INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

STAFF APPRAISAL REPORT 13780-CHA

China: Yangzhou Thermal Power Project

June 16, 1994

The above-captioned Staff Appraisal Report for China: Yangzhou Thermal Power Project is a revised version of the report prepared following the approval of the Project by the Executive Directors of the Bank and does not include information deemed confidential by the Government of the People's Republic of China.

STAFF APPRAISAL REPORT 13780-CHA

CHINA

YANGZHOU THERMAL POWER PROJECT

February 22, 1994

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

CURRENCY EQUIVALENTS
(As of January 24, 1994)

Currency	=	Yuan (Y)
Y 1.00	=	100 fen
$1.00	=	Y 8.7
Y 1.00	=	$0.11

WEIGHTS AND MEASURES

km	=	Kilometer (= 0.62 miles)
kWh	=	Kilowatt hour (= 860.42 kcals)
GWh	=	Gigawatt hour (1,000,000 kilowatt hours)
TWh	=	Terawatt hour (1,000,000,000 kilowatt hours)
kW	=	Kilowatt (1,000 watts)
MW	=	Megawatt (1,000 kilowatts)
GW	=	Gigawatt (1 million kilowatts)
kV	=	Kilovolt (1,000 volts)
kVA	=	Kilovolt-ampere (1,000 volt-amperes)
MVA	=	Megavolt-ampere (1,000 kilovolt-amperes)
mg	=	Milligram
m^3	=	Cubic meter
tce	=	tons of standard coal equivalent

ABBREVIATIONS AND ACRONYMS USED

BERIWREP	- Beijing Economic Research Institute for Water Resources and Electric Power
CNPC	- China National Petroleum Corporation
CRISPP	- China Reform, Institutional Support and Preinvestment Project
EAR	- Environmental Assessment Report
ECEPDI	- East China Electric Power Design Institute
ECO	- Expanded Cofinancing Operation
ECPG	- East China Power Grid
GEF	- Global Environment Facility
GNP	- Gross National Product
HIPDC	- Huaneng International Power Development Corporation
JPEPC	- Jiangsu Provincial Electric Power Company
JPIC	- Jiangsu Provincial Investment Company
JPG	- Jiangsu Power Grid
MOEP	- Ministry of Electric Power
MOF	- Ministry of Finance
SAA	- State Audit Administration
SEDC	- Sunblast Energy Development Company
SOEs	- State-Owned Enterprises
SEIC	- State Energy Investment Corporation
SPC	- State Planning Commission
YMIC	- Yangzhou Municipal Investment Company

FISCAL YEAR

January 1 to December 31

CHINA

YANGZHOU THERMAL POWER PROJECT

LOAN AND PROJECT SUMMARY

Borrower:	People's Republic of China
Beneficiary:	Jiangsu Provincial Electric Power Company (JPEPC)
Amount:	$350.0 million equivalent
Terms:	Twenty years, including a five-year grace period, at the Bank's standard variable interest rate.
Onlending Terms:	The proceeds of the loan would be onlent from the Borrower to JPEPC under a subsidiary loan agreement on the same terms and conditions as the Bank loan, with JPEPC bearing the foreign exchange risk.
Project Objectives and Description:	The main objectives of the proposed project are to: (a) support power subsector reforms at the provincial level, through development of JPEPC as an autonomous company; (b) contribute to further rationalization of power tariffs; (c) promote the use of modern financial management techniques in transforming JPEPC's accounting system; (d) provide cost-effective and environmentally sustainable generation capacity to alleviate an acute shortage of power and improve the quality of the power supply; (e) assist in transferring modern technologies for large coal-fired power plants, and in strengthening institutional capabilities for environmental management and monitoring; and (f) extend technical assistance in management development and staff training programs. The project consists of: (a) construction of a coal-fired thermal power plant with two 600-MW generating units and associated equipment; (b) erection of two 500-kV transmission lines (about 30 km long) and reinforcement of the existing power transmission network; (c) provision of engineering and construction management services; (d) extension of technical assistance for the development and implementation of improved accounting and financial management information systems; (e) carrying out of environmental management and resettlement programs; and (f) undertaking of management development and staff training.

Benefits and Risks: This large thermal power plant will greatly increase the critically needed power generation capability of Jiangsu Province and the East China power grid as a whole. According to comprehensive analyses, the project is clearly part of the next sequence of the least-cost development program for meeting future power supply needs. Other intangible benefits are also important, such as institutional development, reduced air pollution through retirement of old small generating units, improvements in power grid operation, and the favorable influence on the social environment by helping many people to reduce excessive hardship caused by the acute power supply shortages. Also, through the project, the Bank will be able to support the Government's power subsector policy and further pursue its sectoral objectives in China. The technical and economic feasibility of the project has been well established. Potential project risks may include delays in implementation due to multiparty financing and JPEPC's lack of experience in managing the construction of similar projects. Necessary precautions and measures will be undertaken to avoid these risks. The project has been designed to comply with applicable Bank and Chinese standards in order to minimize the environmental impact. An environmental management program will be included under the project to prevent and reduce the possibility of developing any adverse environmental problems. The project risks, therefore, are considered to be minimal.

Estimated Costs:	Local	Foreign	Total
		($ million)	
Preparatory works	2.5	0.0	2.5
Land acquisition and resettlement	23.0	0.0	23.0
Civil works	69.7	0.0	69.7
Harbor works	17.2	0.0	17.2
Power plant equipment and materials	113.5	404.3	517.8
Transmission network	50.9	0.0	50.9
Construction administration	13.1	0.0	13.1
Engineering services	2.9	5.4	8.3
Environmental program	0.2	0.8	1.0
Management information systems	1.0	1.5	2.5
Training	0.6	2.8	3.4
Base Cost	294.6	414.8	709.4
Contingencies:			
Physical	27.2	20.8	48.0
Price	24.3	36.6	61.0
Taxes and duties	14.4	0.0	14.4
Total Project Cost	360.6	472.2	832.7
Interest during construction /a	182.1	66.5	248.6
Total Financing Required	542.7	538.7	1,081.4
Financing Plan:			
State Energy Investment Corporation (SEIC)	162.8	20.0	182.8
Jiangsu Provincial Investment Company (JPIC)	135.7	16.6	152.3
Yangzhou Municipal Investment Company (YMIC)	189.9	23.3	213.2
JPEPC	54.3	6.6	60.9
Expanded Cofinancing Operation (ECO) /b	-	120.0	120.0
IBRD	-	350.0	350.0
IDA (CRISPP) /c	-	2.2	2.2
Total	542.7	538.7	1,081.4

/a Interest during construction (IDC) is based on onlending rates for projected disbursements of loan proceeds. The foreign currency portion of IDC is based on the Bank's variable loan rate and the projected rates for ECO financing.

/b $90 million syndicated loan from commercial banks (Tranche A), plus $30 million equivalent in Japanese yen from insurance companies (Tranche B).

/c China Reform, Institutional Support, Preinvestment Project—CRISPP (Credit 2447-CHA).

Estimated Disbursements:

Bank FY	1995	1996	1997	1998	1999	2000
	($ million)					
Annual	34.3	46.4	120.0	99.1	39.1	11.1
Cumulative	34.3	80.7	200.7	299.8	338.9	350.0

Poverty Category: Not applicable.

Economic Rate of Return: 14 percent

Map: IBRD 25250

CONTENTS

This report is based on the findings of an appraisal mission that visited China in October 1993. The report was prepared by V. Mastilović (Task Manager), S. Kataoka (Senior Power Engineer), H.E. Sun (Financial Analyst), R. Taylor (Senior Economist), T. Hassan (Senior Counsel), K. Shimazaki (Senior Cofinancing Officer), B. Baratz (Principal Environmental Specialist), Y. Zhu (Resettlement Specialist), and K.C. Ling (Consultant). Peer reviewers comprised: K. Sheorey (technical), M. Layec (economic), P. Cordukes (institutional), and M. Costan (financial). The Division Chief is R. Newfarmer, and the Acting Department Director is Z. Ecevit.

ANNEXES

CHARTS

MAP

TABLES IN TEXT

1. THE ENERGY SECTOR

A. OVERVIEW

1.1 China has been remarkably successful in developing its energy resources and has become the third largest producer of energy in the world. In 1992, the country's primary commercial energy supply and consumption amounted to 1,075 and 1,090 million tons of standard coal equivalent (tce), respectively. Coal is the most important source of energy, accounting for about 74 percent, and oil for 19 percent of the total production. Hydroelectric power (4.7 percent), natural gas (2 percent), and small quantities of oil shale and geothermal power make up the balance. The largest consumer of energy is the industrial sector (70 percent), followed by households (14 percent), services (10 percent), and agriculture (5 percent). Details of the primary energy outputs are given in Annex 1.1.

Energy Resources

1.2 **Coal.** In 1992, China produced 1.1 billion tons of raw coal. By the year 2000, China aims to produce 1.4 billion tons of coal a year. The best quality coals are found in North China, where Shanxi and Inner Mongolia each have reserves of 200 billion tons. However, insufficient transport capacity makes it extremely difficult to move sufficient coal to the large consuming centers in Central and East China.

1.3 **Hydroelectric Potential.** China is rich in water resources and has a long tradition of harnessing them for energy and other uses. The country's hydroelectric potential is enormous, but only a small portion of it has been developed. Most of the potential is located in the Southwest (70 percent), about 1,500 km away from the main demand centers. The long gestation period for hydroelectric projects has also inhibited the rapid development and utilization of hydroelectric resources.

1.4 **Crude Oil.** China produced 142 million tons of crude oil in 1992, and the target output for the year 2000 is 200 million tons. China's refining capacity is the sixth largest in the world.

1.5 **Natural Gas.** In 1992, China produced 16 billion m^3 of natural gas. About 44 percent of the current production is nonassociated gas, mostly from Sichuan Province. The remaining gas production is associated with onshore crude oil production.

1.6 **Biomass.** Noncommercial biomass energy use currently amounts to about one-quarter of total energy consumption in China. Fuelwood and agricultural residues are the chief biomass fuels, and they are consumed almost entirely by rural households. China is promoting a variety of measures to achieve environmentally sustainable biomass supply

and consumption levels, including more efficient use of biomass, tree planting, and substitution of other fuels for traditional biomass fuels.

1.7 **Nuclear Energy**. Known uranium reserves in China are sufficient to sustain 15,000 MW of nuclear power capacity for 30 years. China commissioned its first commercial nuclear power plant (300 MW) in 1992. In 1994, Daya Bay nuclear power plant (2x900 MW) should be commissioned; 70 percent of its output is intended for nearby Hong Kong. The construction of a few additional plants is planned to start before the year 2000, primarily in regions that lack coal and hydroelectric resources.

1.8 **Other Energy Resources**. Other energy resources play a small role in energy supply and are used mostly in remote areas. Geothermal energy has been found in many locations covering nearly all the country. Although wind and solar energy have promising prospects, they are not expected to affect the overall supply of energy significantly in the near future. Oil shale deposits are large, but little is exploited because of lack of viable technology.

Institutions of the Energy Sector

1.9 During 1988-92, the Ministry of Energy (MOE) maintained primary responsibility within the Central Government for policy, planning and regulations for the energy sector. In May 1993 MOE was disbanded during a broad government reorganization, and a new Ministry of Electric Power (MOEP) was established, along with a Ministry of Coal and the existing China National Petroleum Corporation (CNPC). Chart 1 shows the organization of MOEP. The State Energy Investment Corporation (SEIC), established in 1988, handles project financing in the coal and electricity subsectors. SEIC is responsible for onlending funds for projects of national importance and representing the Government in the joint financing of projects with other parties. The State Planning Commission (SPC), on behalf of the State Council, has the responsibility for review and approval of the strategic plans, investment programs and general pricing policy of the energy sector.

Energy Investments

1.10 Energy investments in the 1980s were planned based on an expected economic growth rate of 7.5 percent a year. Actual economic growth rates exceeded this target by a significant margin, which has exacerbated energy shortages already existing at the outset. Under the Seventh Five-Year Plan (1985-90), the Government gave high priority to energy and also to the transport sector, a bottleneck in economic development. In 1992, China dedicated 3.3 percent and 1.9 percent of its Gross National Product (GNP), respectively, to develop infrastructure for energy production and transportation. It invested a total of Y 80.4 billion ($14 billion) in the energy sector, representing 27 percent of state capital construction, as against 21 percent in the early 1980s. The power subsector accounted for 61 percent of the total. About 20 percent of the investment requirements of the Chinese energy sector are met by foreign loans and direct investments.

B. Energy Sector Issues

1.11 In addition to the already noted shortages, the main energy sector issues in China are: (a) the efficiency of energy supply and use; (b) the dominance of coal and associated environmental problems; (c) scale and technology in energy industries; (d) rationalization of energy pricing policies; and (e) institutional, regulatory and enterprise reform.

Efficiency of Energy Use

1.12 China's energy consumption per capita is low, but consumption per unit of GNP is high compared with other countries. The high share in GNP of industrial output, the structure of industry, the use of inefficient technology, and inadequate energy management practices are major factors that contribute to this. Efforts to improve the efficiency of energy use have been a cornerstone of China's energy policy. Particular progress has been made in building a strong institutional framework for energy conservation. During 1980-92, China's energy intensity per unit of GNP fell by about 30 percent in real terms, and the elasticity of growth in total commercial energy use relative to GNP growth was about 0.57 (Annex 1.2). Nevertheless, further improvements in energy efficiency are crucial. Energy supply targets for the 1990s imply that only about one-half of the increased energy services required will come from new energy supplies, while the other half must come from energy efficiency improvements. This will require major progress in addressing structural and systemic issues as well as still stronger programs to upgrade inefficient technology and strengthen energy management.

Dominance of Coal and Associated Environmental Problems

1.13 Many of China's air pollution problems are related to the heavy use of coal and its dispersed, small-scale application in industry and households. Environmental problems occur at every stage of the coal chain; mining and disposal of mine waste, coal washing, transport and handling, processing and combustion, and ultimately ash disposal. The ambient concentration of particulates is the most serious problem; it is largely related to the dominant small-scale use of coal, its high-ash content (20-30 percent), and the often incomplete combustion. The average sulfur content of the coal is relatively low (about 1.1 percent), but because coal is used so extensively sulfur dioxide emissions are increasing.

1.14 The environmental implications of continued increases in coal use highlight the need for the strict enforcement of environmental regulations and more investment to conserve coal and mitigate its environmental effects. Incorporation of modern technology, achievement of suitable scale economies, and elimination of backward small-scale capacity units is a key to improving coal utilization in many subsectors such as thermal power generation. The scope for substituting cleaner fuels remains limited. The country has insufficient proven natural gas resources; its production of oil is increasingly absorbed by transport and petrochemicals; and large hydropower resources are located far away from major consuming centers.

Scale and Technology in Energy Industries

1.15 **Coal Subsector.** Over half of the coal produced in China comes from small-scale mining operations. Exploitation of large coal reserves through uncoordinated small-scale mining has often led to inefficiencies in production and a waste of coal resources. In the larger mines, productivity and safety could be increased by making greater use of mechanized systems and applying more efficient designs and mining methods.

1.16 **Power Subsector.** Large-scale power development in China is beneficial from the standpoint of both energy conservation and environmental protection. Modern thermal power plants, with unit capacities of 600 MW, are far more efficient than smaller units (para. 2.30). The boilers of the modern utilities also support better pollution control, thus raising the efficiency of particulate removal.

1.17 **Petroleum Subsector.** In the petroleum subsector, there is a need to employ more modern equipment and technology at all stages of exploration and development; seismic survey and related data processing, exploratory drilling, and enhanced oil recovery in order to increase production from aging fields. Improvements in operating and maintenance practices are also needed to increase the efficiency of the subsector.

Energy Pricing

1.18 Energy price reform has proceeded steadily during recent years, resulting in substantial increases in real energy prices. In the mid-1980s, dual-track energy pricing was developed, whereby energy supplies allocated under the national plan were priced at "in-plan" prices, at levels well below incremental production costs or border prices, while higher, market-based prices were charged for energy supplied through the market ("outside of the plan"). Over the years, in-plan prices have increased in real terms, and perhaps more importantly, the portion of energy allocated at in-plan prices has greatly declined.

1.19 The Government had declared its commitment to abolish low, in-plan prices for all the chief forms of energy by the end of 1995, with the exception of a few consumer categories (e.g., ammonia-based fertilizer producers). The country is now in the process of completing this transition to market-driven prices. In general, average consumer energy prices are now close to the economic costs of supply in the principal demand centers. Distortions remain, however, in both the structure of prices and inequitable treatment of different producers and consumers, requiring further concerted action to complete the transition to a truly efficient pricing system suitable for the emerging market economy.

1.20 *Coal* supplied at market-driven prices now accounts for over three-quarters of coal consumption. In January 1993, the Government announced its intention to decontrol in-plan prices over the next three years, and followed through by cutting the amount of coal supplied at in-plan prices by about one-half. Market prices are generally in line with the economic costs of domestic production and distribution, and in East China local market coal prices are close to or even above international price levels. Further

action is required, however, to fully remove production subsidies and reduce the substantial losses still incurred by the coal industry.

1.21 While the average retail price levels of light *petroleum* products now generally are equal to or exceed border prices, average prices of crude oil and heavy fuel oil have been kept substantially lower. In 1992, however, the Government indicated that crude oil prices would be increased to international levels by the end of 1995. Although increases of 40% were implemented in 1992, producer prices for *natural gas* remain distorted and need to be adjusted further to provide better incentives to find and develop more resources.

1.22 Major progress has been made in increasing *electricity* prices; in East China, for example, average consumer prices now approximate the long-run marginal costs (LRMC) of supply. Substantial improvements also have been made in producer prices in 1993. The principal remaining problems in the electricity pricing system lie with its structure, unnecessary complexity, lack of transparency, and continued inequitable treatment of different types of producers and consumers (para. 2.21).

Economic System and Enterprise Reform

1.23 The process of transformation from a command economy to a market-based economic system has gained momentum in recent years, fueled by past successes and the strong economic performance of the more liberalized economy. Considerable progress has been made in the macroeconomic policy framework for the transition to a market economy; from trade to price liberalization, to encouragement of foreign investment and nonstate enterprise development, to decreased involvement of Government in the management and operations of state enterprises. Since mid-1992, efforts to reform state-owned enterprises (SOEs) have stepped up sharply, with the promulgation of new regulations granting greater autonomy to enterprises, and reorganization of the Government to reduce its role in enterprise operations. A wave of initiatives also has been launched to untie the social obligations that constrict SOEs and provide a more market-oriented operating environment, through reforms in the financial sector, fiscal system, pricing, housing and social security system. These reform efforts are indicative of the Government's resolve to gradually transform the SOEs' system into a structure of truly independent corporations. However, given the complexity and multidimensional nature of the enterprise reform, it will take time to complete the process.

1.24 System reform in the energy sector has been following the trends in the other parts of the economy. In the power subsector, the pace and depth of the reform program has increased especially since mid-1992; the Government is proceeding with a far-reaching program to commercialize the power companies, to revamp the regulatory and legal framework within which these companies operate, and to develop more diversified sources of financing, including private sector participation (paras. 2.20). In the oil and gas sector, recent achievements include the further opening of concessions to foreign firms, major price reforms, and the introduction of competition among the various newly created subsidiaries of CNPC. Emphasis is now being given to the commercialization and

corporatization of CNPC, as part of the drive towards greater market orientation. In the coal sector, however, progress in reform has been slower.

C. Energy Sector Strategy

1.25 Sector reform now plays a central role in China's energy development strategy. To reduce the prevailing energy shortages in today's environment of rapid economic growth will require further major improvements in the efficiency of the supply system, in domestic and foreign capital mobilization, and in energy use. The Government is committed to the reforms needed to make these improvements, including the commercialization of enterprises, the achievement of greater autonomy with respect to the government, regulatory and legal reforms to provide the framework for more market-oriented enterprises, promotion of competition, completion of price reforms, and adoption of a variety of new means to mobilize financing.

1.26 Efforts to improve the efficiency of energy use remain a cornerstone of China's energy policy; it is well recognized that China's economic development goals cannot be attained without further major efficiency gains. Focus on environmental issues in China's energy policy also has increased sharply in recent years. While heavy reliance on coal is an unescapable necessity in China, improvements in the efficiency of coal use and reduction of pollution from coal are recognized as critical. The Government's strategy in this area focuses on (a) strengthening environmental policy and regulation of emissions, (b) restructuring and renovation of inefficient, polluting industrial capacity, (c) achievement of greater efficiency and enhanced pollution control through development of large-scale power and industrial plants that properly capture scale economies, and (d) transfer and development of more efficient and cleaner industrial process and coal utilization technology.

D. Bank Role in the Energy Sector

1.27 The Bank has supported 13 projects in electric power development, 5 in petroleum (including one natural gas project), and one in coal. In these projects, particular progress has been achieved in the Bank's support for transfer of modern technology, development of efficient large-scale energy production facilities, promotion of modern management practices, improvements in power system planning, rationalization of energy pricing, and greater attention to environmental issues. With the Bank's assistance, the Chinese have developed capabilities to properly assess the economic costs of electric power and coal, and set up their price reform strategies. In the case of electric power, a joint effort to establish LRMC and pricing principles for East China has been followed up through the development of provincial tariff reform action plans under recent power loans (para. 2.23). A strengthening in environmental and resettlement policies and programs has been achieved through Bank assistance to develop and systematically apply new methodologies and approaches for environmental impact assessments and resettlement planning, and adoption of environmental and resettlement procedures in strict conformity with Bank and national standards.

1.28 The Bank's assistance program for energy in China places special emphasis on energy conservation, improved coal utilization and sector reform. Through sector work, technical assistance and lending operations, the Bank is pursuing a multidimensional, sustained program of assistance to increase energy efficiency, improve coal utilization practices and reduce air pollution stemming from coal use. A continuing dialogue with the Government has been established through the completion of three joint studies; Efficiency and Environmental Impact of Coal Use (Report No. 8915-CHA, 1991), Environmental Strategy Paper (Report No. 9669-CHA, 1992), and the Energy Conservation Study (Report No. 10813-CHA, 1993). Further follow-up technical assistance and preinvestment work is currently under way with support from the Global Environment Facility (GEF). Because the issues involved concern the use of energy across the economy, assistance through the lending program involves operations in a variety of sectors. Investment and policy support will continue to be provided through industry and urban/environment operations, as well as operations in the energy sector.

1.29 The Bank is actively involved in providing assistance for China's reform efforts in the oil, gas and power subsectors. Following completion of a successful joint workshop in China on petroleum subsector reform in 1992, a major technical assistance effort has been launched with Japan Grant Facility assistance to review (a) establishment of an appropriate legal and regulatory framework for the oil and gas subsectors, (b) competition policy and petroleum market development, and (c) institutional restructuring of CNPC. The Bank's assistance program for power subsector reform includes the successful completion of technical assistance on reform options sponsored by the Bank's Institutional Development Fund (IDF) in 1993, sector work reviewing subsector reform implementation strategies, and reform-oriented lending operations. A Power Sector Strategy Paper for China is being completed, which will focus especially on China's power subsector reform and a program to support reform implementation (para. 2.38).

2. THE POWER SUBSECTOR

A. BACKGROUND

2.1 China is the fourth largest producer of electricity in the world. By the end of 1992, its total installed capacity reached 166 GW, with 75.6 percent based on thermal power and 24.4 percent based on hydropower (Annex 2.1). China has 13 power networks with capacities of 1 GW or more. They include five regional power grids (East China, North China, Northeast China, Central China and Northwest China), which coordinate the power systems of several provinces together, and eight major separate provincial grids. The total length of the extra high voltage transmission lines reached 8,638 km and the capacity of substations 30.9 GVA. Including all aspects of the power supply, regardless of ownership, transmission and distribution losses amounted to about 16 percent of generation.

2.2 Total power generation in China reached 754 TWh in 1992, of which thermal power accounted for 82.6 percent. The share of hydroelectric power has remained fairly stable over the last decade; Government has maintained a strong commitment to hydropower development, but the bulk of resources are relatively distant from the major load centers. In thermal power, coal-fired plants provide about 90 percent of generation. The share of oil-fired generation, which accounts for most of the balance, has declined sharply since the early 1980s. The share of natural-gas based generation is virtually negligible and is expected to remain so barring unforeseen major new natural gas discoveries. Natural gas currently accounts for only 2 percent of China's primary energy production.

2.3 Although China's current power development program emphasizes addition of 200-600 MW units, over one-half of China's thermal power capacity is still in units below 200 MW. Only about 15 percent is in units of 250 MW or more, compared to 60-80 percent in industrialized countries. The average gross conversion efficiency of thermal units over 6 MW has improved steadily over the 1980s, reaching 31.8 percent in 1992. This efficiency level is not unreasonable given the low average unit sizes in operation, but is substantially lower than the 36-37 percent typical of systems with larger units.

2.4 Industry continues to dominate electricity consumption in China, accounting for 77.1 percent of electricity use in 1992; 6.8 percent was consumed by agriculture, 8.5 percent by residential users, 5.8 percent by municipal and commercial consumers, and 1.8 percent in transportation/communications (Annex 2.2). Although service is of uneven quality, rural access to electricity is high; 96 percent of the nation's villages and about 80 percent of rural families now have access to electricity.

2.5 Power generation in China increased by two and one-half times between 1980 and 1992, an average increase of 8.0 percent a year over 12 years. Growth was particularly robust during 1985-88, it tapered off during 1989-90 when economic growth slowed, but picked up once again, with increases in generation of 9 percent in 1991, and over 11 percent in 1992. Industrial demand has continued to drive overall power demand; 74 percent of incremental electricity use between 1985 and 1992 was in the industrial sector.

2.6 Despite the strong growth in electricity output, most areas of China continue to suffer from severe power shortages. Given that GNP grew by 9.3 percent a year during the same period, the elasticity of electricity consumption growth relative to GNP growth during 1980-92 was only 0.86—an exceptionally low elasticity for any country over a sustained period, and particularly for an industrializing country such as China. The Chinese estimate that there is a shortfall between peak power demand and supply of 10-20 percent. Daily load curves tend to be relatively flat, as industries have had to respond to shortages of power during the peak daytime periods through rescheduling of work shifts. The load factor in the East China power grid in 1990, for example, was 72 percent.

2.7 China's GNP is expected to grow by at least 8-9 percent a year during 1993-2000. This sustained rapid economic growth will put tremendous pressure on electric power industry to avoid yet worse shortages. Building further upon the gains achieved over the last 10 years, the country's programs to increase the efficiency of electricity use must be greatly intensified. Even so, China's electric power construction program for the 1990s will almost certainly be the largest in the world. Assuming that an intensive conservation effort can enable the country to sustain an electricity demand/GNP growth elasticity of 1.0, electricity demand is expected to grow at average rates of 8-9 percent per year during 1993-2000. This implies an increase in production from 621 TWh in 1990 to 1,380-1,480 TWh in 2000. Corresponding growth in installed capacity would amount to an increase from 138 GW in 1990 to 300-330 GW in 2000. To keep pace with this demand growth, China would need to add some 17-20 GW of capacity per year, compared to 13 GW added in 1992. To meet this demand, the Chinese are looking primarily towards more thermal projects which can be constructed as quickly as possible.

2.8 The principal issues which must be addressed in order to successfully meet China's development challenge in the power subsector are discussed in the sections below.

B. Power Subsector Reform

Achievements

2.9 Reforms in China's power subsector during the 1980s involved a series of incremental adjustments, in large part due to pressing needs to mobilize increasingly large sums of investment capital, particularly from domestic sources. Taken together, however, these adjustments have resulted in a subsector structure that is in many ways unrecognizable from that of the previous three decades. In 1980, the power subsector was

fully controlled, managed and funded by a hierarchy of Central Government departments, led by the Ministry of Water Resources and Electric Power. By the early 1990s, however, the subsector had become much more decentralized and less vertically integrated. Although progress also has been made in all areas, particular progress has been made in diversification of financing sources, institutional restructuring, and electricity pricing reform (paras. 2.21-2.25.).

2.10 **Diversification of Financing Sources.** Following change in investment funding from Government grants to loans in the early 1980s, the Government has encouraged the development of multiple-channel financing for new projects, involving mobilization of funding through provincial and local governments, independent corporations, and, in some cases, private foreign partners. Since the mid-1980s, the Government has allowed power produced from power plants financed through these noncentral government sources to be sold at prices which provide for adequate debt servicing and reasonable profit. The share of Central Government financing in total power subsector investment has fallen sharply, from 91 percent in 1980 to 30 percent in 1992. Empowered with rights to charge price surcharges to accumulate funds for investment in power construction, provincial and local governments have become a key source of financing, providing about 40 percent of the investment funding for the subsector in 1992.

2.11 Newly formed corporations also have become important actors in the subsector. The Huaneng International Power Development Corporation (HIPDC) was created in 1985 with the aim of attracting foreign capital and technology for power generating plants located mainly in the open coastal areas. HIPDC has a mandate to raise funds directly from the international financial market, and it has been active in tapping bilateral and suppliers' credits, and commercial bank loans. It is now also considering foreign equity participation as an option for the future. The Sunburst Energy Development Corporation (SEDC) is another window for the Government's investment in cofinancing with the local governments and foreign sources in energy projects, with three large thermal power projects now under implementation.

2.12 As an independent power producer, HIPDC operates its 15 plants (5800 MW total) under a build, own, and operate (B-O-O) framework. Build, own and transfer (B-O-T) schemes also have been introduced in China, most notably the privately-financed Shajiao B thermal power plant in Guangdong Province. Current Government policy encourages greater foreign direct investment in the subsector (see para. 2.20, and Annexes 2.3 and 2.4).

2.13 **Institutional Restructuring.** Provincial power companies have become the utilities in charge of management and operation of the bulk of the nation's power system. The newly created MOEP is charged with overall sector coordination and policy guidance (para. 1.9, and is no longer involved in enterprise management. Regional power entities are charged with responsibilities for regional grid coordination and dispatching.

2.14 The nature of the provincial power companies varies substantially, but few remain full monopolies of the power supply systems in their respective provinces. At the

distribution level, about one-third of the country's urban distribution companies and five-sixths of the country's rural distribution utilities are separate economic entities. At the generation level, semi-independent joint-investment plants and fully independent power plants have been developed in many areas, with which the provincial power companies maintain written agreements. In coastal provinces where these arrangements have become particularly common, a structure conducive to competition in generation has been put in place.

The Current Reform Agenda

2.15 In line with the step-up in national reforms to build a market economy begun in mid-1992, the Government has recently initiated a broad program of sector reforms in the electric power industry. Implementation of the program will require a concerted effort over a number of years. The agenda put forward for action now includes: (a) implementation of measures to further commercialize power companies, including achievement of greater enterprise autonomy from the Government, (b) further measures to simplify and rationalize power tariffs (paras. 2.21-2.25), (c) realignment of the regulatory and legal framework for the subsector, including the promulgation of a National Electricity Law, and (d) strong encouragement for further diversification in financing for power development, including private sector participation. While actions are occurring on all of the above fronts, implementation of measures to commercialize the provincial power companies is now a central linchpin in the overall effort.

2.16 **Commercialization.** The goal is to develop the power companies into more efficient, truly commercial utilities, autonomous and responsive to market forces. The most important steps required at this stage include the following, each of which will be undertaken by JPEPC in an effort supported through the proposed project (para. 3.6):

(a) Separation of government functions from power company management, and reduction of government interference in power company activities. Some provinces have made progress by creating power companies, responsible for the day-to-day commercial operations of the provincial power system, alongside the longstanding power bureaus of the Government. In practice, however, the companies and bureaus have remained institutionally unseparated. For commercialization to properly proceed, government regulatory functions must be entrusted to agencies fully separate from the power companies, and the power companies should be given an autonomous position to operate as a business-oriented enterprise.

(b) Strengthening of power company autonomy. In particular, provincial power companies need to be granted greater financial autonomy, including expanded rights to undertake investments and to raise funds.

(c) Adoption of modern, commercial accounting and financial reporting practices. In line with the nation's efforts to adopt international accounting practices beginning in 1993, design and implementation of modern internal

cost accounting and financial reporting systems in the provincial power companies is now absolutely necessary for power company managers to have the financial information needed to control costs and maintain financial accountability.

2.17 Following the reform implementation program for SOEs as a whole, subsequent steps in the Government's program to commercialize power companies include: (a) taxation and profit remittance reforms in the subsector, following on from the new national reforms; (b) revaluation of assets and clarification of asset ownership rights—a process which has already begun in some provinces such as Jiangsu; (c) a narrowing in power company operations to core activities, and gradual elimination of social welfare responsibilities, initiated through current efforts to "spin off" peripheral operations, and deepened as reforms proceed in the social security system, unemployment insurance, etc.; and (d) corporatization in the form of limited liability or limited shareholding companies.

2.18 **Legal and Regulatory Reform.** China currently is in the process of developing an overall legal and regulatory framework for operations in the power industry. The existing legal framework includes of a series of incomplete and inconsistent regulations and rulings, developed over many years. There is a need to establish both the principles and model contracts for establishing more transparent and efficient economic relationships between the various entities now involved in the subsector, including different grids, semiautonomous joint-investment power plants and independent power producers. To meet the needs of the new market-oriented environment, the Central Government is preparing a new Electricity Law, which will provide the umbrella principles for the legal and regulatory system for the subsector. The Government also is preparing a series of more specific regulations, consistent with the principles of the proposed Law.

2.19 The emerging new regulatory system for the power subsector will include different government regulatory functions at central and provincial levels. At the provincial level, government oversight functions must first be separated from power company management (para. 2.16 (a)), and then regulatory responsibilities defined in tune with the overall national program.

2.20 **Further Diversification of Financing Sources and Private Sector Participation.** Financing of China's major power expansion program during the 1990s (para. 2.7) will require aggressive efforts to mobilize increased investment resources through all potential financing channels. Building further upon recent reforms and experiences (paras. 2.10-2.12), expanding financing sources include an increasing variety of domestic channels, foreign borrowings and direct foreign private investment. The Government recognizes that domestic sources of financing and borrowings from international multilateral and bilateral institutions will not be sufficient to meet the sector's financing needs. Accordingly, the Government is encouraging direct foreign investment in the power industry. Independent power production schemes which have already been developed and are slated for further expansion include fully privately-owned BOT projects and Chinese/foreign joint-venture BOO schemes. In Shandong Province, plans for the

establishment of a substantial Chinese/foreign joint-venture power generation company also are in the advanced stages.

C. Power Pricing

2.21 Electricity price reform in China has involved a series of incremental changes taken over the last 10 years. In the mid-1980s, multiple-track pricing was introduced for both producers and for consumers, in line with the shift away from full vertical integration in the industry (para. 2.14). By the end of the decade, the power pricing system had become too complex and difficult to manage. Recent reforms have focused on simplification and rationalization of the system. The end results of price reform at this point include major achievements, especially compared with the situation in most other developing countries.

2.22 **Producer Prices.** A full overhaul was completed during the summer of 1993 of the state base prices charged for power produced by plants financed by the Central Government. Prices for the electricity produced from *all* new power plants are now set by contract to cover financing and operating costs, on a plant-by-plant basis, and rolled into the power tariff. Cost recovery through the tariff system is thus ensured. Prices also are similarly determined for existing plants financed through loans. The electricity tariff applied for plants built with grant financing before 1985 has been revised and rationalized, and now includes an improved mechanism for automatic adjustment in prices to reflect annual changes in fuel costs.

2.23 **Consumer Prices.** Consumer electricity prices include summations of the state base prices; the costs of the growing other sources of power supply not financed through the Central Government; and a series of local fees and surcharges. In Jiangsu Province, the average electricity prices now paid by consumers are now roughly at the level of the estimated LRMC of supply, in economic shadow prices. While the situation varies somewhat between regions, the nature of the existing pricing system is such that average consumer prices can now be expected to approximate LRMC levels in areas with rapid load growth, such as the coastal provinces. Average consumer prices in underdeveloped areas may still be somewhat below LRMC levels, but should be brought more and more into line with growth in new capacity.

2.24 The structure of consumer prices, however, remains too complex, lacks transparency, and is often inequitable. In most areas, including Jiangsu Province, unfair "old" administered rates and "new" guidance rates continue to be applied to different consumers. Some consumers are protected from high cost electricity supply charges and certain local surcharges because they still hold "in-plan" quota allocations, but other new or small consumers must pay high prices well above actual supply costs.

2.25 **Directions for Further Reform.** While the 1993 reforms brought major improvements, further reforms are still necessary to simplify and rationalize the power tariff system. One area for emphasis is to improve the pricing and dispatching contractual arrangements between provincial power companies and power producers. Another area is

to rationalize the structure of consumer prices. Annex 2.5 provides a description of the pricing system in Jiangsu, and JPEPC's power pricing reform program to abolish the prevailing dual-track system of consumer prices.

D. Electricity Conservation and Environmental Protection

Electricity Conservation

2.26 The industrial sector is the key to more efficient use of electricity (para. 2.4). At a macro level, the most important factors determining China's ability to produce more economic output with less electricity are the share of industry in future growth and changes in industrial structure. Other especially important issues include the rate of modernization in industrial process technology and China's ability to produce and disseminate high efficiency electricity-using equipment, such as transformers, motors, fans, pumps, and cooling equipment.

2.27 China has over 10 years of experience in the active promotion of electricity conservation, with a solid record of achievement. The strength of its program lies in the well developed institutional framework that has been gradually built up. Electricity conservation is handled by the network of Three Electricity Offices, with offices at central, provincial, prefectural and county levels throughout the country. These offices are under the leadership of local Economic Commissions, and coordinate their work with provincial power companies. They monitor electricity intensity and use patterns in all major enterprises, promote adoption of conservation technologies and electricity management improvements, and assist, at times, in organizing funding for efficiency improvements.

2.28 Further improvements in the efficiency of electricity use are imperative if China is to realize its economic growth goals. Three areas which are receiving increased attention in some provinces, such as Jiangsu, and deserve emphasis include: (a) improvements in coordination between industrial planning and electricity demand and supply planning at local levels; (b) expansion of programs to reduce losses in power distribution systems; and (c) development, production and dissemination of high efficiency equipment, including variable-speed motors and modern appliances.

Environmental Protection

2.29 Thermal power production currently accounts for about one-quarter of China's coal consumption, and this share is expected to gradually increase. Improvements in the efficiency of coal use in this subsector not only alleviate pressure on the coal production and transportation system, but also have a major impact on particulate, and sulfur dioxide and carbon dioxide emissions.

2.30 The achievement of economies of scale in thermal power production, through expanded development of large generating units, is an issue of overriding importance. Particularly disturbing is the recent rapid growth of small coal-fired power plants, in unit sizes of 50 MW or less. While national policy emphasizes the addition of

300 MW and 600 MW units, new projects have lagged behind demand, largely due to difficulties in mobilizing the necessary large investment resources. As a consequence, local governments are continuing to invest in large numbers of new small plants. In Jiangsu, 35 percent of the incremental thermal power produced during 1985-92 came from such small plants (see para. 7.8 and Annex 7.2). Compared with a state-of-the-art plant, such as the proposed Yangzhou thermal power plant, these plants consume over 60 percent more coal per unit of electricity produced. This results in at least 60 percent higher sulfur dioxide emissions (depending upon the coal used), and roughly 60 percent greater emissions of carbon dioxide. Particulate emissions from the small plants are proportionally even higher, due to use of inefficient particulate control technology. If a sufficient pipeline of large-scale projects cannot be brought on stream in a timely fashion, there is little doubt that this problem will worsen.

2.31 In terms of emission control in large and medium-scale plants, China has made substantial progress in particulate control, through deployment of electrostatic precipitator technologies of increasing efficiency. As the country is blessed with large reserves of low sulfur coal which can be used in most areas, China is just beginning to employ sulfur dioxide control devices in the power subsector. Top priority should be given to areas which have little choice but to rely on local high sulfur coal, such as in Southwest China. In these regions, thermal power plants often burn coal of over 4 percent sulfur content (e.g. 5-10 times the level typical through most of North and East China), and development of sulfur dioxide control strategies and corresponding investments are now urgent in these areas using coals with high sulfur content.

E. Power System Planning and Technology Transfer

2.32 **Power System Planning.** As planning for China's power development becomes increasingly complex, there is a compelling need to apply state-of-the-art system planning techniques. This is particularly important for evaluating large-scale projects which have long lead times and for making decisions about generation mix, power plant location, and grid configuration. Support for strengthening domestic capabilities in least-cost generation planning techniques in both East China and Sichuan has been provided under previous Bank loans. Additional support, however, also is needed in the preparation of balanced generation, transmission, distribution and utilization plans, and to better incorporate increasingly important environmental concerns into the planning methodology.

2.33 **Modern Technology Transfer.** For China to achieve its ambitious goals for the power subsector, the transfer of appropriate modern technologies will be crucial. This is particularly important for thermal power plants, where increases in the steam parameters and unit sizes can reduce fuel consumption as well as pressures on both the supply and transport of coal, as well as on the environment. Technology transfer is also needed for large hydroelectric projects, particularly in connection with the project general layout, the design of sophisticated structures and large underground works, the selection of equipment, efficient construction management, and environmental assessments. Assistance in technology transfer for large coal-based thermal power projects will be provided under the proposed project (para. 5.7).

F. Role of the Bank in the Power Subsector

2.34 The Bank has supported the Government's efforts to foster efficient and sustainable development of the power subsector through sector work, policy dialogue, and a series of lending operations. In previous years, the Bank's participation in the power subsector in China has particularly focused on institution building, price reform, improvements in system planning, and the transfer of appropriate modern technologies.

2.35 The Bank has helped to finance 12 large power generation and load management projects (5 thermal, 7 hydro), and one transmission project. Through these operations, the Bank has successfully (a) introduced international competitive bidding (ICB) for works and goods; (b) supported the transfer of modern technologies in project construction and management; (c) helped to improve the efficiency of pollution abatement; (d) supported the rationalization of power tariffs; (e) promoted the integration of regional power systems; (f) supported the development of master plans for modern distribution networks; and (g) promoted operational efficiency and more prudent financial management.

2.36 Most of the power projects financed by the Bank are being implemented in a satisfactory manner, on schedule, and within budget. The first two operations, Lubuge Hydroelectric Project (Loan 2382-CHA) and the 500-kV Xuzhou-Shanghai Transmission Project (Loan 2493-CHA) have been successfully completed. The Yantan Hydroelectric Project (Loan 2707-CHA) is progressing satisfactorily and nearing completion. Several problems which were encountered early in the implementation of the Shuikou Hydroelectric Project (Loan 2775-CHA) have been resolved and the second loan for Shuikou Project II (Loan 3515-CHA) was approved recently. The construction of the Ertan Hydroelectric Project (Loan 3387-CHA), Daguangba Multipurpose Project (Loan 3412-CHA and Credit 2305-CHA) and Tianhuangping Pumped-Storage Hydroelectric Project (Loan 3606-CHA) is now progressing well. Furthermore, the Bank is involved in financing five thermal power projects—Beilungang (Loan 2706-CHA), Wujing (Loan 2852-CHA), Beilungang Extension (Loan 2955-CHA), Yanshi (Loan 3433-CHA) and Zouxian (Loan 3462-CHA). Wujing was completed on schedule. Beilungang encountered delays due to procurement problems and poor coordination of goods supplies. Unit No. 1 was commissioned in 1991 and Unit No. 2 is expected for commissioning in 1993, about one year behind schedule. The implementation of Yanshi and Zouxian projects has started successfully.

2.37 The lessons learned from lending operations for the power projects in China have been taken into account in preparing the proposed project. These lessons basically include: (a) improving procurement and contractual arrangements; and (b) enhancing the role of project management and the use of engineering consultants. Particular attention has been given to the environmental aspects of the projects.

The Current Bank Power Subsector Assistance Program

2.38 To support the Government's ambitious program in power subsector reform (paras. 2.9-2.19), and in keeping with the Bank's assistance policies in the power subsector, the Bank has developed a new power subsector assistance program in China

which places central focus on reform. This program is discussed in detail, together with analysis of the related issues, in the forthcoming Power Sector Strategy Paper for China.

2.39 In line with the Bankwide power policy (The World Bank's Role in the Electric Power Sector, 1993) the Bank's power subsector assistance program in China includes an integrated package of sector work, technical assistance activities and lending operations, actively involving both central and regional/provincial levels. At the central level, a strong dialogue on reform has been developed through completion in 1993 of a collaborative technical assistance activity involving the Bank and key national agencies, with support from IDF, on Strategic Options in Power Sector Reform in China. Recently initiated follow-up includes a joint Chinese/Bank review of innovative options for financing power projects. The dialogue at the provincial level is being developed primarily through lending operations. While the concentration of each operation will vary, all new power subsector lending operations in China, including this proposed operation, are being designed to focus on implementation of key aspects of the overall program.

2.40 Supported through various combinations of sector work, technical assistance, and lending projects, the objectives of the Bank's program include active support for the Government's efforts in the following main areas:

(a) **Commercialization of power companies.** To achieve true power company commercialization, main areas being supported include: (i) separation of government functions from power companies; (ii) strengthening of power company autonomy, particularly financial autonomy; (iii) conversion to modern, commercialized financial accounting and cost-and-profit reporting systems; and (iv) gradual conversion of power companies into shareholding companies.

(b) **Improvement in the regulatory framework.** Key areas include: (i) the definition of a national regulatory framework for the power subsector at various levels, fully independent from the country's power enterprises; (ii) establishment of institutional capacity at provincial levels for power subsector regulation, following (i) the above and separation of government functions from provincial power companies; and (iii) codification of the umbrella principles for the legal and regulatory system for the subsector in the Electricity Law.

(c) **Further diversification of financing sources.** Primary focus is being placed on efforts to accelerate mobilization of external sources of financing, particularly from the private sector, and especially for independent power production. A pivotal point is development of an improved contractual framework for such projects.

(d) **Power pricing.** Through previous lending operations, marginal cost pricing principles have gained wide acceptance in China, and a number of provincial power tariff reform action programs are now under

implementation. Emphasis is now being placed on (i) effective supervision of the implementation of these programs, (ii) unification of consumer tariffs, and (iii) improvements in pricing contracts between power companies and independent producers.

(e) **Environmental protection.** In addition to support for preparation of proper environmental impact assessments and for deployment of efficient, modern technology to ensure compliance with internationally accepted environmental standards, planned new assistance efforts include (i) support for institutional strengthening for assessment, planning and monitoring of resettlement and environmental impacts in both hydro and thermal power projects, (ii) technical assistance for development of a national strategy for pollution control in thermal power plants, and (iii) support for the reduction of sulfur dioxide emissions in thermal power plants in areas with high sulfur coal.

(f) **Electricity conservation (demand-side management).** A strong program of technical assistance, launched with sector work and continued with support from GEF, focuses on means to improve the efficiency of electricity use through industrial restructuring and modernization, as well as through adoption of more efficient equipment and electricity supply management practices. Support for improving the efficiency of electricity use by reducing losses in power distribution, through industrial process change, and production and dissemination of high-efficiency electrical equipment also is planned in power and industry lending operations, and future GEF investment operations.

(g) **Power system planning.** Building upon past achievements, emphasis in this area is being placed on incorporation of environmental issues and improving the transmission, distribution and utilization aspects of power system planning.

2.41 With its support for specific efforts in power system reform, the proposed project is a key element in the overall assistance program for China's power subsector. Although the project also provides other significant contributions as well, the most important contribution of the proposed project to the Bank's overall assistance program for power subsector reform lies in the effort to commercialize JPEPC. Through this project, the Bank will be able to work together with central, regional and provincial authorities to implement the nation's first program to develop a fully commercialized provincial power company, independent from the government power bureaus, and designed to operate according to modern utility commercial practices.

3. THE BENEFICIARY

3.1 China is in the process of reforming its state enterprise system through progressive development of a suitable corporate legal system. It has thus come a long way from carrying out its economic agenda through state enterprises wholly owned, controlled and operated by line departments and agencies of the Government. The Law of the People's Republic of China on Industrial Enterprises Owned by the Whole People enacted by the National People's Congress in 1988 has introduced the concept of semi-independent management and allowed more operational autonomy. Presently, the Government is actively promoting the restructuring of state enterprises as shareholding companies pursuant to its Regulations on Enterprises' Shareholding System Experiment issued in 1992. For this purpose, it has also issued its Views on Standards for Limited Share Companies and Views on Standards for Limited Liability Companies. A number of other related regulations have been issued on a provisional basis. All these efforts are indicative of the Government's resolve to transform the state enterprise system into a full-fledged independent corporate structure.

A. Legal Status and Organization of JPEPC

3.2 The Beneficiary of the proposed loan is the Jiangsu Provincial Electric Power Company (JPEPC), an independent economic entity that possesses the legal status of a limited liability company under its Charter (dated December 19, 1988), formulated pursuant to the Law on Industrial Enterprises (para. 3.1), and the Scheme of Structural Reformation of East China Power Network, approved by the State Council. JPEPC's Charter is a self-implementing legal instrument.

3.3 The registered capital of the JPEPC is Y 2.6 billion. The Charter empowers JPEPC to obtain funds from various sources such as: (a) investments from the state, the province, and local governments; (b) loans from financial sources such as banks and financial organizations both domestic and foreign; (c) electricity sales and charges for specific power use; (d) stocks and bonds; and (e) joint ventures with foreign companies. JPEPC is also authorized to use its retained profits for investment purposes. Although JPEPC has the corporate powers to invest and issue bonds, these activities are regulated and government approvals are required therefor at various levels.

3.4 JPEPC has been entrusted by central and provincial governments with the management and administration of generation, transmission, distribution and electricity supply in Jiangsu Province. The scope of JPEPC's business includes undertaking construction of power projects funded either by the state or by local finance. The functions and powers of JPEPC have been outlined in the Charter and further elaborated in a document regarding Confirmation of the Functions and Powers of JPEPC approved

by MOE in 1992. Pursuant to these documents, JPEPC has the power to obtain loans from and to enter into contracts with various organizations including foreign institutions (with the permission of the concerned government authorities).

3.5 The Charter provides for the establishment of a Board of Directors ostensibly to manage the company, and JPEPC plans to develop a management system led by a Board of Directors as part of its overall reform program. Currently, however, the overall management and administration of JPEPC is entrusted to a General Manager (assisted by several deputy General Managers) appointed by MOEP in consultation and agreement with the Jiangsu Provincial Government and East China Electric Power Administrative Bureau. The General Manager is the legal representative of the company and responsible for its operations. The exercise of managerial and administrative powers (e.g., hiring and firing of staff and labor) is, however, controlled by "relevant state rules and regulations." JPEPC has pursuant to the Charter established various administrative rules and regulations including regulations on power grid management. JPEPC has adequately carried out its mandate and effectively coordinated power system development and operations in Jiangsu Province. JPEPC exercises control over the electric power enterprises operating in Jiangsu Province on the basis of contractual arrangements. These arrangements include only a general nonstandard formula for pricing that is based on the government's pricing policy. The actual prices are established by the State Pricing Bureau of SPC. JPEPC also has the requisite authority, under its Charter and the Confirmation Document, to receive the proceeds of the proposed Bank loan through the Central Government, to carry out the proposed project, and to enter into a project agreement in respect thereof with the World Bank subject, of course, to necessary government approvals. Details of JPEPC's institutional and legal framework are presented in Annex 3.1.

B. Action Plan to Commercialize JPEPC

3.6 A key objective of the proposed project is to implement a series of reforms to fully commercialize JPEPC. In consultation with the Bank, JPEPC has prepared and agreed to implement an Action Plan for the Commercialization of JPEPC (Annex 3.2), which consists of an integrated, time-bound package of reforms, many of which would be implemented in China for the first time. The objective of the reform package is to develop JPEPC into a power company fully separate from Government, with autonomy in its own operations, accountability for its own profits and losses, and self sufficiency in its development. The principle features of this package include:

(a) Separation of government regulatory functions from JPEPC and provision of these functions to authorities institutionally separate from JPEPC. Following reforms within JPEPC and other preparations during 1994, this reform will be implemented during 1995.

(b) Provision of rights to JPEPC to undertake investments and raise funds, to enable JPEPC to achieve greater financial autonomy and self-sufficiency. This will be completed during 1994.

(c) Unification of consumer tariffs. Following the model of Nantong Prefecture, two to three additional prefectures will implement uniform consumer tariffs in 1994, replacing the current system of different rates for planned and nonplanned power usage. Implementation will be completed in all prefectures in Jiangsu Province in 1997.

(d) Completion of a package of accounting and financial system reforms within JPEPC by the end of 1996 to improve cost control and the accountability of subentities, and to provide a foundation for efficient commercial operation.

(e) Completion of a review of options for corporatization of JPEPC as a shareholding company by the end of 1995.

3.7 Working together with other relevant agencies, JPEPC will prepare a detailed implementation program for the Action Plan during 1994, clarifying all details, including the specifics of required institutional changes. Following discussion with the Bank, the program will be submitted for approval to the Jiangsu Provincial Government and MOEP and its implementation will commence by early 1995. MOEP has provided a Policy Letter to the Bank, confirming the Government's support for the implementation of the Action Plan. JPEPC will finalize by December 31, 1994, in consultation with MOEP and the Bank, a detailed implementation program including timetable for carrying out the Action Plan, and thereafter carry out the Action Plan in accordance with the implementation program in a manner satisfactory to the Bank. Furthermore, the Borrower would cause JPEPC to carry out the Action Plan satisfactory to the Bank.

C. Management

3.8 Recent performance indicators for the Jiangsu Power Grid reveal high plant capacity factors and rather low transmission and distribution losses (Annex 3.3). JPEPC prepares accounting information in a timely fashion and operates an effective billing and collection system (para. 3.24). However, the successful upgrading of management systems and procedures, and the strengthening of financial planning, deserve special attention as a critical aspect of JPEPC's commercialization reform program (para. 3.18). The proposed project includes specific training in utility management and financial planning for this purpose (para. 5.9).

3.9 JPEPC is capable of formulating its own expansion program and implementing power projects by itself. However, for a large project such as the one proposed, outside assistance will be required for the preparation of bid documents, bid evaluation, contract negotiations, and construction management (para. 5.7).

D. Staffing and Training

3.10 As of December 31, 1992, the company had a total staff of 67,268, of which about 10 percent were engineers and technicians, 9 percent administrative staff, 66 percent

workers, and the rest others. Except for the core group of key technical and managerial personnel who are assigned by the State, almost all of JPEPC's employees are recruited locally. Most of the employees are hired on a permanent basis, except for laborers contracted for construction. The company is currently reforming is personnel policies to provide for improved performance-based review and accountability, and to reduce total staff levels. Total personnel is being reduced by 17 to 20 percent during 1993-94, followed by further planned reductions in 1995. JPEPC has 16 functional divisions and offices, and its organization structure is presented in Chart 2. Details of JPEPC's staffing are shown in Annex 3.4.

3.11 JPEPC is understaffed in engineering and technical areas, financial control and planning and management, especially in dispatching operations of large power grids. JPEPC runs three technical schools/training centers for skilled workers, one electric power institute for technicians, and one staff college. There are 1,255 teaching and administrative staff in all these training and educational centers, which have a total enrolment of over 5,000 students (details in Annex 3.5). This training capacity is basically sufficient to meet JPEPC's long-term needs. However, the skills of teaching staff and quality of teaching facilities need to be upgraded and modernized. Training needs to be designed to help senior managerial, financial and technical staff adapt to the new situations brought about by a larger and more complex power grid. The training component included in the proposed project is designed to meet these needs. It also covers upgrading and equipping of JPEPC's training institutions and project-related training for technical staff (paras. 5.11-5.12).

E. Planning, Budgeting and Control

3.12 Power bureaus and companies are responsible for developing annual and five-year production and investment plans that are integrated into the national plans and are approved, through MOEP's and SEIC's auspices, by SPC. In the past, financial planning was confined to attaching monetary values, predetermined by MOE, to the quantities being planned. Although a power bureau's plan might be revised to reflect changes, it would ordinarily not be revised to reflect differences between estimated prices and actual prices.

3.13 However, with the economic changes in the 1980s, prices have begun to move toward market levels and the Government has begun to finance more investments through loans rather than grants. Centralized control is being relaxed and replaced by greater financial autonomy and responsibilities for the power entities. To address these changes, JPEPC will need to adjust its planning system to include modern financial planning.

3.14 MOEP and SEIC recognize the importance of financial management in the power subsector in China and are organizing a comprehensive training program for all the power institutions under their control. Many of the power bureaus/companies have been equipped with computers and software for planning, budgeting, and accounting functions.

Information from the bureaus/companies can be transferred to MOEP and consolidated into regional and national data.

3.15 The new systems represent a good first generation of automated management information; however, they still are not sufficiently flexible to take into account price changes at the local level or those associated with large-scale debt service obligations. Currently MOEP and SEIC, with assistance from the Bank, manage a number of seminars in China and overseas covering computer-based management information systems as well as tariffs, cost control, project financing, comparative accounting systems, and the organization and structure of financial management. After JPEPC installs the new financing management information system to be financed under the proposed project (para. 3.18), it will be able to significantly upgrade the existing financial planning, budgeting and control system.

F. ACCOUNTING

Enterprise Accounting

3.16 JPEPC follows a uniform enterprise accounting system and detailed regulations established by the MOF. The accounting framework effective before July 1, 1993 was developed in the context of a highly centralized planned economy. With a view to complementing China's move towards a market-oriented economy and strengthening the financial management of enterprises, new regulations covering accounting rules and financial affairs are being introduced by MOF since July 1, 1993. These revised accounting principles are generally consistent with those of international accounting standards. Within this broad framework, specific accounting standards would be developed with the assistance of the Bank Group under the Financial Sector Technical Assistance Project (Credit 2423-CHA).

3.17 Currently, the main differences between JPEPC's accounting practices and international practices relate to: (a) the approach for determining and accounting for equity, and for separating those items now accounted for through special funds that relate to liabilities, such as provision for payments to employees; (b) the need for including construction in progress and related liabilities in the accounts (now only included after completion of construction); and (c) the introduction of the concept for provision against probable losses such as, provision for doubtful debts and for stating inventories at the lower of cost and net realizable assets. These differences have been generally addressed in the new regulations. Nevertheless, given the conceptual and practicable gaps between the old and new regulations, implementation of the new accounting system is a challenge to JPEPC. Most importantly, it is critical for JPEPC to introduce accounting and financial management systems that will recognize commercial practices in a market economy such as: (a) allocating costs to areas of responsibilities; (b) providing information for comparative analysis of actual cost with budgets; and (c) providing transparency of information for investors, authorities, lenders, and the public in general.

3.18 The proposed project would include a technical assistance component to support JPEPC making a speedy and smooth transition to the new accounting system, based on the principles promulgated by MOF in 1993 and upgrading its financial management system, including provision of software and hardware, as well as enhancement of its staff skills, would be included (para. 5.8 and Annex 5.3). Training in modern financial management, including international accounting practices, would also be provided to senior managers and financial staff of JPEPC (para. 5.10).

Revaluation of Fixed Assets

3.19 The Chinese traditional accounting system has not required revaluation of fixed assets. In the past, the revaluation of assets probably would not have had a major impact on enterprises' financial status because of low inflation and low foreign content in existing assets. However, with recent inflation and the depreciation of the renminbi, the need to revalue assets is more compelling. Under the revised accounting principles, enterprises in certain categories such as joint ventures with foreign partners or merged enterprise will have to undertake asset revaluation. Regular revaluation of fixed assets is recognized in China as being essential for the future corporatization of power entities and for a better foundation for managing state assets. Following the guidelines for how to undertake asset revaluation issued by the State Council in 1993, all power entities in China are revaluing their fixed assets. A pro-forma revaluation of JPEPC's assets (using projected domestic inflation rates as indexes to revalue JPEPC's assets with a steep increase of 50 percent in 1993) was performed during appraisal of the proposed project. The resulting estimated average rate of return on assets for the period 1993 through 2002 fell to 12.3 percent, compared to 20.3 percent on a historically valued basis.

G. AUDIT

External Audit

3.20 The State Audit Administration (SAA) was established in 1983 and given the status of a ministry reporting directly to the State Council. In addition, provincial audit bureaus have been established in each province and large municipality. The audit regulations and standards prepared by MOF are based on international auditing practices and were promulgated by the State Council on October 21, 1988. Audits of Bank-financed projects have been conducted by SAA's Foreign Investment Audit Bureau or one of the Provincial Audit Bureaus (PAB) under its guidance. The audits have focused on enterprises with foreign participation in the form of equity or loan financing. SAA and PABs have been receiving training supported by the Bank Group-financed Technical Assistance Credit.

3.21 Under the proposed project, JPEPC's accounts will be audited by Jiangsu Provincial Audit Bureau under the supervision of SAA. This arrangement is satisfactory. *Assurances were obtained from JPEPC that: (a) it would maintain and provide the Bank with semiannual progress reports with unaudited project accounts in a format to reflect project expenditures of the period under report and accumulated to date; and (b) it would*

furnish the Bank with the audited project accounts, statements of expenditures, and financial statements of JPEPC within six months after the end of each fiscal year. In addition, Jiangsu Provincial Audit Bureau would be required to: (a) include in the audited financial statements a summary of any differences in the basis of accounts due to the conversion to new accounting policies; (b) provide a management letter summarizing any significant errors that may have been discovered during the audit, and any major weaknesses in internal control; and (c) provide on request a copy of its audit plan.

Internal Audit

3.22 JPEPC has developed an internal auditing section (staffed with qualified accountants) that periodically examine the accounts of each operating unit. The objective of these examinations is primarily to test for accuracy and compliance with MOF regulations. The internal auditing section is not expected to review the appropriateness of accounting regulations or procedures; such reviews are considered to be the responsibility of MOF and MOEP. However, the section will serve as liaison between external auditors and the project entity. The Bank will review the internal auditing function during project implementation with a view toward increasing its efficiency and usefulness to JPEPC.

H. Billing and Collections

3.23 As of December 31, 1992, electricity consumption in Jiangsu Province, distributed according to the consumer categories, is shown in Table 3.1. Details of the sales and average price by category of consumers are given in Annex 2.5.

Table 3.1: Electricity Consumption in Jiangsu Province
(1992)

Customer category	Consumption (GWh)	%
Heavy industry	27,953	55
Light industry	10,875	21
Agriculture	5,733	11
Residential	3,691	7
Commercial	601	1
Others	2,039	5
Total	50,892	100

3.24 JPEPC conducts its billing and collection activities through twelve power supply units. All major industrial consumers receiving supply over 320 kVA are charged in advance three times per month at approximate 10-day intervals. The last two bills, rendered on about the sixteenth and twenty-fifth days of the month, are based on estimated usage derived from the consumer's contractual power consumption. The first bill,

rendered on about the sixth day of the month, is also based on estimated usage but includes an adjustment to reflect the previous month's actual usage as computed from a meter reading. All other customers are billed once a month based on actual usage.

3.25 Industrial, commercial and bulk consumers pay their bills through direct debit from their bank accounts. Urban residential and low voltage agricultural consumers receiving power directly from JPEPC render payments to local branches of the National Bank. Payment is due within five days of receipt of the bill. Regulations stipulate that consumers who do not pay within this period are to be charged a fine of 0.03 percent per day of delay, and that after several notices those who still refuse to pay their bills are to be disconnected from the power supply. These billing and collection arrangements have established a reliable cash flow from sales. It is expected to bring JPEPC's accounts receivable down from an average collection period of 42 days in 1992 to within one month by 1995.

4. THE POWER MARKET AND PROGRAM

A. The Jiangsu Power Grid

4.1 The proposed project would be located in Jiangsu Province, which is experiencing remarkable economic growth; its industrial output increased in 1992 about 27 percent in spite of acute power shortages. Many problems with power supply in the area have so far been averted by improved power subsector performance, especially energy conservation and load management measures. Also, increased capacity will be needed in view of the Government's open-door policy in the East China area and the consequent foreign investments and private sector developments, which require an adequate supply of high quality power. The East China area is expected to match, and in some respects surpass, the degree of market orientation that Guangdong Province already displays.

4.2 In 1992, the Jiangsu Power Grid (JPG) had a total installed generating capacity of 8,280 MW, almost all coal-based, and only 24 MW of hydropower (Annex 4.1). The generating facilities include 16 thermal power plants owned by JPEPC and the Province, and a number of captive and other plants. Major power generating plants greater than 50 MW in installed capacity are described in Annex 4.2. The captive power plants total about 1,551 MW in installed capacity. Electricity generated in the province in 1992 amounted to 47,408 GWh. JPEPC's operated power plants produced 32,601 GWh, about 70 percent of the total.

4.3 The transmission system in Jiangsu Province in 1992 consisted of 740 km of 500 kV lines, 4,760 km of 220 kV lines, and 7,025 km of 110 kV lines. JPEPC owns and operates all 500 kV, 220 kV, and 110 kV lines. The system also includes transformer substations, with a total capacity of 28,659 MVA (Annex 4.3).

4.4 The growth of energy requirements in JPG between 1985 and 1992 is shown in Annex 4.4 and summarized in Table 4.1. JPG's peak demand has increased more rapidly than energy requirements. The system has a maximum daily load factor of about 88 percent and an annual load factor of 77 percent. The peak load usually occurs in August.

4.5 In 1992, electricity consumption of the JPG amounted to 50,892 GWh; of which industry, 76 percent; agriculture, 11 percent; residential, commercial and other municipal customers in the cities, 12 percent; and the transport/telecommunication sector, 1 percent. Energy consumption by consumer categories for JPG in the period 1987-92 is shown in Annex 4.5.

Table 4.1: LOAD GROWTH OF JIANGSU POWER GRID (JPG)

Year	Energy requirement (GWh) /a	Peak demand (MW)
1985	27,800	4,033
1986	30,615	4,436
1987	33,677	4,880
1988	36,191	5,368
1989	37,437	5,905
1990	40,687	6,495
1991	44,866	7,145
1992	50,892	7,859
Average annual growth	9.61%	10.11%

/a On a provincial basis, including generation and purchased energy.

B. LOAD FORECAST

4.6 Load forecasts for the years 1993 through 2002 have been developed as part of the economic planning process carried out by JPEPC. The forecasts were obtained by applying a combination of statistical methods and planning targets to every major consumer category. In particular, industrial loads were estimated on the basis of a market survey and the projected industrial output growth and electricity intensities for different categories of industry. Rural loads were estimated based on past trends for drainage and irrigation, rural industries loads, and lighting. Municipal loads were estimated based on market surveys of hotels, buildings, and government projects. Specific demand management and energy conservation measures have been fully incorporated in the load forecasts. Details of the energy forecasts for JPG are given in Annex 4.6 and summarized in Table 4.2.

4.7 The load growth forecasts appear to be on the high side. However, JPEPC claims that (a) power shortages have been occurring for a long time, so there is likely to be a lot of suppressed demand for electricity; and (b) Jiangsu Province has been one of the fastest growth areas in China. Its GNP increased by about 10 percent a year in real terms between 1985 and 1991 and is expected to continue to grow by about 11 percent a year over the next decade. To sustain this growth, electricity supply should expand at about the same rate (an elasticity coefficient of about 1.0).

C. POWER DEVELOPMENT PROGRAM

4.8 East China is short of hydroelectric potential and the expansion of generating capacity, therefore, will be virtually entirely based on thermal power stations. A study of the least-cost investment program was made by the Beijing Economic Research Institute for Water Resources and Electric Power (BERIWREP) in 1992 and revised in 1993. The study is based on an optimization of the JPG, including least-cost expansion alternatives

Table 4.2: LOAD FORECAST FOR JIANGSU POWER GRID (JPG) /a

Year	Energy requirement (GWh)	Peak demand (MW)
1993	57,000	8,900
1994	63,500	10,000
1995	70,200	11,200
1996	78,000	13,000
1997	88,000	14,500
1998	99,000	16,500
1999	110,000	18,400
2000	121,000	19,800
2001	133,000	21,500
2002	139,000	23,000
Average annual growth	11.1%	11.3%

/a On a provincial basis.

for the period 1993-2003. The analysis shows that the development program for JPG should be based primarily on the construction of large coal-fired base load thermal power plants. The study also confirms that there are no other alternatives better than the proposed project (para. 7.5) to meet the future power supply requirements.

4.9 A summary of the power development program (1993-2002) for the JPG system is given in Annex 4.7. The balances between power demand and supply are presented in Annex 4.8. They demonstrate that the power system will be short of energy supply and capacity up to the year 2002. Therefore, the system load growth would be controlled by the available generating capability. Under the presently proposed power development program, it can sustain a growth rate of about 10 percent a year over the next decade, instead of 11 percent under unconstrained power supply capability.

5. THE PROJECT

A. Project Objectives

5.1 The proposed project is consistent with the Government strategy of modernizing the power subsector and improving its efficiency. The main objectives of the project are to: (a) support the implementation of institutional and structural power subsector reforms at the provincial level, through development of JPEPC as an autonomous company; (b) contribute to further rationalization of the power tariff structure through implementation of a program to simplify the existing complex tariffs; (c) promote applications of more transparent and efficient financial management techniques to assist in transforming the provincial power company's accounting system; (d) provide cost-effective and environmentally sustainable additional generation capacity to alleviate a current acute shortage of power, meet the future power demand growth, and improve the quality of the power supply in Jiangsu Province and the East China power system by the construction of the Yangzhou thermal power plant and associated facilities; (e) assist in transferring new technologies for large coal-fired thermal power plants in China, applying modern power system operation methods, and strengthening institutional capabilities for environmental management and monitoring; and (f) extend technical assistance in management development and staff training programs.

B. Project Description

5.2 The proposed project is located about 11 km from Yangzhou city in Jiangsu Province, and close to the major load centers in East China. Its site has favorable topographical conditions and easy access by railroads, highways and river navigation. In its initial phase the Yangzhou thermal power plant will have an installed capacity of 1,200 MW (2 x 600 MW). In the second phase, if and when developed, the site could reach an ultimate capacity of 2,400 MW. The power plant will consume up to four million tons of coal a year. Coal from the Shenfu-Dongsheng coal mines in Inner Mongolia will be supplied to the plant through a newly built railroad to a new port (Huang Hua) in North China, and then by sea and river transportation to the special coal jetty near the plant site. The basic coal characteristics are: low calorific value—about 5,100 kcal/kg, ash content—15.5 percent, and sulfur content—0.31 percent. The plant site is very close to the Yangtze River, which can fully meet the water demand for the makeup and cooling requirements of the power plant. Two 500-kV transmission lines to the Jiangdu substation will connect the power plant with the East China power system.

5.3 The project consists of:

(a) construction of a coal-fired thermal power plant with two 600-MW generating units and associated equipment and facilities;

(b) erection of two 500-kV transmission lines (about 30 km long) and reinforcement of the existing power transmission network;

(c) engineering and construction management services;

(d) environmental management and monitoring program;

(e) resettlement program;

(f) assistance for the development and implementation of improved accounting and financial management information systems; and

(g) management development and training.

A detailed description of the project components is given in Annex 5.1.

Project Origin and Design

5.4 The proposed project was first brought to the attention of the Bank in October 1991 by the Government. An identification mission visited the project in October 1992. The project feasibility study and design report were prepared by the East China Electric Power Design Institute (ECEPDI) in 1986, and revised and updated in 1992. The project was approved by the SPC in 1992. An Environmental Assessment Report (EAR) was prepared in 1993 by ECEPDI in accordance with the Chinese and Bank environmental review procedures and guidelines for thermal power projects. The EAR has been approved by all Government authorities, and its summary was distributed to the Executive Directors on May 6, 1993. The design of the project is at an advanced stage, and appears to be satisfactory in its overall concept.

Consulting Services

5.5 ECEPDI has been retained by JPEPC to assist in detailed design and project implementation. It is one of the most experienced design institutes in China, and has completed the design of several large thermal power projects. ECEPDI has over 2,000 professional staff and is equipped with modern facilities and laboratories. International engineering consultants have also been selected in accordance with the Bank Guidelines for the Use of Consultants. The JPEPC's engineering staff have visited a number of large coal-fired thermal power plants and shared experience in building large and complex thermal power projects.

5.6 The consulting services for the project comprise two stages. For Stage I, the Government has approved $2.2 million out of the CRISPP (Credit 2447-CHA) funds for financing services of expatriate consultants for project preparation, implementation scheduling, and procurement of works and goods. In Stage II, the expatriate consultants will assist in the interfacing of engineering and design components for different power plant islands, in reviewing detailed drawings, technical documents submitted by the manufacturers of procured equipment, and will provide support in construction management of the power plant.

5.7 Due to the magnitude and complexity of the project and the expected use of various equipment suppliers, as well as foreign financing sources, JPEPC will continue to employ professional international consultants throughout the entire project implementation period to assist in managing project construction. The scope of work for the consultants will include contract administration, cost control, scheduling, construction inspection and quality assurance, design engineering services, and construction site administration. Terms of reference for these services are given in Annex 5.2. The total cost of engineering services is estimated to be about $11.6 million, of which $6.3 million is in foreign exchange. These costs include about 300 staff-months of foreign consultants' services.

Accounting and Financial Management Information Systems

5.8 JPEPC will develop more modern computerized financial systems that would take account of the new accounting regulations introduced in China in July 1993. These would be eventually established on a computer network serving JPEPC's activities. JPEPC also plans to send its representatives to visit other countries to obtain a better idea of accounting and financial systems being used elsewhere. The scope of the assistance to develop the modern accounting and financial systems, together with the terms of reference, is given in Annex 5.3. *Assurances were obtained from JPEPC that it would engage management consultants by December 31, 1994, to assist the development and implementation of improved accounting and financial management systems based on terms of reference agreed with the Bank.*

Management Development and Training

5.9 To meet the long-term needs of JPEPC's staffing requirements and to further develop JPEPC's management capability, a comprehensive training program is included under the proposed project. It consists of the following: (a) training in utility management and financial planning; (b) project-related training for technical staff; and (c) upgrading and equipping of JPEPC's training facilities.

5.10 High level management, planning and financial staff will receive training in modern management and decision-making techniques, particularly in utility management, planning of investments, engineering economics, power pricing, financial operations and management information systems. Engineering personnel will also receive training in their specific fields, especially related to large thermal power projects, such as construction management, plant operation, control and load dispatching of the power grid, etc. Part

of the training will be carried out in China in the form of seminars, conducted by Chinese and foreign experts. This will then be followed by study tours and overseas training through visits to a few selected utilities and modern coal-fired power plants.

5.11 Project-related training will include: (a) on-the-job training for the engineering and construction management staff to be implemented by working together with the foreign consultants; (b) training of engineering staff under the contract for major plant equipment; and (c) training of operation and maintenance staff at other similar thermal power plants in China and abroad. The cost of such training will be included in the equipment contracts.

5.12 It is estimated that 384 staff in various fields, totalling 810 staff-months, will be trained abroad and in China. About 80 staff members, with total staff-months of 160, will be trained abroad, of which 20 staff-months are for senior management, 10 staff-months for legal staff, 60 staff-months for technical, 40 staff-months for financial, 20 staff-months for environmental staff, and 10 staff-months for training of trainers (see Annex 5.4 for details). In addition, 126 people will receive training by foreign suppliers of goods and services. *Assurances were obtained from JPEPC that it would carry out the management development and training program as agreed with the Bank.*

C. Cost Estimate

5.13 The total cost of the project is estimated at $832.7 million equivalent [excluding interest during construction (IDC)], of which $472.2 million (57 percent) represents the foreign exchange component. The detailed project cost estimates are available in the Project File. The cost estimates reflect early 1994 prices and are based on the recent tendering information available for similar projects, including prices of bids for major generating equipment and control systems. Physical contingencies are calculated at 10 percent for preparatory and other works, local cost of equipment and services, and 5 percent for the costs of plant equipment and materials, and transmission facilities. Price-contingency allowances for foreign costs estimated in US dollars are calculated according to anticipated international price increases of 2.5 percent a year on average for the period 1994-2000. The price escalation for costs expressed in local currency is calculated according to projected domestic inflation rates of 12.0 percent for 1994, 9.0 percent for 1995, 8.0 percent for 1996, 7.2 percent for 1997 and 6.5 percent thereafter.

D. Financing Plan

5.14 The total financing requirements (including *IDC* of *$248.6* million equivalent), are estimated at *$1,081.4* million equivalent. SEIC, Jiangsu Provincial Investment Company (JPIC), Yangzhou Municipal Investment Company (YMIC), and JPEPC would share the financing of the local costs, IDC, and principal repayments of the Bank loan during the project implementation period. Their contribution to the local project financing has been confirmed to be as follows: SEIC—30 percent of the total; JPIC—25 percent; YMIC—35 percent, and JPEPC—10 percent. It has also been agreed that part of the total domestic financing (Y 300 million) would be in the form of equity, and the

balance in the form of loans. The loans will have a variable interest rate (currently 11.16 percent a year) and 15 years maturity, including five years' grace. The equity contribution will enhance the capital structure of the project entity and represents an important step for enterprise reform in the power subsector. The local financial arrangements are acceptable to the Bank.

5.15 The proposed Bank loan of $350.0 million, together with ECO cofinancing of $120 million, will cover all foreign costs, excluding IDC. Details of the financing plan are summarized in Table 5.1. The Bank loan will be used to finance the following project items:

(a) major power plant equipment, including boilers, turbine-generators, and instrumentation and control islands;

(b) 500-kV electrical equipment;

(c) construction equipment and materials;

(d) consulting services for engineering and construction management;

(e) environmental management program;

(f) development of accounting and financial management systems; and

(g) management development and training.

Table 5.1: FINANCING PLAN FOR THE PROJECT
($ million equivalent)

	Local cost	Foreign cost	Total cost
State Energy Investment Corporation (SEIC)	162.8	20.0	182.8
Jiangsu Provincial Investment Company (JPIC)	135.7	16.6	152.3
Yangzhou Municipal Investment Company (YMIC)	189.9	23.3	213.2
Jiangsu Provincial Electric Power Company (JPEPC)	54.3	6.6	60.9
Expanded Cofinancing Operation (ECO)	0.0	120.0	120.0
IBRD	0.0	350.0	350.0
IDA (CRISPP)	0.0	2.2	2.2
Total	542.7	538.7	1,081.4

5.16 The proposed ECO is expected to meet one of the key objectives of the project, through establishing the beneficiary's direct access to the international financial markets. MOF and JPEPC have accepted the idea of two-tranche financing in US dollars and Japanese yen to take advantage of a wider participation from the markets and low fixed

interest rates. Borrowing in two currencies would put JPEPC in a better position to deal with the foreign exchange risk during project implementation and operation period over 15 years. The floating rate dollar tranche provides the benefit of the low interest rate prevailing in the short-term dollar market (current six-month LIBOR is 3.25 percent). The yen tranche would be with a fixed interest rate for the initial 10 years (currently 3.8 percent). The tentative structure of ECO assumes that the Bank guarantee would be callable on an accelerating basis for the later maturity (from the tenth year onward). The Bank's exposure calculated on the present value basis under this assumption would be approximately $30 million equivalent, or 25 percent of the total ECO financing of $120 million. Details of the ECO cofinancing structure and the schedule for processing are given in Annex 5.5.

5.17 The proposed Bank loan will be made to the People's Republic of China at the Bank's standard variable interest rate for a 20-year term, including five years' grace. Proceeds of the loan would be onlent from the Government to JPEPC with terms and conditions satisfactory to the Bank. *Assurances were obtained from the Government that it would onlend the proceeds of the proposed Bank loan to JPEPC under a subsidiary loan agreement with a term of 20 years, including a 5-year grace period, at the Bank's standard variable interest rate.* JPEPC will bear the foreign exchange risk. *Execution of the subsidiary loan agreement between the Government and JPEPC, and approval of the Loan Agreement by the State Council will be conditions of effectiveness for the loan.*

E. PROCUREMENT

5.18 In the past, the main issues in connection with procurement of works and goods in the power subsector in China included reluctance to use consulting services, delays in the procurement process and in domestic contract approval, lack of coordination and clarity of responsibility among agencies involved in the procurement process, and very often inappropriate contract packaging. However, significant improvements have been made more recently in the sphere of procurement and these are expected to be continued under the proposed project. Expatriate engineering consultants will assist the Chinese in the procurement process, and the Model Bidding Documents following the Bank's Standard Bidding Documents, would contribute to efficient procurement. Necessary efforts are also being made to improve coordination and avoid undue delays in the procurement process. The project's civil construction works (not financed by the Bank) will be procured through local competitive bidding (LCB). Project circumstances justify the use of LCB for these works, since foreign bidders are not expected to be interested in civil works that are labor-intensive, contract values are not large enough, and local prices are well below the international market. Furthermore, Chinese contractors are well-experienced and competent in carrying out such construction works. If foreign firms wish to participate in LCB for these works, they would be allowed to do so in accordance with local procedures, which are acceptable to the Bank and considered appropriate for the efficient execution of the project.

5.19 Major equipment, including two 600-MW units, will be procured through ICB. Goods manufactured in China will be eligible for a preference in bid evaluation of

15 percent of the c.i.f. price or the actual import duty, whichever is lower. Some specialized equipment estimated to cost less than $300,000 per contract up to an aggregate amount of $6 million will be procured through limited international bidding (LIB) in accordance with the Bank's Procurement Guidelines. Goods, instruments and accessories needed for construction and operation of the power plant, including equipment for environmental monitoring and training, estimated to cost less than $300,000 per contract up to an aggregate amount of $3 million will be procured by shopping or through direct negotiations with suppliers. Consulting services will be obtained following the Bank's Guidelines for the Use of Consultants. The Model Bidding Documents for Procurement under ICB and LCB in The People's Republic of China would be used to the maximum extent possible. All procurement documents pertaining to bidding packages for goods financed by the Bank and estimated to cost more than $5.0 million equivalent will be subject to the Bank's prior review procedures (about 95 percent of Bank's funded purchases). Although the Bank will not finance the civil works (para. 5.18), they have to be carried out efficiently, on time, and within a budget that will satisfy the economic and financial parameters of the operation. The proposed procurement arrangements are summarized in Table 5.2, and the related procurement schedules for various packages are given in Annex 5.6.

F. Project Implementation

5.20 JPEPC will be responsible for project implementation and operation. A specialized construction unit has been established to manage site construction activities. Its organizational structure is shown in Chart 3. Preparatory works including access roads and construction power supply have been started in 1992 and are progressing satisfactorily. The bidding documents for the procurement of the main electromechanical equipment and control system were issued in December 1993 to be opened in April,1994. The commercial operation of the first generating unit is expected in late 1998, and the second unit by the end of 1999. Thus, the project completion date would be December 31, 1999 and the closing date of the Bank loan would be December 31, 2000. Chart 4 presents the implementation schedule for the various components of the project. Furthermore, key dates of project implementation are given in Annex 5.7, and estimated annual contractual and other payments are summarized Table 5.3.

G. Disbursement

5.21 The Bank loan will be disbursed against: (a) 100 percent of the foreign expenditures for directly imported equipment and materials quoted on a c.i.f. basis; (b) 100 percent of local expenditures ex-factory for locally manufactured items, and 75 percent of local expenditures for other items procured locally; and (c) 100 percent of the expenditure for consulting services and training. For expenditures pertaining to (a) training; and (b) contracts for goods and works valued at less than $400,000 equivalent, reimbursement will be made on the basis of Statements of Expenditures. Documentation supporting such expenditures would be retained in the JPEPC office and made available for review by the Bank's supervision mission. To facilitate disbursements under this project, a Special Account will be established with an authorized allocation of $15 million, representing

Table 5.2: SUMMARY OF PROPOSED PROCUREMENT ARRANGEMENTS
($ million)

Project item	Proposed Method			Total project costs
	ICB	Other	NBF /a	
Works				
Preparatory works	-	-	2.5	2.5
Land acquisition & resettlement	-	-	23.4	23.4
Civil works	-	-	87.4	87.4
Harbor works	-	-	21.3	21.3
Goods				
Plant equipment, materials & systems	591.5 (329.0)	9.0 (9.0)/b	-	600.5 (338.0)
Transmission network	-	-	64.2	64.2
Services				
Construction administration	-	-	15.6	15.6
Engineering services	-	9.7 (6.2)	-	9.7/c (6.2)
Environmental program	-	1.2 (0.9)	-	1.2 (0.9)
Accounting and financial MIS	-	2.9 (1.7)	-	2.9 (1.7)
Training	-	4.0 (3.2)	-	4.0 (3.2)
Total	591.5 (329.0)	26.8 (21.0)	214.4 (0.0)	832.7/c (350.0)

/a NBF = Not Bank Financed.
/b LIB and shopping for minor equipment and instruments, and direct negotiations with suppliers for training and environmental monitoring equipment.
/c Includes the CRISPP-related financing.

Note: Figures in parentheses are the respective amounts financed by the Bank loan.

approximately four months of average project disbursements. Applications for replenishment will be submitted monthly or when the amounts withdrawn equal 50 percent of the initial deposit, whichever comes sooner. Annex 5.8 presents the disbursement schedule for the proposed Bank loan as well as a standard profile of disbursements for all sectors in China. The disbursements are expected to be completed in six years, very close

Table 5.3: Implementation Schedule: Estimated Annual Contractual and Other Payments
($ million equivalent)

Project element	Project Year /a								Total payments	Remarks
	1993 & before	1994	1995	1996	1997	1998	1999	2000		
Works										
Preparatory works	2.5	-	-	-	-	-	-	-	2.5	LCB
Land acquisition and resettlement	19.3	4.1	-	-	-	-	-	-	23.4	NBF
Civil works	-	6.4	17.0	19.0	18.1	12.4	9.0	5.6	87.4	LCB
Harbor works	1.2	4.5	5.1	4.1	3.1	3.3	-	-	21.3	NBF
Goods										
Power plant equipment, materials and systems	-	44.5 (33.7)	37.4 (5.9)	151.9 (97.0)	198.0 (127.5)	1,05.5 (54.8)	52.3 (19.0)	11.1	600.7 (337.9)	ICB
Transmission system	-	4.8	13.6	15.3	12.4	9.3	8.8	-	64.2	NBF
Services										
Construction management	-	1.5	2.1	3.4	2.8	2.6	2.3	1.0	15.6	NBF
Engineering services	-	0.9 (0.6)	1.3 (0.8)	1.4 (0.9)	1.7 (1.1)	2.2 (1.4)	1.6 (1.0)	0.5 (0.3)	9.7/b (6.2)	Other
Environmental program	-	-	-	0.4 (0.3)	0.7 (0.6)	-	-	-	1.2 (0.9)	Other
Accounting and financial MIS	-	-	0.3 (0.2)	0.6 (0.3)	0.7 (0.4)	0.7 (0.4)	0.6 (0.6)	-	2.9 (1.7)	Other
Training	-	-	0.4 (0.3)	0.8 (0.6)	0.9 (0.8)	0.9 (0.7)	0.7 (0.6)	0.3 (0.2)	4.0 (3.2)	Other
Total	23.0 (0.0)	66.7 (34.3)	77.1 (7.2)	196.7 (99.2)	238.5 (130.4)	136.8 (57.3)	75.3 (21.0)	18.7 (0.7)	832.7 (350.0)	

/a Based on calendar year.
/b Includes the CRISPP-related financing.

Note: Figures in parentheses are the respective amounts financed by the Bank loan.

to the standard disbursement profile for China. The last year is for payment of retention money.

H. Environmental Considerations

5.22 In accordance with OD 4.01 (Environmental Assessment), the project has been assigned to Category A. The EAR (para. 5.4) has been approved by the Environmental Protection Bureau of Jiangsu Province, MOEP and the National Environmental Protection Agency. The EAR has been reviewed by the Bank; it is considered that all environmental aspects of the project are satisfactorily addressed and in compliance with all environmental policies and procedures. The project has been designed and will be carried out in accordance with current technological practices and it is expected to cause minimum disturbance to the environment.

5.23 The project is a greenfield operation, located in a semirural agricultural area near the bank of the Yangtze River. Alternative locations for the power plant and ash disposal sites had been considered. The selected site requires the least amount of land, affects the least number of people, and offers the smallest impact on the natural and human environment. Also, appropriate technologies will be applied in the power plant design, such as low NO_x burners. Furthermore, the power plant layout provides enough space to enable installation of additional pollution control devices if required in the future as a result of changes in standards and new technological developments. Annex 5.9 presents the environmental management program, including a summary of key environmental issues associated with the project and their anticipated impacts, the mitigating plan to assure these impacts are minimized, and the monitoring program with which environmental impacts will be measured and compared with the predictions in the EAR. Strengthening of JPEPC's institutional capabilities for environmental management will be carried out under the JPEPC management development and staff training program (para. 5.12). Monitoring equipment in an amount of $0.8 million will also be provided under the proposed project.

5.24 Environmental issues associated with the project and addressed in the EAR have been discussed at public meetings that were held by the Yangzhou Municipality. The local public and authorities supported the project and the recommended mitigating measures offered in the EAR. The mitigation plan recommended in the EAR will be fully implemented.

5.25 Key issues investigated in the EAR include: air pollution (dust, sulfur dioxide, nitrogen oxides, and fluorides), water pollution (primarily thermal discharges and residual chlorine from the once-through cooling system), coal transport and handling, ash disposal management, worker health and safety, transmission line impacts (electric field, noise, and bird flight), barge collision risks, and the influence of the construction labor force on the local infrastructure. All mitigating measures for air, water, and land impacts are designed to meet appropriate Chinese requirements and/or World Bank environmental guidelines whichever is stricter. In the absence of either, international standards or codes of practice will be utilized.

5.26 All environmentally related issues considered were deemed manageable, and, with the mitigation plan offered in the EAR, should result in a minimum environmental impact by the project. *Assurances were obtained from JPEPC that it would carry out the environmental management program in a manner satisfactory to the Bank.*

I. Resettlement Aspects

5.27 The proposed project will require acquisition of about 179 hectares of farmland and relocation of 1,053 households, affecting about 4,500 people. According to the resettlement program and action plan the affected people and communities will be compensated generously according to both national and local regulations (up to 20 times of the gross output of land). A well-organized environmental and resettlement unit has also been set up by the Yangzhou municipality and JPEPC to handle the resettlement planning and implementation. Arrangements for relocation, which have been made through a participatory process with land users and local authorities, appear to be satisfactory. The Chinese have had extensive experience with World Bank policies and requirements for resettlement, and have, in the past, achieved good results in their implementation. A resettlement plan, including details of land acquisition is presented in Annex 5.10.

5.28 Institutional strengthening of the resettlement unit is included in the project. In addition, an experienced resettlement team from the National Research Center for Resettlement of the Hehai University in Nanjing has been actively involved in the preparation of the resettlement program and related action plan. The monitoring of progress in the resettlement and rehabilitation program will be subcontracted by JPEPC to this Center. *Assurances were obtained that JPEPC would carry out relocation of persons affected by the project in accordance with a resettlement plan acceptable to the Bank.*

Project Risks

5.29 Project construction risks are within reasonable limits and would be manageable given the continuous supervision arrangements, involving foreign and Chinese consultants, that have been put in place. Particular attention will be given to safety aspects of the project, and to capabilities and performance of major contractors. The economic risks, if any, would be minimal (para. 7.10). The financial risks may result from joint financing. However, proper financial arrangements have been made to avoid these risks. The project's nonquantitative risks (including institutional) are considered to be minimal. The borrower and beneficiary will ensure the proper coordination of all project participants and delineation of authorities. Other potential risks could include the continuity of goods supply, funding shortages, contract management difficulties, and effective implementation of the environmental program. No major environmental problems are expected under this project, and the implementation of the proposed environmental management program (including a monitoring process) would assure the adequate quality of the environment at the project site and in the nearby areas.

Monitoring and Reporting

5.30 Satisfactory procedures for monitoring, evaluating, and reporting on the project have been agreed by JPEPC. The Bank would be furnished with semiannual and annual project progress reports. The timely implementation of the project is critical and depends on adequate financial resources being made available when needed. For this reason, the annual project progress reports would include, inter alia, JPEPC's proposals regarding project costs and financing plan for the following year. The scope and content of the project progress reports have also been agreed. In view of the experience with similar power projects in China, regular project supervision would be required. Bank supervision input into key activities is presented in Annex 5.11, and a framework for project monitoring and reporting in Annex 5.12.

6. FINANCIAL ASPECTS

A. INTRODUCTION

6.1 JPEPC follows MOF financial regulations applying to state enterprises. Under the current system, JPEPC's operational budget and investment projects over Y 10 million require approval by the Government, its tariffs are largely set by and a significant share of its surpluses are remitted to the Government. The Government, for its part, provides a share of investment funds for approved projects. Historically, such funds were fully provided by the Government and were on a grant basis. Starting from the early 1980s, government grants have been replaced by loans through the People's Construction Bank of China, first at subsidized rates, and more recently at rates very close to commercial ones for new investments. These financial arrangements have a number of shortcomings, notably the inadequacy of resource mobilization for sector development and inadequate financial accountability and discipline in power entities.

6.2 Before the contract responsibility system was introduced in 1987, power entities had very little financial incentive to increase tariffs or improve their efficiency, because once a power entity had sufficient revenues to meet the costs charged directly to the operations and all special fund allocations and debt service, any additional revenues were remitted to the Government through sales (25 percent), income (55 percent after debt service), and adjustment (28.5 percent) taxes as well as other levies. This system left power entities with almost no internally generated funds to finance new investments other than small renovations. Consequently, a conservative and passive approach was taken by many power entities. Actual capital expenditures fell far short of requirements and severe shortages of electricity have been experienced.

6.3 However, this system has been evolving as part of the ongoing economic reforms. Beginning from 1987, the contract responsibility system was put in place to increase autonomy and accountability of enterprises. In the case of JPEPC, the existing contract that covers the period 1991-93 requires JPEPC to submit a fixed amount of income and adjustment tax to the Government each year, Y 115.9 million in 1992. In return, JPEPC has agreed to carry out all technology renovation projects at given costs in accordance with specific parameters, in particular, the unit coal consumption target. In addition, the compensation of JPEPC's employees is linked to electricity sales and production costs. Starting from 1992, power entities are allowed to accelerate depreciation of fixed assets by 20 percent to increase their self-financing capability and, by 1993, they are exempt from submitting 25 percent of the depreciation funds to the Government. However, power entities still have to rely on tax exemptions and lax debt repayment schedule to maintain their operations and only retain about 5-7 percent of their net income for future expansion program.

6.4 Compared with those newly established independent corporations, such as Huaneng, Sunburst, and others, the level of autonomy over planning, financing, and investment enjoyed by JPEPC and other provincial power companies is still very limited. Unlike provincial power companies, the former are permitted to set power prices at actual cost, including debt service at an accelerated amortization schedule, plus a reasonable profit, to retain their profits, and to reinvest them in new developments, and thus have more incentive to increase their efficiency.

6.5 The authorities are aware of the above systemic issues. In the absence of deepened enterprise and fiscal reforms, the gap in financing the required sector investment would continue to increase in the 1990s. As a first step, they are committed to including the power sector in the categories governed by the guiding principles of "regulation on transforming the operating mechanisms of stated-owned industrial enterprises" promulgated in July 1992 by the State Council that gives enterprises 14 management rights, including financing, investment, and assets management rights. Secondly, SPC and MOEP jointly issued in August, 1993 a set of detailed principles and regulations for setting "the state based prices" by all provincial and municipal power entities. In principle, power entities are allowed to incorporate the principal and interest payments in their prices retroactive to April 1, 1993. In practice, there will be a phase-in period to have the full debt service requirements reflected in the prices. This new policy actually guarantees a breakeven position for power entities and leaves them with all the depreciation funds for new investments. Therefore, it will encourage power entities' managers to take a more aggressive approach in investments. In JPEPC's case, it calls for an increase of 9.1 percent per year in the average price of electricity during 1994-2002. JPEPC's projected depreciation fund (equivalent to 40 percent of its projected net income) is expected to meet about 16 percent of its projected capital expenditures during 1993-2002.

6.6 The new accounting principles and financial rules effective on July 1, 1993 will also have far-reaching impacts on the sector. First, they require power entities to clarify and separate debt from equity. This is an important step for power entities moving toward limited liability companies and eventually shareholding companies. Diversification of ownership is critical to mobilizing more resources to the sector. Secondly, under the new profit allocation system specified in the new financial rules issued by MOF, the adjustment tax and special fund allocations have been abolished. The management of power entities are given greater autonomy in making decisions on profit distribution. Thirdly, enterprises are permitted to design their own internal accounting and financial management system based on the business needs. Overall, the new financial rules together with other reforms, such as state assets management, fiscal and financial sector reforms, will lead the Government gradually to play a more limited and indirect role in the management of power entities. With new autonomy and increased accountability power entities will also have to improve their budgetary and cost controls as well as cash management in order to stay competitive in a market-oriented environment.

6.7 The Government is currently considering an overhaul of the fiscal policies, with particular focus on how to replace the contract responsibility system with a transparent and simplified tax system. At latest starting from January 1, 1996, a corporate

income tax rate of 33 percent would be applied to the East China Power Group, including JPEPC. The Government will then only collect income tax from enterprises based on a unified rate and dividend distribution for Government equity contribution in enterprises would be decided by the management and Board of Directors. The new tax policy does not necessarily mean that the tax and remittance burden for power entities will be reduced. However, it eliminates the lengthy and complicated negotiations between enterprises and the Government. More importantly, it is really conducive to strengthening power entities' planning and financial management functions.

6.8 JPEPC's financial performance in the past was generally satisfactory. However, as the details of many critical reforms, such as property rights, investment, fiscal, financial, trade, are still being formulated, considerable uncertainties relating to the specific parameters would affect JPEPC's future finances. Therefore, strengthening the financial management holds the key for JPEPC to perform its increased financial role efficiently and effectively. Toward this end, the proposed project would continue the process of institutional building already initiated under previous Bank-financed projects, including (a) a component to improve and upgrade JPEPC's accounting and financial management system (para. 5.8); (b) training in financial management for JPEPC (para. 5.12); and (c) agreements with JPEPC on financial performance targets that would provide a framework for financial discipline (para. 6.11).

B. JPEPC's Past and Present Financial Performance

6.9 JPEPC's income statements, fund flow statements and balance sheets for the period 1989-92 are set out in Annex 6.1. Salient points and features highlighting its past and present finances are summarized in Table 6.1.

6.10 During the period 1989-92, JPEPC reported modest profits. Its operating revenue in 1992 doubled the level of 1989's due to the higher average tariff and vigorous growth in energy sales. Specifically, JPEPC's sales volume grew by about 32 percent over the three years, but operating revenues increased by more than 100 percent, as a result of an increase of about 52 percent in the average revenues, from 10.60 fen/kWh in 1989 to 16.08 fen/kWh in 1992. Despite these increases, the operating ratio deteriorated from about 74 percent to about 83 percent, indicating that the increase in JPEPC's operating cost, 110 percent in three years, outpaced the increase in average revenues. In particular, the cost for purchased power went up 246 percent in three years, an annual increase of about 51 percent, and accounted for close to one third of the operating costs in 1992 compared with 17 percent in 1989. Moreover, both the fuel and the operating and maintenance costs rose beyond the general price increases. The negative impacts on JPEPC's finances were only partially offset by the robust growth in energy sales and impressive increases in the average revenues. As a result, the rate of return based on historically valued assets also declined from over 10 percent in the mid-1980s to 6-7 percent.

Table 6.1: JPEPC'S KEY FINANCIAL INDICATORS, 1989-92
(Million Yuan)

Year ended December 31	1989	1990	1991	1992	Growth Rate % p.a. (1989-92)
Electricity Sales (GWh)	25,900	27,900	30,200	34,300	9.8
Average Revenues (fen/kWh)	10.63	12.83	14.12	16.08	14.8
Operating Revenues	2750	3,578	4,259	5,509	26.1
Operating Income /a	335	393	341	450	10.3
Net Income	242	279	256	317	9.4
Net Fixed Assets in Operation	3,947	4,400	4,480	4,832	7.0
Capital Expenditure	632	488	1,729	1,444	31.7
Operating Ratio (%)	74.3	78	81.8	82.6	
Rate of Return (%) /b	6.7	6.7	5.8	6.8	
Debt Service Coverage (times)	2.3	1.6	2.3	1.9	
Current Ratio	1.8	1.8	2.1	1.9	
Debt as % of Debt and Equity	33.2	27.4	31.9	28.4	

/a Operating revenues less the aggregate of fuel, power purchases, administration, operation and maintenance, and depreciation.

/b Based on historically valued average net fixed assets in operation. purchases, administration, operation and maintenance, and depreciation.

C. FINANCIAL PERFORMANCE TARGETS

6.11 Traditional performance indicators (such as rate of return and self-financing ratio) have thus far had limited significance in measuring the performance of power entities operating in a centralized financial system. However, as the Government is taking steps to reform rules governing enterprise accounting and financial affairs and to increase the financial autonomy of enterprises, the self-financing ratio will become a very meaningful indicator. At present, the indicator serves as an effective tool to ensure adequate tariff levels. With a view to promoting prudent financial management, *assurances were obtained from JPEPC that it would*:

(a) *take all necessary measures, including but not limited to tariff adjustments, to ensure that its internal cash generation is sufficient to maintain a self-financing ratio of no less than 30 percent from 1994 onwards;*

(b) *not incur additional debt unless a reasonable forecast shows its internal cash generation would provide a debt service coverage ratio of no less than 1.5 times at all times; and*

(c) *by April 30 of each year, commencing in 1995, furnish to the Bank a rolling eight-year financial plan containing projected income statements, statements of sources and uses of funds, and balance sheets.*

D. FUTURE FINANCES

6.12 The projections of JPEPC's finances for 1993-2002 are presented in Annex 6.2, and the salient features of these finances are highlighted below in Table 6.2. The projections are based on the assumptions contained in Annex 6.3. The average prices shown depict the minimum tariff adjustments needed to allow JPEPC to achieve the above financial performance targets.

Table 6.2: KEY FINANCIAL INDICATORS, 1993-2002
(Million Yuan)

Year Ended December 31	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Energy Sales (100 GWh)	386	439	491	530	575	632	713	805	895	923
Average Price (fen/kWh)	25.00	27.17	30.91	34.98	37.58	40.92	45.57	50.47	54.32	54.84
Operating Revenue	9,661	11,918	15,181	18,547	21,622	25,861	32,491	40,608	48,623	50,621
Operating Income	1,851	1,994	2,670	3,804	4,632	5,120	6,671	9,888	12,631	10,616
Annual Capital Expenditures	2,960	3,766	3,949	5,271	8,102	10,476	12,984	13,176	12,238	10,719
Rate Base	10,736	14,019	18,312	22,288	28,607	36,860	43,654	51,289	63,067	75,787
Long-term Debt	3,510	5,332	6,945	9,341	13,862	19,100	25,033	29,655	32,342	33,945
Debt Service	302	440	695	988	1,079	1,024	1,795	3,157	3,972	4,357
Cash in Banks	2,042	2,371	2,863	3,266	3,680	3,920	4,227	5,393	5,687	6,165
Rate of Return on										
Revalued Assets (%)	13.3	9.7	10.1	12.1	11.4	9.7	11.1	14.5	15.1	10.2
Hist. Valued Assets (%)	27.0	19.3	19.3	22.7	19.9	15.7	18.0	23.5	23.7	17.0
Self Financing Ratio (%)	31.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Operating Ratio (%)	71.0	74.4	73.9	71.1	70.2	72.1	71.7	68.0	66.5	71.5
Debt/Total Capital (%)	33.4	38.7	40.8	43.7	49.5	54.0	56.7	56.0	52.3	49.0
Debt Service Coverage	2.2	1.9	2.0	2.0	2.5	3.2	2.4	1.9	1.6	1.5

6.13 The mechanism for tariff adjustments to cover debt service requirements is already built into the existing power pricing system (Annex 2.5). Electricity generated from all new plants invested by JPEPC is being priced, on a plant-by-plant basis, at "debt repayment price" levels, allowing for full debt service based on 10-year payback period after commissioning of new power plants. For plants invested by independent investors, such as Huaneng and Sunburst, in addition to the debt repayment requirement based on even shorter payback period, seven years in Huaneng's case, the pricing formula further incorporates a reasonable level of profitability. These prices are included in the average tariff when the new plants are commissioned. In order to meet the expansion plan and projected cost increases in the future and comply with the financial performance targets set forth above, JPEPC's tariff has to increase by 9.1 percent in current terms or 2.8 percent in real terms a year from 1993 to 2002 and is expected to decline in real terms in 2002.

6.14 During the period 1993-2002, JPEPC is projected to maintain high rates of growth necessitated by the prospective robust economic growth in Jiangsu Province, one of the fastest-growing economies in China. Based on the latest demand forecast and expansion plan assumptions, energy sales are expected to increase by about 169 percent over 1992 levels, representing a compound annual growth rate of about 10.4 percent. JPEPC's annual investment program is expected to expand by more than ninefold over the period, an annual increase of 22 percent. Net fixed assets in operation are projected to grow by about 977 percent, an annualized growth rate of about 26.8 percent during the period. Moreover, to meet forecast acute power shortages, sharp increases in both the quantity and costs of purchased power are expected. It is now projected that the cost for purchased power will grow by more than 27 percent per annum and constitute over 41 percent of JPEPC's operating cost in 2002 compared with 29 percent in 1992.

6.15 From 1993 on, JPEPC's performance is anticipated to improve steadily as sales continue to grow, the tariff structure is further rationalized, and debt service requirements emerge as a dominant factor in pricing formulation. Based on the projected minimum tariff level, about 13 percent increase per annum from 1992 to 2002, both revenues and net income are expected to grow considerably over the period. Operational ratios are projected to revert from over 83 percent in 1992 to 67 percent by 2000. Moreover, the rate of return on historically valued assets and on revalued assets will also improve from single digit in 1989-92, to double digits, averaging 20.6 and 11.7 percent, respectively, over the period of 1993-2002.

E. Financing Plan

6.16 JPEPC's financing plan for the project implementation period (1993-2000) displayed in Table 6.3. During the financial forecast period, JPEPC's planned investments would total Y 60.7 billion ($6.9 billion). The proposed project would account for about 15.7 percent of the company's total investment program and the proposed Bank loan together with the ECO financing would meet about 6.8 percent of JPEPC's total financing requirements.

Table 6.3: JPEPC'S FINANCING PLAN, CY1993-2000

	Y million	$ million
Sources of Funds		
Internal cash generation	36,886	4,239
(less) increment in working capital	2,614	300
(less) repayment of loans	10,362	1,191
(less) interest charged to operation	5,303	609
Cash Available for Investment	18,607	2,139
Equity Contribution	300	34
Proposed IBRD loan	3,064	352
ECO financing	1,044	120
Other loans for proposed project	5,130	590
All other loans	32,539	3,740
Total Borrowings	41,777	4,802
Total Sources of Funds	60,684	6,975
Application of Funds		
Proposed project	9,538	1,096
Other construction	39,767	4,571
Interest during construction	7,176	825
Distribution improvements	4,203	483
Total Application of Funds	60,684	6,975

7. ECONOMIC JUSTIFICATION

A. Role of Coal-Based Power in Jiangsu Province

7.1 Coal-fired thermal power is clearly the most economic means to provide additional electric power in Jiangsu Province to alleviate current shortages (para.4.9) and sustain the province's further economic development. The province produces some coal and a small amount of crude oil, but must rely on energy provided from other parts of China, primarily in the form of coal, to meet two-thirds of its energy needs. The province is devoid of natural gas resources, and there are no prospects for securing supplies from other parts of China, as natural gas supplies are scarce in the country as a whole. The province also is basically devoid of hydropower resources. Hydropower currently accounts for 0.3 percent of Jiangsu's total installed capacity, and there are no realistic opportunities for expansion. Further expansion of the provinces's small amount of oil-fired capacity, or development of power production based on imported liquefied natural gas, are technically feasible options in Jiangsu. However, recent studies completed for Shandong Province (see China: Zouxian Thermal Power Project SAR), a coastal province with similar conditions, show that large-scale coal-fired power is clearly more economic than either of these options.

7.2 In 1992, Jiangsu Province obtained about 7 percent of its total power use through purchases from other grids, outside of the province. Although JPEPC would like to purchase more supply in the future, the supplies available are likely to fall below current levels in the future. Other provinces in the East China regional grid also face severe shortages and have few alternatives to coal-based power. Tie-lines between East China and other regional grids will remain relatively weak through the end of the century, as power shortages are forecast in neighboring regions as well.

7.3 For Jiangsu, therefore, the question is not whether or not to develop coal-based power, but rather, what type of coal-based power to develop.

B. Least-Cost Studies

7.4 The Yangzhou Thermal Power Project clearly is part of the least-cost expansion program for the Jiangsu Provincial power grid. A variety of expansion sequences from 1993-2010 were prepared and analyzed in detail by JPEPC and BERIWREP. Commissioning of the two 600 MW units of the Yangzhou project in 1998 and 1999, the earliest dates now feasible, remains part of the least-cost sequence under a wide variety of assumptions. Discounted at 12 percent into 1996 terms, the present value cost of a "second best" expansion sequence—without the Yangzhou project—exceeds that of the with-project base case expansion program by about Y 1.4 billion (see Annex 7.1).

7.5 Aside from several expansion projects that also are in the pipeline for early commissioning (see Annex 4.7), the Yangzhou project is the least cost project among available coal-based alternatives. The Jiangsu power system is easily large enough to accommodate the project's two 600 MW units, which generate significant scale economies compared with 300 MW units. Compared with the proposed construction of two 600 MW units in the New Nanjing project, which is considered the next most attractive candidate, the Yangzhou project is about 5 percent less expensive. Key cost advantages in the case of the Yangzhou project include the plant's proximity to an existing 500 KV substation, the availability of an inexpensive ash disposal site near to the generating plant, and the plant's proximity to coal port facilities on the Changjiang River.

7.6 The planned timing for the Yangzhou project remains economically optimal under a variety of sensitivity tests. Commissioning of units in 1998 and 1999 remains part of the least-cost expansion even with a higher discount rate (16 percent), or a dramatic increase in coal prices (40 percent).

7.7 The commissioning schedule for the Yangzhou project also would not be affected by far more dramatic gains in the efficiency of electricity use than expected, or by some other factors leading to a much slower growth in power demand than projected. If electricity demand were to grow by 6.0 percent per year, as opposed to the 11.1 percent per year forecast by JPEPC, construction of the Yangzhou plant as planned for 1998/99 commissioning would still be required to meet power demand in the least cost manner.

Environmental and Energy Efficiency Benefits

7.8 Construction of the Yangzhou project (and other 600 MW units) provides major benefits in coal conservation and associated reductions in pollution, compared to the most likely alternative. The net coal consumption rate for the Yangzhou project is projected to be 310 grams of coal equivalent (gCE) per kWh. If the Yangzhou project, and other similar large-scale projects, do not proceed in a timely fashion, the expected result will be that local governments and enterprises will continue to make further investments in thermal plants of 50 MW or less. This is precisely what has occurred in recent years, as large-scale development has lagged behind demand. During 1985-92, 35 percent of incremental power demand in Jiangsu was met by small coal-fired plants, and this trend has been increasing. The unit coal consumption of these plants was 503 gCE per kWh in 1992—over 60 percent higher than in modern 600 MW units. This results in at least 60 percent higher sulfur dioxide emissions, and roughly 60 percent greater emissions of carbon dioxide. Particulate emissions from the small plants clearly are over 60 percent higher, as control technology is typically far less sophisticated. It is unlikely that development of small plants can be radically curtailed over the short term, given that power shortages are expected to increase during the next few years. For the medium and long term, timely construction of large plants is critical to supply of power in as environmentally sustainable manner as possible (see Annex 7.2).

C. Economic Rate of Return

7.9 The internal economic rate of return (IERR) for the project was calculated using the estimated economic costs of the project and associated investments in transmission and distribution (Annex 7.1). An economic price of 37 fen/kWh, in 1993 prices, was used as a minimum proxy for the economic value of electricity benefits. This economic price is equivalent to the estimated average price of electricity actually paid by consumers in Jiangsu Province in late 1993 (Annex 2.4). On this basis, the IERR of the project is about 14 percent. Using the current average guidance price that many consumers now pay in Jiangsu (42 fen/kWh) as a somewhat less conservative estimate of the economic value of electricity, the IERR is about 17 percent.

Sensitivity Analysis

7.10 The IERR of the project remains robust when subjected to a variety of sensitivity tests:

	IERR (%)
Base case	14.2
20 percent cost overrun	12.6
One-year delay in commissioning	12.7
20 percent increase in coal price	13.2

If the shadow exchange rate used in this analysis (Y 9.0/$1.0) is increased by 20 percent (to Y 10.8/$1.0), the IERR of the project would still be acceptable, at a rate of 12.3 percent. It is highly unlikely that project parameters will be yet more pessimistic than these sensitivity test assumptions.

8. AGREEMENTS AND RECOMMENDATION

8.1 The following assurances were obtained at negotiations:

(a) From the Borrower that it would:

(i) onlend the proceeds of the proposed Bank loan to JPEPC, on terms and conditions satisfactory to the Bank (para. 5.17).

(b) From JPEPC that it would:

(i) furnish the Bank with the semiannual progress reports, audited project accounts, statements of expenditures, and financial statements within six months of the end of each fiscal year (para. 3.21);

(ii) engage management consultants to assist the development and implementation of improved accounting and financial management systems based on terms of reference agreed with the Bank (para. 5.8);

(iii) carry out the management development and training program as agreed with the Bank (para. 5.12);

(iv) carry out the environmental management program in a manner satisfactory to the Bank (para. 5.26);

(v) carry out relocation of persons affected by the project in accordance with a resettlement plan acceptable to the Bank (para. 5.28);

(vi) take all necessary measures to ensure that its internal cash generation is sufficient to maintain a self-financing ratio of no less than 30 percent from 1994 onward [para. 6.11(a)];

(vii) not incur additional debt unless a reasonable forecast shows its internal cash generation would provide a debt service coverage ratio of no less than 1.5 [para. 6.11(b)]; and

(viii) furnish to the Bank, by April 30 of each year a rolling eight-year financial plan containing projected income statements, statements of sources and uses of funds, and balance sheets [para. 6.11(c)].

8.2 Execution of the subsidiary loan agreement between the Borrower and JPEPC, and approval of the Loan Agreement by the State Council would be conditions of effectiveness of the loan (para. 5.17).

8.3 Subject to the above agreements, the proposed project is suitable for a Bank loan of $350 million to the People's Republic of China. The loan would be for a term of 20 years, including a 5-year grace period, at the Bank's standard variable interest rate.

ANNEXES

PRIMARY ENERGY OUTPUT IN CHINA (1949-92)

Year	Raw coal (10^6t)	Crude oil (10^6t)	Natural gas (10^8m^3)	Electricity	
				Total output (TWh)	of which: Hydropower (TWh)
1949	32.0	0.12	0.07	4.3	0.7
1955	98.0	0.97	0.17	12.3	2.4
1960	397.0	5.20	10.40	59.4	7.4
1965	232.0	11.31	11.00	67.6	10.4
1970	354.0	30.65	28.70	115.9	20.5
1975	482.0	77.06	88.50	195.8	47.6
1980	620.0	105.95	142.70	300.6	58.2
1981	622.0	101.22	127.40	309.3	65.5
1982	666.3	102.12	119.30	327.7	74.4
1983	714.5	106.07	122.10	351.4	86.4
1984	789.2	114.61	124.20	377.0	86.8
1985	872.3	124.89	129.30	410.7	92.4
1986	894.0	130.69	137.60	449.5	94.5
1987	928.1	134.14	138.94	497.3	100.2
1988	979.9	137.05	142.64	545.2	109.1
1989	1,054.2	137.65	150.49	584.7	118.4
1990	1,079.9	138.31	152.98	621.3	126.4
1991	1,087.4	140.99	153.96	677.5	124.7
1992	1,115.0	142.10	157.90	754.2	131.5

Source: MOEP.

TOTAL PRODUCTION AND CONSUMPTION OF ENERGY VS. GNP GROWTH

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Production (million tons of standard coal equivalent)	628	646	637	632	668	713	779	855	881	913	958	1,016	1,039	1,048	1,075
							Proportion (%)								
Coal	70.3	70.2	69.4	70.2	71.3	71.6	72.4	72.8	72.4	72.6	73.1	74.1	74.2	74.1	74.3
Crude oil	23.7	23.5	23.8	22.9	21.8	21.3	21.0	20.9	21.2	21.0	20.4	19.3	19.0	19.2	19.0
Natural gas	2.9	3.0	3.0	2.7	2.4	2.3	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0
Hydropower	3.1	3.3	3.8	4.2	4.5	4.8	4.5	4.3	4.3	4.4	4.5	4.6	4.8	4.7	4.7
Consumption (million tons of standard coal equivalent)	571	586	603	594	621	660	709	767	809	866	930	969	980	1,038	1,090
							Proportion (%)								
Coal	70.7	71.3	72.2	72.7	73.7	74.2	75.3	75.8	75.8	76.2	76.2	76.0	75.6	76.1	74.9
Crude oil	22.7	21.8	20.7	20.0	18.9	18.1	17.4	17.1	17.2	17.0	17.0	17.1	17.0	17.1	18.0
Natural gas	3.2	3.3	3.1	2.8	2.5	2.4	2.4	2.2	2.3	2.1	2.1	2.0	2.1	2.0	2.0
Hydropower	3.4	3.6	4.0	4.5	4.9	5.3	4.9	4.9	4.7	4.7	4.7	4.9	5.3	4.8	5.1
GNP Index (constant prices)	100.0	107.6	116.0	121.2	131.8	145.4	166.9	188.2	203.5	225.7	251.2	262.1	272.7	295.0	333.4
Energy Intensity Index (consumption/GNP)	100.0	95.4	91.0	85.8	82.5	75.9	74.5	71.5	69.7	67.2	65.0	65.1	62.6	61.6	57.3

Notes: (1) Excluding bio-energy, solar, geothermal and nuclear energy.
(2) All fuels are converted into standard coal with thermal equivalent of 7,000 kilocalorie per kilogram. The conversion factors are:

1 kg of coal (5,000 kcal) =0.714 kg of standard coal
1 kg of crude oil (10,000 kcal) =1.43 kg of standard coal
1 cubic meter of natural gas (9,310 kcal) =1.33 kg of standard coal

(3) The conversion of hydropower is based on the specific consumption of standard coal for thermal power generation of the year.

Source: China Statistical Yearbook 1991.1.

INSTALLED CAPACITY, ELECTRICITY GENERATION AND CONSUMPTION IN THE POWER SUBSECTOR

Year	Installed Capacity (MW) /a			Electricity Generation (GWh) /a			Electricity Consumption /b
	Hydro	Thermal	Total	Hydro	Thermal	Total	(GWh)
1949	163	1,686	1,849	710	3,600	4,310	3,460
1952	188	1,776	1,964	1,260	6,001	7,261	6,277
1957	1,019	3,616	4,635	4,820	14,515	19,335	16,407
1962	2,379	10,686	13,065	9,042	36,753	45,795	n.a.
1965	3,020	12,056	15,076	10,414	57,190	67,604	56,802
1970	6,235	17,535	23,770	20,450	95,420	115,870	n.a.
1971	7,804	18,478	26,282	25,060	113,300	138,360	101,274
1972	8,700	20,801	29,501	28,820	123,630	152,450	123,600
1973	10,299	23,626	33,925	38,900	127,860	166,760	135,106
1974	11,817	26,291	38,108	41,440	127,410	168,850	135,708
1975	13,428	29,978	43,406	47,630	148,210	195,840	156,969
1976	14,655	32,492	47,147	45,640	157,490	203,130	164,698
1977	15,765	35,686	51,451	47,670	175,740	223,410	181,691
1978	17,277	39,845	57,122	44,630	211,920	256,550	210,239
1979	19,110	43,906	63,016	50,120	231,827	281,947	233,577
1980	20,318	45.551	65,869	58,211	242,416	300,627	251,639
1981	21,933	47,069	69,002	65,546	243,723	309,269	258,976
1982	22,959	49,401	72,360	74,399	253,279	327,678	275,299
1983	24,160	52,280	76,440	86,450	264,990	351,440	297,126
1984	25,547	54,373	79,920	86,780	290,207	376,987	319,600
1985	26,120	60,373	86,493	92,374	318,315	410,689	348,353
1986	27,542	66,276	93,818	94,480	355,091	449,571	357,057
1987	30,193	72,704	102,897	100,229	397,092	497,321	420,019
1988	32,698	82,799	115,497	109,177	435,888	545,065	464,013
1989	34,570	92,060	126,637	118,475	466,200	584,675	495,135
1990	36,050	101,844	137,894	126,350	494,986	621,318	527,154
1991	37,884	113,589	151,473	124,845	552,649	677,494	575,219
1992	40,681	125,852	166,533	131,466	622,723	754,189	644,696

/a On a countrywide basis.

/b Energy consumption not including uses by stations and line losses.

Source: MOEP.

ELECTRICITY CONSUMPTION BY SECTORS /a

Year	Total consumption (TWh)	Industry			Agri-cultural	Resi-dential	Trans-portation	Municipal and commercial
		Heavy	Light	Sub-total				
1985	411.7	63.8	15.9	79.7	7.7	5.4	1.5	5.7
1986	456.7	64.9	15.8	80.7	7.1	5.5	1.5	5.2
1987	498.5	64.0	16.4	80.4	7.2	5.7	1.5	5.2
1988	546.7	62.8	17.0	79.8	6.9	6.3	1.6	5.4
1989	586.5	63.0	16.2	79.2	7.0	6.7	1.7	5.4
1990	623.0	62.2	16.0	78.2	6.9	7.7	1.7	5.5
1991	680.4	61.2	16.2	77.4	7.1	8.0	1.7	5.8
1992	745.5	61.2	15.9	77.1	6.8	8.5	1.8	5.8

/a On a countrywide basis, including station uses and line losses for power industry.

Source: MOEP.

MAJOR ONGOING HYDRO AND THERMAL POWER PROJECTS WITH EXTERNAL FINANCING /a

	Installed capacity (Unit x MW)	Location	Construction period	Source of finance	Loan amount ($ mln)
A. HYDRO POWER					
East China					
Mianhuatan	4 x 150	Fujian	1995-2002	ADB	200.0
North China					
Shisanling pumped storage	4 x 200	Hebei	1990-95	OECF	100.0
Zhangjiawan	4 x 250	Hebei	1995-2001	ADB	250.0
Central China					
Gehehan hydro	6 x 200	Hubei	1988-93	Canada Supplier's Credit	108.0
Wuqiangqi hydro	5 x 240	Hunan	1988-96	OECF	200.0
Lingjintan	8 x 300	Hunan	1994-99	ADB	100.0
Southwest China					
Tienshengqiao (II) hydro	4 x 220	Guizhou	1984-93	OECF	478.5
Tienshengqiao (I) hydro	4 x 300	Guizhou	1992-2000/b	OECF	160.0
Hongjiadu hydro	3 x 180	Guizhou	1995-2001/b	ADB	180.0
South China					
Guangzhou Pumped Storage (I)	4 x 300	Guangdong	1988-94	France	200.0
Guangzhou Pumped Storage (II)	4 x 300	Guangdong	1994-98/b	ADB	290.0
				Joint financing	67.0
Subtotal	12,220				2,303.5
B. THERMAL POWER					
East China					
Shidongkou No. 2 (HIPDC)	2 x 600	Shanghai	1988-92	USA, France, Japan, Supplier's Credit	380.0
Nanjing	2 x 300	Jiangsu	1989-93	Former USSR Barter Credit	241.0
Ligang I (SEDC)	2 x 350	Jiangsu	1988-93	Spain & Italy	245.0
North China					
Sanhe	2 x 300	Beijing	1993-96/b	OECF	250.0
Hejin	2 x 300	Shanxi	1994-97/b	OECF	250.0
Jixian	2 x 500	Tianjin	1989-93	Former USSR Barter Credit	430.0
Central China					
Ezhou	2 x 300	Hubei	1992-95/b	OECF	250.0
Jiujiang	2 x 300	Jiangxi	1993-96/b	OECF	250.0
Yahekou	2 x 350	Henan	1993-97	Spanish Export Credit	384.0
South China					
Shenzhen gas turbines	2 x 90	Guangdong	1992-93	USA, France	101.0
Southwest China					
Chongqing gas turbines	66	Sichuan	1992-93	UK Credit	33.1
Nejiang	1 x 100	Sichuan	1993-95	Finish Government Credit	38.0
Subtotal	6,930.0				2,852.1

	Installed capacity (Unit x MW)	Location	Construc-tion period	Source of finance	Loan amount ($ mln)
C. NUCLEAR POWER					
South China					
Daya Bay	2 x 900	Guangdong	1986-94	UK, France	2,500.0
Subtotal	1,800				2,500.0
D. TRANSMISSION & SUBSTATION					
Tienshengqiao (II) - Guangzhou	1,050 km 1,750 MVA	-	1988-93	OECF	115.5
Tienshengqiao (II)-Guiyang	285 km	-	1988-92	OECF	24.1
Tienshengqiao (I)-Guangdong	1,000 km (DC)	-	1994-98/b	OECF	140.0
Subtotal					279.6
Total	20,950.0 MW in generating capacity 2,335.0 km for 500-kV transmission line 1,750.0 MVA in substation capacity				7,935.2

/a World Bank-financed projects are not included.
/b Commissioning year.

Source: MOEP.

FUTURE THERMAL POWER PROJECTS PLANNED TO BE FINANCED UNDER BOT OR BOO ARRANGEMENTS /a

Projects	Installed capacity (No. x MW)	Construction period	Location (Province, Municipality, Region)
Waigaoqiao (phase 2)	2x800 or 2x1,000		Shanghai
Jiaxing (phase 2)	4x600		Zhejiang
Ligang (phase 2)	2x350	1993-98	Jiangsu
Ligang (phase 3)	2x600	1998-2002	Jiangsu
Yangcheng	4x600		Shanxi
Tuoketuo No. 2	4x660		Inner Mongolia
Daihai	4x600		Inner Mongolia
Datong No. 2	2x600		Shanxi
Shalingzi (phase 2)	2x600		Hebei
Shuangyashan	2x600		Heilongjiang
Zhuhai	2x660		Guangdong
Beihai	2x350		Guangxi
Xidu	2x660		Jiangsu
Rizhao	2x350		Shandong
Shiliquan	2x300		Shandong
Laicheng	2x600		Shandong
Shiheng (phase 2)	2x300		Shandong
Heze (phase 2)	2x300		Shandong
Meizhouwan	2x350		Fujian
Songyu	2x350		Fujian
Hanchuan (phase 2)	2x300		Hubei
Pingu	2x600		Beijing
Expansion of Liaoning	2x300		Liaoning
Shenmu	2x350		Shaanxi
Dalian (phase 2)	2x350	1995-99	Liaoning
Dandong	2x350	1995-99	Jilin
Nantong (phase 2)	2x350	1995-99	Jiangsu
Fuzhou (phase 2)	4x660	1996-2000	Fujian
Yueyang (phase 2)	2x350	1996-2000	Hunan
Shidongkou No. 2 (phase 2)	2x600	1996-2000	Shanghai
Luohuang (phase 2)	2x350	1996-2000	
Shantou (phase 2)	2x350	1996-2000	Guangdong
Yingkou (phase 2)	2x600	1996-2000	Liaoning
Shajiao C	3x660	1994-96	Guangdong
LNG Combined Cycle	4x600	1997-99	Jiangsu

/a BOT: Build-Own (Operate)-Transfer
BOO: Build-Own-Operate

POWER PRICING IN JIANGSU PROVINCE

1. The power pricing system in Jiangsu Province consists of three components: (a) the state base prices, (b) a guidance price differential, and (c) a schedule of additional fees and surcharges. These components are then added to form the "administered" (in-plan) consumer price tariff or the "guidance" (out-of-plan) consumer price tariff. Although explanations and the names for different components vary from region to region, as do the level and nature of specific fees, this basic system also is employed most other parts of China.

State Base Prices

2. The state base prices (also referred to as "state catalog" prices) are the base prices charged for electricity generated by capacity financed by the Central Government and managed by provincial power companies such as JPEPC. This capacity includes (a) virtually all power plants constructed before 1985, with grant funding, and (b) plants, or shares of plants, constructed with loan funds allocated by the Central Government since 1985. In Jiangsu, this capacity now accounts for roughly one half of total installed capacity.

3. The state base prices provide the basis for the revenue of JPEPC and other provincial power companies. (Prices for power from other generating plant discussed below and other fees and charges to not accrue to JPEPC.)

4. State base prices were fully revised throughout China during the summer of 1993, both in structure and level, for the first time since 1976. Compared with the old state base prices, the new system provides for an increase in the overall price levels and simplification. The new system allows for automatic annual price adjustments to fully reflect changes in fuel prices. It also allows for power from all capacity financed through loans to be priced at "debt repayment prices," calculated for each individual plant, to fully cover financing costs. This applies to all new plant, and to plant financed during 1986-92. In terms of structure, the new base prices include an increase in the demand charges for large industries, and separate prices for a new commercial sector consumer category.

5. State base prices in Jiangsu increased with the reform from an average of 18.5 f/kWh in 1992 to an average of about 26.0 f/kWh in 1993 (see Table 1).

6. The state base prices, together with various price markups from the schedule of fees and surcharges, form the administered price tariff for certain qualified consumers.

Table 1: STATE BASE PRICES IN JIANGSU PROVINCE, SEPTEMBER 1993

Consumer category	Energy charge (f/kWh) Low voltage	1-10 kVA	35 kVA & above	Demand charge Maximum load (Y/kW/mo)	Substation capacity (Y/kVA/mo)
Residences	26.0	25.0			
Commercial sector	37.9	36.9			
Regular industry	30.2	29.5	28.4		
Large industry		21.3	20.2	15.00	10.00
Of which: special chemicals		20.3	19.2	15.00	10.00
Agriculture	25.0	24.2	22.9		
Agricultural irrigation in poor areas	6.0	5.8	5.5		

Source: JPEPC.

The Guidance Price Differential

7. The guidance price differential (also referred to as the "local comprehensive price difference" or increased cost of out-of-plan supply) factors the cost of other, noncentral government financed sources of power supply into the power pricing system. In Jiangsu, noncentral government-affiliated sources of power supply accounted for about one half of the total in 1993. The main supply sources in Jiangsu include:

(a) Power from capacity financed by provincial and local governments, using the provincial and local government Power Construction Funds, usually as part of "joint-investment" plants. Prices are established by contract with individual plants, based on debt repayment principles. Prices for this type of power in Jiangsu were about 30-35 f/kWh in 1993.

(b) Power from other, independent plants. These include plants owned and operated by the Huaneng Group. Prices for this power are also established by contract, based on debt repayment principles.

(c) Power provided by various power plants above and beyond their contracted production quotas, at negotiated prices. This often involves local government agreement to supply coal from outside of the central coal allocation network.

(d) Electricity provided to the grid from captive industrial plant, at negotiated prices.

8. The higher costs of these sources of power supply are added together and averaged into a price markup, which is then added to the state base price, with various price markups from the schedule of fees and surcharges, to form the "guidance price tariff" applicable to many consumers. In Jiangsu, this guidance price differential is calculated both at the prefectural level, based on the sources of supply obtained by the Prefectural Power Supply Bureaus, and then also at the county/urban district level, where additional sources of supply also may be factored in. In September 1993, the guidance price differential was 12.5 f/kWh in Nanjing Prefecture, and 9.0 f/kWh in Changzhou Prefecture and Changzhou City.

Schedule of Fees and Surcharges

9. A variety of additional fees are now added to the prices paid by consumers. With the exception of a new 0.3 f/kWh levy on all consumers throughout the country to help finance the Three Gorges Hydroelectric Project, these charges are levied by provincial and local governments. In Jiangsu, about 70 percent of power sales is subject to both a 2.0 f/kWh surcharge for a Provincial Power Construction Fund (as in other provinces) and a 3.0 f/kWh surcharge for Local Power Construction Funds operated by prefectural governments. Some other fees are earmarked to partially cover local distribution costs or street lighting. Although the bulk of the revenue collected through these additional fees is invested in the power sector, some portions may be used by local government for other purposes.

Consumer Tariffs

10. Table 2 shows price buildup and final consumer prices charged in Changzhou City, a typical city in Jiangsu, in September 1993. (The consumer price buildup in Nanjing Prefecture is also similar.) The administered price tariff includes the state base prices and various fees and surcharges, whereas the guidance price tariff includes these two plus the guidance price differential. About one half of power sales in Jiangsu are priced at the administered price tariff, while the guidance price tariff applies to the remainder. The administered price tariff is generally applied to power allocated based on quotas reflecting consumption levels in 1983. In industry, factories are provided with power at administrative price levels for consumption up to their 1983 levels (if they existed then), but all additional consumption, stemming from new capacity, is priced at guidance price levels. Exceptions to this rule include urban residential consumption—which is all priced at administrative price levels—and a portion of post-1983 additional consumption in agriculture or certain protected industries, such as chemical fertilizer producers.

11. In Changzhou, the average state base price was about 26 f/kWh. Adding in the applicable fees and surcharges, the average administered price is estimated at about 33 f/kWh. The average guidance price is estimated at about 42 f/kWh. The overall

Table 2: CONSUMER ELECTRICITY PRICES IN CHANGZHOU CITY, JIANGSU PROVINCE, SEPTEMBER 1993 /a
(fen/kWh)

	Residential and commercial /b				Agriculture	
	Urban residences (LV) /c	Urban government (LV)	Urban commercial (LV)	Urban commercial (1-10 kV)	LV	1-10 kV
State base price	26.0	37.9	37.9	36.9	25.0	24.2
Prov. power investment charge	-	-	2.0	2.0	-	-
Local power investment charge	-	-	3.0	3.0	-	-
Distribution charge	0.7	-	-	-	-	-
Urban construction fee	3.0	3.0	3.0	3.0	-	-
Three Gorges surcharge	0.3	0.3	0.3	0.3	0.3	0.3
Other local surcharges	-	2.1	2.1	2.1	2.1	2.1
Administered Price	30.0	43.3	48.3	47.3	27.4	26.6
Guidance price differential			9.0	9.0	9.0/c	9.0/c
Guidance Price			57.3	56.3	36.4/c	35.6/c

	Large industry							
	Demand charges/d		Energy charges					
	Y/ kVA	Y/ kW	1-10 kV	35 kV & above	Chemical fertilizers	Other preferential users /e	Regular industry 1-10 kV	Regular industry 35 kV
State base price	10	15	21.3	20.2	15.2	19.2	29.5	28.4
Prov. power investment charge	-	-	2.0/f	2.0/f	-	2.0/f	2.0	2.0
Local power investment charge	-	-	3.0/f	3.0/f	-	3.0/f	3.0	3.0
Urban construction fee	-	-	0.7	0.7	0.7	0.7	0.7/g	0.7/g
Three Gorges surcharge	-	-	0.3	0.3	0.3	0.3	0.3	0.3
Other local surcharges	-	-	2.1	2.1	2.1	2.1	2.1	2.1
Administered Price	10	15	29.4	28.3	18.3	27.3	37.6	36.5
Guidance price differential	-	-	9.0	9.0	9.0	9.0	9.0	9.0
Guidance Price	10	15	38.4	37.3	27.3	36.3	46.6	45.5

/a Actual prices also include an additional temporary 3.6 fen/kWh charge for all consumers, except for residential users, to cover the cost of the state base price increase during July and August 1993, which had not yet been reflected on consumer bills for those months. As this fee is temporary, it has been omitted here.
/b Only the main consumer categories are listed here.
/c Township governments may levy additional charges not included here.
/d Large industries pay both a demand (capacity) charge and an energy charge.
/e Includes selected chemical industries.
/f Provincial and local power investment charges are waived for a few types of consumers.
/g Rural industries are exempt from this charge.

Source: Changzhou Prefecture Electricity Supply Bureau.

average consumer price is estimated at about 37 f/kWh. (In Nanjing, power bureau officials estimate that the average consumer price is about 36 f/kWh.) These figures compare with an estimated long-run average incremental cost of supply, in economic shadow prices, of some 35-40 f/kWh.

12. As Table 2 shows, prices are highest for commercial consumers and regular industries. Among the general price categories, prices are lowest for urban residences and agricultural consumers. Within industry, however, certain consumers receive preferential prices. Chemical fertilizer producers receive particularly low rates as a matter of national policy. Certain other chemical consumers also receive somewhat lower rates than other industries. Not explicitly listed in the tariff table, enterprises with foreign investment (including joint ventures and wholly foreign-owned enterprises) also receive preferential treatment as a matter of provincial government policy, in that their electricity prices are set between administered and guidance price tariff levels.

Consumer Price Reform

13. JPEPC is committed to abolition of the existing two-track, administered and guidance price system by the end of 1997. The existing system is too complex, unfair and inefficient. The two-track system already has been successfully collapsed into one, unified consumer price tariff in Nantong Prefecture. An additional 2-3 of the province's 11 prefectures will implement this reform during 1994. Arrangements will then be made with the various other prefectural governments to unify consumer tariffs during 1995-97.

14. Based in part on the results of a recent joint power tariff study by JPEPC and BERIWREP, JPEPC is also promoting expansion of time-of-day pricing among large consumers, and further increases in the ratio of demand charges to energy charges for large industries.

INSTITUTIONAL AND LEGAL FRAMEWORK

Institutional Framework

1. **Legal Status.** Jiangsu Provincial Electric Power Company (JPEPC) is an independent economic entity that possesses the legal status of a limited liability company under its Charter, dated December 19, 1988 (Charter), formulated pursuant to the Law of the People's Republic of China on State-owned Industrial Enterprises, promulgated by the National People's Congress in 1988, and the Scheme of Structural Reformation of East China Power Network, approved by the State Council, including implementation regulations thereof. The Charter is a self-implementing legal instrument.

2. **Ownership and Funds.** JPEPC is co-owned by the Central Government (CG) through the State Energy Investment Company (SEIC) and the Jiangsu Provincial Government (JPG) through the Jiangsu Province Energy Investment Company (JPEIC). The registered capital of JPEPC is Y 2.6 billion. The Charter empowers and authorized the company to obtain funds from the following additional sources and means such as: (a) receiving investments from the state (through SEIC), the province (through JPEIC), and local governments; (b) obtaining loans from financial sources such as banks and financial organizations both domestic and foreign; (c) selling electricity to users and charging users additional payment for specific power use; (d) issuing stocks and bonds; and (e) forming joint ventures with foreign companies. It is also authorized to use its retained profits for the purpose [Article 11 (4), Charter]. Although JPEPC has the corporate powers to invest and to borrower and issue bonds, these activities are regulated and government approvals are required therefor at various levels.

3. **Functions and Powers.** JPEPC has been entrusted by CG and JPG with the management and administration of generation, transmission, distribution and supply of electricity in Jiangsu Province (JP). JPEPC's overall purpose is to manage and develop the provincial power industry. The scope of its business includes undertaking construction of power projects funded either by the state or by local finance. The functions and powers of JPEPC have been outlined in the Charter and further elaborated in a document regarding Confirmation of the Functions and Powers of Jiangsu Provincial Electric Power Company (Confirmation Document) approved by the Ministry of Energy [the predecessor of Ministry of Electric Power (MOEP)] in 1992. Pursuant to these documents, JPEPC has the power to obtain loans from and to enter into contracts with various organizations including foreign organizations (with the permission of the concerned government authorities).

4. **Management and Administration.** The Charter provides for the establishment of a board of directors ostensibly to manage the company (Articles 17-21). However, to date the board of directors has not been established and, contrarily, the

Confirmation Document declares that "JPEPC practices the general manager responsibility system." Accordingly, the overall management and administration of JPEPC is entrusted to a general manager (assisted by several deputy general managers) appointed (and removable) by MOEF in consultation and agreement with JPG and East China Electric Power Administrative Bureau (ECEPAB). The general manager is the legal representative of the company and responsible for the company's operations. The functions and powers of the general manger are enumerated in the Charter (Article 24). The exercise of managerial and administrative powers (e.g., hiring and firing of staff and labor) is, however, controlled by "relevant state rules and regulations." JPEPC has pursuant to the Charter established various administrative rules and regulations including regulations on power grid management.

5. **Financial Matters**. The Charter requires JPEPC to establish an independent financial accounting and auditing system. It furthermore makes the company responsible for its own gains and losses. However, the declaration and distribution of company profits are regulated by the Ministry of Finance (MOF) and the Jiangsu Provincial Department of Finance (JPDOF). JPEPC is required to carry out a multileveled power price policy in accordance with state regulations on price control and in consideration of the sources of investment and fuel. It is empowered to charge users additional payment for the portion of power consumption exceeding specified quota.

6. **Operations**. JPEPC is a provincial monopoly holding company and as such owns and/or controls all the electric power enterprises operating in JP.

Legal and Regulatory Framework

7. **Legal Regime**. There is presently no central legislation in force in respect of the generation, transmission, distribution or supply of electricity in China.

8. **Regulatory Framework**. JPEPC is regulated by MOEP through ECEPAB, which is administratively the same as the East China Electric Power United Corporation (ECEPUC, of which JPEPC is a member!) and JPG through the Jiangsu Provincial Electric Power Bureau (JPEPB, which is administratively the same as JPEPC). There are numerous regulations at different levels of government which deal with various sectoral, institutional, and contractual aspects of power generation, transmission, distribution and supply.

9. **Contractual Arrangements**. JPEPC exercises control over the electric power enterprises operating in JP on the basis of contractual arrangements. Profits are declared and distributed in accordance with the terms of these contractual arrangements. The terms and conditions of the contractual arrangements are not standard and need no governmental approval. The contractual arrangements include only a general non-standard formula for pricing which is based on the government's pricing policy. The actual prices are established by the State Pricing Bureau of the State Planning Commission.

Conclusions and Recommendations

10. **Legal Status and Corporate Authority.** JPEPC appears to be duly organized and operating under the laws and regulations of the People's Republic of China. It also appears to have the requisite authority both, under its Charter and the Confirmation Document, to receive the proceeds of the proposed project loan through CG, to carry out the proposed project, and to enter into a project agreement in respect thereof with the World Bank (WB) subject, of course, to necessary government approvals.

11. **Commercialization.** This objective can, at least notionally, be achieved in the short-term through the separation of ownership and management by the establishment of a board of directors. This would not necessitate an amendment of the Charter because of the existing unimplemented provisions regarding board of directors therein. However, for the purpose of strengthening the board in accordance with the State Regulations on Transforming the Management Mechanisms of State-Owned Industrial Enterprises, 1992 (1992 Regulations), the Charter would need to be amended. It is suggested that the amended Charter include *all* the management rights granted by the 1992 Regulations. Since the exercise of these rights is subject to applicable laws and regulations (for example, price setting would continue to be subject to whatever pricing regulations there are in force) there would be no need to exclude any such rights in the revised charter. The present advantage would be to have a *limited* right as opposed to *no* right at all and the potential benefit would be to have an unqualified right in case the applicable regulation is rescinded in future. It would be important to ensure the application of the independent management system that may be established and to clearly demarcate the respective role of the board of directors and the general manager/chief administrative officer of the company. It is suggested that the process of commercialization involve not only institutional restructuring of the company but also include some of deregulation of various corporate activities currently controlled by "relevant state rules and regulations".

12. **Corporatization.** JPEPC, which is presently a State-Owned Enterprise (SOE), should consider diversifying its ownership in order, among other things, to increase its capital base in order to improve its financial status. This would also help the company to achieve financial autonomy and could be done through the eventual transformation of the company into a limited liability shareholding company under the evolving company regulations in China. It is suggested that a review of various options in this regard be undertaken by JPEPC as part of an action plan to corporatize and make the company financially autonomous.

13. **Sectoral Restructuring.** The ownership, management, and regulatory structure of the electricity sector appears to be rather convoluted and needs to be streamlined. It is, therefore, suggested that sectoral restructuring be carried out at the provincial level including the separation of combined regulatory and enterprise functions of JPEPB and JPEPC.

14. **Legal and Regulatory Reform.** The need for the formulation and promulgation of a national Electricity Law is obvious. The need to consolidate, simplify

and update the numerous regulations in light of the ongoing developments in the power sector is also clearly warranted.

15. **Rationalization of Contractual Arrangements.** Operations of power enterprises under JPEPC's jurisdiction may also need to be streamlined. For this purpose, it is suggested that JPEPC's contractual arrangements, through which it operates the power generating plants and power supply facilities, be reviewed with a view to rationalizing the system. Consequently, model contracts for various kinds of contractual arrangements may also be formulated with a view to commercializing these arrangements.

16. **Charter Amendment.** While considering an amendment to introduce the management rights granted by the 1992 Regulations, it may be opportune to undertake a complete revision of the Charter in order to: (a) add clarity and precision in respect of the concept of separation of ownership and management; and (b) remove some inconsistencies between the role of the board of directors and the general manager caused by the Confirmation Document. For this purpose, a model draft charter, attached herewith, has been prepared and submitted to JPEPC in order to assist JPEPC in drafting a new charter or redrafting the existing Charter. The procedure of amending the Charter is in Articles 44 and 45 of the Charter. Accordingly, the board of directors is authorized to amend the Charter with the endorsement and approval of JPG/JPEPB and MOEF respectively. In the absence of the board of directors, the General Manager of JPEPC, who appears to exercise management powers instead of the board, would presumably have the authority to initiate the required amendment of the Charter.

17. **Technical Assistance and Training.** Since the concepts of commercialization and corporatization are relatively new and reregulation of the power sector a complex and specialized task, it would be essential to provide the requisite legal assistance and training to the relevant JPEPC staff to enable it to properly implement the corporate and legal reforms. It is, therefore, agreed that a portion of the proceeds of the proposed WB loan be allocated for providing assistance and training to the staff of JPEPC dealing with corporate and legal reforms.

ACTION PLAN FOR THE COMMERCIALIZATION OF THE JIANGSU PROVINCIAL ELECTRIC POWER COMPANY

1. As raised by the World Bank mission during the appraisal of the Yangzhou Number 2 Power Project, and in order to better suit a market economy, the enterprise reform of the Jiangsu Provincial Electric Power Company (JPEPC) should be deepened. JPEPC should be developed into a power utility with autonomy in its own operations, accountability for its own profits and losses, self-sufficiency in development and self-discipline. JPEPC has developed the following action plan for the reform of JPEPC, in accordance with the "Company Law" of the Peoples Republic of China and the 1992 "Regulations on Transformation of the Operating Mechanism of State-owned Industrial Enterprises," and in the spirit of the 1993 International Workshop on Power Sector Reform Strategy in China, convened by the Ministry of Electric Power (MOEP), Ministry of Finance and the World Bank. JPEPC confirms that this action program will be fully implemented during the periods specified, once certain approvals have been provided by relevant authorities.

Separation of the Utility from Government

2. **First Reform Step.** By the end of 1993, the scope of government regulatory functions in power sector and the scope of provincial power company responsibilities will be clearly and separately defined.

3. **Additional Preparatory Measures for Separation of the Utility from the Government.** Beginning in 1994, a Bureau Director (or Vice-Director) will be designated from among the leading managers of JPEPC and JPEPB and given sole responsibility for carrying out the functions of the provincial government in power industry regulation. At the same time, staff and subunits will be assigned sole responsibility for government functions in the power sector, under the leadership of the designated Director.

4. **Implementation of Full Institutional Separation.** In order to realize full government and enterprise separation, and to implement the separation of government and enterprise institutions, JPEPB will be provided with the mandate for carrying out government regulatory functions, and these functions will no longer be carried out by staff in a separated JPEPC. JPEPC will fully implement enterprise-oriented management, based on commercial operating principles. Detailed arrangements will be provided in the reform implementation program to be submitted for approval to MOEP and the Provincial Government during 1994 (see Reform Implementation Program, below), and implementation will take place in 1995, following relevant approval.

Implementation of Rights in Enterprise Autonomy

5. Rights of enterprise autonomy provided under the "1992 Regulations" should be provided to JPEPC as soon as possible in 1994.

6. Operating as the backbone enterprise for the Jiangsu power grid, JPEPC must develop into a utility with autonomy in development and operation, with stronger capabilities and a greater role in investment, and greater self-sufficiency in its development as an enterprise. It should be allowed to expand its productive operations, so that it can continue to fulfill its role as the backbone enterprise in the Jiangsu power grid and ensure efficient management of the power grid.

7. Urgently required rights of enterprise autonomy include rights to undertake investments and rights to raise funds. JPEPC should be allowed to earn and retains sufficient profits, after debt service, to enable it to make a reasonable contribution to the expansion of the Jiangsu power system. In order to commercialize its operations, JPEPC must be permitted to borrow in foreign and domestic markets and issue bonds on its own account, under guidelines set by relevant authorities.

Consumer Power Tariff Reform

8. Following the model already established in Nantong Prefecture, two or three additional prefectures will implement uniform consumer tariffs in 1994, replacing the predominant current system of different rates for planned and nonplanned consumption. JPEPB will complete work to implement uniform consumer tariffs at the prefectural level throughout Jiangsu Province by the end of 1996. Full implementation will be completed in 1997.

Accounting and Financial System Reform

9. JPEPC will implement a reform of its accounting and financial management system, in order to improve cost control and the accountability of subentities, and to provide a strong, long-term foundation for efficient commercial operation. The reform will include:

(a) Conversion of JPEPC's accounting system to a new accounting system based on international accounting system principles and standards issued by the Ministry of Finance.

(b) Design and implementation of a new accounting and financial reporting system, based on responsibility concepts.

(c) Design and installation of an integrated MIS system for financial reporting.

(d) Implementation of a staff reorganization and institutional restructuring in JPEPC's accounting system.

(e) Completion of technical and managerial training.

This reform will be completed by the end of 1996.

Company Corporatization

10. JPEPC aims to become a shareholding company. The first step, which JPEPC has already initiated, is to complete revaluation of all assets under JPEPC's management. The second step will be to complete a study and review of options for corporatization. This also will include participation in a national effort to review contractual arrangements between power companies and other enterprises. This will be completed by the end of 1995. The training program of the proposed World Bank loan will include these topics. JPEPC will then implement the most suitable option.

Reform Implementation Program

11. In concert with other relevant organizations, JPEPC will prepare a detailed program to implement the above action plan during 1994. The program will clarify all details required for full implementation, including the specifics of required institutional changes and a plan on how to finance associated study and implementation costs. Following discussion with the World Bank, the program should be submitted for approval to the Jiangsu Provincial Government and MOEP in 1994. Following approval, full implementation should commence by early 1995.

PERFORMANCE INDICATORS FOR JIANGSU POWER SYSTEM

	1985	1986	1987	1988	1989	1990	1991	1992
Installed capacity (MW)	3,840.45	4,528.36	5,486.94	6,223.10	6,674.24	7,519.70	7,805.81	8,280.12
JPEPC	3,787.05	4,464.56	5,213.64	5,654.20	6,075.64	6,901.60	7,128.91	7,460.22
Local & captive plants	53.40	63.80	273.30	568.90	598.60	618.10	676.90	819.90
Energy generation (GWh)	22,558.28	25,458.58	29,432.60	33,288.86	35,403.84	39,605.62	43,369.19	47,408.01
JPEPC	22,342.69	25,156.54	28,656.80	30,887.52	32,254.07	36,327.40	39,596.34	43,031.68
Local & captive plants	215.59	302.04	775.80	2,421.34	3,149.77	3,278.22	3,772.85	4,376.33
Energy generation (GWh)	22,558.28	25,458.58	29,432.60	33,288.86	35,403.84	39,605.62	43,369.19	47,408.01
Thermal	22,510.77	25,426.38	29,374.03	33,251.87	35,356.36	39,560.95	43,325.91	47,364.73
Hydro	47.51	32.20	58.57	36.99	47.48	44.67	43.28	43.28
Net energy purchase (GWh)								
JPEPC	4,299	4,322	4,238	2,905	2,029	1,074	1,489	3,481
Capacity factor (%) /a	74.0	71.6	69.8	64.7	62.6	62.0	64.7	67.3
JPEPC	78.0	75.7	74.1	68.8	65.6	65.0	68.7	71.2
Local & captive plants	46.0	45.5	45.0	40.3	39.2	38.8	40.5	44.4
Peak demand (MW) /b								
JPEPC	3,862	4,300	4,501	4,486	4,831	5,267	5,918	6,315
Energy sales (GWh)								
JPEPC	22,405.29	24,585.48	27,314.68	28,892.08	29,731.74	32,064.65	35,417.92	40,111.12
System losses								
Plant use (%)	7.27	7.24	7.46	7.55	7.65	7.56	7.42	7.37
JPEPC	7.17	7.16	7.38	7.44	7.57	7.47	7.33	7.26
Local & captive plants	8.37	8.07	8.30	8.67	8.47	8.42	8.36	8.29
T&D losses (%)	8.57	8.72	8.73	8.16	7.87	7.84	7.89	8.31
JPEPC	2.73	3.28	3.30	2.85	2.52	2.39	2.73	3.07
Total (%)	15.84	15.96	16.19	15.71	15.52	15.40	15.31	15.66
JPEPC	9.90	10.44	10.68	10.29	10.09	9.86	10.06	10.33
Average coal consumption (standard coal) (g/kWh)	414.0	424.2	415.8	415.8	409.0	395.8	389.5	389.0
JPEPC	394.0	397.0	397.0	404.0	401.0	389.0	383.0	382.0
Local & captive plants	615.0	696.0	604.0	574.0	490.0	464.0	454.0	460.0
Number of employees /c	52,360	55,367	58,980	60,716	61,516	64,651	66,275	68,244
Sales per employee (kWh) /c	427,909	444,046	463,118	475,856	483,317	495,965	534,408	587,760

/a Based on average installed capacity of the year.

/b Not including demand met by captive plants and local generation.

/c Employees including only administration, generation, supply and services.

Source: JPEPC.

STAFFING OF JPEPC

(As of December 31, 1992)

	Number of units	Number of staff	Percentage
By Functional Units			
Headquarters	16	362	0.5
Generation	16	22,225	33.0
Supply and services	11	23,198	34.5
Construction and installation	3	14,123	21.0
Education	3	1,170	1.7
Design	1	391	0.6
Repair	6	4,775	7.1
Miscellaneous	3	1,024	1.5
Total	59	67,268	100.0
By Specialty			
Staff			
Administration		6,217	9.2
Technical			
Engineers and technicians		6,409	9.5
Subtotal		12,626	18.8
Workers			
Junior		11,305	-
Average skilled		13,705	-
Highly skilled		17,865	-
Apprentices		1,648	-
Subtotal		44,523	66.2
Others		10,119	15.0
Total		67,268	100.0
By Schooling Received			
Postgraduates		131	
College graduates		2,871	
Graduates of polytechnical institutes		4,297	
Graduates of secondary technical school		5,263	
Graduates of technical schools		9,710	
Middle school graduates		40,715	
By Technical Titles			
Senior technical titles		759	
Medium technical titles		3,774	
Junior technical titles and technicians		7,953	

STAFFING OF JPEPC

CLASSIFICATION OF JPEPC SKILLED WORKERS
(As of December 31, 1992)

	Total of skilled workers		Junior		Average skilled		Highly skilled	
	Number	%	Number	%	Number	%	Number	%
Generation	15,876	37.0	4,517	40.0	4,141	30.2	7,218	40.4
Power supply & services	14,594	34.0	2,649	23.4	5,344	39.0	6,601	36.9
Construction and installation	9,251	21.6	3,550	31.4	3,184	23.2	2,517	14.1
Workers in repair and manufacture enterprises	2,879	6.7	561	5.0	807	5.9	1,511	8.5
Miscellaneous	275	0.6	28	0.2	229	1.7	18	0.1
Total	42,875	100.0	11,305	100.0	13,705	100.0	17,865	100.0

SCHOOLS AND TRAINING CENTERS UNDER JPEPC

School	Current status 1992 Students	Staff	Graduates	Proposed plan 1995 Students	Staff	Graduates	2000 Students	Staff	Graduates
Nanjing Elec. Power Institute	2,086	621	584	2,480	892	600	2,480	892	600
Jiangsu Staff College	170	80	35	490	80	140	440	80	120
Jianbi Tech. School	558	108	187	400	115	100	600	120	200
Suzhou Tech. School	1,455	225	480	1,080	240	330	1,080	250	360
Xuzhou Tech. School	761	221	279	1,000	311	180	1,200	350	400
Total	5,030	1,255	1,565	5,450	1,638	1,350	5,800	1,692	1,680

SALES AND AVERAGE PRICE BY CATEGORY OF CONSUMERS (1992)

Consumer category	Energy sales (GWh)	Average price (yuan/MWh)
Large industrial users	14,555.7	140.49
Ordinary and commercial users	7,662.94	145.42
Agriculture and rural users	3,351.23	125.77
in which:		
Agriculture users		
Residential (lighting) users	3,806.69	214.29
Other users	4,874.22	222.4
Total	34,250.78	160.83

Source: JPEPC.

INSTALLED GENERATING CAPACITIES OF JIANGSU POWER GRID (1985-92)

(Power Plants with 0.5 MW or above) (Unit: MW)

Name of plant	1985	1986	1987	1988	1989	1990	1991	1992	Average annual growth rates from 1985 to 1992 (%)
Total	3,840.45	4,528.36	5,486.94	6,223.10	6,674.24	7,519.70	7,805.81	8,280.12	11.60
Hydropower	21.38	21.82	21.88	21.88	23.48	23.48	23.88	23.88	1.59
Thermal power	3,19.07	4,506.54	5,465.06	6,201.22	6,650.77	7,496.22	7,781.93	8,256.24	11.64
1. Plants under Ministry	2,756.70	3,253.30	3,753.30	3,953.30	3,943.00	4,143.00	4,143.00	4,259.00	6.41
Xiaguan Power Plant	105.00	105.00	105.00	105.00	105.00	105.00	105.00	85.00	-2.97
Nanjing Power Plant	385.00	385.00	385.00	385.00	385.00	385.00	385.00	385.00	0.00
Jianbi Power Plant	1,025.00	1,325.00	1,625.00	1,625.00	1,625.00	1,625.00	1,625.00	1,625.00	6.80
Qishuyan Power Plant	87.70	84.30	84.30	84.30	74.00	74.00	74.00	274.00	17.67
Yangzhou Power Plant	36.00	36.00	36.00	236.00	236.00	436.00	436.00	412.00	41.65
Zhangzhu Power Plant	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	0.00
Hanzhuang Power Plant	96.00	96.00	96.00	96.00	96.00	96.00	96.00	74.00	-3.65
Xutang Power Plant	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	0.00
Jiawang Power Plant	30.00	30.00	30.00	30.00	30.00	30.00	30.00	12.00	-12.27
Xuzhou Power Plant	900.00	1,100.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	5.39
2. Plants under Province	557.00	575.00	575.00	569.00	557.00	757.00	939.00	916.00	7.47
Tianshenggang Power Plant	324.00	324.00	324.00	324.00	324.00	324.00	324.00	324.00	0.00
Qidong Power Plant	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	0.00
Xinghai Power Plant	82.50	82.50	82.50	76.50	70.50	270.50	470.50	462.00	27.90
Huaiyin Power Plant	70.50	70.50	70.50	70.50	64.50	64.50	52.50	50.00	-4.79
Yancheng Power Plant	68.00	68.00	68.00	68.00	68.00	68.00	62.00	50.00	-2.74
Binhai Power Plant	-	18.00	18.00	18.00	18.00	18.00	18.00	18.00	-
3. Local Plants	53.40	63.80	273.30	568.90	598.60	618.10	676.90	825.90	47.73
4. Captive Plants	451.97	614.44	863.46	1,110.02	1,202.17	1,278.12	1,323.03	1,551.34	19.27
5. Plants under Huaneng	:	:	:	:	350.00	700.00	700.00	704.00	26.23

MAJOR POWER GENERATING STATIONS IN JIANGSU PROVINCE

(As of December 31, 1992)

Name of plant/unit	Nameplate rate (MW)	Dependable capacity (MW)	Year of commissioning
1. Xiaguang Power Plant			
No. 5	12.00	12.00	1958
No. 6	12.00	11.00	1958
No. 7	12.00	12.00	1958
No. 8	12.00	11.00	1959
No. 9	12.00	12.00	1959
No. 10	25.00	25.00	1961
Subtotal	85.00	83.00	
2. Nanjing Power Plant			
No. 1	25.00	25.00	1960
No. 2	25.00	25.00	1960
No. 3	50.00	50.00	1968
No. 4	50.00	50.00	1971
No. 5	110.00	110.00	1975
No. 6	125.00	125.00	1976
Subtotal	385.00	385.00	
3. Jianbi Power Plant			
No. 1	25.00	20.00	1965
No. 2	50.00	45.00	1966
No. 3	50.00	45.00	1967
No. 4	100.00	100.00	1970
No. 5	100.00	95.00	1970
No. 6	100.00	95.00	1973
No. 7	300.00	300.00	1980
No. 8	300.00	300.00	1983
No. 9	300.00	300.00	1986
No. 10	300.00	300.00	1987
Subtotal	1,625.00	1,600.00	

Name of plant/unit	Nameplate rate (MW)	Dependable capacity (MW)	Year of commissioning
4. Qishuyan Power Plant			
No. 6	12.00	12.00	1984
No. 7	25.00	25.00	1973
No. 8	25.00	25.00	1981
No. 9	12.00	10.80	1981
No. 10	200.00	200.00	1992
Subtotal	274.00	272.80	
5. Hanzhuang Power Plant			
No. 3	12.00	12.00	1959
No. 5	12.00	12.00	1961
No. 6	25.00	25.00	1960
No. 7	25.00	25.00	1961
Subtotal	74.00	74.00	
6. Yangzhou Power Plant			
No. 1	12.00	11.00	1960
No. 4	200.00	200.00	1988
No. 5	200.00	200.00	1990
Subtotal	412.00	411.00	
7. Xutang Power Plant			
No. 1	40.00	40.00	1973
No. 2	40.00	40.00	1974
Subtotal	80.00	80.00	
8. Xuzhou Power Plant			
No. 1	125.00	125.00	1978
No. 2	125.00	125.00	1978
No. 3	125.00	125.00	1979
No. 4	125.00	125.00	1979
No. 5	200.00	200.00	1985
No. 6	200.00	200.00	1985
No. 7	200.00	200.00	1986
No. 8	200.00	200.00	1987
Subtotal	1,300.00	1,300.00	

Name of plant/unit	Nameplate rate (MW)	Dependable capacity (MW)	Year of commissioning
9. Tianshenggang Power Plant			
No. 4	12.00	12.00	1960
No. 5	12.00	12.00	1965
No. 6	25.00	25.00	1971
No. 7	25.00	25.00	1973
No. 8	125.00	125.00	1979
No. 9	125.00	125.00	1980
Subtotal	324.00	324.00	
10. Xinghai Power Plant			
No. 7	12.00	9.00	1973
No. 8	25.00	25.00	1976
No. 9	25.00	25.00	1977
No. 11	200.00	200.00	1990
No. 12	200.00	190.00	1991
Subtotal	462.00	449.00	
11. Huaiyin Power Plant			
No. 7	25.00	25.00	1969
No. 8	25.00	25.00	1972
Subtotal	50.00	50.00	
12. Yancheng Power Plant			
No. 6	25.00	25.00	1974
No. 7	25.00	25.00	1978
Subtotal	50.00	50.00	
13. Other units	549.00		
14. Total installed capacity of JPEPC (Ministry or Province)	5,181.00		
15. Other plants	3,075.24		
16. Total installed capacity of Jiangsu Province	8,280.12		

Source: JPEPC.

TRANSMISSION NETWORK OF JPEPC

(As of December 31, 1992)

	Transformer				Transmission line		
	Public transformer		Consumer's transformer		Overhead line		
	Substation/unit	Name plate (MVA)	Substation/unit	Name plate (MVA)	Number of line	Length of line (km)	Length of circuit (km)
Total of JPG	961/2,067	28,659.5	1,187/2,550	6,280.6	2,138	26,732.1	27,560.5
500 kV	2/9	1,500.0	-	-	1	728.8	739.9
220 kV	59/93	10,880.0	-	-	138	4,459.0	4,760.1
110 kV	235/361	10,524.6	33/62	1,409.1	411	6,815.3	7,023.5
35 kV	665/1,604	5,754.9	1,154/2,488	4,871.5	1,588	14,729.0	15,037.1
Of which under JPEPC	961/2,067	28,659.5	-	-	1,871	25,352.8	26,168.5
500 kV	2/9	1,500.0	-	-	1	728.8	739.9
220 kV	59/93	10,880.0	-	-	138	4,459.0	4,760.1
110 kV	235/361	10,524.6	-	-	401	6,755.6	6,963.1
35 kV	665/1,604	5,754.9	-	-	1,331	13,409.4	13,705.5

Source: JPEPC.

ENERGY GENERATION OF JAINGSU POWER GRID (1985-92)

(Power Plants with 0.5 MW or above) (Unit: GWH)

Name of plant	1985	1986	1987	1988	1989	1990	1991	1992	Average annual growth rates from 1985 to 1992 (%)
Total	22,558.28	25,456.58	29,432.60	33,288.86	35,403.84	39,605.62	43,369.19	47,408.01	11.19
Hydropower	47.51	30.20	58.57	36.99	47.48	44.67	43.28	43.28	-1.32
Thermal power	22,510.77	25.426.38	29,374.03	33,251.87	35,356.36	39,560.95	43,325.91	47,364.73	11.21
1. Plants under Ministry	16,389.31	18,688.65	21,239.21	22,791.70	23,488.85	25,465.59	26,360.93	26,975.76	7.38
Xiaguan Power Plant	619.10	701.96	693.63	669.54	576.09	560.94	548.92	569.3	-1.19
Nanjing Power Plant	3,008.89	2,992.02	2,876.80	2,756.44	2,514.42	2,726.59	2,742.37	2,847.32	-0.79
Jianbi Power Plant	6,468.56	7,110.88	8,374.23	8,803.54	8,866.04	10,040.73	10,117.46	10,458.05	7.10
Qishuyan Power Plant	601.30	581.87	576.92	573.50	482.21	472.40	471.20	535.19	-1.65
Yangzhou Power Plant	272.04	268.62	216.56	242.79	1,101.98	1,732.67	2,598.00	2,709.37	38.87
Zhangzhu Power Plant	93.74	93.73	88.16	90.03	83.62	76.58	75.58	75.59	-3.03
Hanzhuang Power Plant	731.19	701.34	683.40	676.76	651.86	594.46	564.45	476.87	-5.92
Xutang Power Plant	231.00	240.09	230.03	220.50	216.00	189.62	192.62	561.22	13.52
Jiawang Power Plant	637.02	598.14	528.31	618.96	611.12	549.36	537.59	140.32	-19.44
Xuzhou Power Plant	3,726.47	5,400.00	6,971.17	8,139.64	8,385.51	8,522.24	8,512.74	8,602.48	12.69
2. Plants under Province	4,175.64	4,288.19	4,268.67	4,048.03	3,975.65	4,099.91	4,852.82	5,624.49	4.35
Tianshenggang Power Plant	2,453.17	2,487.12	2,522.86	2,420.72	2,345.90	2,369.74	2,263.13	2,346.99	-0.63
Qidong Power Plant	98.75	98.58	94.78	90.51	85.03	73.16	28.51	42.35	-11.39
Xinghai Power Plant	625.99	589.51	582.47	541.02	539.05	742.61	1,637.26	2,387.44	21.07
Huaiyin Power Plant	476.81	469.76	441.92	428.60	405.08	385.13	391.94	359.46	-3.96
Yancheng Power Plant	520.92	528.84	503.81	489.92	516.53	481.66	463.75	419.75	-3.04
Binhai Power Plant	-	114.38	122.83	77.26	84.06	47.61	68.23	68.50	-
3. Local Plants	215.59	302.04	775.80	2,421.34	3,149.77	3,278.22	3,772.85	4,376.33	53.74
4. Captive Plants	1,730.23	2,147.50	3,090.35	3,990.80	4,116.32	4,395.63	4,825.15	6,275.26	20.21
5. Plants under Huaneng	:	:	:	:	625.77	2,321.60	3,514.16	4,112.89	:

Source: JPEPC.

ENERGY CONSUMPTION BY CATEGORY OF CONSUMERS IN JIANGSU PROVINCE (1987-92)

Consumer category	1987 GWh	1988 GWh	1988 (%)	1989 GWh	1989 (%)	1990 GWh	1990 (%)	1991 GWh	1991 (%)	1992 GWh	1992 (%)	Average annual growth rate 1987 to 1992
A. Agriculture Load Including forestry, animal husbandry, fishery, etc.												
1. Agriculture	2,298.03	3,020.24	31.43	3,435.07	13.74	3,732.60	8.66	4,208.41	12.75	4,725.86	12.30	15.51
Drainage & irrigation	1,433.91	1,827.14	27.42	1,820.01	-0.39	2,00.61	9.92	2,483.61	24.14	2,705.61	8.94	13.54
Sideline protection	1,689.25	1,719.71	1.80	1,770.69	2.96	1,873.42	5.80	1,89.32	0.90	2,195.24	16.13	5.38
2. Forestry	10.61	13.85	30.54	19.76	42.67	20.77	5.11	23.35	12.42	28.24	20.94	21.63
3. Animal husbandry	28.51	62.38	118.80	63.62	1.99	71.25	11.99	81.89	14.93	105.01	28.23	29.79
4. Fishery	64.78	81.08	25.16	76.77	-5.32	82.17	7.03	102.67	24.95	119.49	16.38	13.03
5. Other	1,254.41	912.08	-27.29	656.68	-28.00	659.49	0.43	699.55	6.07	754.26	7.82	-9.67
Subtotal	3,656.34	4,089.63	11.85	4,251.90	3.97	4,566.28	7.39	5,115.87	12.04	5,732.86	12.06	9.41
B. Industrial Load												
1. Light	7,689.84	8,197.64	6.60	8,366.18	2.06	8,935.73	6.81	9,721.59	8.79	10,874.70	11.86	7.18
2. Heavy	19,558.80	20,568.60	5.16	21,027.30	2.23	22,588.60	7.42	24,697.00	9.33	27,952.90	13.18	7.40
Subtotal	27,248.60	28,766.20	5.57	29,393.50	2.18	31,524.40	7.25	34,418.60	9.18	38,827.60	12.81	7.34
C. Geological Prospecting Load	11.68	14.32	22.60	15.04	5.03	15.55	3.39	17.93	15.31	21.19	18.18	12.65
D. Architectural Load	159.32	181.93	14.19	186.82	2.69	202.80	8.55	215.33	6.18	266.24	23.64	10.82
E. Load for Transportation & Communication												
Transportation	275.71	311.32	12.92	309.15	-0.70	308.35	-0.26	323.85	5.03	355.10	9.65	5.19
Communication	31.34	41.47	32.32	46.13	11.24	58.29	26.36	72.44	24.28	90.99	25.61	23.76
Subtotal	307.05	352.79	14.90	355.28	0.71	366.64	3.20	396.29	8.09	426.09	7.52	6.77
F. Commercial Load	263.89	327.12	23.96	359.65	9.94	434.68	20.86	507.57	16.77	600.61	18.33	17.88
G. Residential Load												
Municipal	606.95	783.49	29.09	1,031.86	31.70	1,430.49	38.63	1,643.77	14.91	1,906.12	15.96	25.72
Rural	699.04	818.54	17.09	975.44	19.17	1,179.10	20.88	1,417.98	20.26	1,785.23	25.90	20.63
Subtotal	1,305.99	1,602.03	22.67	2,007.30	25.30	2,609.59	30.00	3,061.75	17.33	3,691.35	20.56	23.10
H. Others	723.77	856.82	18.38	867.60	1.26	966.95	11.45	1,131.14	16.98	1,325.79	17.21	12.87
Total	33,676.70	36,190.80	7.47	37,437.10	3.44	40,686.80	8.68	44,864.50	10.27	50,891.70	13.43	8.61

Source: JPEPC.

ENERGY FORECAST FOR JIANGSU POWER GRID (1993-2002)

(Unit: GWh)

Consumer category	1992 (actual)	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average annual growth rates (%)
Agriculture	5,733	6,300	7,000	7,700	8,800	10,120	11,500	12,650	14,000	14,800	15,140	10.74
of which: Irrigation & drainage	2,706	3,000	3,450	3,750	4,210	4,850	5,010	5,810	6,750	7,150	7,400	11.10
Industry	38,826	43,100	47,600	52,300	57,720	64,680	72,270	79,750	87,120	95,380	98,600	10.31
Transportation & communications	426	500	550	590	650	720	800	900	1,100	1,250	1,280	12.23
Residential	3,691	4,550	5,080	5,950	7,020	8,360	9,900	11,550	13,300	15,340	16,680	16.85
Others	2,214	2,550	3,270	3,660	3,810	4,120	4,530	5,150	5,480	6,230	7,300	13.17
Total	50,892	57,000	63,500	70,200	78,000	88,000	99,000	110,000	121,000	133,000	139,000	11.11

Source: JPEPC.

JPEPC'S POWER DEVELOPMENT PROGRAM (1993-2002)

Name of plant	Installed capacity (MW)	No. of units	Unit size (MW)	Construction starting date	Scheduled commissioning date
1. Plant under JPEPC					
Yangzhou No. 2 I	1,200	2	600	1994	1998,1999
Yangzhou No. 2 II	1,200	2	600	1997	2000,2001
Shangshu I	1,200	4	300	1990	1993,1995
Shangshu II	1,200	2	600	1995	1999,2000
Xiaguan II	250	2	125	1993	1995,1996
Qishuyan II	400	2	200	1989	1992,1993
Sheyanggang I	250	2	125	1992	1994,1995
Sheyanggang II	600	2	300	1996	1999,2000
Xuzhou Pengchen I	600	2	300	1993	1995,1996
Xuzhou Pengchen II	600	2	300	1997	1999,2000
Yanjiang No. 1	1,200	2	600	1997	2000,2001
Nantong Lusigang	1,000	1	1,000	1998	2002
2. Plant under Joint Venture					
Ligang I	700	2	350	1989	1993,1993
Ligang II	700	2	350	1993	1997,1998
Ligang III	1,200	2	600	1998	2001,2002
3. Plant under Huaneng					
Huaneng Nantong II	700	2	350	1995	1998,1999
Huaneng Huaiyin I	400	2	200	1991	1993,1994
Huaneng Huaiyin II	600	2	300	1995	1998,1999
Huaneng Nanjing	600	2	300	1989	1993,1994
Nanjing New	2,400	4	600	1996	2000,2002
4. Local and Captive	500	10	50	-	1992-1998

Source: JPEPC.

SYSTEM DEMAND AND ENERGY BALANCE OF JIANGSU POWER GRID, 1993-2000

	System demand		System capacity /a		Energy generated	Power purchased		Power balance			Realistic system demand	
	Energy (GWh)	Peak (MW)	Installed (MW)	Dependable (MW)	(GWh)	Capacity (MW)	Energy (GWh)	Energy (GWh)	Capacity (MW)	Reserve margin (%)	Peak (MW) at 15% reserve	Energy (GWh)
1992 (actual)	50,892	7,859	8,280	7,866	47,408	1,076	3,484	0	633	8.05	7,358	50,892
1993	57,000	8,900	9,930	9,434	50,600	700	1,500	-4,900	(334)	-3.75	7,281	52,100
1994	63,500	10,000	11,505	10,930	58,600	300	500	-4,400	(267)	-2.67	8,273	59,100
1995	70,200	11,200	12,055	11,452	62,500	700	1,500	-6,200	430	3.84	9,885	64,000
1996	78,000	13,000	12,830	12,189	67 000	600	3,000	-8,000	(948)	-7.29	10,244	70,000
1997	88,000	14,500	13,430	12,759	70,000	800	3,500	-14,500	(1,512)	-10.42	11,040	73,500
1998	99,000	16,500	15,530	14,754	81,000	1,500	3,000	-15,000	(2,242)	-13.58	12,120	84,000
1999	110,000	18,400	18,580	17,651	97,000	2,000	2,500	-10,500	(1,647)	-8.95	14,240	99,500
2000	121,000	19,800	20,980	19,931	107,000	2,400	3,000	-11,000	251	-1.27	17,043	110,000
2001	130,000	21,500	23,380	22,211	120,000	2,700	2,500	-7,500	1,131	5.26	19,236	122,500
2002	139,000	23,000	25,580	24,301	130,000	3,000	2,500	-6,500	2,211	9.61	21,429	132,500
								Average rate of growth		=	11.3%	10.0%

/a Capacity at the end of the year.

Source: JPEPB.

SYSTEM DEMAND AND ENERGY BALANCE OF JIANGSU POWER GRID

	System demand		System capacity /a		Energy generated	Power purchased		Power balance		
	Energy (GWh)	Peak (MW)	Installed (MW)	Dependable (MW)	(GWh)	Capacity (MW)	Energy (GWh)	Energy (GWh)	Capacity (MW)	Reserve margin (%)
1992 (actual)	50,892	7,859	8,280	7,866	47,408	1,076	3,484	0	633	8.05
1993	57,000	8,900	10,380	9,861	51,900	700	1,500	-3,600	(334)	-3.75
1994	63,500	10,000	11,305	10,740	56,525	300	500	-6,475	161	1.61
1995	70,200	11,200	12,155	11,547	60,775	700	1,500	-7,925	240	2.14
1996	78,000	13,000	12,580	11,951	62,900	600	3,000	-12,100	(853)	-6.56
1997	88,000	14,500	13,180	12,521	65,900	800	3,500	-18,600	(1,749)	-12.06
1998	99,000	16,500	14,730	13,994	73,650	1,000	1,000	-24,350	(2,979)	-18.05
1999	110,000	18,400	16,580	15,751	82,900	800	3,000	-24,100	(3,607)	-19.60
2000	121,000	19,800	18,080	17,176	90,400	1,200	4,000	-26,600	(2,849)	-14.39
2001	130,000	21,500	18,680	17,746	93,400	400	0	-36,600	(3,924)	-18.25
2002	139,000	23,000	19,280	18,316	96,400	600	0	-42,600	(4,654)	-20.23

/a Capacity at the end of the year.

PROJECT DESCRIPTION

General

1. The proposed Yangzhou thermal power plant is located about 11 km from Yangzhou City and about 100 km from Nanjing City, the capital of Jiangsu Province. The project site is situated along the embankment of the Yangtze River and has favorable topographical and geological conditions and an easy access by railroads, highways and river navigation. The plant will be leveled above the 100-year flood line. In its initial phase the Yangzhou thermal power plant will have an installed capacity of 1,200 MW (2 x 600 MW units). In the second phase, if and when developed, the site could accommodate an ultimate capacity of 2,400 MW. The scheduled dates of commercial operation of the generating units are as follows:

Unit 1	December 1998
Unit 2	December 1999

2. The 1,200-MW thermal power plant will consume up to 4 million tons of coal a year. The plant will be designed to burn coal from the Shenfu-Dongsheng coal mines in Inner Mongolia as "design coal" (5,113 kcal/kg, 0.31 percent sulfur, 15.5 percent ash) and also to burn "check coal" (4,890 kcal/kg, 0.92 percent sulfur, 28.4 percent ash). In the initial stage until 1999, coal from the northern part of Shanxi Province (5,360 kcal/kg, 0.63 percent sulfur, 20 percent ash) will be supplied to the plant through the existing railroad between Datong and the Qinhuangdao port. From the year 2000, the design coal will be supplied. The coal will be transported first by new railroad to the Huanghua port (now under construction) in North China, and then by sea and river transportation to a special coal jetty near the plant site. The new railroad and port are being constructed by the Huaneng Fine Coal Company.

3. The source of cooling and make-up water required by the plant will be supplied from the Yangtze River, which can fully meet the plant's water demand. A direct flow unit system will be adopted for supplying water to the power plant.

4. The two 500-kV transmission lines of 34 km long from the plant site to the Jiangdu substation will connect the power plant to the East China power system.

5. The steam parameters of the 600 MW power plant will be selected to have a steam pressure of 16.66 MPa at high-pressure turbine inlet and superheat and reheat temperatures of 538°C, which are standardized ratings of 600 MW units. Experiences in other thermal power plants in China will be reflected in plant design.

Turbine Generator

6. Turbine generator units will have a nominal capacity of 600 MW each. Many units of this size range are in satisfactory operation the world over, based on well-proven technology.

7. The power plant design will incorporate a high-pressure turbine bypass system and a low-pressure turbine bypass system for the purpose of unit start-up. The turbines will also be capable of variable pressure operation to contribute in reducing auxiliary losses when the units are in operation under partial loads. The generators will be hydrogen cooled, with water-cooled stator windings. The excitation system will be static one.

Steam Generator

8. The stream generators will be of the single reheat, drum type, each rated to produce 2 million kg of steam per hour at the rated steam conditions given in para. 5. above. Six coal pulverizes per unit will be provided to ensure boiler operation under MCR and 10 percent margin when burning the "check coal" with five pulverizes in operation and one in standby. There will be two trains of draft fans per boiler, along with two separate air heaters. The units will be designed both for base load operation and variable pressure operation up to 30 percent load. Range of automatic control with burning coal only will be 100 to 30 percent load. Light fuel oil will be used for start-up. For air pollution mitigation, the units will be designed to provide low NO_x burners and other low NO_x technology and provide space for future provision of the flue gas desulfurization plant.

Coal Handling

9. The power plant is located on the northern bank of the Yangtze River, which is directly accessible by oceangoing vessels. Coal will be transported by large-size shallow-draft vessels of 35,000 or 16,000-25,000 tonnage class and delivered to the special coal jetty near the plant site. The unloaded coal will be delivered to the coal storage yard which will have storage capacity of about 280,000 tons.

Cooling Water System

10. A direct flow unit system will be adopted for supplying water from the Yangtze River to the power plant. Each unit will be provided with a mushroom-shaped water intake. A circulating water pump house will be provided for the first phase of the project. Each unit will be equipped with two circulating water pumps, one gravity-flow water pipe for the intake portion, one pressurized main pipe and one reinforced concrete water discharge channel.

Ash Handling System

11. Ash will be conveyed pneumatically inside the power plant and hydraulically outside the plant. To facilitate the utilization of fly ash, each boiler will be provided with a coarse ash storage and a fine ash storage. The dry ash under the storage is added with water in the water mixer before discharging into the slurry pond from which the slurry ash mixed with water is pumped to the ash yard through pipes. The slag handling system will be provided as a common facility of two 600 MW units and will be operated hydraulically and in intermittent cycle. The power plant (2 x 600 MW) will produce about 420,000 tons of ash and slag each year. Three ash yards and one slag yard in abandoned river courses will be provided to meet ash and slag disposal from phase I and II development (4 x 600 MW), adequate for 28 years of operation.

Instrumentation and Control System

12. A microprocessor-based distributed control system will be used. Display of plant-specific equipment status and operating parameters on CRT's installed in the central control room will provide real-time interface between operators and plant systems. CRT's will also provide facilities for retrieval of plant operating data, as desired. Data loggers and sequence of events recorders will automatically record plant performance on a periodic basis, and display operating problems.

Transmission Lines and Substation

13. Two 500 kV transmission lines, 34 km long each, will be constructed to connect the Yangzhou power plant and Jiangdu substation, which is one of key substations in the East China Power Grid. In Jiangdu substation, two units of 750 MVA step-down transformers will be installed. Twelve (12) 220-kV substations, nine (9) new and three (3) extension, with a total capacity of 1,440 MVA will be constructed to feed into the Jiangsu provincial grid.

CONSULTING SERVICES
(Terms of Reference)

A. SCOPE OF CONSULTING SERVICES

1. Consulting Engineer (hereinafter called the Engineer) shall provide consulting services for Boiler island, Turbine-Generator island and I&C island as follows:

Stage I: Review of Bidding Documents, Technical Bid Evaluation and Contract Negotiations

Task 1: Provide assistance in review of Bidding Documents and finalization of Bidding Documents for issuance by the Owner.

Task 2: Provide assistance in Technical Bid Evaluation and Preparation of Technical Bid Evaluation Reports.

Task 3: Provide assistance in Technical Negotiation of Contracts and review of island contract documents.

Stage II: The Engineer shall be in charge of Engineering and Design Interfaces Coordination and Vendor Drawing Review; Attend Design Liaison Meetings and Provide Construction Management Support

Task 1: Review shop drawings and other detailed drawings, technical documents, and calculations submitted by the Vendors, provide the List of Interfaces and coordinate interfaces between the various islands.

Task 2: Attend and provide assistance in Design Liaison Meetings.

Task 3: Assist the Owner in construction management.

B. Detailed Description of Consulting Services

Stage I: Engineer shall provide assistance in review of Bidding Documents, Bid Evaluation and Contract Negotiation

Task 1

2. Engineer shall review bidding documents of three ICB islands and provide a list of interfaces between the three islands and also balance of plant (BOP). Major equipment bid specifications:

(a) Turbine-Generator island shall include medium-voltage power supply equipment, and auxiliary power distribution system.

(b) Boiler island shall include all ash-handling equipment.

(c) Instrument and Control.

The bid specifications are being prepared by ECEPDI. Engineer is responsible for review of bidding documents; Engineer should provide review reports to the Owner within six weeks after receipt of the documents.

3. Engineer should meet the requirements as follows:

(a) Engineer's review shall make extra effort to assure the soundness of specifications and the reasonability and flexibility of process system plan based on Engineer's standards, the Owner's specific project requirements, the applicable codes and standards and international engineering practices to obtain competitive bids from qualified vendors from various countries, ensure that equipment and process systems are procured according to bidding documents of islands, and that they will meet the requirements for safety, provide the latest in technical advancement, operate economically after commercial operation.

(b) The bidding documents will be reviewed from a design, furnish and delivery basis, Engineer shall place special emphasis on the following aspects:

(i) technical parameters;

(ii) codes and standards;

(iii) scope of contracts and completeness of specifications;

(iv) design criteria (including type of calculation, type of drawing);

(v) quality assurance;

(vi) schedules of design, manufacturing and delivery;

(vii) erection assistance;

(viii) interfaces among various islands included but not limited to: a. parameter match; b. main steam, reheat steam piping, feed water piping, bypass piping; c. cables, cable trays; d. control, protection signals; e. pipes of ϕ 65mm above; f. steel construction; g. overall station supply system, etc.

(c) Engineer shall review scope of supply in each bid package such that interfacing is clear and equipment and materials are complete. This review for scope is intended to eliminate any gaps or overlaps between the islands. Engineer will also provide the list of major interfaces in each island to the Owner. Engineer will assist the Owner to establish an Interface Procedures Manual detailing the responsibilities of each Island Vendor, the method of interface drawing transmittal, and the correspondence numbering system.

(d) While reviewing the bid specifications, Engineer will provide the mandatory spare parts requirements to direct the vendors in selecting parts, to support one-year commercial operation after start-up.

(e) Engineer's review should make the bid specification documents meet World Bank's requirements and guidelines such as:

(i) criteria of domestic preference;

(ii) evaluation factors;

(iii) acceptable alternative plan; and

(iv) performance assurance and penalty.

(f) Engineer will prepare a formal summary of comments on the post qualification of bidders (including equipment manufacturing, engineering design and quality assurance) and forward it to the Owner so as to determine the minimum qualification requirements for bidders while reviewing the bidding documents.

(g) Engineer will work very closely with the Owner and his Engineer during this effort to resolve and promptly identify any areas that may require additional attention and will provide guidance and assistance to the Owner, to address any specific areas of concern with respect to the conceptual design and the bid specifications. Engineer will prepare a formal written summary of all comments that will include marked-up drawings, specifications, and descriptions and forward this summary to the Owner as

early as possible. After the review of bid specifications and documents, all pertinent comments shall be incorporated into the final bidding documents by ECEPDI.

4. The reviewing report of the bidding documents will be prepared by the Engineer, confirmed by the Owner and submitted to the World Bank.

Task 2. Assist the Owner in bid evaluation, preparing bid evaluation reports.

5. Engineer will send the consultants to China to attend the prebid meeting for Boiler Island, Turbine-Generator Island and I&C Island, conducted by the Owner, to provide assistance to the Owner in answering the questions required by bidders during the meeting.

6. Copies of all technical bids will be submitted to Engineer's home office at the same time they are submitted to the Owner. The Owner will prepare a bidders short list consisting of four bidders for Engineer's in-depth evaluation. Engineer shall conduct a preliminary review and prepare preliminary comments in its home office, then send a team of technical personnel, consisting of Project Manager, Mechanical Engineer, Electrical Engineer, Instrumentation and Control Engineer and Civil Engineer and Boiler/ Turbine-Generator Specialists, to China for four weeks' duration to work with the Owner to reach preliminary results of evaluation for Boiler Island and Turbine-Generator Island. Engineer's team will attend clarification meeting and assist in preparation of bid evaluation report for each island respectively.

7. Engineer shall provide similar service for I&C Island. The Electrical Engineer and I&C Engineer should be dispatched for the service rendered in China with an expected duration of two weeks.

8. During bid evaluation, Engineer shall certify the reasonability and feasibility of interfacing criteria and interface parameters recommended by bidders and provide suggestion and evaluation criteria for price differences due to the differences of interfacing criteria and interface parameters.

9. Engineer shall provide the Owner and his Engineers with bid evaluation criteria and methodology that will identify specific items for consideration in the evaluation process such as:

(a) evaluation method for differences in equipment performance, such as horsepower, efficiency, power factor, and starting voltage;

(b) evaluation methods for differences in equipment sizes, such as foundation costs, building costs, and differences in erection cost;

(c) evaluation methodology for differences in interface requirements;

(d) evaluation methodology for differences in performance, guarantees and warranties;

(e) evaluation methodology for differences in delivery terms.

The above data must be submitted before the evaluation work starts so that the Owner and his Engineers are completely ready for the evaluation upon receipt of bids.

10. Engineer shall evaluate the bids as follows:

(a) review and clarify questions and problems;

(b) assist in technical review of bids;

(c) prepare a list of questions that require clarification from the bidders;

(d) assist in negotiation for alteration, adjustment and in answering questions in the contents of specifications;

(e) discuss preliminary evaluation results with the Owner and CIECC;

(f) discuss resolution of question and problems in the bids with the Owners and bidders;

(g) review the responses from the bidders during bid evaluation;

(h) assist the Owner to determine the ranking of the bidders;

(i) provide formal written comments on the qualification and experience of vendors and main subcontractors, if so requested by the Owner.

11. Engineer shall place sufficient emphasis on the following aspects during bid evaluation:

(a) effective date and validation of the bids;

(b) completeness in the content, quality, prices, performance and schedule proposed by vendors;

(c) the bids meet requirements relating to guarantees, warranties and bond;

(d) exceptions, deviations and clarification to the specifications;

(e) completeness of all auxiliaries of islands are included.

12. After the Owner has submitted the bid evaluation reports to the World Bank, if the World Bank has any questions regarding the evaluation report, Engineer shall assist the Owner in answering them to the satisfaction of the World Bank.

Task 3. Assist in technical negotiation of contracts, review technical contract documents.

13. After the World Bank has given its approval, Engineer shall not only prepare associated data in its home country, but also send a project team to China consisting of five engineers (four weeks' duration) for the Boiler and Turbine-Generator islands and two engineers (for two weeks' duration) for the I&C island to work with the Owner and his Engineers in contract technical negotiation. During technical negotiation, Engineer shall assure that interfaces among various islands are clearly defined, and interface parameters and interface criteria determined by negotiation to be further confirmed in contract documents. Engineer shall make effort to define the contents and schedule of the required design information exchange among Vendors and the ECEPDI design engineers. Engineer shall also help set up the project procedures of correspondence and drawing numbering system.

14. Engineer shall, using its international experience, provide assistance to assure that the terms of contract meet the requirements of the World Bank. The contracts shall include procedures for supervision and control of Vendors and measures to be taken in various stages.

Stage II: In charge of interfaces coordination and Vendor's drawings review; attend design liaison meetings and provide construction management support

Task 1. In charge of interfacing coordinating, review of vendor's drawings, technical documents and calculations

15. Engineer shall be responsible for coordinating interfaces and to resolve interface problems among island Vendors.

(a) Vendor of each Island shall not only directly exchange drawings and information with each other, but also submit copies of all correspondences associated with interfaces to the Engineer, the Owner and ECEPDI.

(b) Engineer shall provide Home Office project coordination of vendor's interfaces, engineering, and scope of island Vendors.

(c) In order to monitor and expedite schedules of interface, Engineer shall coordinate the project schedules among island Vendors, so that interfaces coordination would be performed in time and data are complete; there should be no gaps and overlaps.

(d) Each of the Vendors shall provide a monthly report about the interfacing condition. Engineer, based on the schedule of information exchange, supervise, manage and expedite the vendor to exchange design information based on interfacing condition, Engineer will be responsible for review of equipment drawings, technical documents and calculations to coordinate the interfaces between each island contractors and to resolve interface problems and potential interferences in design done by contractors.

(e) Engineer will examine the interfaces between vendors' drawings, will quickly handle the comments from various vendors so as to ensure all interface points be confirmed. Comments on vendors' drawings shall be directly forwarded to them and copies shall be sent back to the Owner and ECEPDI.

(f) Engineer will give assistance to the Owner for the coordination of data transfer, drawings and information exchange, between each Vendor in accordance with the interface manual prepared by Engineer. Each Vendor shall maintain a list of submitted drawings and their disposition for the Owner and Engineer to use.

(g) If Engineer thinks it prudent, he will examine the special calculation method so as to guarantee the drawings satisfy the requirements of specifications.

(h) Engineer will direct the Vendors of Boiler Island and Turbine-Generator Island to compose a uniform piping interface list, in which the size, wall thickness, material requirements as well as the preparing sketch of welding ends will be all listed.

(i) Resolution of the commercial items of the island contracts shall be by the Owner.

16. Engineer will assist the Owner's engineers in reviewing the Vendor's drawings, technical documents and calculations for compliance with the specifications.

17. Owner's engineers will be accomplished in three phases, with the second phase performed in Engineer's office. The second phase will start two months prior to the second design liaison meeting and last about six months. During this phase, the Owner's engineers (Mechanical, Electrical, I&C and Civil) will work together with Engineer's staff in review of Vendor drawings. All comments including interfaces comments will be combined and marked on the Vendor's drawings and will be returned to Vendors. Engineer will assist the Owner's engineers in answering questions and provide support service for the joint drawing review effort. The Owner's engineers will participate in the third design liaison meting and return to China after the meeting and continue the Vendor drawing review in China.

Task 2. Attend design liaison meetings and assist the Owner in coordination and resolutions of design interface problems

18. Engineer will attend the design liaison meetings in four times (two will be held in China, two in vendors' host countries) and provide assistance to the Owner; a total of about 20 person-trips are included. Engineer will be responsible for the interface design coordination, and take charge of the design liaison meeting about interface problems.

19. Engineer will provide Home Office project expediting and to assist the Owner in coordination of vendor engineering, component completion and shipment for the three prime vendors.

(a) Engineer will review document submittal schedules of the three prime vendors to verify the timely submittal by the three prime vendors of interface design engineering data, drawings and procedures meet Contract requirements.

(b) For potentially delinquent items, explore corrective measures with prime vendors and exert pressure on prime vendor's management for compliance with contract schedule commitments.

Task 3. Assist the Owner in construction management

20. Engineer shall provide construction management support to the Owner for the following areas:

(a) contract administration,

(b) scheduling and reporting,

(c) construction inspection and quality assurance,

(d) cost control and accounting,

(e) construction site management.

21. The construction management team to be sent by the Consulting Engineer to the field would consist of:

		Staff-Months
1	Resident Engineer	36
1	Mechanical Engineer in charge of boiler island	36
1	Mechanical Engineer in charge of T-G island	30
1	Electrical Engineer in charge of I&C	24
1	Electrical Engineer in charge of start-up, testing and acceptance test	14
1	Engineer in charge of cost control and reporting	30
	Total	170

Staff-Month Estimate

Services	Staff-Months
Phase I	50
Phase II	
Design interfacing and coordination, liaison meetings, and review of drawings	80
Construction management	170
Total	300

ACCOUNTING AND FINANCIAL MANAGEMENT INFORMATION SYSTEM (Terms of Reference)

Objectives and Background

1. The Jiangsu Provincial Electric Power Company (JPEPC) is seeking a loan from the World Bank to finance the Yangzhou Thermal Power Project. It is proposed to include in the proposed loan funds for financing the cost of consulting services for upgrading JPEPC's accounting, budgeting, and financial management systems. The objective of these services is to assist JPEPC making a smooth and speedy transition to the new accounting framework that follows international accounting principles and standards and strengthening JPEPC's financial management. This also includes introduction of computerized financial management information systems that will enable managers to obtain timely information on the costs of all aspects of the company's activities. The new systems would facilitate better budgetary control and reporting on costs and finances to managers responsible for incurring expenditures and also for external reporting to the Government, shareholders, lenders and the public.

2. JPEPC, like all state-owned enterprises has maintained its accounts in accordance with China's uniform accounting system, which has been applied for many years under China's centrally planned economy. The Ministry of Finance has been responsible for issue of regulations relating to accounting by state enterprises in China. However, from July 1, 1993 new regulations covering accounting rules and financial affairs are being introduced to strengthen the financial management of enterprises. These new regulations largely reflect International Accounting Standards.

3. The new regulations will lead gradually to replacement of state control by accountability mechanisms which will allow greater financial autonomy to enterprise managers. This will require enterprises to develop better budgetary and cost control systems. Financial statements will need to be adjusted to provide full disclosure of their financial position; e.g., the ownership and value of fixed assets will need to be updated to establish the amount of equity or value of share capital and the value of construction works-in-progress and related sources of funds will need to be brought to account. Enterprises will be permitted to retain profits after taxes and depreciation funds to finance expansion needs. This will mean that managers will then have to establish better cash management and reporting for government, lenders, shareholders and the public. Public accountability will replace state control as enterprises begin to obtain funds for expansion from financial markets through borrowing and issues of shares.

Scope of Services

Phase 1—Diagnostic Phase to Determine System Requirements

4. Review in depth all existing accounting systems, including (a) policies, procedures, documentation, and reporting formats; (b) transactions and activities at all levels, such as power plants, supply bureaus, substations, etc; both those that are presently on manual systems or computerized.

5. Identify (a) differences between JPEPC accounting practices under the new regulations issued by MOF and international accounting standards; (b) issues/problems existing within JPEPC to record its transactions and activities in accordance with internationally accepted accounting standards.

6. Conduct a survey of the requirements of managers for financial information and identify the functions and activities for which costs will be needed to be reported and controlled.

7. Assess JPEPC's (a) existing organizational structure, including the relationships and linkages between JPEPC and the external units under it; (b) present policies and procedures for planning and financial management, including pricing, investment financing, cost controls and financial reporting.

8. Review existing computer hardware and software.

Phase 2—Detailed Design of New Systems

9. Using information collected under phase 1, prepare a detailed plan for upgrading and improving existing systems, including a new chart of accounts, reporting formats, disclosures, accounting policies and procedures, required documentation to cover each segment of electricity supply, e.g., generation, transmission, and distribution, most suitable for JPEPC's business need. This will also require identification of priorities and selection of suitable hardware and software especially a new general ledger package and mainframe hardware that would be linked to computer terminals or PCs.

10. A new chart of accounts should be prepared incorporating appropriate budgetary control techniques for planning, measurement and control of costs.

11. The level and frequency of reports should be determined and detailed formats and contents agreed for each level of management. These would be submitted for management review and approval. Reporting formats and contents as well as their flows should be designed and step-by-step flow charts should be prepared.

12. Internal and external auditors would have to be consulted and their needs for adequate controls and checks taken into consideration in developing the new systems.

13. The staffing and skills required to implement the new systems would need to be identified. An appropriate training program would also need to be prepared. In connection with the new accounting and financial management information system, a recommended new organization chart for JPEPC's financial department should be prepared.

14. Work sessions need to be organized to assist JPEPC managers and financial staff to fully understand the proposed changes.

15. A detailed work plan and timetable for implementation of the new systems would be prepared. This would show how the new and improved systems would be progressively interfaced with existing systems to ensure a smooth transition.

Phase 3—Implementation

16. Implementation of system improvements, including the organizational and staffing changes, according to the scope and pace in the implementation plan.

17. Procurement and installation of new hardware and software.

18. The new and/or modified systems should be tested and installed preferably at the start of the fiscal year and run in parallel with old systems until the new ones are fully operational.

19. New accounting procedures and manuals would be prepared to assist staff responsible for operating the new systems.

20. Full documentation of the new systems should be prepared including user procedures.

21. Training should be given to financial and other user staff (both formal and on-the-job) who will operate and maintain the new systems and prepare reports. Training should also be given to managers who will make decisions based on information provided by the new systems.

Approach to the Work

22. The consultants would be expected to work under the direction of a Steering Committee set up by the JPEPC. A proposed method of approach and a detailed work plan should be prepared showing the tasks to be undertaken by each member of the team and the time period in consultant weeks which each would provide. A Chinese counterpart team of accountants should be subcontracted by the consultant. The work plan for the study would show how this support would contribute to each phase of the services. The foreign consulting team should represent appropriate capabilities and experience in accounting system design and implementation, training, and public utility industry accounting practices.

Outputs

23. The main output of the work would be reports at the end of Phases 1 and 2 and subsequently under Phase 3, the accounting procedures manuals and documentation of the systems, including all accounting policies, procedures, and reporting formats. Progress reports should be provided quarterly to the Steering Committee.

MANAGEMENT DEVELOPMENT AND TRAINING

A. Objectives

1. The management development and staff training program is designed to enhance JPEPC's managerial, technical and financial capabilities. The main objectives of the program are:

(a) to enable JPEPC to function as an autonomous entity for the efficient and accelerated development of its long-range investment program; and

(b) to staff JPEPC with professionally skilled personnel capable of handling power development and financial planning, modern construction, management and business operations.

B. Scope

2. The training program will consist of the following three main categories:

(a) Training in utility management and financial planning;

(b) Project-related training for technical staff by working together with consultants and those financed under vendors' contracts; and

(c) Upgrading and equipping of JPEPC's training facilities.

C. Organization of Training

3. JPEPC will be responsible for planning and organizing the training program with the approval and support of MOEP. The training program will be conducted both abroad and in China. Initial training activities would aim at providing a general overview of the selected topics by a series of training seminars in China. Both local and foreign experts will be invited to give lectures on these specific topics. Study tours and overseas training will then be followed for senior management and financial and technical staff. Particular attention will be paid to the selection of candidates to be trained and their adequate preparation before sending them abroad for training.

D. Implementation

4. Implementation plan for the management development and staff training program is presented below:

(a) **Domestic Training.** About 170 staff of various fields, totaling 420 staff-months will be trained in China (Table 1); plus 17.5 staff-months of foreign experts will be required for training in China.

(b) **Overseas Training.** Study tours and overseas training will be conducted in 1994-96 for 78 staff, totaling 160 staff-months. The number of trainees, duration of training, staff-months and timing of different specialties of personnel are shown in Table 1.

(c) **Project-Related Training for Technical Staff.** A total of 136 trainees with a total staff-months of 230 will be trained in manufacturers' offices and factories. Another 90 staff totaling 540 staff-months will be trained in China for operation and maintenance personnel. Details are shown in Table 2.

(d) **Training Equipment.** Equipment to be purchased are given in Table 3.

(e) **Estimated Training Cost.** The total training cost will be Y 0.9 million equivalent in local currency and $4.0 million in foreign currency, of which $1.16 million will be included under contracts of major equipment (Tables 1-4).

Table 1: DOMESTIC AND OVERSEAS TRAINING

	No. of trainees	Duration of training (months)	Staff-months	Experts required (staff-months)	Timing	Estimated cost ($'000)
Training in China						
Utility management	40	2.5	100	2.5		50
Planning management	30	2	60	2		40
Financial management	30	4	120	8		160
Automatic dispatching of electric power system	20	2	40	2		40
Reliability analysis, precaution and diagnosis of accident for large power grid and units	40	2	80	2		40
Resettlement	10	2	20	1		20
Total	170		420	17.5		350
Training Abroad						
Legal staff	5	2	10		1994/95	80
Management staff	10	2	20		1994/95	160
Financial staff	20	2	40		1995/96	320
Technical staff	30	2	60		1995/96	480
Teacher training	5	2	10		1995/96	80
Environmental staff	8	2.5	20		1995/96	160
Total	78		160			1,280

Table 2: PROJECT-RELATED TRAINING PROGRAM FOR TECHNICAL STAFF

Category of staff	No. of trainees	Training period (months)	Staff-months	Timing	Estimated cost ($'000)
A. Training for Design and Engineering Staff					
Design staff	5	8	40	1995/96	200
Engineering staff	5	8	40	1995/96	200
Total	10		80		400
B. Training for Electrical and Mechanical Staff					
I&C staff	29	1	29	1995/96	150
Constr. mgmt. & erection	29	1/1.5	40	1995/96	200
Testing & commissioning	20	1	20	1995/96	100
Plant management	10	1	10	1995/96	50
Operation	26	1.5	39	1995/96	200
Maintenance	12	1	12	1995/96	60
Total	126		150		760
C. Domestic Training for Operation and Maintenance Personnel					
Operation engineers	40	6	240	1996/97	
Maintenance engineers	50	6	300	1996/97	
Total	90		540		

Note: (1) Training for A and B will be included in Vendors' contracts.
(2) Training for C will be carried out in China.

Table 3: TRAINING EQUIPMENT TO BE PROCURED

Item	Specification quantity (sets)	Unit price ($'000)	Estimated cost ($'000)
Simulator for training	1		1,150.0
Color projection equipment	3	9.0	27.0
Software for training of simulated management	2	7.5	15.0
Multipen recorder	1	18.0	18.0
Computer	2	3.0	6.0
Total			1,216.0

Table 4: SUMMARY OF TRAINING COST

	No. of trainees	Duration of training (staff-months)	Estimated foreign cost ($'000)
Training in China	170	420	350
Training abroad	78	160	1,280
Project-related training	136	230	(1,160)/a
Training facilities and equipment	-	-	1,216
Total	384	810	2,846

/a Included under the contracts for engineering services and major equipment.

EXPANDED COFINANCING OPERATION

1. **Background**. China has been interested for some time in the use of the Expanded Cofinancing Operations (ECO) program to cofinance some of the Bank projects in the power, transportation, and other infrastructure sectors in China. The Bank has also been encouraging diversification of financing sources and private sector participation in the power and transportation (e.g., railway) subsectors in particular (see China's Railway Strategy, Power Sector Reform and Power Sector Financing papers). As described in the Action Plan to commercialize JPEPC, one of the key objectives of the proposed project has been set to provide support in the implementation of institutional and structural reforms at the provincial level through development of JPEPC as an autonomous company. Following preliminary discussion with the Bank senior management, the Yanzhou Thermal Power Project was identified as an appropriate candidate for the ECO operation, and subsequently during preappraisal, the Bank, MOF and JPEPC confirmed the feasibility of the proposed ECO operation.

2. **Rationale of Proposed ECO**. Under the proposed ECO operation, the Chinese MOF, in addition to the regular Bank loan of $350 million, will borrow directly from international financial markets in the amount of $120 million equivalent supported by the Bank's partial guarantee on the commercial financing, and will onlend to JPEPC under the similar terms of the ECO. Unlike a conventional Bank loan, the ECO operation would provide an opportunity for JPEPC to have a direct contract and access to the commercial markets. JPEPC will be exposed to the market practices in commercial borrowing operations. At the same time foreign commercial lenders and investors will have an opportunity to look into the operations of JPEPC as the project's beneficiary as well as the structural and regulatory developments taking place under the power sector reform program in China. Through these contracts and exchanges between the commercial markets and JPEPC, the commercialization of JPEPC will be promoted from the financing front. This would also encourage the foreign investment and lending on voluntary and commercial basis to JPEPC and other similar power companies in China, and would contribute to the diversification of financing sources in the Chinese power sector as a whole.

3. **ECO Framework**. A preliminary framework for the ECO was agreed with MOF and JPEPC during the appraisal mission in October 1993. The agreed ECO financing framework ins summarized in attachments to this Annex. Based on these financing terms, the Loan Committee approval was sought in November for the proposed ECO operation for the project, and subsequently the approval was granted in December. Upon the determination of the final ECO framework to approach the market, MOF has issued an invitation letter to the interested financial institution to solicit the financing proposals for the proposed ECO operation. A tentative processing schedule of the ECO operation is summarized in the attachments. It is currently envisioned that the Proposed ECO operation will be presented to the Executive Directors of the Bank to give

authorization to negotiate the ECO documents on March 29, 1994, together with the presentation of the proposed Bank loan for the Project.

4. **Market for the ECO.** At the request of MOF, the Bank's cofinancing Department conducted an informal market sounding in major international financial markets. The results of informal market soundings were presented to the Chinese authorities during the appraisal mission in October. Representative markets and instruments such as a commercial bank loan, public bond issue, private placement, etc., in the major financial markets were reviewed in light of their strengths and constraints as a vehicle to carry out the proposed ECO operation. Financing the construction of a power plant would normally require a relatively long grace period and multiple disbursements over three to four years congruent with the progress of project implementation. It would also require a maturity substantially longer than average life of foreign borrowing operations by China. An amortizing structure is preferred for repayment of the loan in order to tie required debt service to the incremental cash revenue from the project. JPEPC and MOF took account of these financial requirement and indicated their preference of a commercial bank loan to a bond issue or private placement that could not be structured in a flexible way.

5. **Currency of the ECO.** Having also given consideration to the foreign exchange risks arising from the mismatching of the currencies of borrowing operations, project contracts and future corporate revenues, JPEPC and MOF have settled with the idea of two-tranche financing in US dollar and Japanese yen. The US dollar was selected as a most preferred currency, and is expected to capture the wider participation from the markets. Japanese yen for the smaller tranche was selected to take advantage of the fixed interest rate under the historically low interest rate environment currently prevailing in the market.

6. **Benefits of Proposed ECO.** The following benefits are expected to be achieved under the proposed ECO operation.

(a) **Access to International Market:** As described in the background and rationale (paras. 1-2), the proposed ECO operation is expected to meet one of the key objectives of the project, through establishing a direct access to the international financial markets.

(b) **Longer Maturity:** The immediate benefit of the ECO would be reflected in the financing terms that are likely to be achieved for the ECO. After a long absence from the market since 1989, China recently returned to the US public bond market in August 1993 with the China International Investment Corporation's (CITIC) $250 million 10-year bond, and also to the Eurobond market in September with People's Republic of China's Yen 30 billion ($280 million equivalent) 5-year issue. In the United States, private placement market, the People's Construction Bank of China has just concluded a $4,120 million bond in two tranches, one with 7-year maturity and the other with 10-year maturity. China has been also regaining ground in the syndicated loan market. However, the average maturity currently available in the loan market still remains between 5 and 7 years. Thus, the

proposed ECO structure would increase the period of uncovered China risk and set financing terms distinct from those available today without a Bank enhancement. Most importantly, the length of the extended ECO maturity (15-20 years) is crucial for the financing for construction of a large-size power plant where an autonomous JPEPC will have to match its corporate cash flow to the project revenue in the commercialized operation.

(c) **Currency Flexibility**. The ECO operation would provide JPEPC the flexibility of borrowing in a combination of US dollars and Japanese yen, which would put the borrower in a better position to deal with the foreign exchange risks during project implementation and operation period over 15 years. Although it is difficult to determine the optimal combination of borrowing currencies over the long run, the ECO would at least enable the borrower to make its own decision in the choice of borrowing currency based on the given set of parameters (currencies of project contracts and project revenues, market indication of the exchange rate movement among major currencies, and nominal interest rate, etc.). Under the proposed framework, US dollar and Japanese yen are combined in a 3 to 1 ratio with a view to reduce the foreign exchange risk exposure to Japanese yen relative to outstanding borrowings in Yen over the past years. The US dollar is a natural choice as a borrowing currency for China from the perspective of its balance of payments situation. The ECO with its currency flexibility would provide China with an opportunity to exploit favorable borrowing conditions while keeping the currency risk at a manageable level though a mix of appropriate currencies for specific investment. Such currency flexibility is not feasible under the regular Bank loan.

(d) **Interest Rate**: The proposed ECO operation would provide quite favorable interest rates for China. The US dollar tranche (Tranche A) with floating interest rated structure would benefit from the low interest rate environment currently prevailing in the short-term dollar market (the current 6-month LIBOR is 3.25 percent per year). The Japanese yen tranche (Tranche B) would be with fixed interest rate for the initial 10 years linked with long-term prime lending rate which, currently at 3.8 percent per year, is at a historically low level. Compared with the current 7.27 percent per year of the Bank's regular variable rate, the proposed ECO financing would have the immediate advantage of a nominal interest rate differential on all-in cost basis (including ECO guarantee fee) of around 3 percent per year.

(e) **Leverage Effect**: With respect to the ECO guarantee, the preliminary structure for the ECO assumes that the Bank guarantee would become callable on an accelerable basis for the later maturity of the loan, at the earliest from the tenth year and thereafter. The Bank's exposure calculated on a present value basis under this assumption would be approximately $30 million equivalent, or 25 percent of the total ECO financing amount of $120 million. This would allow the Bank to leverage its capital by mobilizing financing four times as much as the amount of the capital to be used for the ECO guarantee.

Attachment 1: PRELIMINARY FINANCING FRAMEWORK FOR ECO

	Tranche A	Tranche B
Borrower:	People's Republic of China (China) represented by the Ministry of Finance (MOF)	People's Republic of China (China) represented by the Ministry of Finance (MOF)
Beneficiary:	JPEPC	JPEPC
Guarantor:	IBRD under ECO guarantee	IBRD under ECO guarantee
ECO Guarantee Cover:	Debt service after tenth year or later on accelerable basis	Debt service after tenth year or later on accelerable basis
Counterguarantor:	China	China
Market/Currency:	Eurodollar syndicate loan from commercial banks	Japanese Yen syndicate from insurance companies, etc.
Amount:	$90 million	$30 million equivalent in Japanese Yen
Maturity:	15 years or longer	15 years or longer
Grace Period:	5 years	5 years
Repayment	Semiannual equal installment	Semiannual equal installment
Interest Rates:	Floating on 6-month LIBOR basis	Fixed for first 10 years; to be reviewed afterward on long-term prime lending rate basis
Disbursement Period:	3 years	One-time disbursement
Disbursement Date:	95/5 96/3 96/10 97/3	94/5
Disbursement Amount:	10% 30% 30% 30%	100%
Procurement Items:	I&C and other foreign exchange components	Downpayment for boiler and turbine generators
Onlending Terms:	Same ECO terms to be applied to JPEPC	Same ECO terms to be applied to JPEPC
Other ECO Terms: (margins, fees, etc.)	To be negotiated through bidding	To be negotiated through bidding

Attachment 2: TENTATIVE PROCESSING SCHEDULE OF ECO FOR YANGZHOU THERMAL POWER PROJECT

1.	Identify financial markets and instruments	Oct 31, 1993
2.	Initiating Memorandum (IM) for ECO reviewed by RVP	Nov 12, 1993
3.	IM Circulated to Loan Committee	Nov 19, 1993
4.	Loan Committee Meeting	Dec 3, 1993
5.	Detailed market sounding completed	Dec 10, 1993
6.	ECO financing framework for bidding finalized	Dec 24, 1993
7.	Issuance of invitation for ECO financing offer to the targeted markets	Jan 7, 1994
8.	ECO financing proposals received	Jan 28, 1994
9.	Evaluation of proposals and award of conditional mandate to the winning bidder(s)	Feb 18, 1994
10.	MOP for ECO review	Feb 25, 1994
11.	MOP distribution to EDs	Mar 8, 1994
12.	Initial Board presentation to seek authorization to negotiate detailed terms of ECO	Mar 29, 1994
13.	Negotiation of ECO documents including loan agreements, guarantee agreement, indemnity agreements, etc.	within 1-2 months
14.	Consents under Bank Articles obtained from relevant EDs of currencies and markets for ECO	after step 12
15.	Final MOP confirming the negotiated terms of ECO	2 weeks before step 16
16.	Final Board approval on negotiated ECO terms on no-objection basis in the absence of major deviation from authorized terms at initial Board meeting on March 29	within 2 months from step 12
17.	Signing of ECO documents	immediately after step 16

PROCUREMENT SCHEDULE

Series number	(1)	(2)	(3)	(4)	(5)	(6)	(7) Material				
Work content	Boiler	Turbine	I&C	Electrical equipment	Construction equipment	Plant monitoring and testing instrument	Welding	Timber	Steel products	Pipe steel	Special cable and conductor
Begin preparation of bidding documents	05/23/93	05/23/93	04/10/94	03/10/94	03/10/94	01/15/95	11/01/94	03/01/95	03/01/95	06/30/95	12/10/95
Approval by Chinese government	08/05/93-09/23/93	08/05/93-09/23/93	10/05/94-10/30/94	09/05/94-09/30/94	09/05/94-09/30/94	07/15/95-08/10/95	11/10/94-11/25/94	03/10/95-03/25/95	03/10/95-03/25/95	08/25/95-08/30/95	01/25/96-01/30/96
Review by the World Bank	09/29/93-11/20/93	09/29/93-11/20/93	11/10/94-12/10/94	10/10/94-11/10/94	10/10/94-11/10/94	08/20/95-09/20/95	12/10/94-01/10/95	04/10/95-05/10/95	04/10/95-05/10/95	09/01/95-09/20/95	02/01/96-02/25/96
Issue bidding documents	11/30/93	11/30/93	01/10/95	12/10/94	12/10/94	10/20/95	01/15/95	04/30/95	04/30/95	10/30/95	03/10/96
Prebidding meeting	01/10/94-01/20/94	01/10/94-01/20/94	02/10/95-02/20/95	01/10/95-01/20/95	01/10/95-01/20/95	11/15/95-11/20/95	01/25/95-02/01/95	05/10/95-05/15/95	05/15/95-05/15/95	11/30/95-12/05/95	04/10/96-04/15/96
Bid opening	04/01/94	04/01/94	05/10/95	04/10/95	04/10/95	02/05/96	03/15/95	06/30/95	06/30/95	01/25/96	05/10/96
Bid evaluation	04/01/94-07/01/94	04/01/94-07/01/94	05/10/95-07/30/95	04/10/95-06/30/95	04/10/95-06/30/95	02/06/96-02/15/96	03/16/95-04/10/95	07/01/95-08/01/95	07/01/95-08/01/95	01/26/96-02/26/96	05/11/96-06/10/96
Approval by Chinese government	07/15/94	07/15/94	08/20/95	07/20/95	07/20/95	05/05/96	04/25/95	08/10/95	08/10/95	03/20/96	06/25/96
Confirmation of World Bank	08/15/94	08/15/94	09/25/95	08/25/95	08/25/95	06/25/96	06/05/95	09/20/95	09/20/95	04/20/96	07/20/96
Contract discussion and signing	10/01/94	10/01/94	12/20/95	11/15/95	09/01/95	08/25/96	08/30/95	12/10/95	12/15/95	07/10/96	08/25/96

KEY DATES OF PROJECT IMPLEMENTATION

	Completion date
A. Procurement of Major Equipment for Plant	
Bidding documents available	October 20, 1993
Review and approval by IBRD	November 20, 1993
Issuance of bid documents	November 30, 1993
Bid opening	March 31, 1994
Bid evaluation and award	July 1, 1994
Contract negotiation and signing	October 1, 1994
B. Project Implementation	
Start excavation	April 1, 1994
Start boiler steel structure erection	December 1, 1995
Lifting of boiler drum	June 1, 1997
Hydraulic test of boiler	December 1, 1997
Complete erection of T-G and auxiliaries	May 15, 1998
Start-up	
First unit	June 1998
Second unit	June 1999
Commercial operation	
First unit	December 1998
Second unit	December 1999
Project completion	December 31, 1999

DISBURSEMENT PROFILE

Bank FY and semester	Semester ($ million)	Cumulative ($ million)	Project (%)	Bank profile /a (%)
1995				
December 31, 1994	34.3	34.3	9.8	0.0
June 30, 1995	-	34.3	9.8	6.0
1996				
December 31, 1995	7.2	41.5	11.9	18.0
June 30, 1996	39.2	80.7	23.0	26.0
1997				
December 31, 1996	60.0	140.7	40.2	38.0
June 30, 1997	60.0	200.7	57.3	50.0
1998				
December 31, 1997	70.4	271.1	77.4	58.0
June 30, 1998	28.7	299.8	85.6	66.0
1999				
December 31, 1998	28.6	328.4	93.8	74.0
June 30, 1999	10.5	338.9	96.8	78.0
2000				
December 31, 1999	10.5	349.4	99.8	82.0
June 30, 2000	0.6	350.0	100.0	86.0

/a Standard disbursement profiles for power in China, August 1993.

ENVIRONMENTAL MANAGEMENT PROGRAM

A. Summary of Key Project Environmental Issues

Air Pollution

1. Table 1 presents air pollution characteristics of both the proposed project and the 1,200 MW addition, which is planned for the future. As can be seen, emission standards for dust, sulfur dioxide and nitrogen oxides are all in compliance with Chinese standards and World Bank guidelines for both the design coal and check coal cases. Air quality data are also presented, and again, under almost all circumstances, the project will not result in a violation of standards for this region. The few calculated exceedances are exclusively with respect to overly restrictive Chinese standards. These are not believed to be problematic for several reasons: nitrogen oxide calculations were based on uncontrolled emission levels (still however within standards), in fact, low NO_x burners will be specified as part of the mitigation, so ambient levels of nitrogen oxides should be lower than calculated values indicated, and all remaining exceedances are well within uncertainties associated with diffusion modeling. All results presented would easily comply with United States and Western European air quality standards based on protection of public health and the natural environment. Therefore, the few minor exceedances from Chinese standards are not considered to be of any significant environmental consequence.

2. Carbon dioxide emissions are estimated to be 0.0064 and 0.013 billion tons/ year for the 1,200 MW and 2,400 MW situations, respectively. This represents 0.03 and 0.06 percent of the annual industrial global burden. Therefore, both the project and the expansion should have an insignificant impact on global warming.

Water Pollution

3. Wastewaters will be discharged after appropriate treatment to meet Chinese standards and World Bank guidelines. Treatment will be physical, chemical and/or biological. Heated water discharge from once-through cooling has been determined to provide a 1°C rise zone of about 150 x 320 meters, with a maximum width occupying only 10 percent of the river width. These calculations were done for the 2,400 MW case. Since this is the most extreme condition, no impacts are anticipated for the 1,200 MW case: there is adequate passage space in the river for fish to avoid the plume. A biological survey was performed for a nearby power station (Jiangbi Thermal Power Plant) as part of its Environmental Assessment study. In this survey, no unique breeding or feeding areas were identified within the thermal envelopes of the proposed project, so no irreversible damage to the local aquatic system is expected. Any sessile species can

Table 1: Air Pollution Characteristics of the Yangzhou Thermal Power Plant

	World Bank standard			Chinese national standard			Air Quality ($\mu g/m^3$) Background level											
							A			B			C			D		
	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x
Annual average	100	100	100	60	-	-	27	69	20	41	81	37	26	73	24	48	59	46
Daily maximum	500	500	-	150	300	100	85	165	47	97	193	52	43	135	56	62	154	71
Once maximum	-	-	-	500	1,000	150	347	498	132	316	519	108	189	516	91	140	427	124

Design Coal

	Background value and 2 x 600 MW												Background value and 4 x 600 MW											
	A			B			C			D			A			B			C			D		
	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x
Annual average	27.1	69.1	21	42	81.1	38	26.1	73.1	25	49.4	59.2	47.1	28.8	69.2	20.2	42.6	81.2	38.3	27.8	73.2	25.8	50.4	59.3	47.9
Daily maximum	96.4	166.3	56.1	108.6	194.4	61.3	54.8	136.4	65.4	76.3	155.7	82.4	107.6	167.6	65.1	120.4	195.7	70.7	67	137.8	75.2	90.6	157.3	93.9
Once maximum	397	504	172	367	597	149	241	522	133	203	434	174	446	510	212	419	603	190	295	528	176	266	442	225

Check Coal

	Background value and 2 x 600 MW												Background value and 4 x 600 MW											
	A			B			C			D			A			B			C			D		
	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x	SO_2	TSP	NO_x
Annual average	30.2	69.2	22.3	43.9	81.2	39.3	29.3	73.2	26.6	52.7	59.3	49.8	32.5	69.4	24.4	46	81.3	41	31.6	73.4	28.5	55.5	59.5	52
Daily maximum	120	167.4	75	133	195.5	80.9	80.2	137.6	86	106	157	106.4	155	170	103	169	198	110	118	140	115.6	151	160	142
Once maximum	501	509	255	475	602	235	353	527	222	335	441	280	655	519	379	635	613	363	517	539	353	530	454	436

Notes: The Chinese standard is II—class standard.
- A: Slender West Lake Scenic Spot (major population cater)
- B: Jin Shan Scenic Spot (important historical area)
- C: Sericulture Research Institute (silkworm mulberry growing area)
- D: Spot of the maximum ground concentration downwind direction

Coal		Emissions (Units as Indicated) World Bank standard	Chinese national standard /a	Phase I (2 x 600 MW)	Phase II (4 x 600 MW)
Sulfur (%)	Design			0.31	0.31
	Check			0.92	0.92
Ash (%)	Design			15.45	15.45
	Check			28.42	28.42
Stack height (m)				240	240
ESP efficiency (%)				99.6	99.6
Emission amount of SO_2 (t/day)	Design	500.0	517.0	66.0	132.0
	Check	500.0	520.0	206.0	412.0
Emission concentration of TSP (mg/m^3)	Design	150	237	71	71
	Check	150	348	130	130
Emission amount of NO_x (nanograms/J)	Design	300		195	195
	Check	300		279	279

/a Determined procedures defined in Regulation No. GB-13223-91, "Emission Standards of Atmospheric Pollutions from Coal-Fired Power Plants."

reestablish their colonies nearby, and any feeding or spawning activities can be reestablished at other points on the riverbank.

4. Table 2 details all liquid effluent streams, their pollution characteristics and control measures to be taken. Additionally, Chinese effluent standards are provided. As can be seen, all effluents are in compliance with all standards.

Coal Transport and Handling

5. Coal will be supplied from the Shenfu-Dongsheng Mine and will be transported first by rail to Shuoxian and transferred by rail again from Shuoxian to the port, then by sea and river to the plant. About 3.5 million tons of coal/year will arrive at a specially constructed coal jetty. Based upon local weather conditions, it is estimated that the jetty can receive barges 320 days/year. It is therefore estimated that approximately one barge (capacity 35,000 tons) every three days is anticipated for the first phase, and one barge every 1.5 days when the second phase is in operation. This will increase the ship traffic on the Yangtze River by approximately 0.026 percent and 0.053 percent for the 1,200 MW and 2,400 MW cases, respectively. At these delivery rates, the increased risks of barge-boat collision were determined to be 2 and 4 percent, respectively. Both increases in risk are considered small. Nonetheless, barges and the jetty will be provided with modern docking guidance systems to minimize accidents.

6. Environmental approval for the coal jetty has been received by JPEPC from NEPA and a copy of this approval is available in the project file. The coal railway line will be 815 km long, of which 200 km represent new construction from Shuoxian to Huanghua port. The EA for this construction is currently being prepared by the Science Research Institute of the Ministry of Railroads. Authorization to proceed with the EA preparation was approved by NEPA [approval document Huan Jian Jian (93) 068 dated March 17, 1993] and the EA is almost complete. The schedule for EA completion and government approval must be carefully scrutinized to ensure that it does not critically affect the subject project.

7. If, after EA approval is obtained, the rail line is not completed but the power plant is ready to operate, an alternate coal source using existing railroad lines from Datong (Shanxi Province) has been approved. This line has a capacity of 100 million tons/year and is only being utilized at about 50 percent of capacity. Increased coal shipments to supply the Yangzhou thermal power station would not overburden the shipping route.

8. At the coal yard, conveyors will be either shielded or enclosed. Critical points (transfer points) will be enclosed and fitted with dust collectors. Water sprayers will be provided and all water collected will be sent to a sedimentation pond for settling and treatment prior to discharge.

Table 2: SUMMARY OF WASTEWATER CONTROL

Pollutant source	Wastewater amount	Discharge mode	Pollutant factor	Control measure	Effluent quality (ppm)	Discharge standard (ppm)
Chemical wastewater	402 m^3/d	Continuous	pH (no units) SS COD Heavy metals	Concentrated wastewater treatment system	6.5-8.5 < 70 < 100 0.05/0.8	6-9 70 100 0.1/1.0
Boiler chemical cleaning wastewater	2,000 m^3/ each time	Intermittent	pH (no units) COD	Incineration by injection into furnace	-	-
Living sewage	20 t/h	Continuous	BOD_5 SS	Concentrated biochemical treatment system	< 30 < 70	30 70
Oil contaminated wastewater		Intermittent	Oil	Be treated by skimmer and oil-water separator	< 10	10
Coal yard runoff	a little	During rain	pH (no units) SS	Be collected and settled in coal settling pond	8 30-70	6-9 70
Ash sluice water	360 m^3/h	Continuous	pH SS	Be recirculated and reused	-	-

GB8978-88 "Standard of Integrated Discharge of Effluents, Class I"—Federal Regulation.
SS = Suspended solids.

Ash Management

9. Fly ash and slag will be slurried independently and pumped above ground to the disposal sites, or used by the extensive building materials industries in the area. Three ash yards will be used in succession: the first, Shatouhe (seven-year life), is approximately 4.6 km east of the plant site; the second, along the abandoned Jiajing River, is farther east (about 7.5 km from the power station); and the third, along the abandoned course of the Shatouhe River, is about 5.5 km from the plant site. Total capacity is for a 28-year life (based upon high-ash "check coal"; 37-year life is estimated with "design coal"), for full operation of 2,400 MW and an assumption of no ash recovery/reuse. In fact, it was estimated that 50 percent of the ash can be used by local construction materials industry. Ash is highly alkaline, so leaching of toxic metals is unlikely. This was confirmed with leachate tests. Sites are naturally lined with clay to depths of 6 to 30 meters, with attendant permeabilities of the order of 10^{-6} to 10^{-7} cm/sec. Furthermore, the area is rich in surface water resources, so groundwater is rarely, if ever, used.

Transmission Line

10. The 34-km, 500-kV transmission line will be designed in such a fashion that the maximum electric field strength at ground level will be 9 kV/m and the maximum noise level (rainy days) will be 62 db(A). There are no Chinese or World Bank standards for electric field strengths, but the maximum value is considered safe (within the limits experienced by using an electric heating blanket) and is expected to cause only minor damage to plant life. Additionally, the population along the transmission line will be relocated, so no one in the area should be permanently exposed to the maximum field. The electric field intensity diminishes rapidly with distance and should not present a problem to local residents. Noise levels on the average comply with World Bank and Chinese standards. The rainy day extreme, evaluated at the point of maximum intensity (underneath the power line) is 62 db(A), slightly higher than the Chinese norm [60 db(A)]. Where most of the people live, noise levels have been determined to be 45-50 db(A), which is within the Chinese norm and World Bank guidelines. Both electric field and noise monitoring along the transmission route are part of the overall monitoring program (see Section C).

11. There are migratory bird routes traversing the line, so special devices to repel birds and prevent them from establishing nests on the support structures will be installed.

Aquatic/Terrestrial Ecology

12. There are no rare or endangered species in the vicinity of the proposed project. The nearest government-protected area (Dafeng) is about 250 km away. As discussed earlier, a biological survey of the area indicated no unique locations for nesting or feeding. Any existing biological communities could quickly and easily establish themselves in nearby areas with similar environmental conditions.

13. Fluoride deposition from power plant emissions are estimated to be 0.92 $\mu g/dm^2$-day 1/ in the most sensitive area of mulberry plant growth. Mulberry is used for silkworm production. Estimated levels of fluoride deposition are within the Chinese standard of 1.0 $\mu g/dm^2$-day and thus is not expected to be a problem. Nonetheless, fluoride monitoring at this sensitive locale is included in the monitoring program (see Section C).

Occupational Health and Safety

14. Project design will be such that international standards of worker safety will be included in all bidding documents of project equipment. Boilers and other dangerous equipment will be designed to meet ASME standards of safety and will be so specified. Polychlorinated biphenyls (PCBs) are illegal in China and their use is therefore prohibited in the project.

Human Environment

15. The construction labor force will consist of a fixed level of 1,000 to 2,000 skilled workers and a variable number of unskilled workers numbering about 3,000 at the period of maximum activity. It is estimated that the plant will take two to three years to build. Most of the skilled workers will move to the area without their families, and unskilled workers will consist mostly of local farmers with about half of them living on-site and the other half commuting. Therefore, housing and infrastructure will be needed for the skilled workers and some unskilled labor (about 3,000 units in total). For workers living on-site, Jiangshu Electric Construction Company will build temporary housing on-site as well as medical facilities, shopping, sewage and fire protection. Water supply and electricity will be supplied from Yangzhou City.

16. About 650 workers are needed to operate the plant, of which roughly 60 percent will be married. JPEPC will construct apartments for married workers in Yangzhou City, and apartments for single workers at the plant site. Since Yangzhou City has a population of over 400,000, the addition of power plant personnel should not present a significant burden on the city infrastructure. At the plant site, JPEPC will construct sewage facilities, a clinic, shops, dining facilities, clubhouse and library. It will also supply electricity. Water will be supplied by Yangzhou City. Operating plant personnel living at the plant site should not present a significant impact on the local community level.

Noise Level

17. Noise estimates indicate that the project will conform with Chinese standards and World Bank guidelines as shown in Table 3.

1/ $dm^2 = 0.01\ m^2$.

Table 3: YANGZHOU NO. 2 POWER PLANT PREDICTED NOISE TABLE

	World Bank criteria dB(A)	China criteria dB(A)	Background value dB(A)	Predicted value dB(A) 1,200 MW	Predicted value dB(A) 2,400 MW
Concentrating residential quarter /a	55	60	45-52	50-57	52-60
Plant boundary /b	-	65	43-56.9	57-59	58-62
Production office	-	60	-	55-60	55-60
Noise-insulation control room	75	65	-	60-62	60-62
Under transmission line		60	45-52	53-62	53-62

/a The concentrating residential quarter is about 300 meters, the shortest distance from the plant boundary, criteria implementing according to GB3096-82.

/b According to GB12349-90.

B. MITIGATING PLAN

Summary of Mitigating Measures

Pollutant	Control method recommended
Power Plant SO_2	Use low sulfur coal (design coal S^y=0.31%). Use high-stack dispersion (240 meters) Reserve the space for FGD installation
Dust	Use high-efficiency (99.6%) electrostatic precipitator (ESP) to meet an exit concentration of 150 mg/m^3 requirement
NO_x	According to our calculation, NO_x emission is below the standard. The bid document specifies NO_x emission to be $\leq$258 nanograms/joule. Use low NO_x burner, if necessary.
Chemical waste-water	To be collected and treated together in a chemical wastewater treatment plant.
Living sewage	To be treated by using biochemical treatment system.
Oil-polluted water	To be passed through a sump to get the oil skimmed off. And then go through an oil-water separator.
Coal pile runoff	To be collected into a coal settling basin to let the coal settle. The settled coal to be recovered or discharged to the slag yard.
Ash slurry (ash and slag)	Hydraulically transferred to ash and slag yard. Keep its surface wet. Water is recycled. Trees will be planted around the yard. When the yard is filled up, it will be covered with clay, so that it will be able to be used for plantation. Powered coal ash will be utilized, up to >50%.
Noise	According to regulation, the maximum permissible noise level for all equipment is <90 dB(A). Noise isolating covers and room will be built wherever necessary. Silencers will be installed on the safety valve of boiler, exhaust pipings and forced draft fan.
Coal Jetty Coal dust	Water cleaning facilities will be installed on the jetty. Water jet will be provided where coal is delivered by the unloading machine. Overhead belt conveyors will be totally closed. Dust collecting facilities will be installed where coal is to be transferred from one belt to another.
Coal-polluted water	Water from the water cleaning facilities, polluted by the coal will be directed to the coal sitting basin near the coal yard, to be treated together with the coal pile runoff.
Transmission Line Electromagnetic radiation and noise	During route selection, avoid the areas where signal interferences are sensitive and population densities are high.
Bird protection	Bird repelling facilities will be installed.

C. Environmental Monitoring Program

Table 1: Summary of Monitored Atmospheric Pollutants

Monitoring point	Monitoring factors	Monitoring instrument	Principles guiding monitoring point deployment	Monitoring cycles
Stack	Smoke dust, SO_2, NO_x, CO, CO_2, F^-	Flue gas monitoring system	Sampling points set at one third the stack height	Monitoring automatically and continually
Static electro-precipitator	Smoke dust concentration	Smoke dust sampler	Entrance and exit at ESP	Monitoring after overhauling, also after coal changing
Within the plant area	TSP, SO_2, NO_x, settling dust	Atmosphere sampling car, atmosphere automatic monitoring system	Each point at coal wharf, coal yard downwind direction, plant front area, and single living quarter	Monitoring automatically and continually
Outside the plant	TSP, SO_2, NO_x	Set up two fixed monitoring upwind and downwind of power station. Sampling with van at all other sites. Fluoride monitored by lime-filter method, auto-monitoring station	Within the scope of 10 km up- and downwind direction, deploy one point at every 1 km interval and collect the regular annual monitored data at Yangzhou and Zhenjiang the same time. The fluoride monitoring point set at sericulture institute	Monitoring in every six month during operation one day every week all year round. The work shall start one year before operation, once every week
Ash yard	TSP	TSP sampling car	Deploy 4-6 monitoring points around the ash yard	Once in every six months

Determining Method: TSP GB9802-88
SO_2 GB8970-88
NO_x GB8969-88
Smoke dust GB5468-85
Fluoride: No national monitoring method established; caustic paper method will be used.

Table 2: SUMMARY OF MONITORED WATER POLLUTANTS

Monitored item	Monitored factor	Monitoring instruments	Principles guiding the deployment of monitoring points	Monitoring cycle
Chemical wastewater	pH value, suspension particles, COD, heavy metals	pH meter, turbidity meter, COD analyzer, atomic absorption	Water discharge outlet at chemical wastewater treatment workshop	Monitoring automatically and continually during discharge. Heavy metal once every season.
Living sewage	BOD, suspension particles, oily substance	BOD analyzer, turbidity meter	Water discharge outlet at living sewage treatment workshop	Monitoring once every month.
Ash-slag water and underground water at ash yard	pH value, heavy metal, fluoride ions	pH value meter, atom-absorbing spectrophotometer	Ash yard and underground water supervision well at ash yard	Once every season
Ash pipeline leaks	-	-	Visual inspection	Once every month
Water discharge from coal pond	pH, suspended solid	pH meter, turbidity meter	Discharge port of coal settlement pond	At the time of discharging
Thermal water discharge	Water temperature, residual Cl	Thermometer, automatic residual Cl meter	Discharge port of circulating water	Continuous and automatic
Oil-contaminated water	Oil and grease	Gravimeter	Exit at oil-contaminated water treatment system	Monitoring during discharging, twice every month

Method of Analysis:
pH GB6920-86
SS GB11901-89
COD PS-7-85
BOD_5 GB7488-87
F^- GB7488-87
Heavy metal GB7475-87
Hg GB7468-87
CR^{+6} GB7467-87
Oil PS-9-85

Table 3: NOISE AND ELECTROMAGNETIC RADIATION MONITORING SCHEME

Monitoring points	Monitoring item	Monitoring instrument position	Monitoring method
Various equipment on-site within the main plant building and plant building	Various parts of revolving machine: - steam turbine - feed pump - forced fan - induced fan - coal pulverizer	For large equipment, the measuring instrument set 1 meter from it at several measuring points chosen by the tester, for small one set at its half length	GB7441-87 "power plant noise measuring method"
Outside of the power plant surrounding wall and the inhabitant residential quarter	Environmental noise office, plant front area and residential quarter	1 meter outside the power plant surrounding wall, set a point at very 100-200 meter interval, 1 meter outside of the windows	GB3222-87 "Industrial factory noise measuring method" GB3222-87 "Public noise measuring method"
Transmission line	Electromagnetic radiation and noise	Along the transmission line passage	GB3222-87 "Public noise determination method" GB6702-88 "Electromagnetic radiation prevention rule"

Table 4: LABOR SAFETY AND STAFF'S HEALTH MONITORING PLAN

	Factors to be monitored	Location of monitoring	Apparatus for monitoring	Frequency of monitoring
Fire and explosion protection	Fume	Warehouse for dangerous goods, oil tank area	Fume alarm	Continuous and automatic
	Hydrogen	Hydrogen producing system and hydrogen transfer piping	Hydrogen leak detector	Continuous and automatic
	Temperature in furnace	Inside furnace	Safety monitoring apparatus for furnace	Continuous and automatic
Dust and poison protection	Coal dust	Coal jetty, coal crusher building	Sampling device for dust	Once every month
	SO_2, CO, NO_x	Operating floor of the boiler house	Portable apparatus for air quality determination	Once every month
Noise	Level of noise	Offices in all the machine rooms. Central control room. Office building dormitory area	Level of noise apparatus	Once every month

Note: All equipment will be designed to safety standards according to ASME, as so specified in the bidding documents.

Table 5: ENVIRONMENTAL PROTECTION PERSONNEL TRAINING PROGRAM

Personnel	Item	No. of persons	Period (months)	Host country	Cost ($10,000)
Company personnel in charge of environmental protection	Power plant environmental protection administration and controlling technology	2	2	USA Europe	2.0
	Power plant flue gas desulfurization and pollution controlling	2	2	Germany Japan	2.0
Company environmental monitoring personnel	Power plant polluting source monitoring	3	3	USA Europe	4.5
Total	17 person-months				8.5

Table 6: EQUIPMENT TO BE PURCHASED LOCALLY FOR ENVIRONMENTAL MONITORING STATION

Equipment	Quantity	Remarks
Spectrophotometer	1	751G model
pH meter	2	PHS-3C or PXJ-1C model
Analytical balance	2	Sensitive amount 0.1 mg
TSP sampler	.4	FC-2 model
Atmosphere sampler	4	
Noise automatic measuring system	1	HS6211 model (with PC-1500 computer)
Flow meter	2	
Refrigerator	1	
Microcomputer	1	AST-386
Biomicroscope (1600*)	1	ZXC11 model
Thermostatic oven	2	
Heat radiation meter	2	
Resistivity meter	1	
Handy SF6 chromatograph	1	H_2 explosion proof
Electromagnetic intensity meter	1	Measuring electromagnetic energy
Atmosphere sampling car	1	
Total		Y 1.6 million

Table 7: EQUIPMENT TO BE IMPORTED FOR THE ENVIRONMENTAL MONITORING STATION

Instrument equipment name	Quantity	Remarks
Flue gas automonitor system (SO_2, NO_x, CO, F, CO_2, TSP)	1	Including sampling, analyzing and typing
Atom-absorbing spectrophotometer	1	With graphite oven
COD meter	1	
BOD_5 meter	1	
Flue gas supervising instrument (manual type)	1	Measuring SO_2, TSP, NO_x, CO, etc. pollutants in flue gas duct
Atmosphere monitoring automatically and continually instrument (TSP, SO_2, NO_x, etc.)	3	Supervising the air environment quality at two fixed points for Yangzhou No. 2 Power Plant, and equipment for the mobile unit
Total		$665,000

LAND ACQUISITION AND RESETTLEMENT

Scope of Resettlement

1. The Yangzhou Thermal Power Plant is located along the north side of the Yangtze River, about 11 km from the city of Yangzhou. The first phase of power plant financed by the World Bank will consist of three major components: the thermal power plant, 34 km of 500 kV transmission line, and the first-phase ash disposal site. According to the draft resettlement action plan submitted by the Jiangsu Provincial Electric Power Company on August 28, 1993, the project will acquire a total of 2,683 mu of land (178.9 ha), which will involve relocating a total of 4,491 persons or 1,053 families, and demolishing 111,163 m^2 of floor space (Table 1). In addition, about 3,750 mu of state-owned waterway (250 ha) will be allocated to the project to be used as the ash disposal site. A detailed baseline survey and a resettlement and rehabilitation plan have been conducted regarding the main power plant. However, no such detailed plans have been completed for the remaining two components, and the figures used in Table 1 were estimated by the project office. Since the engineering designs for these two components will be ready during the project implementation stage, separate resettlement action plans will be required. The project office has agreed that once the engineering designs are completed for these two components, detailed surveys will be conducted and separate resettlement action plans will be developed which will be submitted to the Bank for approval.

A. Thermal Power Plant

2. The proposed Yangzhou Second Power Plant will occupy a total of 1,650 mu of land (110 ha), which consists of 1,530 mu (102 ha) of plant areas (two phases), and 120 mu (8 ha) of living quarter for the construction workers. Except for some reed land, all these land are located within Bali Township in Hanjiang County. Among the land to be acquired, 85.7 percent of them will be cultivated land (94.24 ha); 3.9 percent as noncultivated land (4.31 ha), and 10.4 percent being ponds (11.45 ha). Specifically, the land acquisition will take place within three administrative villages in Bali Township: Anle, Wang Gang, and Bian Gang, affecting as many as 20 village groups. In 10 of such village groups, existing farmer houses will be removed with demolishing 22,840 m^2 of floor space and relocating 927 persons or 264 households (Table 2). Since these village groups will be removed due to significant loss of farmland, these affected persons will be given nonagricultural residential status and will be relocated into the center of Bali Township. Among total persons to be relocated, 329 will be given nonfarm jobs (with age between 16 and 40); and 383 of them above 40 will receive monthly pension payment. For another 10 village groups, no change of village status will be made, since they will

Table 1: SCOPE OF RESETTLEMENT IN THE YANGZHOU THERMAL POWER PROJECT

Items	Number of relocated households	Amount of removed floor space (m^2)	Amount of land acquisition (mu)	Number of farmers affected
1. Power plant	264	22,840	1,650	927
2. 500 kV transmission line	568	88,223	26	2,657
3. Ash disposal site	221	27,700	1,007	907
Total	1,053	138,763	2,683	4,491

Source: Jiangsu Provincial Electric Power Company.

be affected with only small-scale land acquisition. However, as a result of land acquisition, about 95 nonfarm jobs will be provided for affected farmers.

B. TRANSMISSION LINE

3. The project also includes two 500 kW transmission lines with a total of 34 km each, which run from the proposed power plant in Hanjiang County to the Jiangdu Transformer Station in Jiangdu County passing through six different townships and two counties (Table 3). For the safety reason, all houses within a 120-m wide zone underneath the transmission line will be removed. According to a preliminary estimate, as many as 88,223 m^2 of residential structures will be removed, which will affect 2,657 persons or 568 households. They will be relocated near the previous locations within the same villages. In terms of land acquisition, the only areas to be acquired are for the footings of power line towers, which totals only 26 mu (1.73 ha). However, during the construction process, some standing crop along the alignment will be damaged, which, according to local regulations, will require proper cash compensations. Because no significant land acquisition will take place, there is no need to provide job resettlement for the affected persons. At present, the detailed engineering design of transmission line has not yet been completed. The project office has agreed that a separate resettlement plan will be completed and submitted to the Bank once the design is completed and a more accurate account of land acquisition and resettlement is available.

Table 2: LAND ACQUISITION AND RESETTLEMENT IN THE YANGZHOU POWER PLANT

Villages	Groups	Number of households	Demolished floor space (m^2)	Affected population	Project component
Biangang	Xiagang	36	7,276.4	132	Main plant
	Xionggang	26	2,263.9	107	Site
Wanggang	Qugang	18	2,323.7	64	
	Wangdong	22	2,397.9	82	
Anle	Guanqiao	33	2,183.9	108	
	Wangzhuang	29	2,150.4	115	
	Dongqi	34	2,736.1	118	Construction
	Zhanggang	29	2,342.4	94	Production
	Daigang	29	2,715.3	79	Area
Wanggang	Chezhuang	8	1,000.0	28	Living area
Total		264	22,840.0	927	

Source: Jiangsu Provincial Electric Power Company.

C. ASH DISPOSAL SITE

4. For the third component—an ash disposal site, it is planned to build on an unused water way to the east of the proposed plant. The proposed ash site, with a storing capacity of 10 to 12 years, will cover about 3,750 mu (250 ha) of the state-owned waterway. The waterway is currently being used by local villages as fishing ponds. Certain compensations will be required for lost fishing income and forgone facilities. There are no houses within the proposed site. However, the readjustment of the existing irrigation system in the region (caused by removing the existing waterway) will need acquiring additional 1,007 mu of farmland, which will involve removing about 27,700 m^2 of floor space and relocating 907 persons. Since the preliminary design of the ash site has not yet completed, the project office could not provide more detailed information regarding number of people affected, number of houses to be removed and amount of compensation and resettlement to be required. As in the case of transmission line, the project office has agreed that a separate resettlement plan will be developed and submitted to the Bank once the engineering design is completed.

Table 3: DEMOLITION AND RESETTLEMENT ALONG 500-KV TRANSMISSION LINE

County	Township	Length of the line	No. of affected villages (groups)	Number of households	Demolished floor space (m^2)	Affected population
Hanjiang	Bali	6,090	6 (20)	55	13,981.8	429
	Shiqiao	5,180	4 (13)	102	15,570.0	510
	Quqiao	5,475	4 (11)	99	11,022.1	415
	Hangji	6,365	4 (13)	147	22,854.0	656
	Taian	5,210	3 (7)	81	11,250.0	336
Jiangdu	Shuanggou	5,680	5 (11)	84	13,545.0	311
Total		34,000	26 (75)	568	88,222.9	2,657

Source: Jiangsu Provincial Electric Power Company.

Legal Framework

5. Forming the legal basis for land acquisition and resettlement are the Land Administration Law of the People's Republic of China, Jiangsu Provincial Implementation Regulation of the Land Administration Law, and related regulations made by the Yangzhou Municipal government. According to these laws and regulations, for the purpose of state capital construction, the government has the authority to expropriate farmland owned by rural collectives. At the same time, the land-using units have to provide proper compensation and resettlement arrangement to the affected villages and individuals.

6. In China, land acquisition process follows a well-defined approval procedure in order to ensure that farmland expropriation is minimized and proper compensation is provided. In fact, the land acquisition is only one step of a long project cycle. For any capital construction project, before it enters the process of acquiring land, at lease several key steps have to be passed. They include: (a) project investment plan approval from the local planning commission; (b) urban planning approval on proposed construction by the city planning bureau; and (c) land use application approval by the land administration bureau.

7. This project approval procedure provides a context from which the land acquisition work could be carried out. The adopted "Land Administration Law of PRC" and its provincial and municipal implementation measures provide a comprehensive framework for implementing land acquisition process. According to these regulations, the land administration bureaus at different levels are given the authority to approve the land applications and supervise the implementation of land acquisition, and resettlement contracts reached between land-using units and the affected local units.

8. Broadly speaking, the land acquisition and resettlement work could be divided into four steps. The first step is for the land-using unit to apply for using construction land from the proper levels of land administration bureau. The application has to be made after obtaining project investment approval and "construction land use planning certificate" from local city planning department. The second step is to develop land acquisition and resettlement contract between the land-using unit and local affected units under the supervision of the local land administration bureau. Once the land acquisition contract has been signed, the local land administration bureau will gather all required materials (including land survey data) for land acquisition approval, which constitutes the third step of land acquisition. The approval of land use application, according to different size of land to be acquired, will come from proper level of land administration bureau, specified in the Land Administration Law, following which, the land acquisition process enters the implementation stage. In the last step when the project construction is over, the land administration bureau will issue the land use right certificate to the land-using units after verifying both land acquisition and resettlement contract have been fully implemented.

9. The legal framework also specifies a set of compensation policies concerning affected individuals or villages. The essence of the policy is that the land-using units will pay not only a basic compensation for land, crop and attached properties, but also a job resettlement subsidy.

10. The job resettlement compensation for cultivated land acquisition will be determined according to the existing ratio of amount of cultivated land per person. If the existing villages with per capita of cultivated land above 1 mu, the resettlement compensation will be set at three times the average annual output value per mu in the three years before land acquisition. If the per capita land area below 1 mu, the resettlement compensation will be paid at four times of average annual output value. With reducing per capita cultivated land ratio, the resettlement compensation could increase up to 10 times the average annual output value per mu in the three years before land acquisition. If the land compensation and resettlement subsidy still cannot guarantee the farmer's original living standard according to regulation, the total land compensation and resettlement subsidy may be increased to a level no more than 20 times the average annual output value per mu in the three years before acquisition. A detailed breakdown of the land acquisition compensation is presented in the next section.

11. Among various items in land compensation, only young crop compensation and attached properties of farming facilities will be paid directly to individuals. The rest

of land compensation and resettlement subsidy will all be paid to townships and villages. For the amount earmarked for labor relocation, they will be used for providing employment or living allowance for the affected individuals. For the land compensation fund and others, they can be used for a wide range of purposes that serve the community or can be distributed as stipends for village residents. By law, accounts must be kept of all village/town funds, including resettlement compensation. Financial reports have to be provided annually to the next higher level of government.

Compensation Determination and Payment

12. **Land Compensation.** The land compensation consists of a dozen items, including compensation for young crops, compensation for land, compensation for labors as well as a range of related fees and taxes.

13. Total land acquisition is set at Y 480,000 per ha farmland (Y 32,000/mu). Of the total compensation, the items directly concerned with farmers are:

(a) compensation for young crops, which will be paid directly to the affected farmers: grain crops—Y 9,000/ha; vegetables—Y 18,000/ha;

(b) compensation for land, which could be used to pay living allowance for nonable-bodied resettlers: Y 54,000/ha. For those villages that will not longer exist, this fund will be used to pay those above 40 years old living allowance, which is set at above Y 60 per capita per month. For those remaining villages, the fund could be used to develop village economy, social facilities, or distribute directly to all members within the villages. (All cultivated land within the affected villages will be redistributed after land acquisition);

(c) compensation for labor allocation, which will be used to provide nonfarm jobs for the affected farmers: Y 90,000/ha. For every employment opportunity, the receiving enterprise will get Y 7,000 of job relocation fee. For each person above 40 years old, a pension fund of Y 6,000 to Y 7,000 will be provided to the local civil affairs bureau.

14. **Property Compensation.** The property compensation consists of compensation for lost buildings, compensation for attached facilities, and compensation for trees.

(a) Compensation for old house removal and new house construction: Y 600/m^2;

(b) compensation for nonresidential structures: Y 200/m^2;

(c) compensation for cowshed: Y 100/m^2;

(d) compensation for attached facilities:

pigsty	Y 300/each
toilet or well	Y 150/each
manure pit	Y 50/each
methane generating pit	Y 300/each
tomb	Y 50/each

15. **Transfer Assistance**. Relocation grant: Y 600 per household; relocation transition allowance: Y 500 per households (for those who require temporary resettlement); moving assistance: Y 300 per household.

Purpose and Strategy of Resettlement

16. For the project office, one main objective of resettlement efforts is to minimize the scope of resettlement through the process of project design and planning. For example, by changing the radius of major road to the plant, the project avoids cutting the Bian Gang Elementary School into two parts. Another example is by relocating the construction living quarter from one concentrated location to the sides along the factory road, it avoids demolishing one densely populated village. The Bank mission also noticed that in order to minimize demolition and relocation, serious efforts have been made between project engineers and local officials in determining both the alignments of transmission line and the location of ash disposal site.

17. For those demolition or land acquisition that could not be avoided, proper compensation and resettlement will be provided. For example, for 264 households (927 persons) affected by the land acquisition of the main plant, they will be resettled in newly built apartment buildings at the town center of Bali township, about 3-5 km away from the existing village sites. The new housing are all four-storey walk-ups equipped with standard facilities, like private running water, electricity, modern kitchen and bathroom. All of 927 affected persons will be given nonfarm residential status. For the relocated farmers with age between 16 to 40 (16-35 for females), they will be provided factory jobs in township factories. According to the resettlement plan, 250 of them will be employed in Bali Cement Factory; 69 of them in Bali Rubber Factory; and the rest of 105 will be assigned jobs by the Hanjiang County Labor Bureau. Further discussion with the labor bureau indicated that several county-owned and township-owned factories in neighboring Guazhou township could offer jobs for the remaining surplus labors.1/ For those above 40 (for females, above 35) years old, they will be provided monthly pension at Y 75 per month, which will be administered by the county civil affairs bureau. For those who are still capable to work (with ages between 40 and 50), they will be organized into service companies set up by the Bali township government.

1/ According to the governor of Bali township, not all affected persons require job relocation. Some of them will keep their current jobs in local TVEs. However, their residential status will be changed from rural to urban.

Resettlement Institutional Responsibility

18. In order to effectively implement the land acquisition and resettlement program, a land acquisition and resettlement leading group has been set up at both Yangzhou Municipal level and Hanjiang County level, with the main working team set in the county level. There are 11 full-time staff working on the land acquisition and resettlement implementation for the Yangzhou Power Project. Most of them come from relevant county government agencies, such as land administration bureau, urban construction bureau, labor bureau, public security bureau, civil affairs bureau, and water resources bureau. Similar resettlement office has also been set up in the affected townships. The main responsibilities of the county resettlement office include: (a) signing land acquisition and compensation contract with the project office: Yangzhou Power Plant Preparation Office; (b) signing compensation contracts with affected individuals and affected collective units (townships or villages); (c) developing and implementing resettlement plans; (d) demolishing existing houses and preparing new resettlement housing; (e) assigning nonfarm jobs and setting up living allowance for the seniors; and (f) coordinating the implementation within the county or township governments.

19. The Yangzhou Second Power Plant Preparation Office as the project office is responsible for paying compensation as required under the Land Administration Law. The fund will be channeled from the State Electricity Investment Corporation, Jiangsu Provincial Electric Power Company, and Yangzhou Municipal Government. Within the power plant project office, a land requisition and resettlement unit has been set up with four full-time staff. They work closely with the local municipal and county government. They are responsible for: (a) estimating total resettlement cost; (b) collecting funds from different investment sources and distributing to affected counties, townships or individuals; (c) obtaining project approval documents, like planning permit, land use planning permit, and land acquisition or building demolition permit; (d) formulating the resettlement action plan.

20. The project office negotiates and pays compensation to the affected counties, which act on behalf of all affected villages and individuals. After completion of negotiation with the project office and signing the contract, the county in turn negotiates with individuals for lost private assets, and with affected townships or villages for expropriated land. The township governments (or village management committees) will plan and implement resettlement plans by using collectively owned compensation funds, restricted by the guidelines designed to ensure their use for infrastructure development or other investments that will improve township or village income or social welfare.

Conflict Resolution and Grievance Procedure

21. If an affected person is not satisfied with the compensation package or if, for any reason, the compensation does not materialized according the agreed schedule, he or she could go through an grievance procedure specified in the resettlement action plan. In general, there are three different ways for anyone to resolve his grievance. The first approach is to voice his or her complains to the responsible resettlement offices at

township or county levels. Since these resettlement offices are made of representatives from all relevant departments, they are in much better position to resolve issues brought by affected individuals. If the person found that such discussion does not yield any results, then he could bring his case to the "Public Complaint Office," which exists in both county- and municipal-level governments, directly under the governors' offices. The "Public Complaint Office" has been widely used in China to address issues raised from local government decisions or policies. The staff from that office, after hearing the complaint from the affected individual, will arrange meetings with responsible agencies and resolve the disputes. If such meetings do not bring any results, they could directly call attention from the governor. Finally, if the affected person are still not satisfied with the rulings from above two channels, he could, within 15 days, request an administrative review of the case by the same or higher level of government, or to appeal directly in court. This will follow the procedure of administrative appeal, since most land acquisition and compensation decisions are determined by local government regulations or policies.

22. However, during the process of appeal, if the affected person has been given compensation package, such as resettlement housing, or temporary arrangement, the land acquisition or demolition process could proceed without delay. In other words, it assumes that the appeal only deals with the issue of "fair compensation," rather than "due process." It seems that the process of project approval, from project investment and planning approval to granting construction land use permit, represents a process of authorizing "eminent domain." After such approval, the unresolved issue is simply to decide what is proper level of fair compensation for the affected parties.

Budget and Timetable

23. Based on preliminary budget projection, resettlement costs will total approximately Y 173 million (see Table 5). For the power plant part, the total resettlement cost, including 2 percent contingency cost will amount to Y 68 million. Table 4 illustrates a breakdown cost budget for the power plant resettlement.

24. The implementation of the resettlement program is divided into three phases reflecting construction schedules of three different project components. The land acquisition and resettlement for the main power plant site will be implemented from October 1993 to June 1994. For the 500 kV transmission line, the resettlement program will be carried out during the period of October 1995 to the end of 1996. For the ash disposal site, the land acquisition will be completed by the end of 1996.

25. According to construction contracts, the resettlement for the power plant will also be divided into three stages. The first stage is the land acquisition of 8 ha for the construction living quarters (only relocating eight households), which will be completed by the end of November 1993. The second stage is the land acquisition of the main plant site, which will involve a total of 46 ha of land area and relocating 92 households. This stage will be completed by the end of April 1994. The third stage is the land acquisition for the rest of the plant site, which consists of 56 ha of land area and relocating 164 households. It is scheduled to be complete by the end of June 1994.

Table 4: RESETTLEMENT COST ESTIMATE FOR THE YANGZHOU POWER PLANT

Category of cost		Cost criteria	No. of items	Amount (Yuan)
Compensation for relocation	House removal construction	Y 600/m^2	22,000	13,200,000
	Relocation grant	Y 600/hh	264	158,400
	Moving assistance	Y 300/hh	264	79,200
	Temporary settlement allowance	Y 500/hh	264	132,000
	Nonhousing compensation	Y 200/m^2	160	32,000
	Public facilities	Y 50/m^2	160	8,000
	Compensation for cowshed	Y 100/m^2	18	1,800
Compensation for attached facilities	Pigsty	Y 300 each	139	41,700
	Toilet/well	Y 150 each	220	33,000
	Manure pit	Y 50 each	42	2,100
	Methane pit	Y 300 each	2	600
	Tomb	Y 50 each	268	13,400
	Walls	Y 50/m^2	385	19,250
	Cement surface	Y 20/m^2	871	17,420
Compensation for trees	Fruit tree	Y 20 each	356	7,120
	Other tree	Y 10 each	8,400	84,000
Land acquisition cost		Y 480,000/ha	110	52,800,000
Subtotal				66,629,990
Contingency		2% of total		1,332,600
Total				67,962,590

Source: JPEPC.

26. To accommodate this land acquisition process, a detailed work plan concerning the resettlement and rehabilitation has also been developed, which is included in the resettlement action plan. As of September 1993, 108 units of new resettlement housing have already been completed, which will be sufficient to accommodate the first

Table 5: RESETTLEMENT COST ESTIMATE FOR YANGZHOU THERMAL POWER PROJECT

Items	Land acquisition and resettlement (Yuan)	Implementation schedule
1. Power Plant	68,000,000	Oct 93-Jun 94
2. 500 kV transmission line	29,000,000	Oct 95-Dec 96
3. Ash disposal site	76,000,000	Jan 96-Dec 96
Total	173,000,000	

Source: JPEPC.

two stages of resettlers. According to the project office, the resettlement housing for the last stage (164 households) is currently under construction, which is expected to be completed by June 1994. In terms of time frame for compensation payment, all one-time compensation or transfer fund will be paid before the land acquisition takes place. Table 6 illustrates the resettlement schedule for the first stage of land acquisition within the main plant site.

Monitoring and Evaluation

27. With the involvement of the Resettlement Research Center, Hehai University, the project has established a resettlement monitoring and evaluation team, which consists of staff from Hehai University, Yangzhou Municipal Government, Yangzhou City Land Administration Bureau, and Jiangsu Provincial Power Bureau. Under the leadership of Prof. Shi Guoqing, a working plan for resettlement monitoring has been developed, which will be included in the revised Resettlement Action Plan to be submitted to the Bank by the end of November 1993. The objective of monitoring and evaluation is to ensure that the resettlement program will be implemented smoothly and to see whether resettled people will restore their living condition and income level after relocation. The contents of monitoring include: implementation progress of resettlement program; use of resettlement funds; production restoration among relocated population (jobs and living allowance); living condition of relocated population (housing and related services and facilities); income changes among relocated population (compare income and expenditure before and after resettlement among a sample of families); and administration capacity of resettlement organizations. The team will produce a resettlement progress report for the project office and the Bank every six months. After the completion of resettlement implementation, a resettlement evaluation project will be completed.

Table 6: LAND ACQUISITION AND RESETTLEMENT SCHEDULE FOR THE PLANT (ONE STAGE)

Items	Contents	Dates
Land Acquisition	1. contract between county and project	Oct 15, 1993
	2. contract between county and township	Oct 28, 1993
	3. land survey	Oct 18, 1993
	4. land acquisition approval	Nov 15, 1993
	5. land transfer	Nov 30, 1993
Resettlement Arrangement	1. property appraisal	Oct 25, 1993
	2. housing compensation contract (with HH)	Nov 05, 1993
	3. distribute new housing and make payment	Nov 20, 1993
Living Allowance	1. change resident status	Nov 15, 1993
	2. allocate pension fund	Nov 30, 1993
Labor Arrangement	1. identify employers	Nov 15, 1993
	2. sign labor contract	Feb 28, 1993

Source: Jiangsu Provincial Electric Power Company.

BANK SUPERVISION INPUT INTO KEY ACTIVITIES

Approximate dates	Activity	Expected skill requirements	Staff inputs (staff-weeks)
09/94	SUPERVISION MISSION Project Implementation Start-up	Engineering Financial analysis Procurement Environment Compensation/social experts	5.0
06/95	SUPERVISION MISSION Status of the Project	Engineering Financial analysis	4.0
06/96	SUPERVISION MISSION Status of the Project	Engineering Economic/financial analysis Environment	5.0
06/97	SUPERVISION MISSION Status of the Project Execution of the Studies	Engineering Financial analysis	4.0
06/98	SUPERVISION MISSION	Engineering Financial analysis Environment Compensation/social experts	4.0
06/99	SUPERVISION MISSION Status of the Project	Engineering Financial analysis	4.0
06/2000	SUPERVISION MISSION Status of Project Completion and compliance with covenants	Engineering Financial analysis	4.0
02/2001	SUPERVISION MISSION Preparation of PCR	Engineering Economic/financial analysis	5.0

Note: Supervision missions will be coordinated with other Bank-financed power projects in China.

FRAMEWORK FOR PROJECT MONITORING AND REPORTING

1. Framework for project monitoring would be discussed and agreed with JPEPC. Monitoring will take a series of target dates for major events in the project implementation program (Annex 5.8).

2. Records of selected performance indicators would be maintained by comparing the forecast against actual results for:

(a) activities of engineering consultants;

(b) procurement, i.e., prequalification, preparation of bid documents, bid opening, contract awards;

(c) environmental management program implementation;

(d) construction progress;

(e) progress in staff training;

(f) progress of studies;

(g) energy production and purchases;

(h) maximum demand;

(i) electricity consumption;

(j) power losses;

(k) quality of power supply;

(l) number of outages and their duration;

(m) number of customers by category;

(n) staff statistics;

(o) tariff levels and movements;

(p) rates of return on revalued net fixed assets;

(q) self-financing ratio;

(r) operating ratios;

(s) changes in project cost estimates and related financing;

(t) debt/equity ratios;

(u) debt service coverage; and

(v) current ratio.

ACTUAL FINANCIAL STATEMENTS OF JPEPC (1989-92)

Table 1: INCOME STATEMENT
(Y million)

Year Ended December 31	1989	1990	1991	1992
Operating Revenues				
Sales Increase (%)	1.8	7.8	8.2	13.5
Energy Sales (100 GWh)	259.0	279.0	302.0	343.0
Average Price (Fen/kWh)	10.6	12.8	14.1	16.1
Total Operating Revenues	2,750.3	3,578.1	4,258.9	5,508.7
Operating Costs				
Fuel	1,119.5	1,438.0	1,684.7	2,170.0
Purchased Power	421.8	734.9	1,023.3	1,460.5
Operation & Maintenance	204.6	268.1	317.5	409.8
Administration	101.1	129.3	153.8	181.1
Sales Tax	371.0	393.3	436.2	510.1
Depreciation	197.3	221.4	302.7	327.3
Total Operating Costs	2,415.3	3,185.0	3,918.2	5,058.8
Operating Income	335.0	393.1	340.7	449.9
Other Income	(9.5)	(36.4)	(54.0)	(79.9)
Net Income Before Income Tax	325.5	356.7	286.7	370.0
Income Tax	83.7	77.8	30.8	52.9
Net Income	241.8	278.9	255.9	317.1
Rate of Return on Historically Valued Assets (%)	6.7	6.7	5.8	6.8

ACTUAL FINANCIAL STATEMENTS OF JPEPC (1989-92)

Table 2: BALANCE SHEET
(Y million)

Year Ended December 31	1989	1990	1991	1992
Assets				
Current Assets				
Cash	776.8	974.2	1,232.4	1,780.0
Inventories	407.9	449.6	502.4	514.5
Accounts Receivable	198.7	282.6	152.4	636.1
Total Current Assets	1,383.4	1,706.4	1,887.2	2,930.6
Fixed Assets				
Plant in Services	5,573.9	6,255.8	6,641.0	6,667.0
(less) Accumulated Depreciation	1,627.1	1,855.9	2,161.0	2,356.1
Net Plant in Services	3,946.8	4,399.7	4,480.0	4,831.5
Construction WIP	624.9	468.8	1,456.2	1,700.5
Total Fixed Assets	4,571.7	4,868.5	5,936.2	6,531.9
Special Fund Assets	437.8	472.9	464.7	698.8
Total Assets	6,392.9	7,047.8	8,288.1	10,161.3
Liabilities				
Current Liabilities				
Accounts Payable	609.6	917.9	969.2	1,651.6
Due to Government	135.4	99.3	38.5	255.5
Total Current Liabilities	745.0	1,017.2	1,007.7	1,907.1
Long-term Liabilities & Equity				
Working Capital Funds	139.3	183.1	222.7	277.6
Long-term Debt	1,829.3	1,604.8	2,250.4	2,283.2
Government Funds	2,888.2	3,313.9	3,727.6	3,987.7
Special Funds	791.2	928.8	1,079.8	1,598.7
Total Liabilities & Equity	6,393.0	7,047.8	8,288.2	10,054.3
Debt as % of Debt & Equity	30.9	26.9	29.9	25.1
Current Ratio	1.9	1.7	1.9	1.5

ACTUAL FINANCIAL STATEMENTS OF JPEPC (1989-92)

Table 3: FUNDS FLOW STATEMENT
(Y million)

Year Ended December 31	1989	1990	1991	1992
Sources of Funds				
Net Income	241.8	278.7	255.9	317.0
Depreciation	206.2	230.0	311.8	336.0
Maintenance Special Fund	62.9	98.8	140.7	150.6
Distribution Imprv. Special Funds	139.6	138.7	194.8	381.0
Other Special Funds	306.5	374.6	358.4	681.4
Internal Cash Generation	957.0	1,120.8	1,261.6	1,866.0
Government Funds	16.1	90.7	64.7	6.7
Borrowings				
IBRD Loan	89.5	98.6	50.1	28.0
Other Loans	248.4	106.0	1,295.9	984.2
Total Borrowings	337.9	204.6	1,346.0	1,012.2
Total Sources of Funds	1,311.0	1,416.1	2,672.3	2,884.9
Application of Funds				
Capital Expenditure				
Construction	338.8	240.6	1,383.8	1,056.0
Total Capital Expenditure	338.8	240.6	1,383.8	1,056.0
Operational Requirement				
Inc/dec in Working Capital	(49.6)	(40.2)	(65.2)	(299.9)
Inc/dec in Special Fund Assets	54.4	34.2	(15.3)	234.2
Loan Repayment	195.6	316.7	250.0	336.0
Remittances to Government	48.8	52.1	50.3	62.9
Special Fund Expenditures	623.1	615.3	810.2	948.0
Total Operational Requirement	872.3	978.1	1,030.0	1,281.2
Total Application of Funds	1,211.1	1,218.7	2,413.8	2,337.2
Inc/Dec in Cash	99.7	197.3	258.2	547.6
Annual Debt Service Coverage (times)	3.5	2.6	3.6	3.5

FORECAST FINANCIAL STATEMENTS OF JPEPC (1993-2002)

Table 1: PROJECTED INCOME STATEMENT
(Y million)

Year Ended December 31	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Operating Revenues										
Sales Increase (%)	12.8	13.5	12.0	7.9	8.5	9.8	12.8	12.8	11.2	3.1
Energy Sales (100 GWh)	386	439	491	530	575	632	713	805	895	923
Average Price (fen/kWh)	25.00	27.17	30.91	34.98	37.58	40.92	45.57	50.47	54.32	54.84
Total Operating Revenue	9,661	11,918	15,181	18,547	21,622	25,861	32,491	40,608	48,623	50,621
Operating Costs										
Fuel	2,767	3,088	3,891	4,725	5,805	6,679	7,761	9,551	11,806	13,009
Purchased Power	3,053	4,553	5,744	6,487	7,039	8,819	11,663	13,578	15,061	16,337
Operation & Maintenance	482	570	717	889	1,056	1,370	1,673	1,964	2,376	2,942
Administration	198	225	267	315	360	411	469	549	638	740
Sales Tax	949	1,060	1,294	1,560	1,811	2,105	2,529	3,090	3,664	3,813
Depreciation	362	428	597	767	919	1,355	1,726	1,988	2,447	3,165
Total Operating Costs	7,810	9,924	12,511	14,744	16,990	20,740	25,820	30,720	35,992	40,005
Operating Income	1,851	1,994	2,670	3,804	4,632	5,120	6,671	9,888	12,631	10,616
Nonoperation Income	(200)	(220)	(240)	(260)	(280)	(300)	(320)	(340)	(360)	(380)
Financial charge	64	176	358	564	543	398	1,040	2,161	2,695	2,995
Net Income Before Income Tax	1,587	1,598	2,072	2,980	3,809	4,423	5,311	7,387	9,576	7,241
Income Tax	224	415	572	844	1,080	1,253	1,503	2,109	2,739	1,940
Net Income	1,363	1,183	1,500	2,136	2,729	3,170	3,807	5,278	6,837	5,301
Rate Base	10,736	14,019	18,312	22,288	28,607	36,860	43,654	51,289	63,067	75,787
Rate of Return on Reval. Assets (%)	13.3	9.7	10.1	12.1	11.4	9.7	11.1	14.5	15.1	10.9

FORECAST FINANCIAL STATEMENTS OF JPEPC (1993-2002)

Table 2: PROJECTED BALANCE SHEET
(Y million)

Year Ended December 31	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Assets										
Current Assets										
Cash	2,042	2,371	2,863	3,266	3,680	3,920	4,227	5,393	5,687	6,165
Inventories	565	688	813	924	1,242	1,513	1,705	2,040	2,564	2,954
Receivables	939	993	1,181	1,443	1,562	1,868	2,347	2,820	3,377	3,515
Total Current Assets	3,546	4,052	4,856	5,633	6,484	7,301	8,279	10,253	11,627	12,634
Fixed Assets										
Plant in Service	8,467	11,536	14,639	17,406	25,331	32,064	36,840	45,179	58,227	67,933
(less) Accum. Depreciation	2,741	3,158	3,725	4,477	5,372	6,707	8,392	10,341	12,748	15,872
Net Plant in Service	5,726	8,378	10,914	12,929	19,959	25,357	28,448	34,838	45,480	52,061
Construction WIP	4,103	4,789	5,606	8,095	8,220	11,883	19,920	24,535	23,386	23,739
Total Fixed Assets	9,829	13,167	16,520	21,024	28,179	37,240	48,368	59,373	68,866	75,801
Total Assets	13,375	17,219	21,376	26,657	34,663	44,541	56,647	69,626	80,493	88,435
Liabilities										
Current Liabilities										
L-T loans due in 12 months	767	879	1,143	1,156	1,156	1,688	2,834	4,683	4,751	4,771
Accounts Payable	1,307	1,754	2,231	2,658	3,101	3,719	4,610	5,507	6,439	7,108
Due to Government	230	235	258	284	312	343	378	416	457	503
Other Payable	416	439	463	489	516	543	572	603	635	668
Total Current Liabilities	2,720	3,306	4,095	4,587	5,085	6,293	8,394	11,208	12,282	13,049
Long-term Debt	3,510	5,332	6,945	9,341	13,862	19,100	25,033	29,655	32,342	33,945
Equity										
Paid-In Capital	5,770	6,035	6,372	6,796	7,332	7,958	8,713	9,708	10,984	12,347
Capitial Reserves	179	361	544	730	916	1,107	1,299	1,494	1,691	1,891
Accumulative Retained Earnings	1,034	2,044	3,142	4,516	5,884	7,234	9,087	12,070	16,858	21,156
Undistributed Profits	161	142	278	688	1,584	2,849	4,120	5,491	6,335	6,047
Total L-T Liab. & Equity	10,655	13,913	17,282	22,070	29,578	38,247	48,252	58,418	68,211	75,385
Total Liabilities	13,375	17,219	21,376	26,657	34,663	44,541	56,647	69,626	80,493	88,435
Debt as % of Debt & Equity	33.4	38.7	40.8	43.7	49.5	54.0	56.7	56.0	52.3	49.0
Current Ratio	1.5	1.4	1.4	1.4	1.4	1.3	1.2	1.2	1.2	1.2

FORECAST FINANCIAL STATEMENTS OF JPEPC (1993-2002)

Table 3: PROJECTED FUNDS FLOW STATEMENT
(Y million)

Year Ended December 31	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Internal Sources of Funds										
Net Income	1,363	1,183	1,500	2,136	2,729	3,170	3,807	5,278	6,837	5,301
Depreciation	362	428	597	767	919	1,355	1,726	1,988	2,447	3,165
Distribution Imprv. Spec. Fds.	271	273	276	278	281	283	286	288	291	293
Provision for Bad Debts	3	3	4	4	5	6	7	8	10	11
Total Internal Sources	1,998	1,887	2,376	3,186	3,934	4,814	5,825	7,563	9,585	8,770
Borrowings										
ECO Financing		339	117	470	117					
Yangzhou IBRD Loans			5	620	1,379	723	292	45		
Yangzhou PCBC Loans	100	211	576	1,025	1,255	1,056	726	182		
Other Loans	1,506	1,682	1,560	1,009	2,258	3,808	6,095	7,445	5,911	5,083
IDC Borrowed	288	367	398	427	696	1,398	1,786	1,815	1,825	1,910
Total Borrowings	1,894	2,600	2,656	3,551	5,704	6,986	8,899	9,487	7,736	6,993
Equity Contribution	100	100	100							
Total Sources of Funds	3,992	4,588	5,132	6,737	9,638	11,799	14,724	17,050	17,321	15,763
Capital Expenditures										
Proposed Yangzhou Project	200	651	798	2,115	2,751	1,779	1,018	227		
Other Construction	1,965	2,237	2,238	2,208	4,131	6,763	9,638	10,586	9,860	8,250
Interest During Construction	288	367	398	427	696	1,398	1,786	1,815	1,825	1,910
Distribution Improvements	507	510	516	521	525	535	542	547	553	559
Total Capital Expenditure	2,960	3,766	3,949	5,271	8,102	10,476	12,984	13,176	12,238	10,719
Operational Requirements										
Inc/dec in Working Capital	30	(274)	(188)	(80)	(34)	(73)	(254)	(126)	106	(186)
Loan Repayment	740	767	879	1,143	1,156	1,156	1,688	2,834	4,683	4,751
Total Operational Requirements	770	493	691	1,062	1,122	1,083	1,433	2,708	4,789	4,565
Total Applications of Funds	3,730	4,259	4,640	6,334	9,224	11,559	14,417	15,884	17,027	15,285
Increase/Decrease in Cash	262	329	492	404	414	240	307	1,166	294	478
Annual Debt Service Coverage	2.2	1.9	2.0	2.0	2.5	3.2	2.4	1.9	1.6	1.5

FORECAST FINANCIAL STATEMENTS OF JPEPC (1993-2002)

Table 4: KEY FINANCIAL INDICATORS
(Y million)

Year Ended December 31	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Energy Sales (100 GWh)	386	439	491	530	575	632	713	805	895	923
Average Price (fen/kWh)	25.00	27.17	30.91	34.98	37.58	40.92	45.57	50.47	54.32	54.84
Operating Revenue	9,661	11,918	15,181	18,547	21,622	25,861	32,491	40,608	48,623	50,621
Operating Income	1,851	1,994	2,670	3,804	4,632	5,120	6,671	9,888	12,631	10,616
Annual Capital Expenditures	2,960	3,766	3,949	5,271	8,102	10,476	12,984	13,176	12,238	10,719
Rate Base	10,736	14,019	18,312	22,288	28,607	36,860	43,654	51,289	63,067	75,787
Long-term Debt	3,510	5,332	6,945	9,341	13,862	19,100	25,033	29,655	32,342	33,945
Debt Service	302	440	695	988	1,079	1,024	1,795	3,157	3,972	4,357
Cash in Banks	2,042	2,371	2,863	3,266	3,680	3,920	4,227	5,393	5,687	6,165
Rate of Return on										
Revalued Assets (%)	13.3	9.7	10.1	12.1	11.4	9.7	11.1	14.5	15.1	10.2
Hist. Valued Assets (%)	27.0	19.3	19.3	22.7	19.9	15.7	18.0	23.5	23.7	17.0
Self Financing Ratio (%)	31.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Operating Ratio (%)	71.0	74.4	73.9	71.1	70.2	72.1	71.7	68.0	66.5	71.5
Debt/Total Capital (%)	33.4	38.7	40.8	43.7	49.5	54.0	56.7	56.0	52.3	49.0
Debt Service Coverage	2.2	1.9	2.0	2.0	2.5	3.2	2.4	1.9	1.6	1.5

MAJOR ASSUMPTIONS FOR JPEPC's FINANCIAL PROJECTIONS

A. Income Statement

1. Energy sales reflect JPEPC's projected expansion program.

2. Tariffs are assumed to be adjusted so that the average revenues would be adequate for achieving the minimum financial performance targets.

3. General local inflation rates are assumed at 10.9 percent in 1993, 7.5 percent in 1994 and at 6 percent per annum for 1995-2002.

4. Fuel costs are based on 1993 actual price paid for coal and are assumed to increase with the projected local inflation rates.

5. Purchased power are based on 1993 actual purchased price and are assumed to increase by 3 percent per year in real terms and also to escalate with the projected local inflations for electricity from small hydro plants, local power plants, and both intergrid and local transfers. Purchase price for electricity from power plants under Huaneng and Sunburst Corporations are based on "new plant, new price policy" and derived by full recovery of operating cost and debt service requirement.

6. Operation and Maintenance costs include payroll and materials escalated with projected local inflation rates, 10.9 percent for 1993, 7.5 percent for 1994, and 6 percent for 1995-2002. Maintenance cost is assumed to increase per year by 2.5 percent of annual increase in the gross fixed assets.

7. Administration cost is based on JPEPC's 1992 actual expenditure and is assumed to increase with projected growth of energy sales and local inflation rates.

8. Sales tax is assumed at the following percentage of each year's operating revenues.

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
9.8	8.9	8.6	8.5	8.4	8.2	7.8	7.6	7.5	7.5

9. Depreciation is assumed to be 5.5 percent of gross fixed assets in operation at the beginning of the year.

10. Income tax is expected to be assessed at 33 percent of taxable income.

B. Balance Sheet

1. Inventories are assumed to increase per year by 4 percent of annual fixed assets additions.

2. Accounts receivable is assumed to decrease gradually from 30 days of average collection period in 1993 to 25 days by 2000 onwards.

3. Accounts payable is assumed to be 65 days of costs for fuel, purchased power, and sales tax.

4. Construction work-in-progress reflects the aggregate construction work-in-progress of JPEPC's own construction units and other construction units work as contractors for JPEPC.

5. Due to Government is expected to increase by 2 percent each year.

C. Funds Flow Statement

1. Distribution Improvement Special Fund represents the receipts of consumer connections and is assumed to increase by 12 percent per annum based on 1992 actual collection.

2. Distribution Improvements represent 85 percent of the previous year's and 15 percent of the year prior to the previous year's expenditures from the Distribution Improvement Special Fund.

ECONOMIC JUSTIFICATION OF THE PROJECT

1. Economic analysis for the project included preparation and comparison of a variety of scenarios for the expansion of the Jiangsu provincial electricity grid, calculation of a project internal rate of return, and relevant sensitivity analysis. The analysis was based on studies and updates prepared by BERIWREP, in conjunction with JPEPC, using BERIWREP's GESP model for least-cost generation system planning. These studies are available in the Project File. It also is significant that commissioning of the Yangzhou project's two 600 MW units at as early a date as possible was found to be part of the least-cost expansion program for the East China Grid as a whole in similar analysis completed in 1992 for the Tianhuangping Hydroelectric Project (Report No. 11428-CHA).

Shadow Pricing

2. All economic analysis was based on shadow prices. A discount rate of 12 percent in real terms was used. For the least-cost analysis, the shadow foreign exchange rate (Y 7.5/$1.0) and official foreign exchange rate Y 5.8/$1.0) at the time of appraisal were used. (The conclusions of the analysis, however, still hold if January 1994 official and shadow rates of exchange of Y 8.7/$1.0 and Y 9.0/$1.0 are used.) Costs of imported goods and services were priced at their estimated financial cost (e.g., a conversion factor of 1.0 was used), while domestic costs were shadow priced at a standard conversion factor (SCF) of 0.77, except for a few items for which specific conversion factors were used. These items included coal and domestically produced thermal power generating equipment. (Specific conversion factors for materials used in power plant construction also were prepared BERIWREP, but the resulting average conversion factor for materials was very close to the SCF, and hence the SCF was used.) The shadow price for coal was established at Y 208.5/ton of coal equivalent, with a specific conversion factor of 0.72, based on the September 1993 FOB export price, Qinhuangdao, of $32/ton of 7,000 kcal/kg coal and an estimate of the economic cost of transportation to Yangzhou and unloading of Y 22.7/ton. The specific conversion factor used for domestically produced thermal power generation equipment was 2.0, based on an analysis of current domestic and international prices.

3. Accordingly, key shadow prices for the least-cost analysis were calculated as follows:

Item	Financial Price (Y)	Shadow Price (Y)
Yangzhou project (per kW)	4,417	3,880
New Nanjing (per kW)	4,620	4,061
Local 300 MW plant (per kW)	3,190	4,295
Coal (per TCE)	290.1	208.5

Least-Cost Analysis

4. Least-cost system expansion scenarios were constructed for the Jiangsu provincial power system using BERIWREP's model for a base case, and the alternative scenarios: (a) expansion without the Yangzhou Project; (b) expansion assuming a discount rate of 16 percent instead of 12 percent; (c) expansion to meet a high-demand forecast of growth in electricity demand of 12 percent per year during 1993-2002; (d) expansion to meet a low-demand forecast of growth in electricity demand of 6 percent per year during 1993-2002; and expansion assuming a shadow price for coal at 40 percent above the base case level of Y 208.5/TCE. In scenarios (b)-(d), the least-cost expansion schemes all included commissioning of Yangzhou's two 600 MW units in 1998 and 1999, the same as in the base case. In 1996 prices, the present value of the total investment and operating costs of power generation in the optimum "without Yangzhou" expansion scheme was Y 122,261 million, compared to Y 120,854 in the base case least-cost expansion scheme which includes Yangzhou.

Economic Rate of Return

5. Table 1 presents the calculation of the internal economic rate of return (IERR) for the project, and the key assumptions employed. Sensitivity analysis of the results are reported in the text. The rate of return calculation employs the January 1994 official rate of exchange of Y 8.7/$1.0 and a corresponding shadow rate of foreign exchange of Y 9.0/$1.0. (If the exchange rates at the time of appraisal are employed, the IERR of the project is estimated at 17 percent.) The breakeven financial tariff necessary for the project's IERR to exceed the 12 percent discount rate used in the analysis is 33 f/kWh, compared to a minimum willingness to pay level established in the base case of 37 f/kWh.

Table 1: YANGZHOU THERMAL POWER PROJECT: INTERNAL ECONOMIC RATE OF RETURN
(million yuan)

Year	Generation Costs Foreign	Local	Total	T&D Cost	Fuel Cost	O&M Cost	Total Cost	Benefits GWh	Yuan	Net Benefit
1993		193	193	96			289			-289
1994	299	246	545	268			813			-813
1995	149	456	604	300			904			-904
1996	1,014	539	1,553	760			2,313			-2,313
1997	1,358	494	1,852	903			2,755			-2,755
1998	641	389	1,030	504	30	6	1,571	325	116	-1,455
1999	253	296	549	270	394	82	1,295	4,225	1,511	216
2000	39	93	132	65	728	151	1,076	7,800	2,790	1,713
2001					728	151	879	7,800	2,790	1,911
2002					728	151	879	7,800	2,790	1,911
2003					728	151	879	7,800	2,790	1,911
2004					728	151	879	7,800	2,790	1,911
2005					728	151	879	7,800	2,790	1,911
2006					728	151	879	7,800	2,790	1,911
2007					728	151	879	7,800	2,790	1,911
2008					728	151	879	7,800	2,790	1,911
2009					728	151	879	7,800	2,790	1,911
2010					728	151	879	7,800	2,790	1,911
2011					728	151	879	7,800	2,790	1,911
2012					728	151	879	7,800	2,790	1,911
2013					728	151	879	7,800	2,790	1,911
2014					728	151	879	7,800	2,790	1,911
2015					728	151	879	7,800	2,790	1,911
2016					728	151	879	7,800	2,790	1,911
2017					728	151	879	7,800	2,790	1,911
2018					698	145	842	7,475	2,674	1,831
2019					334	69	403	3,575	1,279	876
Total	3,753	2,705	6,459	3,167	14,561	3,016	27,202	156,000	55,796	28,594

Assumptions:	
Official exchange rate (Y/$):	8.7
Shadow exchange rate (Y/$):	9.0
Standard conversion factor:	0.97
Coal price:	
Export price, FOB Qinhuangdao ($/TCE):	32.0
Export price in yuan (Y/tce):	278.4
Shadow cost, transport to plant (Y/tce):	22.7
Shadow price for coal:	301.1
Net heat rate (gCE/kWh):	310
Derived shadow fuel cost (Y/kWh):	0.093
O&M cost, gen. and T&D (Y/kWh):	0.02
Shadow O&M cost (Y/kWh):	0.019
T&D investment as a percentage of local Y generation investment (%)	50%
Project operation (hrs/year):	6,500
Financial electricity value(Y/kWh):	0.370
Shadow electricity value (Y/kWh):	0.358

Results:	
Economic IRR (%):	14.2%
PV of costs (Y):	8,990
PV of benefits (GWh):	28,215
Shadow AIC (Y/kWh):	0.319
Breakeven tariff (Y/kWh):	0.330
Shadow plant K cost (Y/kW):	5,382
Shadow plant K cost, yuan-denominated border prices (Y/kW):	5,568
Shadow plant K cost ($/kW):	619
Financial plant cost ($/kW):	941

COAL USE IN THERMAL POWER PLANTS IN JIANGSU

1. A variety of different types of thermal power plants currently operate within the Jiangsu provincial power system, with different patterns of ownership and management. The scale of the power production units, and, accordingly, unit coal consumption rates and pollution control facilities, vary sharply between the different categories. As defined by provincial authorities, the categories include:

(a) **Central government plants**. Financed with funds allocated by the central government, these plants form the core of JPEPC's system. In 1992, capacity of these plants totaled 4,259 MW, or 52 percent of total thermal power capacity in the province. Scale and heat rates vary—although new plants in this category are large, old, relatively obsolete plants built during the 1950s and 1960s also are included.

(b) **Provincial government plants**. Financed by the provincial government, and managed directly by JPEPC, these plants account for 11 percent of thermal power capacity. Unit sizes in Jiangsu range from 6 MW to 200 MW.

(c) **Huaneng plants**. In 1992, this included the modern 2x350 MW Nantong Plant.

(d) **Local plants**. These plants are constructed, owned and largely managed by local governments, including township governments. Although some diesel-fueled capacity is included, most is coal-fired and the share of diesel-fueled plants is declining. Most of these plants are 6 or 12 MW units. In 1992, they accounted for about 10 percent of thermal capacity.

(e) **Captive plants**. These plants are owned by enterprises. They generate primarily for the own use of enterprises, but also sell some power to the grid. This category includes some cogenerating capacity, but most capacity is only for power generation, and provincial authorities state that the share of cogenerating plant is not increasing due to the absence of a major space heating load. Units in the 12-25 MW range dominate, although this category also includes some 50 MW units. Although the capacity factors of all other categories are over 60 percent, the capacity factor of these captive plants was still high at 46 percent in 1992. Captive plants accounted for 19 percent of thermal power capacity in 1992.

2. As shown in Table 1, the 1992 heat rates for the first three categories averaged at 362 grams of coal equivalent (gCE) per kWh on a gross basis, and 389 gCE/kWh net of station use and losses. The smaller local and captive plants, however, registered a net heat rate of 503 gCE/kWh—29 percent higher than the other categories.

3. Since 1985, local and captive plant capacity has been growing at far higher rates than central or provincial government capacity, although the average sizes of new central and provincial government capacity are far larger, and hence more energy efficient. During 1985-92, local and captive capacity grew at average annual rates of 48 percent and 19 percent, respectively, compared with 6 and 8 percent for central and provincial government capacity. (Huaneng had no plants in 1985.) Local and captive plant accounted for 35 percent of the total increase in thermal power generation in the province over the period (see Table 1). This trend has been even more pronounced recently, as power shortages have tightened. In 1992, the small plant categories accounted for over one half of incremental power generation.

4. Table 2 shows typical net heat rates for large, modern coal-fired power plants. Imported 600 MW units, such as those which will be employed in the Yangzhou project, register net heat rates of about 310 gCE/kWh. This compares to a current average in the Jiangsu system of 414 gCE/kWh, and rates of over 500 gCE/kWh in the growing local and captive plant categories. JPEPC's expansion program for 1993-2010 emphasizes 600 MW plants, together with a more limited increase in 300 and 350 MW units (see Annex 4.7). Successful completion of the least-cost program, however, is premised upon securing of large financing packages. If large-scale development continues to lag behind demand, local governments and enterprises can be expected to continue to develop small, energy-inefficient plants, as shown by recent experience.

Table 1: COAL CONSUMPTION RATES BY TYPE OF PLANT, JIANGSU PROVINCE

Type of plant	1992 Power Generation (GWh)	Increase in Power Generation 1985-92		Gross Heat Rate (gCE/kwh)	Plant Use of Electricity (%)	Net Heat Rate (gCE/kwh)
		GWh	%			
Central Government	26,976	10,587	42.6	362	7.37	391
Provincial	5,624	1,448	5.8	392	7.37	423
Huaneng	4,113	4,113	16.6	322	3.89	335
Subtotal	36,713	16,148	65.0	362	6.98	389
Local	4,377	4,160	16.7	460	8.29	502
Captive	6,275	4,545	18.3	461	8.43	503
Subtotal	10,652	8,705	35.0	461	8.37	503
Total Thermal	47,365	24,853	100.0	384	7.29	414

Source: JPEPC.

Table 2: ILLUSTRATIVE COAL CONSUMPTION RATES FOR NEW, LARGE PLANTS

Type of Plant	Net Heat Rate (gCE/kWh)
Locally produced 300 MW units (natl. average)	360
Imported 300-381 MW units	325
Locally produced 600 MW units (Pingwei, Anhui)	340
Imported 600 MW units (Yangzhou, est.)	310
Imported supercritical 600 MW units (Shidongkou, Shanghai)	295

Source: JPEPC and mission estimates.

SELECTED DOCUMENTS AND DATA AVAILABLE IN THE PROJECT FILE

Selected Reports and Studies Related to the Project

1. Yangzhou Thermal Power Project, Feasibility Study Report, East China Electric Power Design Institute, Shanghai, China, May 1992 and September 1992.

2. Yangzhou No. 2 Power Plant Project, Basic Information (Revision No.2), June 1993 and (Revision No.3), October 1993.

3. Yangzhou No. 2 Power Plant, Environmental Assessment Report (Main Text and Executive Summary), East China Electric Power Design Institute, Beijing, China, April 1993.

4. Yangzhou Thermal Power Project, Environmental Impact Statement, East China Electric Power Design Institute, Shanghai, China, September 1992.

5. Yangzhou No. 2 Power Plant Report on Environmental Impact (Complementary Explanation), East China Electric Power Design Institute, August 1993.

6. The Economic Analysis of Yangzhou No. 2 Power Plant based on the Optimal Expansion Planning of East China Power System, Beijing Economic Research Institute of Water Resources and Electric Power, September 1992.

7. Jiangsu Power Grid, Tariff Study and Action Plan of Tariff Reform, Beijing Economic Research Institute of Water Resources and Electric Power, November 1992.

8. Jiangsu Provincial Electric Company Plan for Carrying Out Power Tariff Reform.

9. Implementation Plan for the Reform of Power Sector in Jiangsu Province.

10. Supplementary Information about Energy Conservation.

11. Yangzhou No. 2 Power Plant Project, Financial Appraisal Data of the Jiangsu Electric Power Corporation.

12. Short List of Candidate Foreign Consulting Firms, Letter of Invitation for Consulting Service, and Terms of Reference for Consulting Services for Yangzhou No. 2 Thermal Power Project, March 1993.

13. The Evaluation Report on Foreign Consulting Firms' Proposals for Yangzhou No.2 Thermal Power Project, February, 1993.

14. Yangzhou No. 2 Power Plant Resettlement Plan, JPEPC, September 1993.

15. Yangzhou No. 2 Power Plant Project Population Relocation Plan, JPEPC, April 1993.

Selected Worksheets

1. JPEPC Financial Forecast

2. Cost Tables

3. Implementation Schedules and Charts

pp 165 - 174 were blank and therefore not copied.

CHARTS

CHART 1

CHART 2

CHART 3

CHART 4

MAP