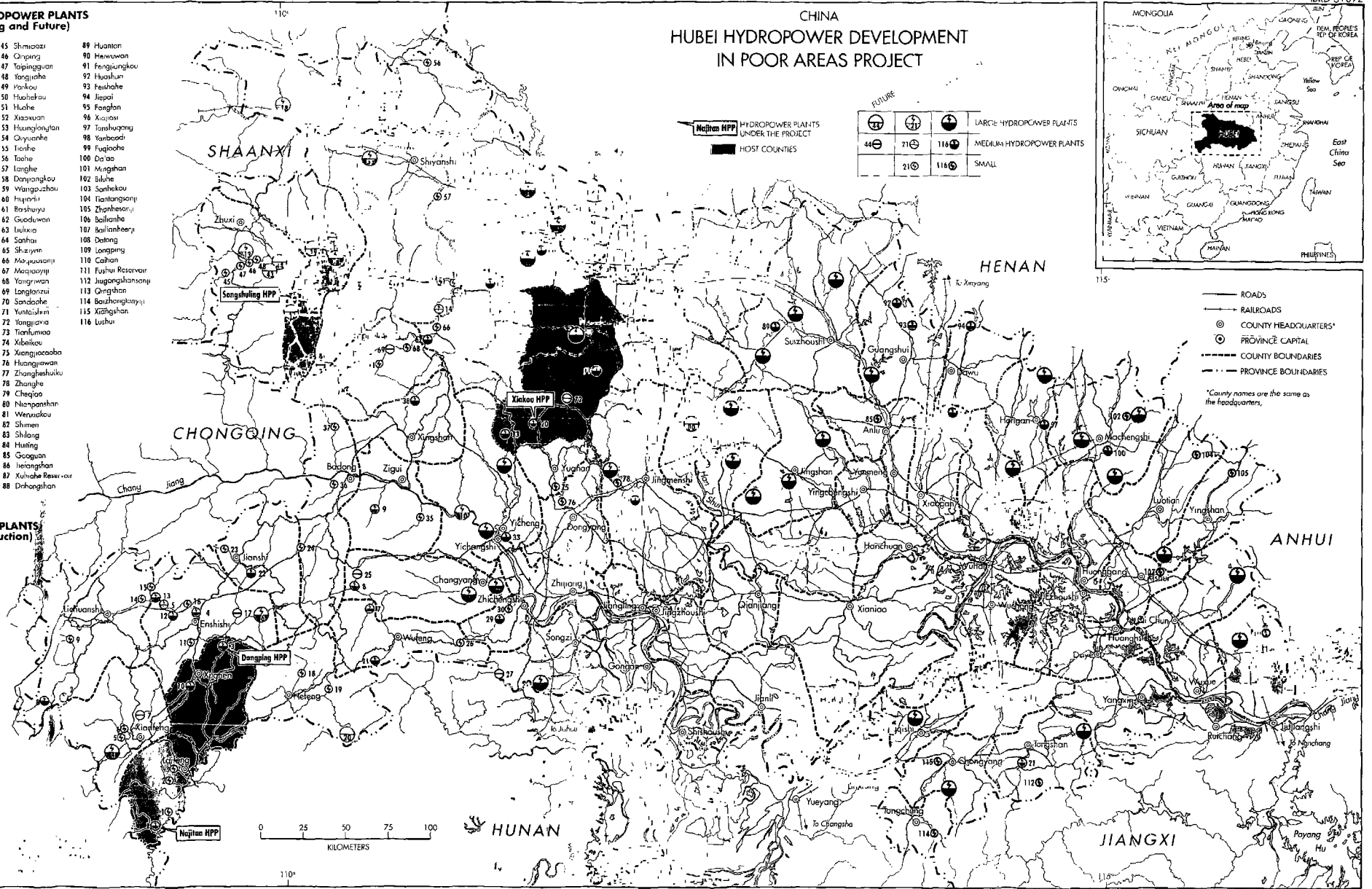
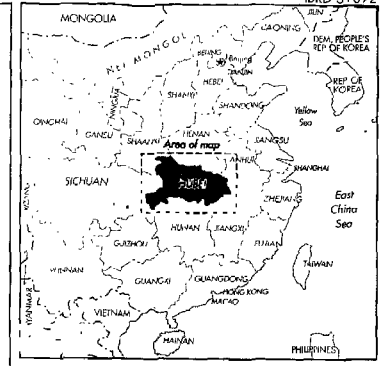
## GREEN HYDROPOWER PLANTS (Under Construction)

- |                |
|----------------|
| 1 Najitan      |
| 2 Xiaokoutang  |
| 3 Dongping     |
| 4 Dalangtan    |
| 5 Yaojiaping   |
| 6 Shuibaya     |
| 7 Mudehe       |
| 8 Zhokaihe     |
| 9 Shengping    |
| 10 Sanxia      |
| 11 Jiakouhe    |
| 12 Songshuling |
| 13 Eping       |
| 14 Sanjiang    |
| 15 Siping      |
| 16 Luyunpu     |
| 17 Jiachang    |
| 18 Tulingzi    |
| 19 Gushan      |
| 20 Xiaokou     |
| 21 Huangyinkou |

**FUTURE**

|                         |                          |       |
|-------------------------|--------------------------|-------|
|                         |                          |       |
| LARGE HYDROPOWER PLANTS | MEDIUM HYDROPOWER PLANTS | SMALL |

**Legend:**  
 HYDROPOWER PLANTS UNDER THE PROJECT  
 HOST COUNTIES



ROADS  
RAILROADS  
COUNTY HEADQUARTERS  
PROVINCE CAPITAL  
COUNTY BOUNDARIES  
PROVINCE BOUNDARIES

\*County names are the same as the headquarters.







---

**IMAGING**

Report No.: 22676 CHA  
Type: PAD