

ASIAN DEVELOPMENT BANK

TAR: PRC 38509

TECHNICAL ASSISTANCE

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR

CAPACITY STRENGTHENING OF POWER PLANNING PROCESS

October 2004

CURRENCY EQUIVALENTS

(as of 15 September 2004)

Currency Unit	–	yuan (CNY)
CNY1.00	=	\$0.1208
\$1.00	=	CNY8.2767

The exchange rate of the yuan is determined in relation to a weighted basket of currencies of the trading partners of the People's Republic of China. In this report, a rate of \$1.00 = CNY8.30 is used.

ABBREVIATIONS

ADB	–	Asian Development Bank
11FYP	–	11th Five-Year Plan
M&E	–	monitoring and evaluation
PRC	–	People's Republic of China
SERC	–	State Electricity Regulatory Commission
SGC	–	State Grid Corporation
SP	–	State Power Corporation
TA	–	technical assistance

TA CLASSIFICATION

Poverty Classification	–	Other
Sector	–	Energy
Subsector	–	Electricity
Theme	–	Sustainable economic growth
Subtheme	–	Promote economic efficiency and enabling markets

NOTE

In this report, "\$" refers to US dollars.

This report was prepared by Bo Q. Lin.

I. INTRODUCTION

1. During the 2004 Country Programming Mission, the Government of the People's Republic of China (PRC) confirmed its request for technical assistance (TA) from the Asian Development Bank (ADB) to assist the State Grid Corporation (SGC) to strengthen its system planning capacity.¹ In July 2004, a Fact-Finding Mission was fielded to assess the results of available studies and determine the scope of the TA. The Mission held discussions with representatives from the Government and SGC. An understanding was reached on the TA goals, purpose, scope, cost estimates, financing and implementation arrangements, and the consultants' terms of reference. The TA framework is in Appendix 1.

II. ISSUES

2. The PRC is the second largest electricity producer in the world after the United States. By the end of 2003, the installed capacity was about 385 gigawatts and annual electricity generation was about 1,900 terawatt-hours. The PRC has experienced large power shortages and surpluses in its history. In the 1950s, demand and supply were in balance. In the 1960s, the PRC started to experience a long power shortage that reached more than 20% of capacity in 1986. Demand and supply again reached balance in 1997, and by 1999, there was a power surplus of about 10%. However, power shortage has again become serious in 2003, with 21 provincial power grids experiencing power shortage.² With about 8% to 8.5% gross domestic product growth, the power demand growth was as low as 2.8% in 1998 and as high as 15.4% in 2003, depending on the fluctuating demand of power-intensive industries. Large surplus and shortage have created substantial costs to the economy and indicate weak capacity for power planning. Small power shortage is manageable and cost of small surplus is acceptable to support stable growth. However, the past planning practices of chasing short-run fluctuations led to overreaction to shortage and surplus, and put the economy in situations of larger power surplus and shortage. In a fast-growing economy with rapid power demand changes, it is important to have effective system planning to accommodate demand fluctuations. Good system planning will not eliminate surplus or shortage, but will reduce the chances of having large surplus and shortage, and therefore minimize the costs of both.

3. Given the size of the PRC, good grid system planning is also important for improving sector efficiency. Large resources for power generation in the PRC are located far from major load centers. Coal mines are in the north and northwestern parts of the country, and hydropower resources are in the western parts, whereas the major load centers are in the eastern and coastal areas. Regional and provincial interconnections are needed to transport power instead of fuel. Although rich in energy resources such as hydropower, gas, and coal, provinces in the western region are the poorest in the PRC. The resources have only been exploited to a limited extent because of the low economic development in the western provinces (consequently limited local market), lack of capital, and poor infrastructure. To support economic development in the western provinces, facilities such as roads, pipelines, and transmission interconnection are needed to transport resources to markets in the east. However, power network development has not kept pace with generation growth due to the low level of investment and barriers to interconnection. Inadequate transmission interconnection can create a power imbalance, with surplus in some regions but shortage in others. The power networks need to be improved to make possible power flow among provinces and regions, and to

¹ The TA first appeared in *ADB Business Opportunities* (Internet edition) on 24 July 2004.

² Overall, the power sector developed rapidly; it took 7 years for the installed capacity to increase from 100 gigawatts (GW) to 200 GW in 1994, and 5 years from 200 GW to 300 GW in 1999, and is expected to take less than 5 years to reach 400 GW by 2004.

optimize existing power generation. Network development requires effective system planning that can optimize resources and ensure efficiency and sustainability.

4. In December 2002, the former State Power Corporation (SP) was unbundled and reorganized into two new grid corporations: (i) SGC, and (ii) China Southern Power Grid Corporation, and five generation corporations, namely (a) China Huaneng Group, (b) China Datang Corporation, (c) China Huadian Corporation, (d) China Guodian Corporation, and (e) China Power Investment Corporation. Restructuring also established the State Electricity Regulatory Commission (SERC). SGC is now responsible for investment in and operation of the power network, and security and reliable operation of the power system except in five provinces covered by China Southern Power Grid Corporation.³ Earlier, SP was responsible for both generation and grid system planning and expansion. Coordination and optimization of generation and grid system planning, and expansion could all be done within SP. In the newly restructured sector, SGC will have to develop new system planning procedures, criteria, and methodologies, and closely coordinate with generation companies to ensure timely grid system planning.

5. In a restructured power sector, all market players including generators and grid companies, tend to maximize their own profits. Coordinated system planning (generation and grid) to optimize overall power supply costs and system reliability requires new procedures, criteria, and methodologies. In countries where the power sector was restructured, considerable effort was made by the government and the regulatory agency to (i) ensure new effective grid system planning procedures, criteria, and methodologies are in place, (ii) optimize generation and grid system planning, (iii) prevent major power shortage, and (iv) ensure system reliability. Otherwise, the cost savings of restructuring could not be realized and the system would be prone to major disturbances. The August 2003 massive power outage in the eastern grid of the United States that left millions of people without power for 2 days was attributable to inadequate planning and upgrading of the power grids. As power markets in the PRC develop further and power trading opportunities increase, timely system planning for power grids will be essential to ensure effective and efficient operation of the power markets. More power trading and exchanges among various power grids will in turn create more stress on the transmission interconnection networks, and increase the possibility of major power disturbances. Therefore, SGC's role and responsibilities for grid planning and expansion in a restructured power sector are more challenging, complicated, and demanding than those in the previous vertically integrated power sector. System planning and efficient grid management in a restructured power sector require related capacity building for SGC.

6. The rapid growth of power demand and high dependence on coal for electricity generation have made environmental impact a matter of great concern to the PRC. The environmental impact from thermal power generation is a major source of the PRC's environmental problem.⁴ Proper grid system planning will result in transmission of more economical and efficient power in one region or province to replace more costly and less efficient power in other regions or provinces. More efficient power plants have lower air emissions. Optimal system planning will also reduce transmission congestion and energy losses. Another key objective of SGC's system planning is to transport clean and renewable hydropower from western PRC to reduce the use of thermal power in eastern PRC. Improved system planning will optimize power resources, improve energy efficiency, and reduce air emissions. System planning should be carried out taking into account energy efficiency, demand-side management options, environmental protection, and clean energy development.

³ The five provinces are Guangdong, Guangxi, Guizhou, Hainan, and Yunnan.

⁴ At present, at least 75% of the power generation capacity in the PRC uses fossil fuels, and power generation is responsible for about 45% of air pollution.

7. SGC is making substantial efforts to improve its network to optimize existing power generation and accommodate future power generation development. ADB's operational strategy in the PRC is aimed at helping the country achieve economic growth in an efficient, equitable, and sustainable manner. ADB's energy sector strategy in the PRC includes (i) developing cleaner energy sources, (ii) renovating and retrofitting existing facilities to improve efficiency and reduce emissions, (iii) promoting corporatization and commercialization of energy utilities, and (iv) pricing and tariff reforms. The current power shortage has encouraged a large increase in generation capacity. However, power network development attracts lesser attention and could become "bottlenecks" of power supply if not improved in the next few years. SGC is committed to provide adequate, affordable, and cleaner electricity by improving power networks. The TA is a major part of the effort. The TA, by strengthening grid system planning capacity, making a priority list of least-cost projects for the 11th Five-Year Plan (11FYP),⁵ and active policy dialogue, is consistent with the Government's development objectives, and ADB's energy sector strategy.

8. ADB provided TA in 2000 to help SP optimize power generation through regional interconnection and promote substantial power development by formulating a regional transmission interconnection strategy.⁶ That TA analyzed the key barriers to interregional connections, recommended reform measures, and developed an interregional transmission strategy. Full implementation of the interregional transmission strategy will help resolve the current energy imbalance and result in substantial savings of power supply costs (through transport of cheaper power to the load centers, reduced reserve capacity requirements in the interconnected power systems, and reduced environmental costs). To effectively implement the regional interconnection strategy, several areas of capacity building and further assistance were identified, including a system planning to incorporate the strategy. The present TA will enable ADB to assist in the implementation of the interconnection strategy, thus promoting economic growth of the western region and contributing to reducing poverty, addressing power shortages in the east and coastal regions, protecting the environment, and improving the quality of life of the population.

III. THE TECHNICAL ASSISTANCE

A. Purpose and Output

9. The TA will help SGC improve network development to optimize the use of existing power generation capacity and accommodate future power generation development by strengthening its grid system planning capacity and identifying a priority list of least-cost projects for the 11FYP.

10. The TA will (i) examine key issues related to grid system planning; (ii) assess the current grid development planning and management capacity of SGC; (iii) survey and analyze international best practices in grid system planning and management in a restructured power market; (iv) assist SGC to establish guidelines on grid system planning procedures, criteria, and methodologies suitable for the PRC's power sector; (v) strengthen SGC's capacity in grid development planning and management; (vi) assist SGC to implement the regional interconnection strategy recommended in the earlier TA; (vii) carry out grid system planning for the selected pilot regional or provincial power networks; (viii) assist SGC in identifying a priority

⁵ The 11FYP is the key economic development plan for the PRC that covers the period 2006–2010.

⁶ ADB. 2000. *Technical Assistance to the People's Republic of China for Interregional Power Transmission Network Development Strategy*. Manila. The TA was successfully completed in 2003.

list of least-cost projects for 11FYP; (ix) make a preliminary assessment of the identified least-cost projects; (x) establish an effective monitoring and evaluation (M&E) system to monitor the impact of the TA; (xi) conduct an international seminar; (xii) carry out a field study; and (xiii) conduct a consultation workshop with main stakeholders.

B. Methodology and Key Activities

11. The TA will be implemented in close consultation with stakeholders, targeted consumers, and potential private sector investors. The TA will be in three phases. In phase 1, the consultants will do a detailed background study and provide a thorough understanding of the issues. During phase 2, the consultants will undertake data gathering and preliminary analysis. They will identify the main issues to be addressed to achieve the TA objectives and conduct an international seminar to introduce international best practices that are suitable for the PRC's power sector, and required reform measures. In phase 3, the consultants will analyze in detail the issues relating to grid system and grid development planning and carry out grid system planning for the pilot regional and provincial power grids. The consultants will also carry out impact assessments from the technical, institutional, economic, social, financial, pricing, environmental, and poverty impact viewpoints. The consultants will organize a workshop with the main stakeholders to disseminate the TA findings and recommendations. The outline terms of reference for consultants are in Appendix 2.

12. The TA will include an international seminar on grid system planning in phase 2. The seminar will evaluate international experience in related areas and their relevance to the PRC, to be incorporated in grid system planning in phases 2 and 3. Consultants will help organize this seminar. International and domestic experts will be invited to present papers and participate in the discussions. The consultants will prepare a report summarizing the discussions and identifying issues relevant to the PRC. The TA includes an international field study to expose selected PRC personnel to the latest trends and international best practices in grid system planning and management. Personnel from SGC and other governmental agencies involved in policymaking and implementation of grid system planning will undertake the 2-week study. The consultants will consider the particular needs of the study participants and prepare a detailed proposal for ADB approval, specifying the (i) objectives of the field study, (ii) institutions to be visited, (iii) agenda for discussion and training, (iv) name and job description of each nominee, and (v) costs. Selection procedures for the international field study must be acceptable to ADB, taking into account economy and efficiency. At the end of the field study, the participants will submit to ADB a report summarizing their findings and recommendations.

13. The major assumptions and risks in successful implementation of the TA include counterpart support, adequate and timely provision of data, delay in submission of required studies, delay in consultant selection, and poor consultant performance. In addition, the Government's continuing commitment to power sector reforms, tariff rationalization, and transparent regulation is necessary. Efforts will be made for timely recruitment of competent consultants. SGC is committed to necessary reforms and agreed to provide adequate counterpart support and data when needed. Close coordination among the consultants, executing and implementing agencies, and ADB will further mitigate the risks.

C. Cost and Financing

14. The TA is estimated to cost \$700,000 equivalent comprising \$362,000 in foreign exchange and \$338,000 in local currency equivalent (Appendix 3). ADB will provide \$500,000 equivalent to finance \$322,000 of the foreign exchange cost and \$178,000 equivalent of the local currency cost. The TA will be financed on a grant basis by ADB's TA funding program.

SGC will contribute \$200,000 equivalent representing about 29% of the TA cost, to finance the remaining foreign exchange cost of \$40,000⁷ and local currency cost of \$160,000 equivalent.

D. Implementation Arrangements

15. SGC will be the Executing Agency for the TA. ADB will select and engage the services of international and domestic consultants according to its *Guidelines on the Use of Consultants* and other arrangements satisfactory to ADB for selecting and engaging domestic consultants. The international consultants will have expertise in grid system planning and network management, power sector restructuring and institutional reforms, power economics, and environmental and poverty assessment. The domestic consultants will have similar expertise. An estimated 29 person-months of consulting services will be required, including 8 person-months of international and 21 person-months of domestic consulting services. The services of consultants will be provided through a consulting firm selected after the submission of simplified technical proposals and the use of the quality- and cost-based selection method. The consultants' terms of reference are in Appendix 2. The TA is expected to commence on 25 January 2005 and be completed by 30 May 2006

16. SGC will establish a counterpart team with representatives from SGC and the provinces and regions selected for pilot studies.⁸ The counterpart team will interact with the consultants during TA implementation. SGC will establish a steering committee comprising senior officials from SGC and the five generating companies and representatives from other government organizations and agencies involved in formulating and implementing policies for power system planning and development, including the national development and reform commission and SERC. The steering committee will be the apex body that will convey and interpret the government's views on policy issues and generally oversee TA implementation. The counterpart team members will interact with members of the steering committee to seek clarification on issues and matters that fall outside the purview of SGC. SGC will provide interpreters, local transportation, and office space with suitable facilities in Beijing. Some office equipment to be financed under the TA will be procured by the international consultants in accordance with ADB's *Guidelines for Procurement*. The consultants will establish an effective M&E system to monitor the impact of the TA and provide the basis for SGC's impact monitoring after TA completion. The M&E system will include specific and measurable targets, and identify key risks and institutional arrangement for effective monitoring. The consultants will give the necessary training in monitoring. The established M&E system will be shared with SERC, which, as the power sector regulatory body, closely monitors power sector development.

IV. THE PRESIDENT'S DECISION

17. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of \$500,000 on a grant basis to the Government of the People's Republic of China for Capacity Strengthening of Power Planning Process, and hereby reports this action to the Board.

⁷ To finance part of the 2-week field study by personnel from SGC and other government agencies.

⁸ The pilot region and province will be selected by SGC, and ADB in phase 1.

TECHNICAL ASSISTANCE FRAMEWORK

Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
<p>Goal</p> <p>Improvement of system planning of State Grid Corporation (SGC) to optimize existing power generation and accommodate future power generation development</p>	<p>Adequate and efficient electricity supply by 2006 as defined in State Electricity Regulatory Commission's (SERC) annual report</p>	<p>Country economic and power sector statistics</p> <p>Ex-post monitoring by SERC</p> <p>Implementation and impact monitoring by SGC and the Asian Development Bank (ADB)</p>	
<p>Purpose</p> <p>Strengthening of SGC's grid system planning capacity</p> <p>Implementation of the regional interconnection strategy recommended in the ADB technical assistance (TA)</p>	<p>Guidelines on grid system planning developed and tested in pilot grids by 2006 and applied to all provincial/regional power grids of SGC by 2008</p> <p>The regional interconnection strategy incorporated in SGC's system planning by 2006 and implemented starting in 2007</p>	<p>TA final report and completion report</p> <p>Consultation workshop</p> <p>Review missions</p> <p>Implementation and impact monitoring by SGC and ADB</p> <p>Ex-post monitoring by SERC</p>	<p>Risks:</p> <p>Inadequate counterpart support</p> <p>Lack of adequate data</p> <p>Poor consultant performance</p> <p>Assumptions:</p> <p>Power sector reform continues</p> <p>Power demand continues to grow</p> <p>Power tariff reform continues</p>
<p>Outputs</p> <p>Guidelines on grid system planning procedures, criteria, and methodologies</p> <p>Priority list of least-cost projects for 11th Five-Year Plan (11FYP)</p> <p>Field study report</p> <p>International seminar report</p> <p>Monitoring, supervision, and evaluation system</p>	<p>Implementable guidelines on grid system planning</p> <p>Least-cost projects incorporated in the 11FYP</p> <p>Sharing knowledge and experience of other countries</p> <p>Monitoring system in place</p>	<p>Inception report</p> <p>International seminar and field study report</p> <p>Final report</p> <p>Implementation and impact monitoring by SGC and ADB</p> <p>Ex-post monitoring by SERC</p>	<p>Assumptions:</p> <p>Reform and development measures are relevant and sensitive to local issues</p> <p>Active counterpart participations</p> <p>A good survey</p>

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TECHNICAL ASSISTANCE FRAMEWORK—Continued

Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
<p>Activities</p> <p>Phase 1. Background study and assessment (January to April 2005)</p> <p>Phase 2. Analysis and international experience (May to November 2005)</p> <p>Phase 3. Recommendation and consultation (December 2005 to May 2006)</p>	<p>Clear understanding of existing policies, rules, regulations, and key issues</p> <p>Survey methodology acceptable to SGC and ADB</p> <p>Selected pilot projects acceptable to SGC and ADB</p> <p>Sharing international experience relevant to SGC</p> <p>Key issues identified acceptable to SGC and ADB</p> <p>System planning methodology developed, acceptable to all stakeholders</p> <p>Regional interconnection strategy recommended in the ADB TA properly incorporated</p> <p>Effective monitoring system</p> <p>Assessment of the selected least-cost projects according to ADB guidelines</p>	<p>Meetings with consultants</p> <p>Review mission reports</p> <p>Draft final report</p> <p>Consultation workshop report</p> <p>Final report</p> <p>TA implementation plan</p> <p>Implementation and impact monitoring by SGC and ADB</p>	<p>Risks:</p> <p>Lack of counterpart support</p> <p>Lack of adequate data</p> <p>Late consultant recruitment</p> <p>Assumptions:</p> <p>Good arrangements for International visits</p> <p>Consultants selected on time, suitably qualified, and performing well</p> <p>International and domestic speakers qualified, and selected on schedule</p> <p>A good household survey</p> <p>Strong TA ownership by the Executing Agency</p>
<p>Inputs</p> <p>International and domestic consulting services</p> <p>Field study and training</p> <p>International seminar and consultation workshop</p> <p>Counterpart staff participation</p> <p>Computer and office facilities</p>	<p>8 person-months of international and 21 person-months of domestic consulting services</p> <p>ADB financing of \$500,000</p> <p>SGC contribution of \$200,000 equivalent</p> <p>Field study for \$60,000</p> <p>Training, seminars, and conferences for \$52,000</p>	<p>Review mission reports</p> <p>Consultation workshop report</p> <p>Final report</p> <p>Field study report</p> <p>Implementation and impact monitoring by SGC and ADB</p>	<p>Assumptions:</p> <p>Trainings, international visits and seminars are arranged efficiently</p> <p>Accuracy of cost estimates</p> <p>Good counterpart support and office facilities</p>

OUTLINE TERMS OF REFERENCE FOR CONSULTING SERVICES

1. The technical assistance (TA) will be carried out by a consulting firm with experience in grid system planning; institutional, economic, financial, environmental, and social analyses; and impact assessment in the power subsector. The international consultants will be a system planning specialist, a power or environmental economist, a social impact analyst, a financial analyst, and an institutional specialist. The study will require about 8 person-months of international and 21 person-months of domestic consulting services. To ensure effective assistance to the international consultants, the domestic consultants will have the same expertise. The consultants will work closely with the State Grid Corporation (SGC) and ensure effective transfer of know-how. The international consultants will be recruited in accordance with *Guidelines on the Use of Consultants* of the Asian Development Bank (ADB). The consultants will evaluate international experience in related areas and its relevance to the People's Republic of China (PRC) and tailor the recommendations to reflect PRC's situation so that these can be effectively implemented. The recommendations should focus on how to go from the current grid system planning to an efficient stage of system planning using international best practices.

A. Terms of Reference

2. The terms of reference of the consulting services will include, but will not be limited to the following:

1. Phase 1: Background Study and Assessment

3. At the start of the TA, the consultants will do a detailed background study to gain a thorough understanding of the issues related to power grid system planning in the PRC. The consultants will review relevant reports and studies, including those of SGC and international agencies such as ADB, World Bank, and other funding agencies, and will have discussions with members of the steering committee and counterpart team to obtain a good understanding of the Government's reform directions and establish a sound basis for the TA work. An inception report will be submitted after the phase 1 study. The report should trace the history of grid system planning in the PRC, discuss significant changes and their impact, and present a clear picture of grid system and development planning in the PRC covering (i) the current grid system and development planning in different regions and provinces; (ii) the procedures in grid system planning approval; (iii) the relationship among the institutions involved; (iv) roles and responsibilities of central and provincial governments in grid system and development planning; (v) financial position and financial governance of power grid utilities; (vi) affordability of power to consumers; (vii) objectives of grid system and development planning, i.e. the overall objective and the objective at each development stage; and (viii) past reform measures including those for grid system and development planning at each development stage.

2. Phase 2: Analysis and International Experience

4. The consultants will analyze the power supply and demand situations, develop long-term forecasts; and examine the key issues relating to technologies, investment programs, power tariffs, planning mechanism, affordability of heating, and legal and regulatory aspects of power supply. The consultants will carry out the following tasks:

- (i) Determine the historical power supply and demand growth patterns, and select appropriate methodologies including assessment of load factor, and

incorporating demand-side management (DSM) to develop the power demand forecasts.

- (ii) Conduct a survey to identify the stakeholders of grid system planning, the willingness and ability of consumers to pay for transmission and distribution, and level of surcharges and fees at the local level. The survey will provide a base for impact assessment.
- (iii) Assess the current power demand forecast procedures, criteria, and methodologies, and make power demand forecasts.
- (iv) Interview regional and provincial grid companies to get a clear picture of the current power tariff levels and structures, transmission and distribution tariffs, connection fees and any surcharges, tariff payment systems, revenue collection efficiency, tariff-setting policies, criteria and methodologies, adjustment procedures and approval process, and any existing tariff discounts or design to help the poor reduce their electricity expenses
- (v) Evaluate the role and duties of power grid companies in system planning in other countries.
- (vi) Analyze important issues related to grid system planning, such as (a) how to realize optimal resources allocation when arranging generation layout and generation projects, (b) how to incorporate the concept of environmental protection and sustainable development into generation expansion planning, and (c) how a power grid company can promote renewable energy development, especially for hydropower.
- (vii) Analyze important issues related to power grid development such as developing the power network and generation in a harmonious way; uniform planning; involving the power grid company in the approval procedure of new generation projects; planning, investment and construction of exclusive transmission lines of power plants; securing the cooperation of power grid and generation companies in planning; international experience in promoting new power network technologies, as well as cost savings, efficiency improvement, and environmental protection.
- (viii) Assess the scope and methodologies of grid company development planning in other countries. Analyze supervision and regulation by governments of countries whose situation is similar to that of the PRC. Present the principles and methodologies to carry out company development planning by power grid companies under different types of supervision and regulation.
- (ix) Analyze in detail the indicators regulated by government and their quantification; regulation of investment and construction of power network projects; regulation of transmission and distribution tariff and profits; and financing of major power network projects.
- (x) Summarize and analyze the methodologies of power grid planning adopted in other countries. In a few samples, demonstrate the application of these methodologies.

- (xi) Review existing financing mechanisms for developing prioritized network development projects; identify and describe suitable general financing mechanisms for various types of network development projects, including the sector loan modality.
- (xii) Discuss with concerned government officials and ADB staff the proposed projects and prioritize them by required investments, project ownership by the proposed developer, and possible implementation arrangements.
- (xiii) Prepare a program of visits by concerned ADB staff to prioritized network development projects, arrange meetings with the agencies responsible for the proposed projects, and assist ADB staff in their discussions with the agencies and other government officials.
- (xiv) Assess the general financial, economic, and environmental benefits of the prioritized network development projects discussed.
- (xv) Identify technical assistance required to develop comprehensive project proposals for the network development projects as identified and prioritized after discussions between government officials and ADB staff, and prepare the scope and terms of reference for the required technical assistance.

3. Phase 3: Recommendation and Consultation

5. Using the results of the previous phase, phase 3 will perform in-depth analysis to develop recommendations:

- (i) Carry out power network planning for the pilot grid company, covering the main principles that guide power grid system planning including power demand forecast in a competitive power market environment; method for coordinating power generation planning and power grid planning; transmission network planning and power network structure design; basic principles and technical criteria of distribution network planning; economic rationale and risk analysis of power grid planning; application of new technologies in power network development; and environmental impact and poverty reduction analysis in power grid planning.
- (ii) Carry out grid development planning based on a sound demand forecast for the selected regional or provincial grid company. Include the main principles that guide company development planning in a market-oriented situation; and analysis of the present situation, the development environment of the pilot power network company, and the target of company development planning under present regulation and policies.
- (iii) Develop guidelines for grid company development planning, including transmission network development planning; distribution network development planning; financing plan of the company; projection of profit of the company's core business; analysis and evaluation of company development planning; analysis of the trend regulation, and the corresponding adjustment of company development planning; and the analysis of adaptability of power network planning to demand growth and generation layout.

- (iv) Identify training needs. To facilitate technology transfer provide necessary trainings to SGC staff, through seminars, workshops, and classroom instruction.
- (v) With the assistance of SGC staff, make a priority list of least-cost projects for the 11th Five-Year Plan.
- (vi) Determine necessary coordination of the existing asset management and incremental asset management, and propose a methodology for power grid planning suitable for SGC. Develop a set of methodologies for carrying out power network planning and company development planning by SGC that will be suitable for the duties and responsibilities of SGC and for the PRC situation. Make the recommendations and suggestions consistent with power network planning carried out by SGC, the sector development plan carried out by the government, and generation expansion planning.
- (vii) Analyze the economic, poverty, financial, environmental impact of the recommendations developed in the above tasks for consistency with ADB guidelines and methodologies.
- (viii) Recommend measures for overcoming the identified barriers to private sector participation in transmission and distribution in the PRC.
- (ix) Develop an effective monitoring and evaluation (M&E) system by reviewing all related documents to determine a set of monitoring indicators in the areas of economic growth, energy efficiency, institutional reforms, poverty and social aspects, and environmental improvement. Choose indicators that are appropriate for the intended objectives of the monitoring system, the main stakeholders who have an interest in the findings, the speed with which the information is needed, and the cost.
- (x) Assess resource requirements and institutional arrangements for monitoring the TA impact and identify data collection analysis and reporting skills, and management information system skills required to implement the M&E system. The consultants will identify the training requirements and provide the necessary training on monitoring.
- (xi) Identify critical issues that concerned government agencies need to address and steps to take to develop the identified and prioritized network development projects with assistance from ADB.
- (xii) Carry out a consultation workshop with all stakeholders to present the final draft report of the TA. The consultants will incorporate the comments received at the workshop into the final TA report.
- (xiii) Provide necessary training to SGC staff on guidelines on grid system planning procedures, criteria, and methodologies to promote technology transfer.

B. Field Study and International Seminar

6. The consultants will help organize an international seminar on grid system planning in phase 2. The seminar will introduce and evaluate international experience in related areas and their relevance to the PRC. International and domestic experts will be invited to present papers and participate in the discussions. The consultants will prepare a report summarizing the discussions, and identifying reforms and development issues relevant to the PRC. The consultants will also help organize and conduct a field visit with the participation of key SGC staff involved in policymaking and implementing of grid system planning. The visits will be to selected countries to discuss with government officials, regulatory bodies, and grid companies the policy and implementation aspects of power grid planning. The consultants will prepare a report summarizing the main issues and findings of the field visit participants.

C. Reports

7. The consultants will submit the following reports:

- (i) **An inception report.** The report will be submitted within 1 month after the TA starts. It will summarize the initial findings, and suggest changes (if any) in the TA's approach, methodology, and time schedule.
- (ii) **Draft final report.** One month will be provided for SGC and ADB to review the report. The report will be discussed in a consultation workshop with the participation of main electricity consumers, counterpart team, steering committee members, key officials from other government agencies involved in system planning, and ADB staff. The main objectives of the workshop are to (a) present to the policy makers and stakeholders the findings and recommendations of the TA, (b) facilitate an exchange of ideas and gather comments, (c) increase the sense of ownership and commitment to the TA recommendations, and (d) allow the policy makers to discuss the feedback of stakeholders.
- (iii) **Final report.** One month after the consultation workshop, the consultants will submit the final report, taking into account the comments of SGC and ADB on the draft final report, and the discussions held during the consultation workshop. The consultants will finalize the report, translate it into Chinese, and organize a final workshop with the main stakeholders to disseminate the TA findings and recommendations.

COST ESTIMATES AND FINANCING PLAN
(\$)

Item	Foreign Exchange	Local Currency	Total Cost
A Asian Development Bank (ADB) Financing^a			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	174,700	0	174,700
ii. Domestic Consultants	0	97,200	97,200
b. International and Local Travel	40,000	7,500	47,500
c. Reports and Communications	8,000	9,000	17,000
2. Equipment ^b	15,000	0	15,000
3. Training, Seminars, and Conferences	15,000	7,000	22,000
4. Field Study	20,000	0	20,000
5. Surveys	0	25,000	25,000
6. Miscellaneous Administration and Support Costs	2,000	5,000	7,000
7. Representative for Contract Negotiations	5,000	0	5,000
8. Contingencies	42,300	27,300	69,600
Subtotal (A)	322,000	178,000	500,000
B. Government Financing			
1. Office Accommodation and Transport	0	60,000	60,000
2. Remuneration and Per Diem of Counterpart Staff	0	42,000	42,000
3. Training, Seminars, and Conferences	0	30,000	30,000
4. Field Study	40,000	0	40,000
5. Others	0	28,000	28,000
Subtotal (B)	40,000	160,000	200,000
Total	362,000	338,000	700,000

^a Financed by ADB's technical assistance funding program.

^b Including three pentium computers, two photocopiers, a laser printer, a projector, and a facsimile machine.

Source: ADB estimates.