Document of
The World Bank

Report No: 30698-CN

PROJECT DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US$87 MILLION

AND

PROPOSED GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$40.22 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

RENEWABLE ENERGY SCALE-UP PROGRAM

April 7, 2005

Energy and Mining Sector Unit
Infrastructure Unit
East Asia and Pacific Region

CURRENCY EQUIVALENTS
(exchange rate effective November 1, 2004)

Currency unit	=	Renminbi yuan
1 yuan	=	US$0.12
1 U.S. dollar	=	Y 8.28

FISCAL YEAR

January 1 – December 31

ACRONYMS AND ABBREVIATIONS

agl	Above ground level
APL	Adaptable Program Loan
CAS	China Academy of Science
CNCAA	China National Certification Accreditation Administration
CRESP	China Renewable Energy Scale-up Program
dBa	Decibel (filter characteristic curve a)
EA	Environment assessment
EIA	Environmental impact assessment
EIRR	Economic internal rate of return
EMP	Environment management plan
FIRR	Financial internal rate of return
FYP	Five-Year Plan
FMS	Financial Management Specialist
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GIS	Geographic information system
GoC	Government of China
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
GW	Gigawatt (1,000 megawatts)
GWh	Gigawatt-hour
ICB	International Competitive Bidding
IEC	International Electrotechnical Commission
IPP	Independent power producer
LSDP	Letter of Sector Development Policy
MBD	Model Bidding Document
MMP	Mandated market policy
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOST	Ministries of Science and Technology
MOWR	Ministry of Water Resources
Mtce	Million tons of coal equivalent (1 tce = 29.3 Gigajoules)
Mu	
MW	Megawatt (1,000 kilowatts)
MWh	Megawatt-hour
NDRC	National Development and Reform Commission
NED	Jiangsu Guo Xin New Energy Development Company Ltd.
NUPC	Northern Union Power Company
NLYWPC	Inner Mongolia North Long Yuan Wind Power Company
OECD	Organization for Economic Cooperation and Development
PDO	Project Development Objectives
PIP	Project Implementation Plan
PIU	Project Implementation Unit
PPA	Power Purchase Agreement
PMO	Project Management Office
PPO	Provincial Project Office (Zhejiang)
RAP	Resettlement Action Plan
RE	Renewable energy
REDP	Renewable Energy Development Project (Loan 4488-CHA)
REL	Renewable Energy Law
SEPA	State Environmental Protection Agency
SERC	State Electricity Regulatory Commission
SFA	State Forestry Administration
SIL	Specific investment loan
SP	Strategic Priority (GEF)
TA	Technical Assistance
TOR	Terms of Reference
TSP	Total Suspended Particulates
TW	Terawatt (1,000 GW)
TWh	Terawatt-hour
UNEP	United Nations Environment Program
VSL	Variable spread loan
ZFB	Zhejiang Finance Bureau
ZHPMDC	Zhejiang Hydro Power Management Development Center

Vice President:	Jemal-ud-din Kassum
Country Manager/Director:	David Dollar
Sector Manager:	Junhui Wu
Task Team Leader:	Noureddine Berrah

CHINA
Renewable Energy Scale-up Program (CRESP)

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GEF PROJECT DOCUMENT

East Asia and Pacific Region
EASEG

Date: April 7, 2005 Country Director: David R. Dollar Sector Manager/Director: Junhui Wu Project ID: P067828 Lending Instrument: Specific Investment Loan	Team Leader: Noureddine Berrah Sectors: Renewable energy (100%) Themes: Infrastructure services for private sector development (P); environmental policies and institutions (P); climate change (P); trade facilitation and market access (S); rural services and infrastructure (S) Environmental screening category: Partial Assessment Safeguard screening category: S2
Global Supplemental ID: P067625 Lending Instrument: Adaptable Program Loan Focal Area: C-Climate change Supplement Fully Blended? Yes	Team Leader: Noureddine Berrah Sector: Renewable energy (80%); National government administration (10%); Subnational government administration (10%) Themes: Infrastructure services for private sector development (P); environmental policies and institutions (P)

Project Financing Data

[X] Loan [ ] Credit [X] Grant [ ] Guarantee [ ] Other:

For Loans/Credits/Others:
Total Bank financing (US$ million): 87.00
Proposed terms: VSL, 20 years maturity, five years' grace

Financing Plan (US$ million)

Source	Local	Foreign	Total
BORROWER/RECIPIENT	29.76	2.60	32.36
INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT	0.00	87.00	87.00
GLOBAL ENVIRONMENT FACILITY	19.26	20.96	40.22
LOCAL FINANCIAL INTERMEDIARIES	20.64		20.64
OTHER LOCAL SOURCES IN BORROWING COUNTRY	48.60	0.00	48.60
Total:	118.26	110.56	228.82

The cofinancing sources for global environment (GE) supplemental (other local sources in borrowing country: US$48.60 million).
This amount is not additional to the amounts shown in the Financing Plan table above.

Borrower: People's Republic of China
Responsible Agency: National Development and Reform Commission

Estimated disbursements (Bank FY/US$ million)									
FY	2006	2007	2008	2009					
Annual	26.6	53.40	6.00	1.00					
Cumulative	26.6	80.00	86.00	87.00					

GEF Estimated disbursements (Bank FY/US$ million)									
FY	2006	2007	2008	2009	2010	0	0	0	0
Annual	2.81	12.39	17.54	5.24	2.24				
Cumulative	2.81	15.20	32.74	37.98	40.22				

Project implementation period: Start: September 2005 End: March 31, 2010
Expected effectiveness date: September 30, 2005
Expected closing date: September 30, 2010

Does the project depart from the CAS in content or other significant respects? ***Ref. PAD A.3***	[ ] Yes [X] No
Does the project require any exceptions from Bank policies? ***Ref. PAD D.7***	[ ] Yes [X] No
Have these been approved by Bank management?	[ ] Yes [ ] No
Is approval for any policy exception sought from the Board?	[ ] Yes [ ] No
Does the project include any critical risks rated "substantial" or "high"? ***Ref. PAD C.5***	[X] Yes [ ] No
Does the project meet the Regional criteria for readiness for implementation? ***Ref. PAD D.7***	[X] Yes [ ] No

Project development objective ***Ref. PAD B.2, Technical Annex 3***
The project development objective is to:

- Create a legal, regulatory, and institutional environment conducive to large-scale, renewable-based electricity generation; and
- Demonstrate early success in large-scale renewable energy development with participating local developers in two provinces.

Global Environment objective ***Ref. PAD B.2, Technical Annex 3***
The global objective of the program is to enable commercial renewable electricity suppliers to provide energy to the electricity market efficiently, cost-effectively and on a large scale.

Project description ***Ref. PAD B.3.a, Technical Annex 4***
GEF-financed Institutional Development and Capacity Building Component: Prepare and implement renewable energy laws and regulations; cost-shared technology improvement and pipeline building for renewable energy investment. Support for Wind and Biomass in Pilot Provinces Component: Investment in 100 MW wind farm and 25 MW biomass power plant.

Which safeguard policies are triggered, if any? ***Ref. PAD D.6, Technical Annex 10***
Environmental Assessment (OP/BP 4.01), Involuntary Resettlement (OP/BP 4.12), Safety of Dams (OP/BP 4.37)

Significant, nonstandard conditions, **if any**, for:
Ref. PAD C.7
Board presentation: None
Loan/credit effectiveness: None
Covenants applicable to project implementation: Technical and financial reporting, financial performance, and maintenance of a project management office.

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and Sector Issues

China's primary energy consumption more than doubled from 600 million tons of coal equivalent (Mtce) in 1980 to about 1,300 Mtce in 2000, whereas the gross domestic product (GDP) quadrupled during the same period. Although based on slightly different growth assumptions, studies carried out in the late 1990s and early 2000s by the Government of China (GoC) and international agencies concluded that even in the case of increased and sustained energy efficiency efforts, energy consumption will continue to grow rapidly to between 1,850 and 2,150 Mtce in 2010 and to between 2,500 and 3,300 Mtce in 2020.[1] They also concluded that even with an aggressive fuel diversification policy, coal will remain the dominant energy source.

As did most of the studies, the one by the Chinese Energy Research Institute found that coal's share in primary energy consumption, which accounted for 66 percent in 2000, would decrease only slightly to about 65 percent by 2010, and slightly less than 60 percent in 2020 even if exceptional efforts were made in diversifying primary energy sources and improving overall energy efficiency (the "green scenario"). Under business as usual, coal's share in primary energy consumption would decrease to about 63 percent in 2020. Evidence from the early 2000s indicates that these and other studies have underestimated primary energy consumption growth. Primary energy consumption has soared from 1,300 Mtce in 2000 to around 1,700 Mtce in 2004, or 80 to 95 percent of the low and high studies' forecasts for consumption in 2010.

About 50 percent of the coal consumed in 2004 was used for electricity generation. China's electric generating capacity is projected to increase from a little less than 400 GW in 2004 to between 950 and 1,100 GW by 2020. During this same period, coal-based electric generation capacity is expected to grow threefold to about 700 GW. This will require building about 500 to 650 GW of coal-based capacity (in the case of the more likely high growth, about 450 GW to meet the fast-growing demand and about 200 GW to replace existing capacity). Coal-based generation will remain the predominant mode of electricity generation until 2030, and will account for more than 60 percent of total capacity and supply about 70 percent of total electricity generation.

The damage caused by SO_2 and NO_x emissions to agriculture and health is at the center of the debate on the 11th Five-Year Plan and the long-term energy plan (China 2020). Estimates of the costs vary, according to existing studies, from 3 to 7 percent currently and could grow to as high as 13 percent of GDP in 2020 if environmental issues are not properly addressed. Emissions of carbon from coal combustion will also increase from about 820 million tons in 2000 to more than 1.1 billion tons in 2010 and more than 1.8 billion tons in 2020 even with sustained efforts in energy efficiency and fuel diversification. Even then, China's carbon dioxide (CO_2) emissions

[1] Four studies of particular relevance are (a) "Basic Concepts of the National Energy Strategy" 2004—Unpublished draft by the Development Research Center based on a study by the Chinese Energy Research Institute presented during a workshop entitled "China Development Forum: China's National Energy Strategy and Reform," Beijing November 15–17, 2003; (b) World Energy Outlooks 2002 and 2004, International Energy Agency; and (c) International Energy Outlook 2004—Energy Information Administration, Office of Integrated Analysis and Forecasting, US Department of Energy.

per capita would amount to only 20 to 30 percent of Organization of Economic Cooperation and Development (OECD) countries in 2010 and 2020, respectively.

China's highest-level authorities recognize that a business-as-usual approach in the energy sector would lead to unacceptable environmental damages. They recently adopted a multipronged energy strategy aiming at (a) improving the efficiency of the energy sector and bringing energy intensity in line with international best practice; (b) increasing gas penetration and aggressively developing renewable energy use, especially for power generation; (c) further developing clean coal technologies; and (d) securing energy supply to meet the country's growing needs. Chinese authorities recognize the vital need to pursue vigorously each prong of the strategy and to rely more on market-based approaches to achieve the higher-level objectives of sustainable development and a "well-off" society.

Renewable Energy Strategy. Scaling-up of renewable energy for electricity generation in particular will require a shift from off-grid and demonstration approaches to increased commercialization of high-potential technologies. China has abundant undeveloped resources of small hydropower, wind, biomass, geothermal, and solar energy. Exploitation of these resources has been constrained by an inadequate legal and regulatory framework, high costs of renewable-based electricity generation, insufficient assessment of the resource, and lack of or inadequate financing. Creation of an adequate legal and regulatory framework, cost reductions, and internalization of fossil fuel externalities and capacity building to improve design, construction, and operation to improve competitiveness with fossil fuel–based generation are all needed.

Economic studies, undertaken as part of project preparation, have demonstrated that much more of China's renewable resources can be developed to produce electricity below the system-avoided cost, particularly if institutional barriers are lifted and external costs of damage caused by coal-fired generation are considered. The GoC has therefore developed a strategy for scaling up renewable energy-based capacity for power generation based on (a) development and implementation of a legal and regulatory framework, in step with the overall reform process, which supports and encourages the development of renewable energy resources; (b) access to advanced technology and techniques to improve quality, reduce cost, and permit the economic exploitation of renewable energy resources through the assimilation of best international practice in research, manufacturing, assembly, and installation, as well as in operation; and (c) strengthening of the capacity of existing companies to develop, finance, construct, and operate renewable energy on a large scale and further opening of the sector to private investors.

The GoC has, with the Global Environment Facility (GEF) and other donor assistance, prepared a Renewable Energy Law (REL) that was approved by the Standing Committee of the National People's Congress on February 28, 2005. Implementing regulations are now under preparation. Further details on the sector background are provided in Annex 1 and the GoC's program for development of the renewable energy subsector is set out in a letter from a vice Chairman of the National Development and Reform Commission (NDRC), which is reproduced in Annex 1A.

2. Rationale for Bank Involvement

The Bank and GEF provided extensive support during the preparation and discussion of the renewable energy strategy. Studies and consultation activities supported by the Bank and GEF introduced the concept of law- and regulation-based, market-oriented support for renewable

energy. Such support would address three critical barriers to renewable-based electricity generation: (a) the financial prices of fossil fuel– (especially coal-) based electricity generation do not reflect the costs of environmental damage; (b) the resulting incremental financial cost of renewable-based electricity cannot be passed on to the end consumer; and (c) renewable electricity generators are often unable to obtain access to the electricity grid on the same terms as other generators.

The dialogue between the Bank and China has centered around the most appropriate way to overcome these obstacles. There is now general agreement on the need to work in step with the reform of the electricity sector and implement a policy mandating that either a share of the electricity delivered to end consumers by power companies comes from renewable sources or by imposing an obligation on power companies to buy renewable energy–based electricity at a government-determined price. Concomitant with that obligation is the right of the power companies to recover the additional cost from consumers and for electricity generators to be able to connect to the grid. The term *mandated market policy* (MMP) is used in this document to refer to systems incorporating these three principles.

The continued involvement of the Bank and GEF will increase the prospects for the successful introduction of the MMP and the accompanying technology transfer and knowledge upgrade needed for the successful and sustained scaling-up of renewable energy use in China. The Bank's sustained engagement, within the programmatic approach approved by the GEF Council, will facilitate the implementation of the strategy and sustain the scaling-up through (a) support and leverage of investment in renewable energy generation; (b) policy advice and institutional support during the implementation of the REL based on international best practice; and (c) transfer of technology and upgrade of renewable energy technology to improve quality and reduce cost. Annex 2 provides information on related projects and the lessons learned from them.

3. Higher-Level Objectives to Which the Project Contributes

The most recent full Country Assistance Strategy (CAS), discussed by the Board on January 21, 2003 (Report No. 25141-CHA), focuses on supporting China's sustainable transition from a rural to an urban society and from a centrally planned to a market-based economy. An important theme within the CAS is to facilitate an environmentally sustainable development process, including dealing with global environment and air quality issues, to which increased electricity generation from renewable energy sources will contribute. The program will also contribute to the GoC objectives of economic development in the lagging regions, because much of the renewable energy resource is in those areas. More significant penetration of renewable energy resources will also contribute to increased security of supply and more predictable prices.

B. PROJECT DESCRIPTION

1. Lending Instrument

The proposed Bank specific investment loan (SIL) supports the first phase of a three-phase GEF adaptable program. The GEF program is justified by the long-term and complex nature of the policy issues hampering the scale-up of renewable energy and the need for a flexible approach to adapt to the fast-changing environment and the priorities as they emerge during implementation. The Borrower's choice of SILs to contribute to the scale-up of renewable energy–based power

capacity is justified by uncertainties about the physical investment needs and the sources of funding for them in future years. Other lending instruments, such as a sector adjustment loan and a Bank Adaptable Program Loan (APL) synchronized with the GEF program were considered, but rejected as unsuitable for the proposed project, especially because of the project approval framework in China.

The Borrower has expressed preference for a variable spread loan (VSL), which is perceived as having the characteristics needed for the project. The lending instruments were discussed with the implementing agencies and the Ministry of Finance (MOF), and confirmed during negotiations.

2. Program Objective and Phases

The program objective is to enable commercial renewable electricity suppliers to provide energy to the electricity market efficiently, cost-effectively, and on a large scale.

The core of the program is GEF-financed support for institution and capacity building for the scale-up of renewable energy based electricity generation capacity. The Program Brief outlining this concept was approved by the GEF Council in May 2001.

Phase 1

The first phase will contribute to the program's global objective through development and implementation of the legal and regulatory framework to create and gradually increase the share of renewable energy–based electricity generation, and will support its effective implementation in four pilot provinces. The REL has been enacted and will be effective on January 1, 2006. Associated implementation regulations will be prepared and promulgated during this phase. Effective implementation and enforcement, which have always been problematic and uneven for environmental laws, will be piloted in four provinces, namely Fujian, Inner Mongolia, Jiangsu, and Zhejiang and supported by well-targeted and sustained technical assistance (TA). Technology transfer at the national level will be supported through capacity building and TA, focusing particularly on wind and biomass. Investments in important technologies will be undertaken in the four pilot provinces to demonstrate the viability of large-scale, renewable energy–based electricity generation. Expected duration is 3–4 years. GEF will provide a US$40.22 million grant to support the institutional development and capacity building component during the first phase, with cost-sharing from participants expected to contribute a further US$48.6 million for a total cost of about US$88.82 million.[2]

Triggers to move from GEF phase 1 to 2 will be based on indicators of institutional progress and scale-up of renewable energy development and will include (a) issuing of required regulations to implement the REL; (b) publication of resource assessments for at least two pilot provinces and technology improvement subgrants signed with at least five companies; (c) full commitment and disbursement of at least half of the GEF grant for the first phase; and (d) approval by State Council of Bank–financed investments in all four pilot provinces.

[2] The cost-sharing is based only on the **direct** costs borne by the participants in the GEF-supported, cost-shared activities (which comprise around 33 percent of the proposed GEF budget), using a ratio of 1:3, which is based on experience gained during implementation of the Renewable Energy Development Project. Indirect and other contributing programs' costs are more important, but difficult to quantify.

Phase 2

Phase 2 will continue to support the program's global objectives through institutional development and capacity building to further decrease cost, and to improve the financing framework and provide assistance for implementation in about 10 provinces. TA will be provided for the implementation of the REL and regulations in an increased number of provinces, as required. Continued support for technology transfer, quality improvement, and cost reduction will be provided for wind and other selected technologies, building on Phase 1 results and market needs. Expected duration is three to four years. Total cost for TA is expected to be about US$120 million, of which about US$50 million GEF grant.

Phase 2 to phase 3 triggers will be determined during appraisal of phase 2, but are likely to include measures of progress in the implementation of the law and achievement of the program performance indicators, measures of investment (Bank- and non-Bank-financed) in renewable energy in the phase 1 and 2 provinces, and measures of progress in cost reduction.

Phase 3

The third phase will contribute to the full achievement of the program's global objective through support to the remaining less developed provinces in their implementation of the REL and regulations. TA would continue to be provided for institutional strengthening and capacity building to meet international and best practice standards in constructing and operating renewable energy–based electricity production facilities in the country. Continued support for localization, quality improvement, and cost reduction will be provided to bring selected technologies to competitiveness with fossil fuel–based electricity generation. Further lending to support investment (additional loans and repeater projects mainly to reduce processing time and, exceptionally, SILs) will be discussed, on a need basis, with GoC. Expected duration is three to four years. Total cost for TA is expected to be about US$150–200 million (of which about US$50 million GEF grant).

Bank Investment Support

Bank investment support in the first phase is aimed at supporting scale-up in the pilot provinces. Further lending to support investment will be discussed, on a need basis, with GoC to bridge the gap for financing needs to sustain scale-up in phase 2. Bank investment support in each phase will be on an "as required" basis. Its impact in terms of investment and scale-up of renewable energy will be assessed for their contribution toward achievement of the objectives of the program according to GEF program triggers to move from one phase to the next.

3. Project Development Objective and Key Indicators

The proposed phase 1 project development objective is to do the following:

- Create a legal, regulatory, and institutional environment conducive to large-scale, renewable-based electricity generation.
- Demonstrate early success in large-scale, renewable energy development with participating local developers in two provinces.

Measures of progress made during project implementation and the first phase of the program global objective include (a) issuing of implementing regulations for REL at the national level and initiation of their effective implementation in pilot provinces; (b) improvements to quality and reduction in cost of renewable energy equipment and services, including increases in local content; and (c) proportion of new electricity generation coming from renewable sources in the pilot provinces.

Project performance indicators are set out in Annex 3.

4. Project Components

The project comprises two components: institutional development and capacity building and support for wind and biomass in pilot provinces.

Institutional Development and Capacity Building: GEF grant US$40.22 million, cost-sharing US$48.60 million

The Institutional Development and Capacity Building component was designed to meet national priorities and the needs of the pilot provinces to initiate the scale-up of renewable energy, and will include the following:

- MMP research and implementation support. Studies on further development of the MMP and its implementation, particularly on targets, tariff levels, policy development, sharing of incremental cost, trading and carbon trading, and long-term planning and preparation of implementing regulations. The main counterparts for these activities will be government bodies, and the main outcome will be legislation and regulations leading to sustained scaling-up of renewable energy.
- Technology improvement for wind and biomass. This will cover technology development based on important local investments leveraged by small grants, cost-shared grants or both, for wind and biomass. In addition for wind, it will cover preparation of standards, development of certification and establishment of a testing center. Beneficiaries will be Chinese wind and biomass equipment and related service suppliers, government bodies dealing with standards, and testing and accreditation agencies.
- Long-term capacity building. Support will be provided to selected universities to enter into twinning arrangements with leading international universities to develop postgraduate-level or specialist renewable energy engineering and other related courses and to offer fellowship programs to support senior specialists studying abroad.

At the provincial level, TA will be provided for effective implementation of the REL and initiation of sustained scale-up or renewable energy:

- Implementation of the MMP by focusing on the tasks to make the REL effective in the pilot provinces, aimed principally at provincial government bodies and other stakeholders.
- Support to ensure the success of the investment projects by providing assistance in design, procurement, construction, and operations and maintenance, as needed by each project sponsor.

- Pilot or demonstration projects to be carried out in the pilot provinces supporting technologies other than wind, biomass, and small hydro with potential for replication in the pilot provinces component. In addition, a pilot offshore wind farm will be prepared for implementation in phase 2.
- Renewable resource assessments for each of the pilot provinces.
- Capacity building for market participants.
- Support for investment scale-up with the sponsors of the investment subprojects financed under the Support for Wind and Biomass in Pilot Provinces Component. The purpose is to build a strong pipeline of bankable renewable energy projects with strong sponsors.
- The Institutional Development and Capacity Building Component will include program management and will cover the sustaining costs of the Project Management Office (PMO), GoC, and donor coordination activities, monitoring and evaluation, and administration, including fiduciary duties.

Support for Wind and Biomass in Pilot Provinces: total cost US$140 million, Bank financing US$87 million

Two subcomponents, one for Fujian Province and one for Rudong Province, are submitted for Board approval.

In Fujian, a 100 MW wind farm at Changjiang'ao, Pingtan Island. The Pingtan wind farm will consist of wind turbines, associated civil and electrical works, an extension to an existing control room, a switchyard, and a 15 km, 110 kV transmission line from the wind farm to the Beicuo substation, which will be upgraded to meet the evacuation needs of the wind farm. Total cost of the subcomponent is expected to be US$103.92million, of which US$67 million is to be financed by the Bank.

In Jiangsu, a 25 MW straw-fired biomass power plant at Mabei Village, Rudong County. The Rudong power plant will consist of one 110 ton per hour, high-temperature, high-pressure straw-fired boiler, one 25 MW steam turbine, and associated mechanical, electrical, and civil works. Total cost of the power plant is expected to be US$36.08 million, of which US$20 million is to be financed by the Bank.

GoC has committed to the first phase of the China Renewable Energy Scale-up Program (CRESP) consisting of four pilot provinces and four investment subcomponents. The investment subcomponents, which have been appraised, but which have not yet secured all the required domestic approvals, are a 100 MW wind farm at Huitengxile, Inner Mongolia, and a bundle of rehabilitation and new build small hydro projects in Zhejiang totaling 83 MW in additional capacity. The Huitengxile wind farm and the small hydro projects will be submitted for the Board's consideration as soon as they secure their domestic approvals.

More detailed project descriptions for the Pingtan wind farm and the Rudong biomass power plant are in Annex 4 and for the Huitengxile wind farm and the Zhejiang small hydro projects are in Additional Annex 4A. Project Costs for the Pingtan wind farm and the Rudong biomass power

plant are set out in Annex 5, and for the Huitengxile wind farm and Zhejiang small hydro projects are in Additional Annex 5A.

5. Lessons Learned and Reflected in the Project Design

The evidence accumulated over some 20 years suggests that a complementary set of coordinated and focused policies is necessary to correct market failures that prevent the adequate reflection of the costs of environmental damage in electricity prices and to develop and sustain markets for renewable energy. Supply-side policies to achieve cost reduction and quality improvement are necessary to increase the competitiveness of renewable energy technologies, but are not on their own sufficient to overcome barriers during the transition period.

Sustainability requires (a) development of a competitive environment in the renewable energy subsector to reduce technology and project development costs; (b) flexibility to allow quick adaptation to changing market conditions, such as restructuring and deregulation of power sectors; and (c) minimal reliance on administrative procedures, and increased focus on market-based approaches as soon as barriers are removed.

The following lessons were learned from renewable energy assistance in China:

- Consensus among all concerned agencies is vital to project success.
- The renewable energy resource for individual projects must be carefully assessed and checked.
- Attention must be paid to arrangements for procurement and construction that are in line with international best practice to ensure rapid and effective implementation.
- Agreement on important principles that are essential to the project functioning as envisaged (for example, power offtake and purchase agreements) should be established before project appraisal
- TA must be coordinated with the construction of the physical parts of the project to ensure that the implementing agencies have adequate and timely knowledge of construction, operation, and maintenance.
- Technology transfer efforts are needed to secure improvements to the supply side, including reductions in cost and improvements in quality.

Incorporation of these lessons learned in the proposed program or project required full engagement of all concerned Chinese agencies. Developing consensus on the MMP and project strategy through intensive dialogue within China took longer than expected, but despite that has taken less time than in many other countries.

6. Alternatives Considered and Reasons for Rejection

Various options for assisting scale-up of renewable energy in China were considered. Further investment activities following on from the successful pilot scale investment in wind under Renewable Energy Development Project (REDP; Loan 4488-CHA) were considered, but these alone would not have overcome the barriers to broadening participation nor the bias against renewable energy–based electricity generation. A GEF-supported, comprehensive, stand-alone

TA activity designed to introduce the necessary laws and regulations was also considered, but rejected on the basis that experience in China on implementation has been mixed and that support for effective implementation, enforcement, and investment would be needed. A program consisting mainly of TA, with limited investment support was originally contemplated and pursued, but after the commitment of the GoC to embark on a large-scale development of renewable energy, it became evident that the need for investments would require strong support from both public and private sectors, and the catalytic effect of Bank financing was considered essential, especially in the first phase, to the success of the project.

C. IMPLEMENTATION

1. Institutional and Implementation Arrangements

Institutional and Capacity Building Component

The Institutional and Capacity Building component will be a single national program implemented through a national PMO under the Energy Bureau of NDRC. The CRESP PMO was first formed in May 2002 to undertake project preparation and will increase its capacity by adding and training new staff when the project enters into its implementation phase. The PMO has the authority to enter into contracts on behalf of NDRC and, during preparation, demonstrated its ability to meet Bank fiduciary requirements.

Support for Wind and Biomass in Pilot Provinces Component

The developers of the Pingtan wind farm in Fujian will establish a special-purpose company in which the China Long Yuan Electric Power Group Corporation (Long Yuan), a subsidiary of Guodian Corporation, one of the five state-owned generation companies, will be the majority shareholder. Long Yuan will also be responsible for operation of the plant. It is a credible developer and a shareholder in the wind farm financed in Shanghai under the REDP. It has the capacity to manage the technical, commercial, and fiduciary aspects of the project. Funds will be onlent directly from the MOF to Long Yuan with a guarantee provided by Guodian Corporation.

The Rudong power plant is sponsored by Jiangsu Guo Xin Investment Group Ltd (Guo Xin), which is owned by Jiangsu Province. It has established a special purpose project company that will own and operate the power plant, Jiangsu Guo Xin New Energy Development Company Ltd. (NED). Guo Xin is a minority owner of the Yixing Pumped Storage power plant, financed by the Bank (Loan 4686-CHA), and has the capacity to manage the technical and commercial aspects of the project and knowledge about financial management procedures. TA will be provided to address the fiduciary weaknesses identified during the financial management assessment. Funds will be onlent from the MOF to Jiangsu Province, on to Guo Xin, and thence to NED.

Institutional and implementation arrangements for the Pingtan wind farm and the Rudong biomass power plant are further described in Annex 6. The Huitengxile wind farm and the Zhejiang small hydro projects are described in Additional Annex 6A. Financial management and disbursement arrangements for the Pingtan wind farm and the Rudong biomass power plant are detailed in Annex 7, and for the Huitengxile wind farm and the Zhejiang small hydro projects in Additional Annex 7A. Procurement arrangements for the Pingtan wind farm and the Rudong

biomass power plant are set out in Annex 8, and for the Huitengxile wind farm and the Zhejiang small hydro projects in Additional Annex 8A. They have all been confirmed at appraisal with respective counterparts.

2. Monitoring and Evaluation of Outcomes and Results

Development of capacity to enable the GoC to monitor and evaluate the impact of the REL is an integral part of the Institutional Development and Capacity Building Component and will be undertaken by the PMO. A full-time member of the PMO will be assigned to collect information and develop databases, if they are required, to monitor the performance and progress of implementation of both components. A monitoring and evaluation plan will be prepared during the first year of implementation, and training and support will be provided to the PMO, as required.

Data sources include the China statistical yearbook (national and provincial), market data, project progress reports and third-party assessments through technical and social surveys. Monitoring data on implementing the REL will be provided to relevant agencies through the PMO and NDRC management and information systems developed during project implementation.

The monitoring framework for the Pingtan wind farm and the Rudong biomass power plant are described in Annex 3, and for the Huitengxile wind farm and the Zhejiang small hydro projects in Additional Annex 3A.

3. Sustainability and Replicability

The GoC's renewed commitment to the support and development of renewable energy is documented in the Letter of Sector Development Policy (LSDP), which is attached in Additional Annex 1A.

The passage of the REL introducing an MMP is a major step toward sustainable scale-up of renewable energy. Success now hinges on adequate regulations and design of an effective regulatory system with GEF support to ensure adequate implementation. Sustainability is likely because (a) the rapid progress in developing and passing the law indicates the desire of the government to meet the sector development objectives; and (b) the programmatic approach provides a means of steadily broadening and deepening the engagement of all concerned parties, leading to the point where the environment for renewable energy has been embedded into the legal and institutional framework of the country in step with the long-term plan outlined by the GoC in its LSDP.

Sustainability of the investment projects has been aided by reflecting in their institutional arrangements the principles set out in the law, namely creating a long-term requirement for renewable electricity at the provincial level, backed by Power Purchase Agreements (PPAs) and ensuring cost recovery. The project supports this goal through various activities envisaged under the Institutional Development and Capacity Building component.

4. Critical Risks and Possible Controversial Aspects

The program/project risk was rated as high at the concept stage. Difficulties encountered during the two to three first years of preparation and even after the approval of the GEF grant by the GEF Council justified in hindsight the rating. However, continued engagement of concerned agencies through studies and consultation seminars led to a strong support of all concerned agencies to the approach and concept of the program/project. The risk has been lowered to substantial at this stage.

Table 1: Risk Mitigation Measures

Risk to Project Development Objective	Risk Mitigation Measure	Risk Rating
Weak or failing government commitment to • Market-based approach and competition • Legal basis for mandated market. • Implementation of REL. • Enforcement of mandated market.	Continued dialogue. Support for implementation of the REL to ensure that the design minimizes disincentives to comply. Strong support for effective regulation. Programmatic approach for GEF support allows exit.	M
Environmental externalities not incorporated into electricity pricing.	The REL and related regulations mandate a price for electricity to be provided by renewable energy. State Council regulations mandate development of new pricing mechanisms that incorporate environmental externalities.	S
Insufficient number of developers and potential investors attracted and able to develop projects.	Incentives for developers, including GEF cost-shared prefeasibility studies and capacity building. Awareness campaigns.	S
Banks are not willing to lend to renewable energy projects on long tenor and reasonable terms.	Awareness and capacity building for banks. Cofinancing with local banks in investment projects.	M
Equipment standards are not enforced.	TI program to develop standards and certification. Ensure that buyers are aware of the importance of standards.	S
Renewable electricity supply costs are higher than expected.	Only abundant resources and close-to-commercial technologies are included in the MMP. Targeted cost reduction activities. Cost monitoring and benchmarking, adjustment of policy to meet cost needs. Exit strategy.	M
Regionalism caused by fiscal situation distorts renewable electricity markets.	Wider government program for development of western provinces and fiscal reform under consideration include measures to address this	S

	issue. Progress made on the need for trading to optimize use of resources.	

Risk to Component Results

Poor quality or high cost of equipment and services and of projects in operation.	TA program strongly supports quality improvement. Awareness-raising activities to support quality improvement efforts. Standards and certification as indicated above.	S
Weak cooperation from agencies concerned with the government and power sector in pilot provinces.	Pilot provinces selected on voluntary basis. Incentives for participation, including substantial TA to assist in implementing law.	N
Pilot projects do not operate at close to international performance and price.	Pilot projects sponsored by commercial, reputable companies and prepared to international best practice, adapted to Chinese conditions. ICB for equipment supply.	M

Overall Risk Rating S

Risk ratings: H (high), S (substantial), M (modest), N (negligible or low risk).

No controversial aspects have been identified.

5. Loan Conditions and Covenants

There are no unusual loan conditions or covenants. Standard effectiveness conditions will apply: execution and delivery of the loan and grant agreement must be duly authorized, and a legal opinion that the agreement is legally binding must be furnished. Conditions of disbursement for each of the investment subcomponents will include signature of related subsidiary loan agreements, and for Long Yuan, the formation of the special-purpose company. To avoid holding up the implementation of other subcomponents, individual requirements—for example, the signature of subsidiary loan agreements between the provincial finance bureaus and the implementing companies—will be made conditions of disbursement.

Implementation conditions will include agreements that sales prices and quantities for electricity and connection arrangements will be provided for each project. Financial reporting and auditing requirements will be followed, and the owners of the Pingtan wind farm and the Rudong biomass project will be covenanted to pay in equity and limit dividend payments out of the project companies to a maximum of net income.

D. APPRAISAL SUMMARY

1. Economic and Financial Analyses

Economic Analysis

At the program level, economic, financial, and fiscal impact analyses of various MMP policy options have been undertaken, using a simulation model. In the case of business as usual and no

renewable energy scale-up program, the likely renewable energy–based electricity generation would be 36 TWh in 2010 or 1.2 percent of total generation. A program focused on increasing power generation from renewable energy sources, the costs of which are below the avoided financial cost of coal generation, would result in a renewable energy contribution of 79 TWh per year by 2010, excluding external costs and 89 TWh if they are included. Net annual benefits are estimated to be US$1.2 billion in 2010 and the NPV of the program estimated to be US$3.79 billion at a 12 percent discount rate. It must be noted that the government has announced a more ambitious target indicating higher assumptions on values of externalities, more optimistic assumptions for cost reduction or, possibly more importantly, a lower discount rate.

Additional analyses were also carried out to assess the sensitivity of the results to the different assumptions and in particular to the discount rate. A separate, additional, target of 11 TWh of wind (about 4 GW of capacity) was examined because wind does not make a contribution to the 89 TWh per year in 2010 under the assumptions considered in the study (especially the 12 percent discount rate). The analysis suggested that such a program would cost about US$410 million at a 12 percent discount rate and would be economically justified at a discount rate of about 5 percent.

Incremental cost analyses have been carried out for the removal of barriers to investments that are assumed to become economically viable with consideration of environmental externalities during the lifetime of the program. With the program, and ignoring the external benefits, an incremental 115 TWh of electricity would be generated from renewable sources. This would result in an incremental reduction of carbon emissions of about 800 million tons during the 20-year lifetime of the installed capacity. For a GEF incremental cost of US$140 million, this implies that the cost per ton of carbon is around US$0.17.

Cost-benefit analyses of the Pingtan wind farm and Rudong biomass power plants have been carried out, and the economic internal rates of return (EIRRs) are, respectively, 13.6 percent and 20.8 percent when externalities are taken into account.

Financial Analysis

In addition to the analysis of benefits to the economy, financial analyses have been carried out to assess the incremental financial costs of the policies and their impact on the distribution of costs and benefits among different groups in society, including consumers, equity investors, renewable electricity producers, coal electricity producers, banks, and government. The main financial gains to the power sector are from reduced coal and financing costs. The main costs stem from increases in civil construction and taxes. Net discounted financial benefit of achieving the 89 TWh per year by 2010 is US$2.9 billion.

Fiscal Impact

Fiscal impact to local and provincial government is small, with a discounted gain of about US$100 million over the program from taxes being paid by the new power plant to provincial and local governments.

Investment Projects

Financial performance of each individual investment project has also been analyzed. The financial internal rate of return (FIRR) for the Pingtan wind farm is 6.5 percent and for the Rudong biomass plant 10.6 percent. The sensitivity and risk analyses carried out show that these results are robust and indicate an adequate financial viability of the proposed project.

For further discussion of the economic and financial analysis for the Pingtan wind farm and Rudong biomass power plant, see Annex 9, and for the Huitengxile wind farm and Zhejiang small hydro projects, see Additional Annex 9A. Incremental cost analysis is discussed in more detail in Annex 15.

2. Technical

Each investment subproject has been designed in accordance with international standards and best practice.

For the Pingtan wind farm, the design and layout used internationally recognized standards for wind resource assessment and energy calculation. Variable-speed pitch regulated machines meeting international standards will be specified for their superior performance and output power quality, which will help improve local system stability. Design specifications require wind turbines to meet local environmental conditions, including salt-laden air. The Institutional Development and Capacity Building component will provide support for the wind farm to ensure that best practices in operation and maintenance are followed.

The biomass power plant is based on designs and components that have been commercially proven. Combustion technology has been chosen over more advanced, but commercially unproven gasification concepts. Design specifications will set out requirements for dealing with local feedstock. Feedstock availability has been carefully reviewed and risks of interruptions in fuel supply have been offset by arrangements for stockpiling and setting up multiple sources of supply. The Institutional Development and Capacity Building Component will provide financing to hire consultant support during construction and to set up fuel supply arrangements. The feasibility study has been reviewed by the World Bank and international consultants and found to be adequate.

3. Fiduciary

Financial Management

In Fujian and Jiangsu the assessment concluded that the project companies met minimum Bank financial management requirements. An action plan has been agreed to ensure that adequate financial management capacity will be in place and developed in the special purpose companies by project disbursement.

The financial management capacity of the CRESP PMO, which has been responsible for implementation of the two preparation grants, was reassessed. The assessment concluded that the PMO meets minimum Bank financial management requirements and will have in place an adequate financial management system.

Financial management for the Pingtan wind farm and Rudong biomass power plant is further discussed in Annex 7, and for the Huitengxile wind farm and Zhejiang small hydro projects in Additional Annex 7A.

Procurement

For the investment subcomponent in Fujian, the procurement capacity assessment noted that the parent company has previous experience with Bank procurement. In Jiangsu the parent company has extensive experience with power sector projects, but not with Bank procurement. Both companies have received additional procurement and disbursement training. Procurement risk is considered average.

The procurement capacity of the CRESP PMO was assessed as adequate.

For the potential projects, the Inner Mongolia North Long Yuan Wind Power Company (NLYWPC) has extensive experience with wind power projects, but not with Bank procurement. It was, however, considered to have adequate capacity to carry out procurement activities according to Bank Guidelines. NLYWPC is, in addition, now partly owned by Long Yuan, which is quite familiar with World Bank procurement procedures. The ZHPDMC has extensive experience of small hydro projects and will have a dedicated procurement section. All companies will use procurement agents familiar with Bank procedures.

4. Social

No major social issues have been identified. The wider social impact of the REL will be monitored during project implementation, whereas social impacts at the investment subcomponent level are subject to independent monitoring.

5. Environment

The project contributes to environmentally sustainable growth and protecting people's health from environmental pollution. Reduction in local pollutants—SO_2, NO_x, and particulates, as well as CO_2, will be monitored by reference to the substitution of renewables for coal-based electricity. Monitoring will take account of both direct investment through the project and indirect investment induced as a result of the introduction of the MMP in pilot provinces.

6. Safeguard Policies

Safeguard screening category is S2, and the environmental screening category is B.

Table 2: Safeguard Policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[X]
Involuntary Resettlement (OP/BP 4.12)	[X]	[ ]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)*	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[X]	[ ]
Projects in Disputed Areas (OP/BP/GP 7.60)	[ ]	[X]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[X]

*China uses the term "Ethnic Minorities" to describe those people covered by OD 4.20/OP 4.10.

All subcomponents and subprojects will be carried out in compliance with Bank safeguard policies, and according to environment and resettlement plans that have been agreed with the Bank. No major safeguards issues have been identified.

For the potential investment project in Huitengxile, environment and resettlement plans have been agreed with the Bank and in Zhejiang, environment and resettlement frameworks have been agreed with the Bank and adopted by the province.

For further discussion on the Pingtan wind farm and Rudong biomass power plant, see Annex 10 and on the Huitengxile wind farm and Zhejiang small hydro projects, see Annex 10A.

7. Policy Exceptions and Readiness

No policy exceptions for the project are required.

Readiness conditions have been evaluated as follows:

Table 3: Readiness Conditions]

Condition	PMO	Fujian	Jiangsu
Fiduciary arrangements in place • Financial management • Procurement	 • Yes • Yes	 • Yes • Yes	 • Yes • Yes
PMO/companies mobilized	Yes	Yes	Yes
Counterpart funds/ local financing in place	n/a	Yes	Yes
Bid documents for first year's procurement	Under preparation	Under preparation	Under preparation
Final draft PIP available	Yes	Yes	Yes
Disclosure requirements met (safeguards)	n/a	Yes	Yes
Land acquisition plan ready	n/a	Yes	Yes
Domestic approvals secured	Yes	Yes	Yes

Annex 1: Country and Sector or Program Background

CHINA Renewable Energy Scale-up Program

Heavy Reliance on Coal

China's primary energy consumption more than doubled from 600 million tons of coal equivalent (Mtce) in 1980 to about 1,300 Mtce in 2000, whereas the GDP quadrupled during the same period. Although based on slightly different growth assumptions, several studies carried out in the late 1990s and early 2000s by GoC and international agencies concluded that even in the case of increased and sustained energy efficiency efforts, energy consumption will continue to grow rapidly to between 1,850 and 2,150 Mtce in 2010 and to between 2,500 and 3,300 Mtce in 2020.[3] They also concluded that even with an aggressive fuel diversification policy, coal will remain the dominant energy source.

As did most of the studies, the one by the Chinese Energy Research Institute, found that coal's share in primary energy consumption, which accounted for 66 percent in 2000, would decrease only slightly, to about 65 percent by 2010, and slightly less than 60 percent in 2020 even if exceptional efforts were made in diversifying primary energy sources and improving overall energy efficiency (the "green scenario"). Under business as usual, coal's share in primary energy consumption would decrease to about 63 percent in 2020. Evidence from the early 2000s indicates that these and other studies have underestimated primary energy consumption growth. Primary energy consumption has soared from 1,300 Mtce in 2000 to around 1,700 Mtce in 2004, or 80 to 95 percent of the low and high studies' forecasts for consumption in 2010.

About 50 percent of the coal consumed in 2004 was used for electricity generation. China's electric generating capacity is projected to increase from a little less than 400 GW now to between 950 and 1,100 GW by 2020. During this same period, coal-based electric generation capacity is expected to grow threefold to about 700 GW. This will require building about 500 to 650 GW of coal-based capacity (in the case of the more likely high growth, about 450 GW to meet the fast growing demand and about 200 GW to replace existing capacity). Coal-based generation will remain the predominant mode of electricity generation until 2030, accounting for more than 60 percent of total capacity and supplying around 70 percent of total electricity generation.

Such coal predominance would be disastrous to the local and global environment. The damage caused by SO_2 and NO_x emissions to agriculture and health is at the center of the debate on the 11th Five-Year Plan and the long-term energy plan (China 2020). Estimates of the costs vary, according to existing studies, from 3 to 7 percent currently and could grow to as high as 13 percent of GDP in 2020, if environmental issues are not properly addressed. Emissions of carbon from coal combustion will also increase from about 820 million tons in 2000 to more than 1.1

[3] The three studies used are (a) "Basic Concepts of the National Energy Strategy" 2004—unpublished draft by the Development Research Center based on a study by the Chinese Energy Research Institute presented during the "China Development Forum": China's National Energy Strategy and Reform," Beijing November 15–17, 2003; (b) World Energy Outlooks 2002 and 2004, International Energy Agency; and (c) International Energy Agency Outlook 2004—Energy Information Administration, Office of Integrated Analysis and Forecasting, U.S. Department of Energy.

billion tons in 2010 and more than 1.8 billion tons in 2020 even with sustained efforts in energy efficiency and fuel diversification. Even then, China's CO_2 emissions per capita would amount to only 20 to 30 percent of OECD countries in 2010 and 2020, respectively.

China's highest level authorities recognize that a business as usual approach in the energy sector would lead to unacceptable environmental damages. They recently adopted a multipronged energy strategy aiming at: (a) improving the efficiency of the energy sector and bringing energy intensity in line with international best practice; (b) fuel switching through increased gas penetration and aggressive development of renewable energy use, especially for power generation; and (c) securing energy supply to meet the country's growing needs. Chinese authorities recognize the vital need to pursue vigorously each prong of the strategy and to rely more on market based approaches to achieve the higher level objectives of sustainable development and a "well off" society.

Greenhouse Gas Emission by the Power Sector

This results from recognition of the negative effects of emissions from the coal combustion needed to fuel economic growth—the damages to human health from air pollution and the damages to agricultural crops and natural resources caused by acid rain. In addition to severe impacts on the national environment, China's growing consumption of fossil fuels is projected to make it, by 2015, the leading producer in the world of greenhouse gas (GHG) emissions. Most of the increase in carbon emissions to 1.8 billion tons in 2020 will come mostly as a result of a rapid increase of fossil energy consumption.[4] Electricity production is expected to generate a significant share of these emissions, as shown in Table A1.1 below.

Table A1.1: Forecast Electricity Generation and Emissions in China, 2000–05

	2000	2005	2010	2015
Electricity Generation (TWh)	1303	1676	2161	2855
Thermal Electricity Generation (TWh)	1071	1361	1743	2302
Estimated Emissions (million tons)				
Carbon	266	337	432	571
NO_x	2.7	3.4	4.4	5.8
SO_x	7.0	8.8	11.3	15.0
TSP	0.4	0.6	0.7	1.0

Note: Based on forecasts from the State Power Corporation of China (2001).

A Power Sector in Transition toward Competitive Markets

Reforms in China's power sector during the 1980s and 1990s incurred a series of incremental changes that have resulted in a power sector largely unrecognizable from that in the early 1980s.

In early 2002, government functions were largely separated from enterprise management. All energy enterprises were corporatized and operated as commercial businesses. Budget allocations have been phased out and subsidies practically eliminated. Investments are financed through equity and debt from a variety of public and private sources. Electricity prices were increased to reach, on average, long-term marginal costs of supply in most grids.

[4] Asian Development Bank, "ALGAS: People's Republic of China," Manila, October, 1998. As noted above, such studies have consistently underestimated the actual energy consumption growth in China in recent years.

In April 2002, after approval by the highest authorities in China, the State Council released a comprehensive reform program in Document No. 5:

- Outlining a long-term vision of expanding competition, starting with generation and focusing on regional markets during the 10th Five-Year Plan (FYP);
- Initiating, in the areas where conditions permit, market trials that would allow generators to supply electricity directly to high-voltage or large customers during the 10th Five-Year Plan (2001–05). Price of the contracted electricity supply will be set through negotiation between the generation companies and the customers, with payments of the transmission and/or distribution service established according to the state regulated transmission and/or distribution tariffs; and
- Establishing a State Power Regulatory Agency to ensure fair competition in the competitive segments of the industry and protection of consumers from monopoly abuses in the noncompetitive segments. This is a first step toward a modern light-handed regulation of the sector.

The 2002 State Council Document No. 5 is a major step forward. It clearly states that the objectives of the reform in China are to continue the break up of the monopolistic structure of the industry and gradually expand competition to improve its efficiency and ultimately provide the customers with the best service at the lower possible cost. The plan details these objectives in eight points: (a) Break up of monopolies; (b) Introduction of competition; (c) Increase of efficiency; (d) Improvement of pricing mechanisms with one important requirement to link the price paid to generators to their emissions to foster the development of renewable energy and other clean generation; (e) Optimization of resource allocation; (f) Development of industry; (g) Formation of a national grid; (h) Establishment of competitive electricity markets.

Despite the impressive progress achieved during the last two decades, China's power sector is still facing the following major issues: (a) heavy reliance on coal entailing large emissions of GHGs, particulates, SO_2, and NO_x with consequent environmental damages—potential climate change, adverse health impacts, deteriorating air quality and acid rain; (b) a piecemeal approach to restructuring of the power sector and slow development of a regulatory framework leading to inefficiencies and abuses of monopolistic or monopsonistic power, discrimination against independent and small power producers and disincentives to secure supply at least cost; (c) mismatch between loan maturities and economic lives of power projects; (d) inadequate wholesale electricity and transmission pricing systems; (e) low efficiency of electricity supply and use; and (f) lack of access to electricity for more than 30 million people in isolated rural areas.

Commitment to Development of Renewable Energy

China has long had one of the world's largest renewable energy programs, leading to the development of more than 30 GW of small hydropower and large-scale installation of improved woodstoves and biogas plants. The government's energy strategy in the 10th FYP emphasized renewable energy more strongly than in the past, as one measure to reduce the power sector's use of coal in the medium to long term, and to provide modern energy services to remote rural households. For the first time, GHG emissions and climate change issues are dealt with in the

Plan. The renewable energy policy in the 10th FYP identifies five objectives for which policies will be developed:

- Increasing the share of electricity production coming from renewable energy;
- Introducing greater competition in supply of renewable electricity to the grid and improved incentives to do so;
- Supporting further commercialization and local manufacture of renewable energy equipment;
- Encouraging better financing mechanisms, especially for private capital; and
- Improving cooperation between government departments.

Analyses indicated that the greatest potential for displacing coal by renewable energy was in the power sector. The technical potential for renewable electricity in China includes about 160 GW of wind power; over 75 GW of commercially exploitable small hydropower; approximately 125 GW (300 Mtce) biomass energy; about 6.7 GW of known geothermal energy resources; and an abundance of solar insolation. With respect to renewable electricity, these resources make China one of the most well endowed countries in the world. Recognizing the potential, three high level Commissions in 1995 jointly prepared the *New and Renewable Energy Development Program for 1995–2010*. However, the targets for the year 2000 have not been realized and there still exist formidable barriers to meeting future targets, which are recognized and set out in the LSDP contained in Annex 1A.

To address these barriers the government developed an REL. The government indicated that the law and implementation regulations should be guided by the following principles:

- Adoption of best international practice for renewable energy development, adapted for Chinese conditions.
- Promotion of policies that are detailed, practical, and achievable. Targets should be clearly specified, roles and responsibilities of different parties clearly defined, investment requirements calculated, and sources of financing identified.
- Integration of renewable electricity policies with power sector reform.
- Integration of renewable energy development plans with the strategic objective to develop Western part of country, for example, with a focus on developing small hydro power, wind energy and solar energy.
- Transparency during development of policies to ensure support from all stakeholders during implementation. The NDRC should work more closely than before with other agencies and consults widely with national concerned agencies, provincial and local authorities, power companies, renewable energy industry, and banks.

The REL achieves a major breakthrough for the development of renewable energy in China by recognizing the need for a mandated market to achieve the government's ambitious goals. In designing a mandated market, the government can choose to specify either the price that it is willing to fix for renewable electricity or the quantity of renewable electricity that must be bought at prices determined by the market. Mandating that a quantity of electricity consumption

comes from renewable sources has been introduced in Australia, the Netherlands, UK and states in the US (the so-called Renewable Portfolio Standard or RPS). An obligation on electricity suppliers to buy renewable energy based electricity at a government determined price (the so-called Feed-in Tariff) has been introduced mainly in Europe, where Spain and Germany are leading proponents. The major policy choice for REL is whether to adopt a price- or quantity-based system, which is now under committee discussion in the National People's Congress.

Annex 1A: Letter of Sector Development Policy, NDRC

CHINA Renewable Energy Scale-up Program

中华人民共和国国家发展和改革委员会

November 2, 2004

David Dollar
Country Director
China and Mongolia
The World Bank
Level 16, China World Tower 2
No. 1 Jianguomenwai Avenue
100004 Beijing, P.R. China

Dear Mr. Dollar,

Re: Letter of Sector Development Policy on Renewable Energy Development in China

China is a big country both in energy production and consumption. Along with the rapid development of China's economy and the living standard of the people, energy demand in China is increasing rapidly. Under the current energy structure, coal is the dominating resource; oil consumption depends partially on import. Environmental protection and energy security are becoming issues of particular concerns. Development and utilization of renewable energy is an important option to improve the environment, adjust the energy structure, increase the energy safety, achieve diversified energy supply and ensure sustainable development of the energy sector.

China is rich in renewable energy resources, of which the amount of hydro is about 400GW (50 MW and below capacity of small hydro is 120 GW),; wind resource exceeds 1,000 GW; biomass resource exceeds 600 million tons of standard coal, and solar energy resources are also abundant. China has the full capacity to provide clean, secure and sustainable energy supply for national economy and social development.

Since 1992, the Government of China has signed the Rio Declaration, UN Convention on Climate Change etc. and has issued such documents as China Agenda for 21st Century; 10 Countermeasures for Environment and Development in China. These actions indicate the determination of the Chinese Government in enforcing and implementing sustainable development strategy. The Government of China has set up a series of specific policy measures to promote the development and utilization of renewable energy and the development of the energy industry. The Chinese Government also conducted such programs as Rural Energy Comprehensive Building Program in One Hundred Counties; Development of Initial Rural Electrification Counties; the Program of Brightness and the Township Electrification Program; Riding the Wind Program and the pilot wind power concession projects etc.. Good achievements have been made in these programs. By the end of 2003, the total hydro power capacity in China reached 100GW (of which small

capacity reached 560 MW, and electric power generation fuelled by biomass reached 2,000 MW. More than 12 million rural household biogas digesters and more than 2,000 large and medium-sized biogas digesters had been set up in China. Installation of solar water heaters reached more than 50 million square meters and the total capacity of PV systems was more than 50 MW.

During the International Conference for Renewable Energies Boon 2004, from 1 to 4 June, 2004, I have solemnly announced, on behalf of the Chinese Government, that China would start to develop the Renewable Energy Law to speed up the development and utilization of renewable energy. By 2020, the share of renewable energy (excludes larger than 50MW hydro power) in the primary energy consumption will occupy 10%. China is now drafting the Mid and Long Term Plan on Renewable Energy Development and has incorporated such a plan into the national economic development plan. This will clarify the strategic objective of the renewable energy development; remove market barriers and firm up the incentive measures for renewable energy development; it will also help to create the social and cultural environment for renewable energy development and promote the commercialization and scaled development of renewable energy.

According to the Mid and Long Term Plan on Renewable Energy Development, the development target by the year 2020 are: the installed capacity of hydro power will reach 240 GW (75 GW of which will come from small hydro) and will replace an annual consumption of 250 million tons of standard coal equivalent; the installed capacity of wind power will reach 20 GW and will replace an annual consumption of 15 million tons of standard coal equivalent; the installed capacity for biomass power will reach 20 GW and will replace an annual consumption of 28 million tons of standard coal equivalent, and the total installed capacity of PV systems will reach 1,000 MW. Based on the target mentioned above, we are trying to speed up the pilot projects on wind power concession and biomass power generation. The development speed of small hydropower and PV power is being implemented at a speed which is obviously faster than before.

However, in general, the current production cost of renewable energy in China is relatively high and is not competitive compared to the traditional energy. In order to accelerate the development of renewable energy, the Chinese Government hopes to obtain financial and technical support from international organizations such as the World Bank and GEF. The aim is to increase local manufacturing ability for wind power generation and biomass generation; reduce generation cost of renewable energy; and create conditions for the development and utilization of renewable energy. China will be keen to learn from international experiences and practices. The Chinese Government is willing to promote the commercialization and scale up of renewable energy development jointly with the international world and contribute to the sustainable development of the economy.

The China Renewable Energy Scale-up Program (CRESP) is, for the time being, the largest international technical assistance program in China. We attach high importance to this program and hope to make joint efforts with GEF and the World Bank so as to push

and promote the preparatory work, and make the implementation of the program as soon as possible.

Wish you have a great winter.

Sincerely yours,

Zhang Guobao
Vice Minister
National Development and Reform Commission

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies

CHINA Renewable Energy Scale-up Program

Table A2.1: Major Related Projects

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
Bank-financed		Implementation Progress (IP)	Development Objective (DO)
Coal dominance, renewable energy development	Renewable Energy Development	S	S
Coal dominance, access, financing	Hubei Hydroelectric	S	S
Coal Dominance, environment	Shanghai Waigaoqiao	S	S
Energy efficiency	Energy Conservation	S	S
Energy efficiency	Energy Conservation II	S	S
Sector restructuring, market reform	Tongbai Pumped Storage	S	S
Sector restructuring, market reform	Yixing Pumped Storage	S	S
Other development agencies			
Low efficiency	ADB (TA No. 2789-PRC) Strengthening Demand Side Management in Guangdong and Zhejiang Province	n/a	n/a
Coal dominance, renewable energy development	UNDP/GEF China: Capacity Building for the Rapid Commercialization of Renewable Energy	n/a	n/a
Coal dominance, access	ADB/GEF: China Agricultural Waste Utilization Project	n/a	n/a
Coal dominance, renewable energy development, introduction of competition	ADB/GEF Wind Power Development Project	n/a	n/a
Coal dominance, renewable energy development	UNEP/GEF: Solar and Wind Resource Assessment (Global including China)	n/a	n/a
Coal dominance, renewable energy development	UNDP/GEF: Promoting Methane Recovery and Utilization from Mixed Municipal Waste	n/a	n/a
Coal dominance, renewable energy development	GTZ: Research and training centre for wind energy	n/a	n/a
Coal dominance, access	GTZ: Renewable energies in rural areas	n/a	n/a

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

Lessons Learned from Previous Projects

The OED Report *The Bank's Assistance to the Energy Sector in China* (Report 21891, February 28, 2001) noted that "With none of the 20 completed projects rated unsatisfactory and only one

of the 19 ongoing projects rated a problem project, the performance of the China energy portfolio is without equal." Today in the power sector in China, there are 18 completed projects, all rated satisfactory, and 8 ongoing, again all rated satisfactory. No ongoing energy sector project is rated less than satisfactory.

Nonetheless, important lessons can be drawn from previous energy sector projects, including: (a) the need for full commitment of the Borrower at all levels; (b) the importance of stakeholder participation throughout; (c) important policy reforms, in line with government objectives should be incorporated into the project design; (d) project preparation should include detailed organizational and staffing arrangements for implementation and implementing agencies should receive institutional strengthening support; (e) counterpart funding should be committed before implementation, with the direct participation of relevant levels in NDRC, MOF, and other agencies; (f) projects crossing institutional lines are more difficult to implement and must provide adequate incentives to all participants; (g) capacity building during project preparation can achieve part of project objectives and substantially speed up implementation; and (h) power markets should be carefully assessed and periodically reassessed to ensure a demand for output from proposed projects.

Lessons learned from renewable energy assistance in China include: (a) the renewable energy resource for individual projects must be carefully assessed and checked; (b) for rapid implementation, attention must be paid to ensuring arrangements are in place for procurement and construction that are in line with international best practice; (c) important principles of all agreements that are essential to the project functioning as envisaged (for example, PPAs and voluntary pilot schemes) should be established before project appraisal; and (d) TA must be coordinated with the construction of the physical parts of the project to ensure that the implementing agencies have adequate and timely knowledge of construction, operation and maintenance.

Lessons learned for technology transfer and other activities to improve the supply side suggest that (a) technology transfer is a long-term incremental task and that "single shot" efforts are not generally effective; (b) competitively awarded cost-sharing for major technology transfer activities provide incentives for equipment suppliers to reduce cost and improve quality; (c) technology transfer flourishes where market development and expansion is taking place; (d) Supporting capacity building to embed institutions and skills over the long term are essential to the overall technology transfer process; and (e) short term efforts including courses, study tours and other activities can have an important "bridge building" role to meet specific and identified needs, if well designed and executed.

Other Project Activities

Workshops, studies, study tours and other TA too numerous to mention individually have been financed by multilateral and bilateral donors and foundations in the field of the Mandated Market Policy (MMP), sector reform and legal frameworks supportive of renewable energy. The main bilateral donors have included Australia, Germany, the Netherlands and the UK. The Energy Foundation has been active in China with a support program for five years. Multilateral institutions providing support have included ADB, the EU, UNDP and the World Bank.

The combined effect of these efforts has been to build consensus for (a) the MMP concept and to inform the debate on the relative merits of the price based and quantity based systems and their applicability to China; and (b) the need for a policy to be enshrined in law and regulations. The outcome has been the draft REL and the implementing regulations. The lessons from this consensus are incorporated into the project design.

Annex 3: Results Framework and Monitoring

CHINA Renewable Energy Scale-up Program

Table A3.1: Results Framework

Program Objective	Outcome Indicators	Use of Outcome Information
To enable commercial renewable energy suppliers to provide energy to the electricity market efficiently, cost-effectively and on a large scale	Market framework implemented nationwide Increased renewable electricity over baseline (TWh) and increased renewable capacity over baseline (GW) Cost reductions for important technologies: new and rehabilitated small hydro, new wind, new biomass cogeneration compared with benchmark established in phase 1 Reduced emissions of carbon, NO_x, SO_x and particulates	Gauge progress toward reaching program objective.
PDO (Phase 1)	**Outcome Indicators**	**Use of Outcome Information**
To: • Create a legal, regulatory and institutional environment conducive to large-scale renewable-based electricity generation; • Demonstrate early success in large-scale renewable energy development with participating local developers in four provinces	Evidence that the market framework in pilot provinces has been established through laws and regulations (through technical and social surveys) Evidence that in the pilot provinces the environment for development of renewables has improved (through technical and social surveys) Evidence of improved quality and reduced cost among manufacturers and service providers in wind and biomass (through technical and social surveys) Increased renewable electricity over baseline (TWh/year), increased renewable capacity over baseline (GW), increased size of individual projects Reduced emissions (million tonnes): Carbon NO_x SO_x Particulates	Gauge readiness to move to phase 2 of CRESP Verify progress toward achievement of PDO At midterm review, gauge progress and effectiveness of the Institutional Development and Capacity Building component. At phase completion, gauge readiness to move to phase 2 of CRESP At midterm review, gauge progress and effectiveness of support of wind, biomass and small hydro component. At midterm and phase completion, gauge effectiveness of law, regulations and Support for Wind, Biomass and Small Hydro in Pilot Provinces Component

Intermediate Results One per Component	Results Indicators for Each Component	Use of Results Monitoring
Component One: Legal, regulatory and institutional framework to support development and localization of renewable energy in place	**Component One**: Enactment of REL and issuing of regulations to implement the law at national level by 2009 Issuing of regulations for implementation of REL and their effective implementation in pilot provinces (Fujian, Inner Mongolia, Jiangsu, and Zhejiang) by 2009 Issuing of national standards for wind turbines, availability of testing facilities and certification by 2009 15 companies participating in cost-shared technology and services development activities (with emphasis on biomass and wind) by 2009 Pipeline of renewable energy projects under development in the provinces by 2009	**Component One:** Progress on enactment of law and issuing of regulations will indicate readiness for phase 2 of CRESP Progress in implementation of regulations will indicate readiness for phase 2 of CRESP and needs for further improvement to regulations. Issuing of national standards for wind turbines, availability of testing and certification and company participation in technology development flags how well the culture of quality has been adopted within Chinese manufacturing and service industry and provides direction for further rounds of similar support. As above Pipeline of renewable projects will indicate which areas/technologies and services need further support in subsequent phases.
Component Two: Capacity to develop, finance, construct and operate renewables expanded	**Component Two:** 100MW wind farm at Changjiang'ao, Pingtan Island, Fujian selling 260 GWh/year into local grid by 2008 25MW straw-fired biomass power plant at Mabei Village, Rudong County, Jiangsu selling 192 GWh/year into local grid by 2009	**Component Two:**

Table A3.2: Arrangements for Results Monitoring - Program

		Target Values			Data Collection and Reporting		
Outcome Indicators (Program)	**Baseline**	**Phase 1**	**Phase 2**	**Phase 3**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Market framework established through REL and regulations at national level	None	100%	100%	100%	Six monthly progress reports for supervision	Discussions with lawmakers, monitoring of releases from NPC, regulatory agencies	PMO
Renewable electricity over baseline (TWh/year) and renewable capacity over baseline (GW)	35 7.0	60 11.9	89 17.5	150 29.6	Annual report and plan	REL monitoring database	PMO/regulating agency (in later phases)
Annual reduced emissions:							
Carbon (million tons)	15	23	31	55		REL monitoring database and agreed methodology for calculation	
NO_x (thousand tons	111	171	239	420			
SO_x (thousand tons)	554	852	1,197	2,092			
Particulates (thousand tons)	15	23	32	56			

Table A3.3: Arrangements for Results Monitoring - Project

Outcome Indicators (Phase 1)	**Baseline**	**Midterm**	**Phase end**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Market framework in pilot provinces established through laws and regulations.	None	Some evidence	Substantial evidence	Six monthly progress reports, midterm and end of phase reviews	Discussions with provincial authorities, reports from consultants responsible for providing support in implementation, technical and social surveys	PMO
Environment for development of renewables improved	None	Some evidence	Substantial evidence	Six monthly progress reports, midterm and end of phase reviews	Discussions with companies, monitoring of progress on cost reduction/quality improvement activities, technical and social surveys	PMO

Improved quality and reduced cost among manufacturers and service providers in wind and biomass	None	Some evidence	Substantial evidence	Six monthly progress reports, midterm and end of phase reviews	Discussions with equipment and service providers and users, monitoring of progress on cost reduction/quality improvement activities, technical and social survey	PMO
Delivered renewable electricity in 2010 (TWh/yr) and installed renewable capacity in 2010 (GW)	35 7.0	45 8.9	60 11.9	Midterm and end of phase reviews	Baseline established by analysis based on reference year of 2005. Subsequent years, analysis of new build renewable plant from reports from provinces	PMO
Annual reduced carbon emissions, (million tonnes); NO_x, SO_x and TSP (thousand tonnes)	15 (Carbon) 111 (NO_x) 554 (SO_x) 15 (TSP)	18 (Carbon) 136 (NO_x) 675 (SO_x) 18 (TSP)	23 (Carbon) 171 (NO_x) 852 (SO_x) 23 (TSP)	Midterm and end of phase reviews	Baseline established by analysis based on reference year of 2005. Subsequent years, analysis of new build renewable plant from reports from provinces	
Results Indicators for Each Component						
Component One						
Issuing of regulations to implement the law at national level by 2009	None		100%	Six monthly progress reports for supervision	Discussions with national authorities	PMO
Issuing of regulations for implementation of REL and their effective implementation in pilot provinces (Fujian, Inner Mongolia, Jiangsu, and Zhejiang) by 2009	None	Partial	Full	Six monthly progress reports for supervision	Discussions with provincial authorities	PMO

Issuing of national standards for wind turbines, availability of testing facilities and certification by 2009	Partial	Partial	Full	Six monthly progress reports for supervision	Discussions with national, testing and certification authorities, consultant progress reports	PMO
Companies participating in cost-shared technology and services development activities (with emphasis on biomass and wind) by 2008	0	10	15	Participant reports, aggregated into six monthly progress reports for supervision	Companies' progress reports, discussion with participants	PMO, companies
Pipeline of renewable energy projects under development in the provinces by 2008 (MW capacity in pipeline)	0	150	400	Participant reports, aggregated into six monthly progress reports for supervision	Companies' progress reports, discussion with participants	PMO, companies
Component Two :						
100MW wind farm at Changjiang'ao, Pingtan Island, Fujian selling 260 GWh/year into local grid by 2008	0	0	100MW 260 GWh	Six monthly progress reports for supervision	Company progress reports	Long Yuan/special purpose company
25MW straw-fired biomass power plant at Mabei Village, Rudong County, Jiangsu selling 162 GWh/year into local grid	0	0	25MW 162 GWh	Six monthly progress reports for supervision	Company progress reports	Guo Xin/NED

Additional Annex 3A: Results Framework and Monitoring for Additional Projects Appraised

CHINA Renewable Energy Scale-up Program

Table A3A.1: Results Framework for Additional Appraised Projects

Intermediate Results One per Component	Results Indicators for Each Component	Use of Results Monitoring
Additional Potential Investments under Component Two: Capacity to develop, finance, construct and operate renewables expanded	100MW wind farm at Huitengxile, Desheng County, Inner Mongolia selling 245 GWh/year into local grid by 2008 About 83 MW of capacity of small hydro in Zhejiang built or rehabilitated, selling an incremental 268 GWh/year into local grid by 2008	Performance of physical investments will indicate need, if any, for additional support to market participants to improve their capacity for scale-up.

Table A3A.2: Arrangements for Results Monitoring for Additional Appraised Projects

Outcome Indicators (Phase 1)	Baseline	Midterm	Phase end	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Additional Potential Investments under Component Two:						
100MW wind farm at Huitengxile, Desheng County, Inner Mongolia selling 245 GWh/year into local grid by 2008	0	0	100MW 245 GWh	Six monthly progress reports for supervision	Company progress reports	NLYWPC
83MW of capacity of small hydro in Zhejiang built or rehabilitated, selling an incremental 268 GWh/year into local grid	0	0	83MW 268GWh	Participant company reports, aggregated into six monthly progress reports for supervision	Managing agency reports for supervision	ZHPMDC

Annex 4: Detailed Project Description

CHINA Renewable Energy Scale-up Program

The project consists of two components, each of which is described in more detail below.

Institutional Strengthening and Capacity Building Component

The Institutional Strengthening and Capacity Building Component is to be a single national program, implemented through the CRESP PMO. The Institutional Development and Capacity Building Component supports at the national level (a) introducing the REL and associated regulations at national level; (b) reducing cost and improving quality of renewable energy equipment and services, particularly for wind and biomass; and (c) long-term capacity building for development of wind technology. In the pilot provinces it supports (a) developing province-level regulations and other implementation tasks; (b) helping the pilot provinces meet the requirements of REL, including by undertaking resource assessments, pilot demonstration projects and capacity building. With the investment project sponsors, it supports investment scale-up. It also provides resources for the management of the program, through the PMO.

GEF financing will be US$40.22 million. Where companies participate in the project, they will contribute through cost-sharing, a proven means of technology transfer in China that has found successful application in the REDP. Cost-shared amounts are difficult to estimate because of the decentralized nature of the individual projects that have not yet been proposed. Based on experience in the REDP, GEF: company cost-sharing ratio is 1:3. Applying this metric to CRESP would result in counterpart funding of US$48.6 million. Indirect effects, for example subsequent investment in production facilities, have not been counted.

National Level Institutional Strengthening and Capacity Building: US$20.82 million GEF, US$33 million counterpart funds

National level institutional strengthening and capacity building consists of six subcomponents as follows:

- MMP research (US$1 million GEF). Studies on further development of the MMP and its implementation will include (a) distributing national targets between provinces; (b) setting the tariff level for renewables; (c) transforming the policy from price-based to quantity-based (based on early versions of the law the price-based mechanism has been chosen at least as an interim measure); (d) sharing incremental costs between provinces; (e) developing trading schemes to minimize MMP cost; (f) linking the MMP to carbon trading mechanisms; and (g) preparing a medium- to long-term plan for renewable energy development. Financing will support consultants to undertake the studies;
- Support to MMP implementation (US$1.25 million GEF). Studies, capacity building and training to support implementation of the REL will include (a) preparation of regulations that outline detailed implementation mechanisms; and (b) capacity building and training for implementing agencies, regulators, and others affected by the law. Financing will support consultants and training activities to implement this subcomponent
- Technology improvement for wind (US$16.17 million GEF, expected counterpart funds US$27 million). There will be four activities under this subcomponent as follows:

(a) Technology development by selected manufacturers. This activity will provide grants to companies to share the costs of projects to accelerate the transfer of variable speed; pitch controlled and related wind technology to China using licensing, joint ventures, technology development using international consultants or other means. Grants will be provided to share up to 50 percent of the cost of projects. Beneficiaries will be selected competitively based on proposals submitted by manufacturers that will be encouraged to collaborate with design institutes or other sources of know-how. Beneficiaries will be selected competitively based on proposals that will be evaluated and ranked by disinterested national and international experts. Selection will be guided by the market-driven and results-oriented nature of the proposals, and their ability to yield results in the Chinese market within five years;

(b) Standard setting. Current Chinese standards for wind turbines are limited in scope and requirements and are not equivalent to international standards set by the International Standards Organization (ISO) or the International Electrotechnical Commission (IEC). This activity will support the development and adoption of standards by Standardization Administration of China. Financing will be provided for consultant support and the formation of an technical standards committee;

(c) Wind testing center. The project will provide assistance to a testing organization selected by the government to establish a wind testing facility through capacity building of staff, support to develop procedures and to become accredited as a test center by an internationally recognized standards body such as ISO (ISO 25) or IEC (IEC 17025). Financing will be provided for consultant support, training and the purchase of testing equipment;

(d) Certification. A certification body will be supported through capacity building, training and consultant support with a "twinning" agency to bring it up to the standards that will permit it to certify wind turbine design and performance. Consultant support will also be provided to China National Certification Accreditation Administration (CNCA) to assist it in deciding whether to opt for mandatory or voluntary certification of turbines in China;

(e) Establishment of a National Wind Resource Assessment Center. The project will support development of resource assessment methodologies, national wind resource assessment standards, and a national wind resource database. It will also support overlay of wind mapping with geographic information system (GIS) data to convert resource measurements to identifiable projects. It will also facilitate knowledge transfer and best practices on the international status of wind resource assessment, and support the pilot provinces in planning and implementing wind resource assessment activities. A focal point for the Center will be identified during project start-up;

(f) Long-term capacity building. Efforts to increase the supply of skilled and knowledgeable designers, engineers, manufacturing specialists and wind farm developers and operators will be supported. Two universities will be supported to set up master's level and renewable energy engineering courses, primarily focused on wind and biomass. Universities will be selected based on their track record and reputation for quality, the relevance of the courses they propose, the courses' ability to meet market needs and cost-sharing. There will also be a fellowship program to allow more senior engineers to study abroad at existing centers of excellence;

(g) Studies on interconnection to the grid and turbine micrositing. The project will support studies on connection of wind farms to the grid and their impacts on grid stability. It will raise awareness of power grid operators and wind developers of interconnection requirements and transfer international best practice and knowledge. It will conduct studies on the impact of wind farms on grid stability in one province. Training on turbine micrositing, which has for some time been a weak point in wind farm design, will be provided to complement existing activities.

- Technology improvement for biomass (US$2.4 million GEF, expected counterpart funds US$6 million). This subcomponent will provide grants to companies to share the cost of projects to improve the quality and reduce the cost of biomass technologies, particularly those related to boilers and equipment handling. Grants will be provided to share up to 50 percent of the cost of projects. Beneficiaries will be selected competitively based on proposals that will be evaluated and ranked by independent national and international experts. Selection will be guided by the ability of the proposals to yield results in the Chinese market within five years. Supporting studies will also be undertaken in this area;

Province-level Technical Assistance (US$10.60 million GEF, expected counterpart funds US$9.0 million)

The province-level institutional strengthening and capacity building consists of five subcomponents as set out below. It will take place in the pilot provinces (Fujian, Inner Mongolia, Jiangsu, and Zhejiang).

- MMP implementation (US$2.4 million GEF). Although REL will be passed at national level, implementation will be delegated to the participating pilot provinces. Provinces will be supported to prepare provincial renewable energy development strategies, plans and financial incentive policies; testing renewable energy promotion models and creating awareness among stakeholders. This subcomponent will finance consulting services and training for provincial counterparts and renewable energy market participants;
- Resource assessments (US$4.2 million GEF). The purpose of this subcomponent is to provide detailed information to the public on the renewable energy resources in each of the provinces. For each province, a cost-resource curve for the main renewable resources, and a database with resource information will be prepared and published. Measurement standards will also be prepared, to permit like-for-like comparisons. In Fujian, high-resolution wind resource measurements and wind farm siting data will be prepared. In Inner Mongolia, assessments on the wind, solar energy, biomass and municipal solid waste resource and wind farm siting in 12 counties will be undertaken and published. In Jiangsu, wind and biomass resources will be assessed and published. In Zhejiang, small hydro resources capable of producing electricity below 3,000 hours/year will be evaluated (above 3,000 hours/year is already known). Areas of biomass concentration and wind resource will also be assessed.
- Cost-shared support for scaling up renewable energy (US$3 million GEF, expected counterpart funds US$9 million). This subcomponent will help provinces carry out studies and pilot or demonstration projects in renewable energy technologies other than the one in which the investment subproject will take place. Grants will be provided for cost-shared activities, awarded on a competitive basis across the four pilot provinces. Fujian will carry out studies to identify pilot tidal and geothermal projects. Inner Mongolia will prepare biomass projects and study the potential for grid connected PV. Jiangsu will demonstrate

building-integrated PV systems and strengthen its existing renewable energy development center. Zhejiang will develop standards for integrating solar water heaters into buildings and prepare biogas projects. This component will also support preparation for a pilot offshore wind farm expected to be implemented during phase 2.

- Capacity building for market participants (US$1 million GEF). Capacity building for market participants not directly involved in projects in the pilot provinces will be carried out under this component. It will include training for developers, banks, and technology and service providers covering the project cycle. Financing will also be provided under this subcomponent for studies on improvements to procedures for project approval, and integration of renewable energy into electricity grids and identifying and removing bottlenecks in renewable project development.

Supporting Investment Scale-up (US$2.2 million GEF, expected counterpart funds US$6.6 million)

Based on the lessons of previous renewable energy projects, this subcomponent aims to make resources available to build a strong pipeline of bankable renewable energy projects. The companies implementing the investment projects will be provided resources to carry out feasibility studies, resource assessments and other preinvestment activities on a cost-shared basis. Training and capacity building, and access to international experience and best practice will also be eligible activities.

Funds for Inner Mongolia and Zhejiang will be retained as unallocated pending finalization of the investment subcomponents in those two provinces. In Zhejiang, the Zhejiang Hydro Power Development Management Center (ZHPDMC) will implement this subcomponent in coordination with the small hydropower companies. In Inner Mongolia, no GEF funds will flow to the Huitengxile wind farm subproject described below to avoid risk of commingling GEF and PCF funds;

Program Management (US$3.38 million GEF)

Program management will include day-to-day procurement, financial and contract management for all tasks carried out under the TA program. It will include representation of the PMO in the pilot provinces. Additional tasks expected to be carried out by the PMO at least initially include coordination with other GoC renewable energy initiatives, monitoring and evaluation of the impact of REL and CRESP, preparation of annual reports and plans on behalf of NDRC, providing liaison between the Institutional Development and Capacity Building Component and other stakeholders, including the World Bank, and preparation of phase 2 of CRESP. Also included under this component are national-level studies, to be initiated by the PMO, to address further policy development issues as they arise including, for example, development of a long-term biomass strategy.

Unallocated (US$3.22 million GEF)

An unallocated amount of US$3.22 million is retained. Three million dollars of the funds are earmarked for the companies undertaking Bank-financed investment subprojects in Inner Mongolia and Zhejiang. The balance will be put toward activities where the budget proves inadequate or in response to unforeseen requirements.

Support for Wind and Biomass in Pilot Provinces Component

The support for Wind and Biomass in Pilot Provinces Component consists of two independent subcomponents, implemented through separate agencies—the project sponsors. They are: (a) in Fujian, a 100MW wind farm at Changjiang'ao, Pingtan Island; and (b) in Jiangsu, a 25MW straw-fired biomass power plant at Mabei Village, Rudong County.

Two additional potential projects have been appraised, but have not yet secured the necessary domestic clearances. They are: (a) in Inner Mongolia, a 100MW wind farm at Huitengxile, Wulanchabu County; and (b) in Zhejiang, a framework to enable the Bank the Bank to finance rehabilitation and construction of new small hydro plants. At appraisal this consisted of rehabilitation of sixteen small hydro plants to increase their aggregate capacity from 35 to 51 MW and construction of thirty new hydropower plants, totaling 67MW of capacity.

Pingtan Wind Farm, Fujian.

Estimated cost US$103.92 million, of which US$67.00 million is to be financed by the Bank.

The Pingtan Wind Farm is being developed by the China Long Yuan Electric Power Group Corporation (Long Yuan), which is a subsidiary of China Guodian Corporation, one of the five generation companies that were formed on the break-up of State Power Corporation of China. The sponsor, Long Yuan, was selected to develop the wind farm under a bidding procedure managed by Fujian provincial government based on supply price, which has been agreed at 47.8 fen/kWh.

The wind farm is situated at Changjiang'ao, on the northeastern end of Pingtan Island, some 100 km south east of Fuzhou, the capital of Fujian Province, which is on the eastern side of the Taiwan Strait. The latitude and longitude of the project site is 25°31' north and 119°47' east. Long-term data indicate that typical year annual mean wind speed at the site is 7.8 meters/second (m/s) at 65 m above ground level (agl). The proposed site is near sea level. Annual average temperature is 19.5°C. The climate is generally humid and salty. The site is in a coastal plain formed between two chains of mountains, one to the northwest and one to the southeast. The area is used as farmland, interspersed with low trees, and consists of light sandy soil. The trees are planted as wind breaks and help stabilize the soil against erosion and are specially selected non-native species. An identified archaeological site falls within the perimeter of the wind farm, but will not be disturbed by construction work. The site does not contain human habitation, but there are several villages on its perimeter. There is an existing 6 MW wind farm on the same site that has been operating for about four years, which is owned by Long Yuan (60 percent) and Pingtan County Electric Power Company (40 percent).

The project consists of the installation of turbines with an aggregate capacity of 100 MW, associated civil and electrical works, extension to an existing control room, a switchyard, and a 15 km, 110 kV transmission line from the wind farm to Beicuo. The power of the individual turbines will be in the range 1.5–2MW, but their number and the precise layout of the wind farm will depend on the product offered by the winning bidder. Based on feasibility study calculations using 67, 1.5MW machines (considered to be the most likely configuration), permanent land acquisition including land for turbines, roads and substations, will total 31.6 hectares within an area of approximately 14 km^2. The wind farm, when fully operational, is expected to produce 260 GWh of electricity per year.

Long Yuan has established a project preparation office, registered with Fujian Economic and Trade Commission (ETC), and expects ultimately to establish a special purpose company (with other investors) to own and operate the wind farm, preparation and initial project implementation will be the responsibility of Long Yuan itself. Long Yuan is in the process of establishing a new company (Long Yuan Pingtan Wind Power Company Ltd—LYPWP), which it expects to have completed by April 30, 2005. The special purpose company will be 60 percent owned by Long Yuan, 30 percent by Shandong Luneng Group, and 5 percent each by Fujian Wind Power Company and Pingtan County Electric Power Company.

Rudong Biomass Power Plant, Jiangsu

Estimated cost US$36.08 million, of which US$20.00 million is to be financed by the Bank.

The Rudong biomass power plant is being developed by Jiangsu Guo Xin Investment Group Limited (Guo Xin), which is an investment company wholly owned by Jiangsu Province. Guo Xin was selected by Jiangsu provincial government to develop the project for a supply price estimated at 58 fen/kWh at the feasibility study stage. Guo Xin plans have established a special purpose company in which it holds 65 percent of the equity named Jiangsu Guo Xin New Energy Development Company (NED). The remaining 35 percent is owned by Rudong County. NED will own the plant and will be responsible for its preparation, implementation, operation and maintenance.

The project site is in Mabei Village, Matang Town, Rudong County, Nantong Municipality about 400 km east of Nanjing, the capital of Jiangsu. The straw power plant would occupy a site of about 100 mu, or 66,000 m^2, currently mainly paddy field owned by Mabei village and farmed by local inhabitants. The site adjoins the Mafeng River. There is a made road and a substation within 300 meters of the site perimeter. The area is predominantly agricultural with about 1.23 million tons of straw waste, mainly wheat and rice, arising each year within a radius of 25 km of the proposed project site. The power plant requires 176,000 tons of feedstock per year.

The project consists of installation of a 110t/h straw-fired boiler and a 25 MW steam turbine; and associated civil, mechanical and electrical works. When operational, the plant is expected to produce 162 GWh of electricity per year.

Additional Annex 4A: Project Descriptions for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

Two further potential subcomponents have been appraised and are expected to be brought forward for Bank financing when their domestic approvals have been secured.

Huitengxile Wind Farm, Inner Mongolia

Estimated cost US$100.58 million, of which US$67.00 million would be financed by the Bank.

The Huitengxile wind farm is being developed by the NLYWPC, which is a state-owned enterprise, 50 percent owned by Northern Union Power Company (NUPC), a holding company owning a number of power generation companies in Inner Mongolia, especially in Western Inner Mongolia. The other 50 percent is owned by Long Yuan, the same entity developing the Pingtan wind farm. The sponsor, a predecessor company whose operations have now been subsumed into NLYWPC, was selected by the government of Inner Mongolia Autonomous Region to develop the wind farm; supply price is based on competitive bidding for another wind farm at the same site and has been agreed at 38.2 fen/kWh.

Huitengxile is about 120 km east northeast of Huhhot, the capital of Inner Mongolia Autonomous Region. Its latitude and longitude are 41°09' north and 112°32' east. The area has space sufficient for an estimated 1,000MW, on which about 47 MW of wind has already been developed, by IMWPC with a further 26MW under construction and a further concession of 100MW under development. The long-term annual mean wind speed has been estimated at 8.4 m/s at 40 m above ground level. The site elevation is approximately 2100 m above sea level and consists of slightly rolling grassland, used for grazing. It is owned by the county through a stud farm.

The Huitengxile wind farm will consist of wind turbines, associated electrical and civil works including a substation, switchyard and control room; a 15 km, 110 kV transmission line to Desheng town; and upgrading of the existing 110 kV substation there. The power of the individual wind turbines will be in the range 0.75–1.5MW, but their number and precise layout of the wind farm will be determined at procurement and will depend on the product offered by the winning bidder. Based on feasibility study calculations using 67, 1.5MW machines (considered to be the most likely configuration), permanent land acquisition including land for turbines, roads and substations, will total 23.65 hectares within an area of about 11 km^2. The wind farm is expected to produce about 245 GWh of electricity per year.

NLYWPC plans to seek carbon financing for the wind farm and it is currently developing a proposal for consideration by the World Bank. The additionality of the project (for carbon financing purposes) is based on (a) the dominance of coal in Inner Mongolia where typical power prices are around 25 fen/kWh; and (b) the demonstrated requirement for additional financing perceived by the NLYWPC, which agreed the price contingent on NLYWPC being authorized by the government to seek carbon financing for the project.

For the Pingtan wind farm, the design and layout used internationally recognized standards for wind resource assessment and energy calculation. Variable-speed pitch regulated machines meeting international standards will be specified for their superior performance and output power

quality, which will help improve local system stability. Design specifications require wind turbines to meet local environmental conditions in particular cold weather requirements. Non-GEF funds will be used to support the bidding process and ensure best practices are employed in operation and maintenance.

Small Hydro Projects, Zhejiang

Estimated cost up to US$93.00 million, of which up to US$50.00 million would be financed by the Bank.

In Zhejiang, the Bank would finance rehabilitation and development of selected small hydropower units. Individual state or collectively owned projects of up to 10 MW would be selected based on an appraised framework covering technical, economic, financial, safeguards and procurement criteria. The subcomponent will provide subloans to individual companies carrying out rehabilitation or new construction of small hydro projects not exceeding 10MW with guarantees from county governments. The projects are drawn from the list Zhejiang maintains of rehabilitation and new build projects requiring financing. The preliminary list of projects was agreed with Zhejiang at appraisal, but final decision will depend on projects meeting the requirements set out in the appraised framework. Thus some projects may drop out and be replaced by others from the list maintained by Zhejiang.

The subcomponent falls into two parts: (a) rehabilitation of existing small hydro sites; and (b) development of new sites. Based on the appraised list of projects, the rehabilitation would consist of 16 projects with a total current capacity of 35MW, which would be increased by a further 16MW. Total costs would be US$22.14 million for which Bank financing of US$15.47 million would be sought. Thirty new build projects would have an aggregate capacity of 66MW with a total cost of US$70 million for which Bank financing of US$35.5 million would be sought. Zhejiang may request financing for either rehabilitation subprojects only, or both rehabilitation and new build depending on financing needs. Project design permits either a fixed number of projects to be determined beforehand or a ceiling level of Bank financing to be agreed and projects financed until all the Bank funds have been committed.

Investment requirements and therefore descriptions vary from project to project. In general the component will support new construction or rehabilitation of civil works including dams, diversion and control structures and headraces and tailraces, and supply and installation of mechanical and electrical works.

Zhejiang Hydropower Development Management Center (ZHPDMC) is an experienced designer of small hydro power plants and would undertake technical evaluation, with reputable independent Chinese experts, of all projects that have been proposed for financing. Technical viability of individual small hydro projects in Zhejiang has been reviewed and found adequate.

Table A4.1: Readiness

	Inner Mongolia	**Zhejiang**
Fiduciary arrangements in place • Financial management • Procurement	 • Yes • Yes	 • Yes • Yes
PMO/SP companies mobilized	Yes	Yes

Counterpart funds/ local financing in place	Yes	Yes
Bid documents for first year's procurement	Under preparation	Under preparation
Final draft PIP available	Yes	Yes
Disclosure requirements met (safeguards)	Yes	Yes
Land acquisition plan ready	Yes	Yes
Domestic approvals secured	Pending	Pending

Annex 5: Project Costs

CHINA Renewable Energy Scale-up Program

Table A5.1: Project Costs

Project Cost By Component and/or Activity	Local US$ million	Foreign US$ million	Total US$ million
Institutional Development and Capacity Building Component			
National level	46.60	7.22	53.82
Provincial level	12.00	7.60	19.60
Investment scale-up	6.60	2.20	8.80
Program management/national studies	2.66	0.72	3.38
Unallocated		3.22	3.22
Support for Wind and Biomass Component			
Pingtan wind farm	33.97	63.22	97.19
Rudong biomass power plant	12.20	21.14	33.34
Total Baseline Cost	114.03	105.32	219.35
Physical Contingencies	2.52	2.51	5.03
Price Contingencies	0.00	0.00	0.00
Total Project Costs[1]	116.55	107.83	224.38
Interest during construction	1.41	2.30	3.71
Front-end Fee	0.30	0.44	0.74
Total Financing Required	118.26	110.56	228.82

[1]Identifiable taxes and duties are US$0.525 million, and the total project cost, net of taxes, is US$440.175 million Therefore, the share of project cost net of taxes is 99.88 percent.

Additional Annex 5A: Project Costs for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

Table A5A.1: Project Costs for Additional Appraised Projects

Project Cost By Component and/or Activity	Local US$ million	Foreign US$ million	Total US$ million
Support for Wind and Biomass Component			
Huitengxile wind farm	27.42	66.18	93.60
Zhejiang small hydro plant	42.08	50.67	92.75
Total Baseline Cost	69.50	116.85	186.35
Physical Contingencies	2.16	0.21	2.37
Price Contingencies	2.00	0.20	2.20
Total Project Costs[1]	73.66	117.26	190.92
Interest during construction	0.56	1.46	2.02
Front-end Fee	0.06	0.59	0.65
Total Financing Required	74.28	119.30	193.58

Annex 6: Implementation Arrangements

CHINA Renewable Energy Scale-up Program

Overview

The NDRC, is the government agency responsible for overall project coordination, implementation supervision of the Institutional Development and Capacity Building Component, and approving the investment projects. A PMO under NDRC will be responsible for management of the Institutional Development and Capacity Building Component, and has been operating since the start of project preparation. Project companies, as described below, will be responsible for implementation of the Support for Wind, Biomass and Small Hydro in Pilot Provinces Component.

A project steering committee made up of various ministries involved in renewable energy development will provide overall policy guidance and facilitate coordination among different agencies on project implementation. This committee will be chaired by NDRC and will include representatives from the Environment and Resources Committee of the National People's Congress, the Office of Legislative Affairs of the State Council, the MOF, the People's Bank of China, the Ministry of Science and Technology (MOST), the Ministry of Water Resources (MOWR), the Ministry of Agriculture (MOA), the State Forestry Administration (SFA), the State Environmental Protection Agency (SEPA), the State Electricity Regulatory Commission (SERC), the State Grid Corporation and South Grid Corporation (South Grid), and the China Academy of Science (CAS).

The organizational structure for implementation is given at the end of this annex, and detailed institutional arrangements are described below.

Institutional Development and Capacity Building Component

The PMO, under the Energy Bureau of NDRC, is responsible for implementation of the Institutional Development and Capacity Building component at both national and provincial levels. For the first 18 months of implementation, a work program has been agreed between the Bank and NDRC. For subsequent years, an annual work program will be prepared by the PMO. In implementing the work program, the PMO will be responsible for selection of consultants, including preparation of terms of reference (TOR), advertising, shortlisting, issuing requests for proposals, evaluation of proposals, negotiating with selected consultants and contracting with those who have been selected. The PMO will also be responsible for maintenance of accounting and management information systems, progress reporting to both GoC and the Bank, conducting outreach and liaison and monitoring and evaluation.

Consultants will be hired to provide advice and implement activities in the following areas:

- Research and support for implementation of MMP at national and provincial levels including the development of regulations and decrees;
- Preparation of standards, and advice on certification;
- Evaluation of cost-shared activities;
- Undertaking resource assessments in the pilot provinces;

- Capacity building and training activities;

Stakeholder companies will participate in cost-shared activities following evaluation and appraisal of their requests for funding support in the areas of:

- Wind and biomass technology improvement;
- Establishment of a testing center for wind;
- Long-term capacity building (with universities);
- Pilot or demonstration activities;
- Investment scale-up (the companies sponsoring the investment sub projects described below).

The PMO will be responsible for carrying out donor coordination through: (a) active collection and dissemination of renewable energy activities in China; (b) identification of important and relevant renewable energy areas that are receiving insufficient attention and support; and (c) organization of regular GoC Partnership meetings between donors supporting renewable energy and the GoC and nongovernment agencies involved in renewable energy.

Support for Wind and Biomass Component

Pingtan Wind Farm, Fujian. The sponsor of the Pingtan wind farm in Fujian is China Long Yuan Electric Power Group Corporation (Long Yuan). A special purpose company, to be established, will design, procure, supervise construction, own and operate the wind farm. Until the special purpose company is formed, Long Yuan and its established project preparation office will be responsible for implementation. When the special purpose company is formed, it will assume responsibility for implementation and the onlending and project implementation agreements will be amended.

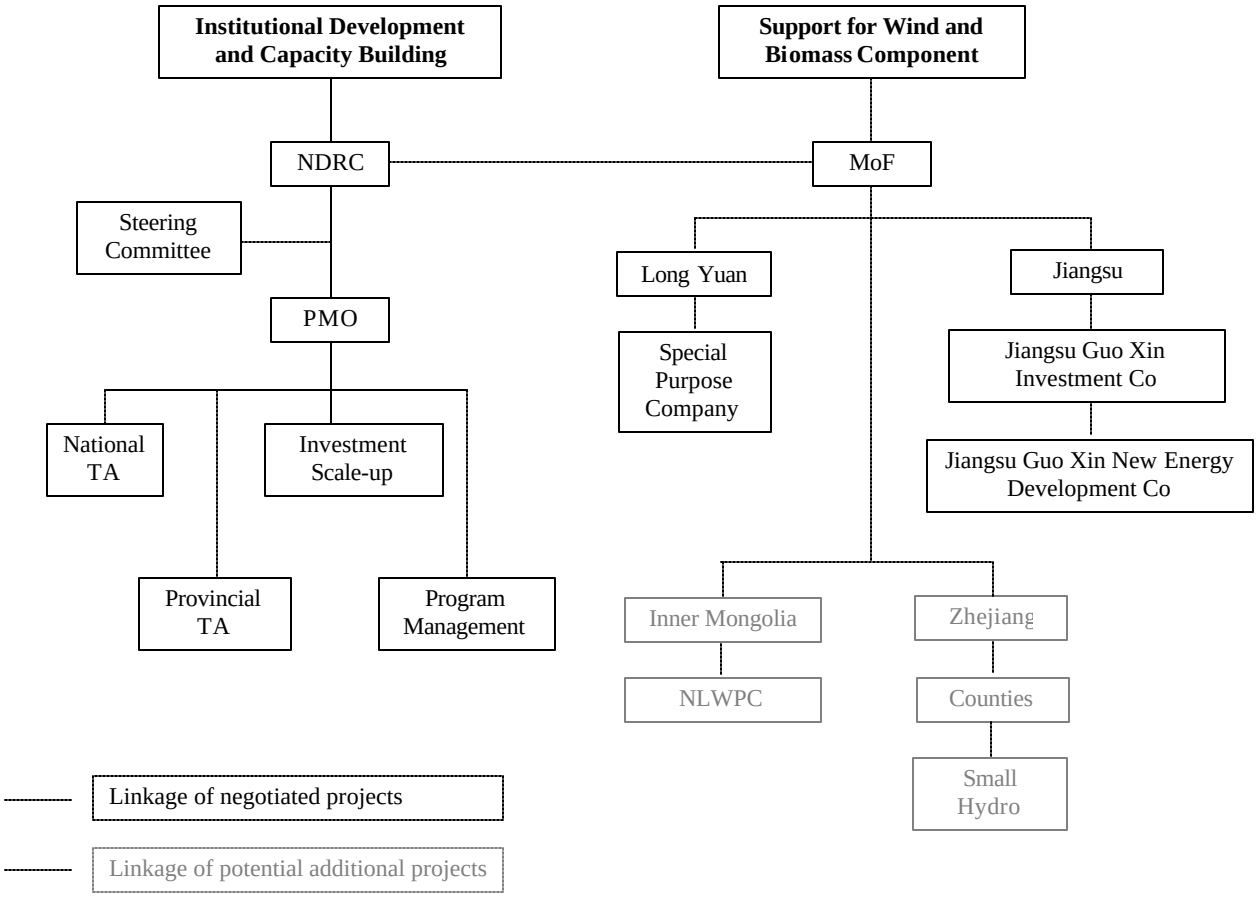
Contractors will undertake ancillary civil and electrical works and a wind turbine supplier will, under single responsibility, supply and install the turbines and control systems and provide design details for towers, foundations and specialized aspects of the electrical system. Additional specialist consultants will be hired, as required, to provide TA in procurement (including bid assessment), construction management (as the owner's engineer or for quality purposes) and wind farm operations. Until the special purpose company is established, preparation and initial project implementation will be the responsibility of Long Yuan itself. As soon as the feasibility study is approved by the Chinese authorities, Long Yuan will establish the special purpose company, and will become the majority shareholder with local investors from Fujian Province minority shareholders.

Rudong Biomass Power Plant, Jiangsu. The Rudong power plant is sponsored by NED. NED will design, procure, supervise construction, own and operate the power plant. It will also enter into contracts with specialist straw brokers to supply of fuel.

Contractors will undertake ancillary civil and electrical works and specialist plant suppliers will, under separate responsibility, supply and install the boiler island, steam turbine island, instrumentation and control island and mechanical handling equipment. The works will be supervised by a qualified engineering consultant to be hired under a separate contract. Additional

specialist consultants will be hired, as required, to provide TA in procurement (including bid assessment), construction management (as the owner's engineer or for quality purposes) and plant operations.

Organization of implementation is shown schematically in the diagram below.



Additional Annex 6A: Implementation Arrangements for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

Huitengxile Wind Farm, Inner Mongolia. The Huitengxile wind farm is being developed by NLYWPC, which is a province-owned enterprise - 50 percent owned by the NUPC and 50 percent by Long Yuan (the company responsible for developing the Pingtan wind farm described in Annex 6). Contractors would undertake ancillary civil and electrical works and a wind turbine supplier will supply and install the turbines, control systems and towers and provide design details for foundations and specialized aspects of the electrical system. Additional specialist consultants would be hired (and financed by non-GEF funds) to provide TA in procurement (including bid assessment), construction management (as the owner's engineer or for quality purposes) and wind farm operations and maintenance.

Small Hydro Projects, Zhejiang. Rehabilitation projects are mainly within state or collectively owned county-level companies. New build projects are mostly sponsored by private companies. Management of the component will be under the supervision of a project leading group composed of members of Zhejiang provincial government, including the provincial People's Representative Committee, the Legislation Office, Finance Bureau, Economic and Trade Commission, Bureau of Construction, Water Resources Bureau, Agriculture Bureau, Environment Protection Agency and the Power Corporation.

Individual subprojects will undergo due diligence by the provincial government, which has appointed Zhejiang Hydropower Management Development Center (ZHPMDC) to act for it. Criteria for technical (including safety), economic, financial, environment, resettlement and procurement aspects of the due diligence have been agreed between the Bank and Zhejiang government at appraisal and set out in the Project Implementation Plan (PIP). Due diligence of individual projects will be managed by ZHPMDC and expert consultants as required. The findings of the due diligence will be recorded and reported to Zhejiang government's leading group and the Bank. On completion of due diligence, each project owner will sign a subloan agreement with Zhejiang Province.

Individual subprojects will be managed by the owners, with construction being undertaken by civil works contractors and supply and installation of electrical and mechanical equipment by specialized contractors.

Annex 7: Financial Management and Disbursement Arrangements

CHINA Renewable Energy Scale-up Program

Summary of Financial Management Assessment

The Financial Management Specialist (FMS) has conducted an assessment of the adequacy of the project financial management system of the CRESP, including both TA and the investment projects within the Support for Wind and Biomass in Pilot Provinces Component. The assessment, based on guidelines issued by the Financial Management Sector Board on October 15, 2003, has concluded that the project meets minimum Bank financial management requirements, as stipulated in BP/OP 10.02. In the opinion of the FMS, the project will have in place an adequate project financial management system that can provide, with reasonable assurance, accurate and timely information on the status of the project in the reporting format agreed with the project and as required by the Bank.

Risk assessment for the financial management arrangements were assessed as low to moderate in Fujian, and Jiangsu. The PMO was determined to be low risk because it was considered that the standards required by the Bank were being met and considered appropriate. A summary of the risk assessment for each of the project entities is given in Table A7.5.

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

Financial management assessments for all the implementing agencies are held on the project file.

Audit Arrangement

In line with other Bank financed projects in China, the project will be audited in accordance with International Auditing Standards and Government Auditing Standards of the People's Republic of China. For the investment subprojects the Provincial Audit Offices have been identified as auditors for the projects in their respective provinces. Annual audit reports will be issued in the name of the Provincial Audit Office and subject to reviews by China National Audit Office (CNAO). The Bank currently accepts audit reports issued by CNAO or its provincial/regional audit bureaus/offices for which CNAO is ultimately responsible. The annual audit requirements for the investment subprojects are summarized below.

Table A7.1: Annual Audit Requirements for the Investment Subprojects

Component	Submitted by	Due date	Auditor
Pingtan wind farm: Project and Entity Financial Statements	SPC	June 30	Fujian Provincial Audit Office
Rudong biomass power plant: Project and Entity Financial Statements	NED	June 30	Jiangsu Provincial Audit Office

The Foreign Funds Application Audit Department of the China National Audit Office (CNAO) has been identified as the auditors for the GEF grant. The annual audit report on the financial statements of the GEF grant will be due at the Bank within six months of the end of each calendar year, with a separate opinion on Statement of Expenditures and Special Account.

Funds Flow and Disbursement Arrangements

The Bank loan will be signed between the Bank and the People's Republic of China through its MOF, and onlending arrangements for the Bank loans will be signed for the investment projects as follows: (a) in Fujian with Long Yuan and then between Long Yuan and the special purpose company to be established, which will implement the project, with a guarantee from Guodian, Long Yuan's parent; (b) in Jiangsu with Jiangsu Provincial Finance Bureau (JPFB) and then between JPFB and Jiangsu Guo Xin Investment Group and then between Jiangsu Guo Xin Investment Group and NED (Guo Xin), which will implement the project, with a guarantee from Guo Xin Investment Group; and GEF grant will flow from the World Bank to the special account established and managed by MOF and then to the CRESP PMO. Counterpart funds will be loans from local commercial banks and equity funds from investors.

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

The Bank loan proceeds will flow from the Bank (a) for Pingtan wind farm, via special commitments and direct disbursement to contractors; and (b) for Rudong biomass power plant from MOF to the special account managed by Jiangsu Provincial Finance Bureau on behalf of NED and thence to contractors.

The GEF grant proceeds will flow from the Bank to a special account managed by MOF on behalf of the PMO. Disbursements will be made from the special account to contractors.

Authorized allocations for special accounts are given below:

Table A7.2: Authorized Allocations for Special Accounts

	PMO (IDCB component)	Jiangsu
Authorized Allocation	US$3 million	US$2 million
Initial Deposit	US$2 million	US$1.5 million
Trigger	US$15 million	US$7 million

Disbursement Schedule

The disbursement schedule for the Bank loan and GEF grant in millions of U.S. dollars is given below:

Table A7.3: Disbursement Schedule for Bank Loans and GEF Grants
(millions of U.S. dollars)

	2006	2007	2008	2009	2010
Loan					
Annual	26.60	53.40	6.00	1.00	
Cumulative	26.60	80.00	86.00	87.00	
Grant					
Annual	2.81	12.39	17.54	5.24	2.24
Cumulative	2.81	15.20	32.74	37.98	40.22

Disbursement by category for the loan and grant proceeds and percentage to be financed is given below:

Table A7.4: Disbursements for Loan and Grant Proceeds and Percentage to Be Financed

Expenditure Category	Amount in US$ million	Financing percentage
Loan		
Goods	85.87	100% of foreign expenditures, 100% of local expenditures (ex factory cost) and 75% of expenditure on other items procured locally
Consultant services	0.70	100%
Fee	0.44	100%
Grant		
Goods	2.39	100% of foreign expenditures, 100% of local expenditures (ex factory cost) and 75% of expenditure on other items procured locally
Consultant services	20.38	100%
Subgrants	13.59	Up to 50% of proposed activity
PMO operating expenses	0.64	100%
Unallocated[1]	3.22	

Use of Statements of Expenditure

Loan withdrawals will be made on the basis of statements of expenditure for subloans, goods costing less than US$100,000 equivalent per contract, services provided by consulting firms costing less than US$50,000 equivalent per contract, and services provided by individual consultants costing less than US$20,000 equivalent per contract. These documents will be made available for the required audits, as well as to the Bank supervision missions upon request. All other expenditures above the SOE thresholds will be submitted on the basis of full documentation.

Grant withdrawals will be made on the basis of statements of expenditure for subgrants, goods costing less then US$10,000 equivalent per contract, services provided by consulting firms costing less than US$100,000 equivalent per contract, and services provided by individual consultants costing less than US$50,000 equivalent per contract. These documents will be made available for the required audits, as well as to the Bank supervision missions upon request. All other expenditures above the SOE thresholds will be submitted on the basis of full documentation.

SOE documentation will be retained by the respective implementing agencies for the Support for Wind and Biomass Pilot Provinces Component and the PMO for the Institutional Development and Capacity Building component.

Conditions of disbursement

The following will be conditions of disbursement:

- In Fujian, for Pingtan wind farm, establishment of the special purpose company and hiring of adequate and qualified financial accounting staff;
- In Jiangsu, for Rudong biomass power plant, adequate and qualified financial and accounting staff hired at NED;
- For Fujian and Jiangsu, financial management manuals should be prepared and issued by the entity responsible for managing and implementing their respective project components.

Table A7.5: Summary Risk Assessment

Risk	Pingtan Wind Farm, Fujian	Rudong Biomass Power, Jiangsu
I. Inherent Project Risk	Moderate. It is the first time for Long Yuan to manage and for the proposed SPC to execute a project financed by the World Bank. All the financial staff assigned have no prior Bank experience. The task team will closely monitor the project from the initial stage and a well-designed and focused training program will be facilitated to help the financial staff with the assignment.	Moderate. It is the first time for Guo Xin to manage and for the proposed SPC to execute a project financed by the World Bank. All the financial staff to be assigned would have no prior Bank experience. The task team will closely monitor the project from the initial stage and a well-designed and focused training program will be facilitated to help the financial staff with the assignment.
II.Control Risk		
a. Implementing Entity	Moderate. Close monitoring by task team is needed to ensure the implementing entity is familiar with Bank procedures and requirements.	Moderate. Close monitoring by task team is needed to ensure the implementing entity is familiar with Bank procedures and requirements.
b. Funds Flow	Moderate. The funds will flow directly to the SPC fromthe Bank. This funds flow arrangement is considered more efficient and effective compared with funds flowing through each level's finance bureau.	Moderate. The funds will flow from the Bank to Jiangsu Finance bureau and then to NED. This funds flow arrangement is considered more time consuming and close monitoring is needed to ensure there are no significant delays.
c. Staffing	Moderate. Since all the financial staff have no prior Bank experience, a training program will be facilitated at the initial stage and close monitoring and supervision will be performed by the task team throughout the implementation process.	Moderate. Since all the financial staff have no prior Bank experience, a training program will be facilitated at the initial stage and close monitoring and supervision will be performed by the task team throughout the implementation process.
d. Accounting Policies and Procedures	Low. Accounting policies and procedures are already in place.	Low. Accounting policies and procedures are already in place.
e. Internal Audit	Moderate. Although an internal audit department exists at Long Yuan, we will not be relying on their work. Supervision visits by the task team along with annual audits performed by the external auditors, Fujian Provincial Audit Office, will be utilized.	Moderate. Although an internal audit department exists at Guo Xin, we will not be relying on their work. Supervision visits by the task team along with annual audits by the external auditors, Jiangsu Provincial Audit Office, will be utilized.
f. External Audit	Low. The external auditors, Fujian Provincial Audit Office, have extensive audit experience with previous Bank-financed projects.	Low. The external auditors, Jiangsu Provincial Audit Office, have extensive audit experience with previous Bank-financed projects.
g. Reporting and Monitoring	Low. Format of financial statements and frequency of submission have been clearly defined by the Bank and MOF.	Low. Format of financial statements and frequency of submission have been clearly defined by the Bank and MOF.
h. Information Systems	Moderate. The computerized financial management system "Yuan Guang" will be utilized by the SPC. The task team will closely monitor the processing of its accounting work in the initial stage and subsequent regular supervision missions	Low. The computerized financial management system "Run Jia" is utilized by Guo Xin, but it has not been decided whether NED also use it. The task team will closely monitor the processing of its accounting work in the initial stage and subsequent regular supervision missions.

Additional Annex 7A: Financial Management and Disbursement Arrangements for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

Summary of Financial Management Assessment

The FMS has conducted an assessment of the adequacy of the project financial management system of the CRESP, including both TA and the investment projects within the Support for Wind and Biomass in Pilot Provinces Component. The assessment, based on guidelines issued by the Financial Management Sector Board on October 15, 2003, has concluded that the project meets minimum Bank financial management requirements, as stipulated in BP/OP 10.02. In the opinion of the FMS, the project will have in place an adequate project financial management system that can provide, with reasonable assurance, accurate and timely information on the status of the project in the reporting format agreed with the project and as required by the Bank.

The financial management assessment for the Huitengxile wind farm and the Zhejiang small hydro projects assessed the financial management arrangements as low to moderate in Inner Mongolia and moderate to high in Zhejiang.

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

Financial management assessments for both the implementing agencies are held on the project file.

Audit Arrangement

In line with other Bank financed projects in China, the project would be audited in accordance with International Auditing Standards and Government Auditing Standards of the People's Republic of China. For the investment subprojects the Provincial Audit Offices have been identified as auditors for the projects in their respective provinces. Annual audit reports will be issued in the name of the Provincial Audit Office and subject to reviews by China National Audit Office (CNAO). The Bank currently accepts audit reports issued by CNAO or its provincial/regional audit bureaus/offices for which CNAO is ultimately responsible. The annual audit requirements for the investment subprojects are summarized below.

Table A7A.1: Annual Audit Requirements for the Investment Subprojects

Component	Submitted by	Due date	Auditor
Huitengzile wind farm: Project and Entity Financial Statements	NLYWPC	June 30	Inner Mongolia Autonomous Region Audit Office
Zhejiang Small Hydro: Project and Entity Financial Statements	ZHPDMC	June 30	Zhejiang Provincial Audit Office

The Foreign Funds Application Audit Department of the China National Audit Office (CNAO) has been identified as the auditors for the GEF grant. The annual audit report on the financial

statements of the GEF grant will be due at the Bank within six months of the end of each calendar year, with a separate opinion on Statement of Expenditures and Special Account.

Funds Flow and Disbursement Arrangements

The Bank loan would be signed between the Bank and the People's Republic of China through its MOF, and onlending arrangements for the Bank loans will be signed for the investment projects as follows: (a) in Inner Mongolia with Inner Mongolia Finance Bureau (IMFB) and then between the IMFB and NLYWPC with a guarantee from the NUPC; and (b) in Zhejiang with the Zhejiang Finance Bureau (ZFB), between the ZFB and county finance bureaus and from county finance bureaus to the project companies.

The project would disburse based on traditional techniques and will not be using FMR-based disbursements, in accordance with the agreement between the Bank and MOF.

Bank loan proceeds would flow from the Bank (a) for the Huitengxile wind farm, via special commitments and direct disbursement to contractor; and (b) for Zhejiang hydro projects from MOF to the special account managed by the ZFB and thence to reimburse project implementing companies.

Authorized allocation that would apply for the special account for Zhejiang is given below:

Table A7A.2: Authorized Allocation for the Special Account for Zhejiang

	Zhejiang
Authorized Allocation	US$4 million
Initial Deposit	US$3 million
Trigger	US$20 million

Disbursement Schedule

For the additional investment projects in Inner Mongolia and Zhejiang, the following disbursement schedule would apply:

Table A7A.3: Disbursement Schedule for Additional Investment Projects in Inner Mongolia and Zhejiang

	2006	2007	2008	2009	2010
Annual		50.82	56.09	9.49	0.6
Cumulative		50.82	106.91	116.40	117.00

Disbursement by category for the potential investment projects would be as follows:

Table A7A.4: Disbursement for the Potential Investment Projects

Expenditure Category	Amount in US$ million	Financing percentage
Loan		
Goods	66.67	100% of foreign expenditures, 100% of local expenditures (ex

		factory cost) and 75% of expenditure on other items procured locally
Subloans	49.75	100%
Fee	0.59	100%

Use of Statements of Expenditure

Loan withdrawals will be made on the basis of statements of expenditure for subloans, goods costing less than US$100,000 equivalent per contract, services provided by consulting firms costing less than US$50,000 equivalent per contract, and services provided by individual consultants costing less than US$20,000 equivalent per contract. These documents will be made available for the required audits, as well as to the Bank supervision missions upon request. All other expenditures above the SOE thresholds will be submitted on the basis of full documentation.

Grant withdrawals will be made on the basis of statements of expenditure for subgrants, goods costing less then US$10,000 equivalent per contract, services provided by consulting firms costing less than US$100,000 equivalent per contract, and services provided by individual consultants costing less than US$50,000 equivalent per contract. These documents will be made available for the required audits, as well as to the Bank supervision missions upon request. All other expenditures above the SOE thresholds will be submitted on the basis of full documentation.

SOE documentation will be retained by the respective implementing agencies for the Support for Wind and Biomass Pilot Provinces Component and the PMO for the Institutional Development and Capacity Building component.

Conditions of disbursement

For the additional investment projects, the following conditions of disbursement would apply:

- For Inner Mongolia after a financial management manual has been prepared and issued by NLYWPC;
- .In Zhejiang, (a) after review by the Bank of individual subprojects according to the procedures set out in the PIP; and (b) issue by ZHPDMC of a financial management manual on behalf of the implementing companies.

Summary Risk Assessment

The risks identified for financial management for the potential investment projects that were appraised are set out in Table A7A.5:

Table A7A.5: Summary Risk Assessment for Additional Appraised Projects

Risk	Huitengxile Wind Farm, Inner Mongolia	Zhejiang Small Hydro
I. Inherent Project Risk	Moderate. It is the first time for NLYWPC to manage and execute a project financed by the World Bank. All the financial staff at NLYWPC have no	Moderate. It is the first time for ZHPMDC to manage and for all the PIUs to execute a project financed by the World Bank. All the financial staff of

	prior Bank experience. The task team will closely monitor the project from the initial stage and a well-designed and focused training program will be facilitated to help the financial staff with the assignment.	ZHPMDC and the PIUs have no prior Bank experience. The task team will closely monitor the project from the initial stage and a well-designed and focused training program will be facilitated to help the financial staff with the assignment.
II. Control Risk		
a. Implementing Entity	Moderate. Close monitoring by task team is needed to ensure the implementing entity is familiar with Bank procedures and requirements.	High. Close monitoring by task team is needed to ensure the implementing entity is familiar with Bank procedures and requirements.
b. Funds Flow	Moderate. The funds will flow from the Bank to Inner Mongolia Finance Bureau, and then to NLYWPC. This funds flow arrangement is considered more time consuming and close monitoring is needed to ensure there are no significant delays.	Moderate. The funds will flow from the Bank to the ZFB then to county/municipal finance bureaus and finally to PIUs. This funds flow arrangement is considered more time consuming and close monitoring is needed to ensure that there are no significant delays.
c. Staffing	Moderate. Since all the financial staff have no prior Bank experience, a training program will be facilitated at the initial stage and close monitoring and supervision will be performed by the task team throughout the implementation process.	Moderate. Since all the financial staff have no prior Bank experience, a training program will be facilitated at the initial stage and close monitoring and supervision will be performed by the task team throughout the implementation process.
d. Accounting Policies and Procedures	Low. Accounting policies and procedures are already in place.	Moderate. Accounting policies and procedures for Bank-financed projects are already in place.
e. Internal Audit	Moderate. No internal audit department exists at NLYWPC. Supervision visits by the task team along with annual audits performed by the external auditors, Inner Mongolia Autonomous Region Audit Office, will be utilized.	Moderate. No internal audit department exists. Supervision visits by the task team along with annual audits performed by the external auditors, Zhejiang Provincial Audit Office, will be utilized.
f. External Audit	Low. The external auditors, Inner Mongolia Autonomous Region Audit Office, have extensive audit experience with previous Bank-financed projects.	Moderate. The external auditors, Zhejiang Provincial Audit Office, have extensive audit experience with previous Bank-financed projects.
g. Reporting and Monitoring	Low. Format of financial statements and frequency of submission have been clearly defined by the Bank and MOF.	Moderate. Format of financial statements and frequency of submission have been clearly defined by the Bank and MOF.
h. Information Systems	Moderate. The computerized financial management system "Yuan Guang" is utilized by the NLYWPC. NLYWPC will continue to use this software for the recording of the project accounts. The task team will closely monitor the processing of its accounting work in the initial stage and subsequent regular supervision missions.	Moderate. The PIUs will all utilize manual books to account for the transactions. The task team will closely monitor the processing of accounting work in the initial stage and subsequent regular supervision missions.

Annex 8: Procurement Arrangements

CHINA Renewable Energy Scale-up Program

A. GENERAL

Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Loan, the different procurement methods or consultant selection methods, the need for prequalification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

Procurement of Goods: A total of US$85.87 million worth of goods would be procured for the project, including (a) for the Pingtan wind farm, wind turbines consisting of the nacelles, blades and control system and ancillary electrical equipment including transformers, conductors and poles; (b) for the Rudong biomass power plant a boiler and steam turbine, mechanical handling equipment for fuel and ash and electrical equipment and control systems; and (c) under the grant, resource measurement equipment and office equipment for the PMO. For Pingtan, and Rudong procurement will use supply and install arrangements.

- *International Competitive Bidding (ICB).* All contracts for goods costing US$500,000 equivalent or more would be awarded through ICB procedures specified in the Procurement Guidelines.
- *National Competitive Bidding (NCB).* NCB procedures would be used for procurement of goods costing less than US$500,000 equivalent per contract. Contracts each estimated to cost less than US$300,000 may be advertised only in a provincial newspaper.
- *Shopping.* Other goods would be procured using shopping procedures with contracts under US$100,000 equivalent each.

Selection of Consultants: A total of US$21 million worth of consultant services would be provided. Detailed design and supervision services will be procured as part of the package for the equipment to be supplied for the Pingtan wind farm and the Rudong biomass power project. Consultant services will be required under the TA component for: (a) advice on development and implementation of the mandated market policy (MMP) at national and provincial level; (b) to assist with implementation of the technology improvement and other cost-shared activities; (c) to assist in the investment scale-up work; and (d) carrying out work to support the management of the program, including the hiring of staff to work in the PMO. Under the investment component, consultants will be hired to provide services for design, procurement support (including bid evaluation), construction management and operations and maintenance. Short lists of consultants for services estimated to cost less than US$300,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. In some cases, particularly providing advice for the development of the

MMP, universities or government research institutions may be hired if they provide unique or exceptional services, and CQS or QBS would be used instead of QCBS.

The consulting contracts, each estimated to cost US$100,000 equivalent or more, will be awarded following the procedure of Quality and Cost Based Selection (QCBS) or Quality Based Selection (QBS). For consulting services estimated to cost less than US$100,000 equivalent per contract under this project, the Selection Based on Consultants' Qualifications (CQS) would be used for these contracts. Chinese universities, design and research institutes as sources of consultants may be included in the shortlist.

Procurement Documents: The Bank's Standard Bidding Documents will be adopted for all ICB procurement. For NCB procurement, the Chinese Model Bidding Document (MBD) will be used, which were issued by the MOF in May 1997 in agreement with the Bank. The latest changes to the Bank's Standard Bidding Documents will be incorporated into the MBD as appropriate. For all contracts to be awarded following QCBS, the Bank's Standard Request for Proposals will be used. Sample procurement documents and contracts for shopping and small consulting assignments will be developed by the implementing agencies with the Bank's assistance.

Operating Costs. The operating costs of the PMO will be financed from the GEF grant, including overheads and items such as travel and subsistence relating to the implementation of the program. The PMO's staffing, management procedures and proposed work plan were reviewed at appraisal and are considered satisfactory.

Others. Other procurement arrangements will be made for cost-shared activities. Cost-shared activities will be supported through competitively awarded grants to commercial entities and universities and fellowship programs. Commercial entities will be selected and appraised according to procedures set out in the TA component PIP agreed at appraisal. Participating commercial entities include wind and biomass equipment suppliers and manufacturers, wind turbine testing centers, certification bodies and project developers. Activities to be supported include wind and biomass technology improvement and cost reduction, setting up of a testing and certification system for wind turbines, undertaking feasibility and prefeasibility studies, resource assessments and pilot/demonstration projects. Cost-sharing with selected universities, to allow them to set up renewable energy engineering courses at master's degree level, will be undertaken in a similar way. A fellowship program, to allow senior staff to study abroad will also be established, with fellowships being awarded along guidelines set out in the PIP.

B. ASSESSMENT OF THE AGENCIES' CAPACITY TO IMPLEMENT PROCUREMENT

Procurement activities will be carried out by the following entities:

- For the Pingtan wind farm, China Long Yuan Power Group Company (Long Yuan) and its special purpose company to be established. The project office, which is the forerunner for the special purpose company, is staffed by a general manager, a chief engineer and a chief financial officer and functional units covering operations, construction, administration and finance and accounting. Staff handling procurement are headed by a senior engineer with experience of World Bank procurement of wind farm equipment. A further three engineers and an economist form the procurement unit.

- For the Rudong biomass power plant, Jiangsu Guo Xin Investment Group Limited (Guo Xin) and the special purpose company Jiangsu Guo Xin New Energy Rudong Development Company (NED). The special purpose company will be staffed by a general manager, a chief engineer and a chief financial officer and functional units covering construction, procurement and contracts, administration and finance and accounting. A group, headed by the general manager of NED will be responsible for procurement, and includes both engineering and commercial staff. Provision has been made for a bid evaluation committee composed of staff working on the project, but with membership from outside the company;
- For the TA component, the established CRESP PMO. The PMO will be increased in size to include a director, deputy director and a technical advisor. Functional staff will be assigned with responsibility for specific aspects of the TA program the one person now responsible for financial and contract management will be replaced by a small unit. Staff handling procurement are headed by the director. Existing staff with procurement responsibilities are experienced in Bank procurement and have received additional training during project preparation.

An assessment of the capacity of the Implementing Agencies to implement procurement actions for the project has been carried out by Li Xiaoping in October 2004. The assessment reviewed the organizational structure for implementing the project and the interaction between the project's staff responsible for procurement. The action plan agreed to address the weaknesses include: (a) Role and responsibility of each agency in handling procurement have been clearly defined in the PIPs provided by the implementing agencies to the Bank. (b) Detailed procurement plans have been agreed at negotiations. (c) Procurement training for all implementing agencies should be organized before the project implementation. (d) Qualified procurement agents should be hired and special attentions should be paid to the experience and competence of their key staff assigned to this project. (d) A proper procurement filing system shall be established and maintained by the implementing agencies up to two years after the closing date of the Loan Agreement of the project.

The overall project risk for procurement is average.

Potential Investment Projects

The capacity of the implementing agencies to undertake procurement was also assessed. Arrangements would be as follows:

- For the Huitengxile wind farm, NLYWPC. The company includes functional departments covering development, construction, operations and finance. The development department is responsible for the project. Staff handling procurement include the deputy general manager, the chief engineer and the manager of the development department. Specialist members of the development department have been assigned to address specific aspects of procurement including technical, financial and construction.
- For the Zhejiang small hydro projects the Zhejiang Provincial Project Office (PPO), staffed by the ZHPMDC, will be responsible for procurement. Staff handling procurement are overseen by the director of ZHPDMC, and assigned staff for procurement are electrical engineers.

An assessment of the capacity of Inner Mongolia Wind Power Company, the predecessor to NLYWPC, and ZHPMDC to implement procurement actions for the project was carried out by Li Xiaoping in November 2004. The assessment reviewed the organizational structure for implementing the project and the interaction between the project's staff responsible for procurement. The action plan agreed to address the weaknesses include: (a) Waivers for Bank-financed NCB procurement shall be included in the legal agreement of the project. (b) Role and responsibility of each agency in handling procurement have been clearly defined in the PIP. (c) a detailed procurement plans have been agreed for Inner Mongolia at negotiations (but is pending for Zhejiang). (d) Procurement training for all implementing agencies should be organized before the project implementation. (e) Qualified procurement agents should be hired and special attentions should be paid to the experience and competence of their key staff assigned to this project. (f) A proper procurement filing system shall be established and maintained by the implementing agencies up to two years after the closing date of the Loan Agreement of the project.

The overall procurement risk for the potential projects was assessed as average.

C. PROCUREMENT PLAN

The Borrower, at appraisal, developed procurement plans for project implementation, which provides the basis for the procurement methods. These plans have been agreed between the Borrower and the Project Team at negotiation and are available at (a) for the Pingtan wind farm at the project offices 216 Bei Huen Zhong Road, Fuzhou; (b) for the Rudong biomass power plant at the project offices of Guo Xin, 5 Qingyuan North Road, Jueguang Town, Rudong, Jiangsu; and (c) for the TA component at the PMO, 1718, Guohong Mansion, Muxidi Beili Jia 11, Xicheng District, Beijing 100038. They will also be available in the project's database and in the Bank's external website. The Procurement Plans will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

D. FREQUENCY OF PROCUREMENT SUPERVISION

In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agencies has recommended six- to eight-monthly supervision missions to visit the field to carry out post review of procurement actions. Post review ratio would be one out of three contracts.

E. DETAILS OF THE PROCUREMENT ARRANGEMENTS

Table A8.1: Procurement Arrangements

Procurement Method		**Thresholds of Procurement Methods**	**Prior Review Thresholds**
Goods:	ICB	≥US$500,000	All contracts above US$500,000,
	NCB	<US$500,000	
	Shopping	<US$100,000	
Consulting services	QCBS	≥US$100,000	All contracts for first year for IDCB component, thereafter all contracts above US$100,000 for firms and US$20,000 for individuals. For Support to Wind, Small Hydro and Biomass component, all contracts
	CQS	<US$100,000	
	IC	Assignments meeting articles 5.1 and 5.3 of the Guidelines	

Table A8.2: List of Contracts subject to ICB

Ref. No.	Contract (Description)	Estimated Cost (US$m)	Procurement Method	P-Q	Domestic Preference (yes/no)	Review by Bank (Prior / Post)	Expected Bid-Opening Date	Comments
1	Pingtan: Supply and supervise the installation of wind turbine blades and nacelles including in each the hub, turbine frame, rotor shaft and bearings gearbox (if applicable), generator, cooling, braking, and control systems, yaw and pitch mechanisms and nacelle cover; supply and supervise the installation of the wind farm control system; design and supervise construction or manufacture of towers and foundations; train wind farm staff in commissioning and operation; provide a warranty.	63.21	ICB	N	Y	Prior	May 2005	
2	Rudong: Supply of boiler and ancillaries including environmental control equipment and design of associated civil works	16.00	ICB	N	Y	Prior	April 2005	
3	Rudong: Supply of steam turbine and ancillaries and design of associated civil works	3.28	ICB	N	Y	Prior	April 2005	
4	Rudong: Supply of fuel feed system and design of associated civil works	2.36	ICB	N	Y	Prior	April 2005	
5	Rudong: Supply of instrumentation and control (I&C) and electrical works	0.96	ICB	N	Y	Prior	April 2005	

Table A8.3: List of Consulting Services Contracts with Shortlist of International Firms

Description of Assignment	Estimated Cost (US$)	Selection Method	Review by Bank (Prior / Post)	Expected Date of Signing Contract	Comments
Rudong biomass project: engineering services to supervise construction	700,000	QCBS	Prior	June 2005	
IDCB Component					
1. Further Studies on Mandated Market Policy					
1.1 RE Target analysis	150,000	QBS	Prior	10/05	Lump Sum including funds for workshops and consultation
1.2 Feed-in Tariff study	150,000	QBS	Prior	10/05	Lump Sum including funds for workshops and consultation
1.3 Study on issues and options for special RE Fund	80,000	CQ	Prior	10/05	Lump Sum including funds for workshops and consultation
1.4 Development of Short, medium- and long-term RE strategies	150,000	QBS	Prior	10/05	Lump Sum including funds for workshops and consultation
1.5 Development National scale-up strategy for biomass	150,000	QBS	Prior	10/05	Lump Sum including funds for workshops and consultation
1.6 Development National scale-up strategy for wind	150,000	QBS	Prior	10/05	Lump Sum including funds for workshops and consultation
2. REL Implementation					
2.1 Preparation of RE regulation	400,000	QBS	Prior	4/06	Lump Sum including funds for workshops and consultation. More than 1 contract possible.
2.2 Monitoring of RE law implementation	100,000	CQ	Prior	4/06	Lump Sum contract
2.3 RE law and regulations capacity building	100,000	TBD	Prior/Post	FY06	Lump Sum including funds for training and workshops
3. Wind Turbine Technology Transfer					
3.1 International wind turbine technology transfer expert	68,000	Individual	Prior	10/05	Time Based contract (cost includes travel cost)
3.2 National wind turbine technology transfer expert	23,000	Individual	Prior	10/05	Time Based contract (cost includes travel cost)
3.3 International technology transfer capabilities assessment expert	17,000	Individual	Prior	11/05	Lump Sum contract, including travel cost
3.4 National technology transfer capabilities assessment expert	6,000	Individual	Post	11/05	Lump Sum contract, including travel cost

Description of Assignment	Estimated Cost (US$)	Selection Method	Review by Bank (Prior / Post)	Expected Date of Signing Contract	Comments
3.5 Wind Technology transfer committee (3 members)	9,000	Individual	Prior	11/05	3 Lump Sum Contract of US$3,000 each
4. Establishment of a Wind Turbine Test Center					
4.1 International wind turbine testing expert	68,000	Individual	Prior	10/05	Time Based contract (cost includes travel cost)
4.2 National wind turbine testing expert	23,000	Individual	Prior	10/05	Time Based contract (cost includes travel cost)
4.3 International testing capabilities assessment expert	17,000	Individual	Prior	11/05	Lump Sum contract, including travel cost
4.4 National testing capabilities assessment expert	6,000	Individual	Post	11/05	Lump Sum contract, including travel cost
4.5 Test center evaluation committee (3 members)	9,000	Individual	Prior	11/05	3 Lump Sum Contract of US$3,000 each
4.6 Testing Center	2,377,000	QBS	Prior	7/06	One Lump Sum Contract with payments after achieving agreed milestones
5. Development and/or Improvement of Wind Turbine Standards					
5.1 Wind standards working group leader	26,000	Individual	Prior	9/05	Time Based
5.2 International wind standards expert	78,000	Individual	Prior	9/05	Time Based. Cost includes travel
5.3 Wind standards working group members (8 members)	96,000	Individual	Prior	9/05	8 Time Based contracts of US$12,000 each
5.4 Standards working group activities	50,000	TBD	Prior/Post	FY06	Based on first year plan standards working group
6. Establishment of Wind Turbine Certification Capabilities					
6.1 International certification expert	26,000	Individual	Prior	10/05	Lump Sum contract including travel cost
6.2 National certification expert	5,000	Individual	Post	10/05	Lump Sum contract including travel cost
6.3 Certification center evaluation committee (3 members)	6,000	Individual	Post	11/05	3 Lump Sum Contracts of US$2,000 each
6.6 Certification center	563,000	QBS	Prior	7/06	One Lump Sum Contract with payments after achieving agreed milestones

Description of Assignment	Estimated Cost (US$)	Selection Method	Review by Bank (Prior / Post)	Expected Date of Signing Contract	Comments
7. Capacity Building and Studies on Wind Resource Assessment					
7.1 Studies (first year, 3 contracts)	1,000,000 aggregate	QBS	Prior/post	10/05	Various contracts based on TORs prepared by PMO
7.2 Workshops/Training Meetings	100,000	TBD	Prior/Post	FY07–FY08	Various contracts based on TORs prepared by PMO
8. Capacity building and studies on Wind Power Electrical Engineering					
8.1 Studies (3 contracts)	700,000 aggregate	QBS	Prior/post	10/05	Various contracts based on TORs prepared by PMO
8.2 Workshops/Training Meetings	100,000	TBD	Prior/Post	FY07–FY08	Various contracts based on TORs prepared by PMO
9. Long-Term Wind Turbine Design and Development Capacity Building					
9.1 International wind energy training expert	8,000	Individual	Prior	10/05	Lump Sum contract, no travel
9.2 National wind energy training expert	2,000	Individual	Prior	10/05	Lump Sum contract, no travel
9.3 Support universities to conduct long-term capacity building	500,000	QBS	Prior	4/06	Various lump sum contracts with selected universities
10. Competitive Grant Facility Biomass					
10.1 Biomass international proposal solicitation expert	66,000	Individual	Prior	12/05	Time Based contract 60 days over 3 year period
10.2 Biomass proposal solicitation committee	31,000	Individual	Prior	12/05	5 Time based contracts 30 days over 3 year period
10.3 Biomass international proposal evaluation expert	66,000	Individual	Prior	12/05	Time Based contract 60 days over 3 year period
11. Biomass Technology Capacity Building and Studies					
11.1 Workshops/Training/Meetings	100,000	TBD	Prior/Post	FY06	Lump Sum contracts based on TORs prepared by PMO
12. Provincial Renewable Energy Policy Implementation					
12.1 Support for consultant—Fujian	250,000	QBS	Prior	1/06, 4/06	2 Lump Sum contracts
12.2 Support for consultant—Inner Mongolia	250,000	QBS	Prior	1/06, 4/06	2 Lump Sum contracts
12.3 Support for consultant—Jiangsu	250,000	QBS	Prior	1/06, 4/06	2 Lump Sum contracts
12.4 Support for consultant—Zhejiang	250,000	QBS	Prior	1/06, 4/06	2 Lump Sum contracts
13. Provincial Resource Assessment					

Description of Assignment	Estimated Cost (US$)	Selection Method	Review by Bank (Prior / Post)	Expected Date of Signing Contract	Comments
13.1 Resource Assessment—Fujian	500,000	QBS	Prior	2/06	1 Lump Sum Contract
13.2 Resource Assessment—Inner Mongolia	500,000	QBS	Prior	2/06	1 Lump Sum Contract
13.3 Resource Assessment—Jiangsu	500,000	QBS	Prior	2/06	1 Lump Sum Contract
13.4 Resource Assessment—Zhejiang	500,000	QBS	Prior	2/06	1 Lump Sum Contract
14. Competitive Grant Facility Provincial Demonstration Projects					
14.1 Demonstration Projects Evaluation Committee (5 members)	10,000	Individual	Prior	4/06	5 Lump Sum Contracts of US$2,000 each
14.2 International Demonstration Projects Evaluation Expert	22,000	Individual	Prior	4/06	Lump Sum contract including travel cost
14.3 Support to prepare proposals (safeguards and procurement)	84,000	Individual	Post	1/06	Various Lump Sum contracts as needed
15. Provincial Capacity Building and Studies					
15.1 First year Capacity Building and Studies (4 contracts)	400,000	TBD	Prior/Post	FY06	Various Lump Sum contracts based on TORs prepared by provinces
16. Capacity Building Investors & Scale-up Support					
16.1 First Year Capacity Building Investors & Scale-up Support (4 contractors)	2,000,000	QBS	Prior/Post	FY06	
17. PMO Operational Budget					
17.1 PMO staff (16 staff, first year contract)	336,000	Individual	Prior	6/05	15 Time Based one year contracts
17.2 PMO training	50,000	CQ	Prior/Post	FY05–FY06	
18. PMO Activities					
18.1 GOC partnership workshops (5 contracts)	280,000 aggregate	CQ	Prior/Post	FY05–FY06	Lump Sum contracts
18 PMO Consultants					
18.1 CTA	216,000	Individual	Prior	9/05	1 Time Based contract covering 18 months
18.2 Consultant Pool first year	252,000	Individual	Prior/Post	FY05–FY06	Contracts based on TORs prepared by PMO

Table A8.4: Cost-Shared Grants

Description of Assignment	Estimated Cost (US$)	No of Contracts	Review By Bank (Prior / Post)	Expected Date of Signing Contract	Comments
1. Wind Technology Transfer support for proposal preparation (cost-sharing of support international expert in preparing proposals)*	200,000	Up to 10	Prior	1/06	Maximum support per proponent is US$20,000 or 50% international expert cost.
2. Cost-shared grants for wind turbine technology transfer	6,677,000	TBD (expected 3)	Prior	7/06	
3. Cost-shared grants for biomass TI (round 1)*	500,000	TBD	Prior	4/06	First round
4. Cost-shared grants for biomass TI (round 2)	700,000	TBD	Prior	3/07	Second round
5. Cost-shared grants for biomass TI (round 3)	637,000	TBD	Prior	2/08	Third round
6. Cost-shared grants for Provincial demonstration projects	2,883,000	TBD	Prior	5/06	One round

Additional Annex 8A: Procurement Arrangements for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

A. GENERAL

Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Loan, the different procurement methods or consultant selection methods, the need for prequalification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

Procurement of Works: A total of US$42.4 million of works would be required for the civil works for the small hydro projects in Zhejiang, consisting of dams, intake systems, power houses and other similar work. Given the small size of the contracts and the large number of competitive contractors in China, they would not be expected to attract international interest and therefore International Competitive Bidding (ICB) would not be proposed for the works contracts. All contracts would be below the current threshold for ICB Works for China of US$15 million.

i) *National Competitive Bidding (NCB).* Contracts for works estimated to cost US$200,000 equivalent or more would be awarded under NCB procedures acceptable to the Bank. Works contracts each estimated to cost less than US$2 million would be advertised only in a provincial newspaper.
ii) *Small Civil Works Procurement (Shopping).* Contracts for works estimated to cost less than US$200,000 equivalent per contract would be awarded through shopping procedures as specified in Para.3.5 of the Procurement Guidelines. These works would be suitable for lump-sum and fixed-price contracts awarded on the basis of quotations obtained from at least three qualified domestic contractors in response to a written invitation.

Procurement of Goods: A total of US$132 million worth of goods would be procured for the potential investment projects, including (a) for the Huitengxile wind farm, wind turbines consisting of the nacelles, blades, towers and control system and ancillary electrical equipment including transformers, conductors and poles; and (b) for the small hydro plant in Zhejiang turbines, generators and related equipment including controls. For both projects, procurement would use supply and install arrangements.

In Zhejiang, with the exception of three contracts, all proposed contracts for the supply of goods would be below US$500,000 and several individual items of equipment are below US$100,000. Given the small size of the contracts and the large number of competitive suppliers in China, they would not be expected to attract international interest and therefore NCB or shopping as appropriate would be proposed for the goods contracts. For the three contracts exceeding US$500,000, Regional Procurement Advisor clearance to undertake NCB has been sought and obtained.

i) *International Competitive Bidding (ICB).* All contracts for goods costing US$500,000 equivalent or more would be awarded through ICB procedures specified in the Procurement Guidelines.
ii) *National Competitive Bidding (NCB).* NCB procedures would be used for procurement of goods costing less than US$500,000 equivalent per contract. Contracts each estimated to cost less than US$300,000 may be advertised only in a provincial newspaper.
iii) *Shopping.* Other goods would be procured using shopping procedures with contracts under US$100,000 equivalent each.

Selection of Consultants: No consultants are expected to be hired to support the additional investment projects. Nonetheless, the same procurement arrangements as set out for consultants for the main project would apply. Short lists of consultants for services estimated to cost less than US$300,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

Consulting contracts, each estimated to cost US$100,000 equivalent or more, will be awarded following the procedure of Quality and Cost Based Selection (QCBS) or Quality Based Selection (QBS). For consulting services estimated to cost less than US$100,000 equivalent per contract under this project, the Selection Based on Consultants' Qualifications (CQS) would be used for these contracts. Chinese universities, design and research institutes as sources of consultants may be included in the shortlist.

Procurement Documents: The Bank's Standard Bidding Documents will be adopted for all ICB procurement. For NCB procurement, the Chinese Model Bidding Document (MBD) will be used, which was issued by the MOF in May 1997 in agreement with the Bank. The latest changes to the Bank's Standard Bidding Documents will be incorporated into the MBD, as appropriate. For all contracts to be awarded following QCBS or QBS, the Bank's Standard Request for Proposals will be used. Sample procurement documents and contracts for shopping and small consulting assignments will be developed by the implementing agencies with the Bank's assistance.

B. ASSESSMENT OF THE AGENCIES' CAPACITY TO IMPLEMENT PROCUREMENT

Procurement activities will be carried out by:

- For the Huitengxile wind farm, NLYWPC. The company includes functional departments covering development, construction, operations and finance. The development department is responsible for the project. Staff handling procurement include the deputy general manager, the chief engineer and the manager of the development department. Specialist members of the development department have been assigned to address specific aspects of procurement including technical, financial and construction;
- For the Zhejiang small hydro projects the Zhejiang PPO, staffed by the ZHPMDC, will be responsible for procurement. Staff handling procurement are overseen by the director of ZHPDMC, and assigned staff for procurement are electrical engineers.

An assessment of the capacity of Inner Mongolia Wind Power Company, the predecessor to NLYWPC, and ZHPMDC to implement procurement actions for the project was carried out by Li Xiaoping in November 2004. The assessment reviewed the organizational structure for implementing the project and the interaction between the project's staff responsible for

procurement. The action plan agreed to address the weaknesses include: (a) Waivers for Bank-financed NCB procurement shall be included in the legal agreement of the project. (b) Role and responsibility of each agency in handling procurement have been clearly defined in the PIP. (c) a detailed procurement plan has been agreed for Inner Mongolia, but is pending for Zhejiang. (d) Procurement training for all implementing agencies should be organized before the project implementation. (e) Qualified procurement agents should be hired and special attentions should be paid to the experience and competence of their key staff assigned to this project. (f) A proper procurement filing system shall be established and maintained by the implementing agencies up to two years after the closing date of the Loan Agreement of the project.

The overall procurement risk for the additional projects was assessed as average.

C. PROCUREMENT PLAN

The Borrower, at appraisal, developed procurement plans for the implementation of the additional investment projects. The plan for Huitengxile has been agreed between the Borrower and the Project Team during technical discussions and is available at the offices of NLYWPC, Power Building, South Xilin Street, Huhhot, Inner Mongolia. For the Zhejiang hydro projects, no agreement has yet been made, but a draft of the procurement plan is available at the offices of ZHPDMC, 7 Meihuabei, Hangzhou 310009, Zhejiang. They would also be available in the project's database and in the Bank's external website. The Procurement Plans would be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

D. FREQUENCY OF PROCUREMENT SUPERVISION

In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agencies has recommended six- to eight-monthly supervision missions to visit the field to carry out post review of procurement actions. Post review ratio would be one out of three contracts.

E. DETAILS OF THE PROCUREMENT ARRANGEMENTS

Table A8A.1: Procurement Arrangements

Procurement Method		**Thresholds of Procurement Methods**	**Prior Review Thresholds**
Goods:	ICB	≥US$500,000, except the three contracts above US$500,000 for Zhejiang	All contracts above US$500,000, and the first three NCB contracts in the first year of project implementation and the first contract in each of the subsequent years for Zhejiang
	NCB	<US$500,000, and the three contracts above US$500,000 for Zhejiang	
	Shopping	<US$100,000	
Works:	NCB	≥US$200,000	The first three NCB contracts in the first year of project implementation and the first NCB contract in each of the subsequent years for Zhejiang
	Shopping	<US$200,000	
Consulting services	QCBS	≥US$100,000	All contracts

Table A8A.2: List of Contracts Subject to ICB

Ref. No.	Contract (Description)	Estimated Cost (US$m)	Procurement Method	P-Q	Domestic Preference (yes/no)	Review by Bank (Prior / Post)	Expected Bid-Opening Date	Comments
1	Huitengxile: Supply and supervise the installation of wind turbine blades and nacelles including in each the hub, turbine frame, rotor shaft and bearings gearbox (if applicable), generator, cooling, braking, and control systems, yaw and pitch mechanisms and nacelle cover; supply and supervise the installation of the wind farm control system; design and supervise construction or manufacture of towers and foundations; train wind farm staff in commissioning and operation; provide a warranty.	**66.17**	**ICB**	**N**	**Y**	**Prior**	**July 2005**	

Annex 9: Economic and Financial Analysis

CHINA Renewable Energy Scale-up Program

ECONOMIC ANALYSIS OF PROGRAM AND OPTIMAL QUANTITY OF RENEWABLES

Objective

The objective of this annex is to provide an analytical framework for assessing and implementing a scale-up program for grid-based electricity generation from renewable energy sources by 2010. The core of the analysis is a simulation model that generates supply curves for potential renewable energy projects; selects an optimum target quantity; and evaluates the economic and financial impacts of policy instruments designed to meet the target. The renewable energy projects in the model's database span China's 31 provinces and municipalities. They consist of ongoing, planned or potential developments in new small hydropower; rehabilitation of existing small hydropower; landfill gas; and wind energy. A follow-up pilot phase of the CRESP, in selected provinces, will further test the validity of the preliminary analytical results and sensitivity analyses in this report.

Policy Rationale

China's power grid is based mainly on coal-fired electricity generation, which accounts for about 70 percent of total generation. This dependence on coal has substantial associated environmental damage costs. At the same time, the country has a sizeable renewable energy potential that could be substituted for some coal based generation and reduce environmental damage. Many renewable energy projects are economic relative to the production costs of coal. However, they do not contribute to electricity generation because of the absence of a proactive policy to incorporate them into the power grid. Furthermore, production of environmental damages stemming from coal utilization are not reflected in (internalized) its financial price. Factoring them in would make additional amounts of renewable energy economic.

Small-scale hydropower currently offers the greatest renewable energy potential for supplying grid-based electricity and China has led the world in the development of this technology. However, in the past, the focus has been on meeting the power needs of rural communities outside the grid rather than an environmental policy to substitute for coal-based generation in the main grid. A renewable energy policy focusing on displacing coal for environmental reasons would help to reorient design practices to meet the requirements of the grid.

Selection of the Economic Optimum Scale-up Quantity

Methodology and Assumptions. The objective of the approach is to determine the optimal quantity of power generation based on renewable energy given a set of technical and economic assumptions. The analysis begins at the provincial level, first developing the renewable energy project database and then determining the unit costs of various renewable energy projects on a unit cost basis (in Y per kWh). It then constructs a provincial supply curve relating cost per kWh to electricity production. The selection of economically viable projects requires a comparison of project costs with the production and social cost of coal on the same per unit basis.

To determine the social costs of coal use, the model calculates coal production costs in each province. It adds to these costs an estimated cost of the environmental damage that results from coal use. Since consistent data was not available for all of China's provinces, the estimate is based on the *benefit transfer method*—using well-established studies outside of China, but adjusting the costs for country conditions.[5] The cost analysis for renewable energy is based on production costs of the renewable energy technologies plus a *capacity penalty*, if applicable.[6] This penalty represents the cost of not having continuous power available for dispatch to the grid and the need to establish a form of back-up generating capacity, as in the case of hydropower projects without storage capacity.

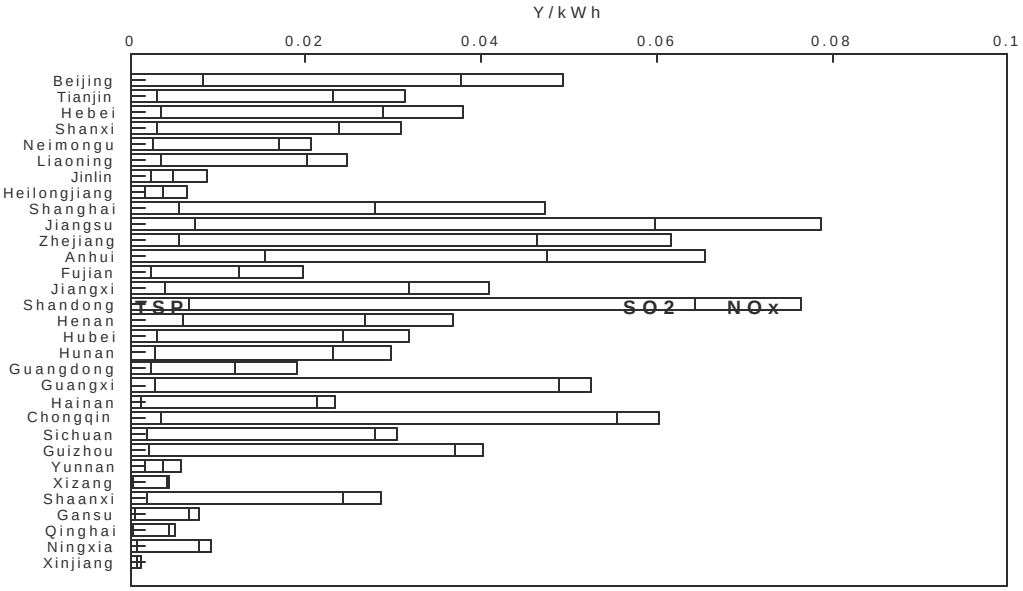
The simulation model extrapolates a national supply curve for electricity generation from renewable energy from the provincial supply curves. It then allocates all electricity production from all renewable energy projects with a unit generation cost less than that of coal in the estimate of the quantity economically justified without considering environmental externalities or $Q_{ECON.}$ It also groups all projects with a unit cost less than the production cost of coal plus the externality cost in the quantity $Q_{ENV.}$ This quantity is considered the economic optimum from an environmental perspective and forms the base case of the analysis.

The target year for the scale-up of renewable energy to the grid is 2010. The quantity analysis is based on economic costs, that is, without the inclusion of taxes and duties. Production costs were calculated as the annual operating and maintenance costs plus an annualized equivalent of capital costs. There were two important assumptions in the annualization of the capital coasts—a 20 year economic life for generating plants and a discount rate of 12 percent, the rate used by the GoC for investment projects. Other important assumptions were the externality values using the benefit transfer method for each of Chinas provinces. Figure A9.1 shows the estimated environmental damage cost per unit of electricity generated across all of China's provinces. Overall the data show the economic benefit of avoiding environmental damage from coal much greater for the densely populated, wealthier provinces in eastern and coastal China than in the western provinces.

[5] The damage cost analysis considers damage from three main air pollutants—oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and particulate matter that would be emitted from plants with pollution controls (electrostatic precipitators).

[6] Although renewable energy can have some adverse environmental impact, the model does not quantify these costs, given that the magnitude of damage costs from coal use are much greater and easily quantifiable.

Figure A9.1: Estimated Environmental Costs of Coal Use by Province



The Supply Curve at the Provincial Level. Figures 2 and 3 illustrate the methodology at the provincial level based on the data for Zhejiang Province. This province is among those with coal damage costs on the high side. The supply curves result from a set of points that represent a renewable energy project in terms of cost per kWh, adjusted for the capacity penalty. Figure 2 expresses the costs in terms of both the production costs of coal and the social costs of coal. Figure 3 shows the avoided cost curve only, derived by subtracting the production cost of coal from each point, to arrive at an avoided damage cost curve. The advantage of this curve is that it can be added to the avoided cost curves of other provinces to arrive at quantity scenarios on a national basis. In contrast the cost curves that include the production cost are applicable at the provincial level only because the production cost varies by province, whereas the avoided damage costs per kWh are the same.

Potential Levels of Electricity from Renewable Energy. Based on the above methodology and assumptions, the simulation model arrived at three potential levels of renewable energy based generation by 2010. First, with business as usual and no renewable energy scale-up program, the likely quantity would be 35 TWh (Q_{BAU}) or 1.2 percent of total generation in 2010. Second, a program focused on increasing power generation from economically viable renewable energy sources—even without considering the damage costs of coal—would result a renewable energy contribution of 79 TWh (Q_{ECON}) or more than double Q_{BAU}. Third, the amount of renewable energy-based generated economically justified with the inclusion of the externality costs of coal would be 89 TWh (Q_{ENV}) considered the base case optimum economic quantity. A more pessimistic assumption for key base case parameters, particularly a reduction in the value of externalities, resulted in an optimum of 76 TWh. More optimistic assumptions, including a substantially higher value of externalities and a lower opportunity cost of capital, result in an optimum of 117 TWh.

Technology Mix of the Economic Optimum (Q_{ENV}). Table 1 shows a breakdown of the base case optimum quantity by type of renewable energy technology. About 75 percent of economic optimum production from renewable energy would come from new small hydropower projects

and an additional 13 percent from rehabilitated hydropower sites. The majority of small hydropower projects in the optimal solution have some degree of water flow. All bagasse projects would be economic without the consideration of environmental externalities. Landfill gas projects would not be economic without incorporating these externalities. No wind energy would be economic at the 12 percent discount rate used for the analysis. For wind energy to be economic at a 12 percent discount rate, the capital cost of the technology would have to decrease by 50 percent in 2010 rather than the 33 percent estimated for the baseload case.

Table A9:1: Base Case Generation from Renewable Energy by Technology Type

Technology	Electricity Production (in TWh)
New Small Hydropower	67
Rehabilitated Small Hydropower	12
Bagasse Cogeneration	8
Landfill Gas	2
Wind Energy	0
Total	89

Figure A9.2: Renewable Energy Supply Curve for Zhejiang Province

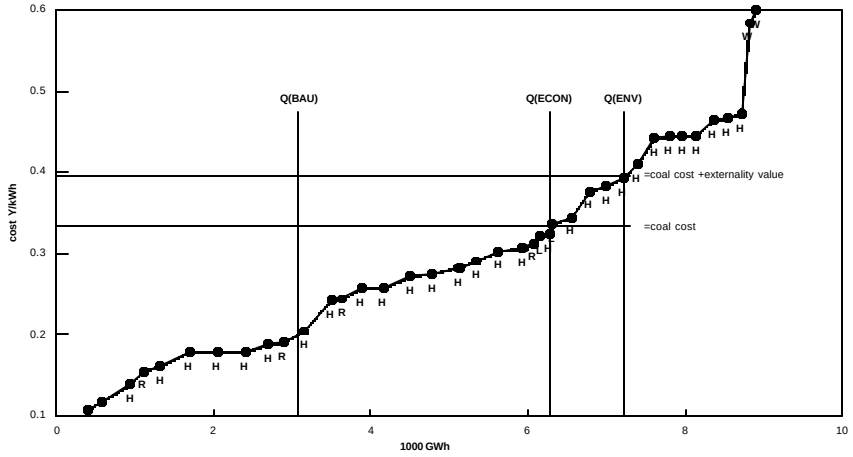
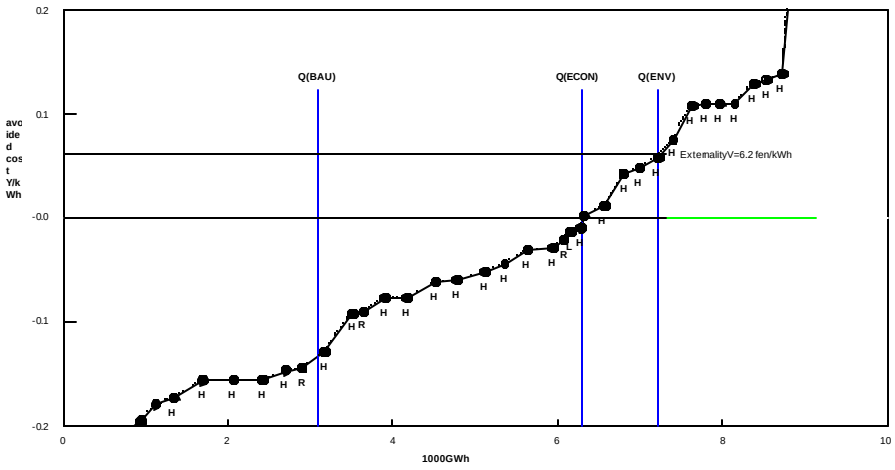


Figure A9.3: Avoided Damage Cost Curve for Zhejiang Province



H=New Small Hydropower; R=Rehabilitated Small Hydropower; L=Landfill Gas; W=Wind Energy

Environmental and Economic Impact at the National Level. Meeting the economic optimum target would result in only half the amount of emissions that would be produced under the business-as-usual scenario (Table 1) and overall would reduce overall emissions from coal in China by about five percent. At the same time, meeting this target would result in a one percent savings in the national cost of electricity and bring about a net increase in employment. The model also indicated a slight increase in GDP, less than one percent.

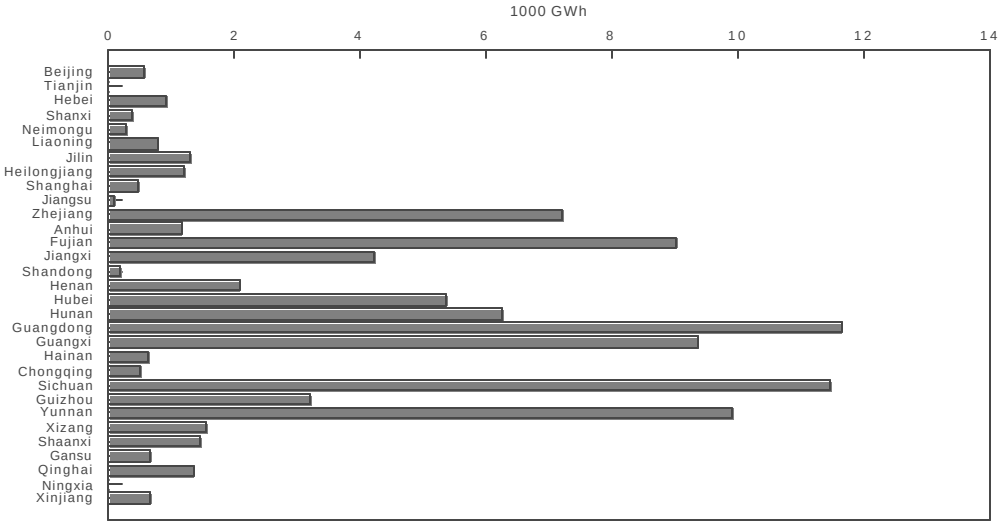
Table A9.2: Renewable Energy Quantity Targets and Related Reduction in Coal Emissions
(per year in 2010)

Coal Emissions	Q_{BAU}	Q_{ECON}	Q_{ENV}
TSP (000 tons)	15	27	32
SO_x (000 tons)	554	992	1,197
NO_x (000 tons)	111	201	239
Carbon (million tons)	15	26	31

Comparative Provincial Results. Figure 4 shows the estimated economically optimum quantity of power production from renewable energy in each of China's provinces, under the baseline assumptions outlined above. The distribution of this quantity across provinces reflects variations in renewable energy resource endowments and the costs of coal production and related externalities. The extremes are represented by Shanghai, Sichuan, and Inner Mongolia. Shanghai has high fossil generation costs, and high externality values, but a poor renewable energy resource endowment. Therefore, its economically optimal quantity is small, mainly limited to landfill gas projects. In contrast, Sichuan has low generation costs and low externality values, but a large renewable energy resource endowment (mainly low cost small hydro), so its potential quantity of renewable energy is large. However, few of its small hydropower projects have water flow regulation, so the economics of small hydro are not as good as in provinces such as Zhejiang, where the corresponding proportion is much greater. Inner Mongolia also has good

wind resources, but low costs of coal-fired generation and externalities limit the economic viability of wind power.

Figure A9.4: Estimated Economic Optimum Quantity of Renewable Energy by Province



Decisionmaking Analysis: Assessment of Important Assumptions, Alternatives and Risk. The parameters with the greatest impact on the results are the discount rate used, the estimated environmental damage costs of coal; and assumptions about reductions in the cost of wind technology. At the standard discount rate of 12 percent no wind energy would be economic. However, at 8 percent projects producing about 3 TWh are economic. At a 12 percent discount rate, meeting the same energy target would require a 40 percent decrease in the capital cost of the technology combined with a five percent increase in the load factor.

The study also reviewed environmental alternatives to promoting renewable energy development, mainly improved energy conservation and clean coal technology. It found that even if all economically justified projects were implemented substantial new coal-based capacity would still be required. It found the same to be the case for clean coal technology. Overall the analysis indicates the three options are complementary not mutually exclusive.

A risk analysis has evaluated the impact of simultaneous changes in all of the important variables—discount rate, world oil price, GDP growth, environmental externality value, wind energy capital cost reduction. The study also constructed payoff and penalty matrices for the three possibilities for the economic optimum quantity—a base case scenario (89 TWh), a pessimistic scenario (76 TWh), and an optimistic scenario (117 TWh). The analysis found a probability of only 27 percent that the optimum economic quantity would be less than 89 TWh. Concerning the higher target of 117 TWh, the penalty matrix shows that the potential maximum penalty of this target not being the optimum is substantially greater than the maximum benefit of the pessimistic target, indicating that it is better to underestimate rather than overestimate. This makes sense on the practical level as well since given uncertainly, it is better to build incrementally than to incur the cost of building unused capacity.

Options for Policy Instruments to Meet the Target

Methodology and Assumptions. The policy focuses on how to meet the economic optimum target considering the distribution of benefits, especially to the western provinces, given the GoC's policy to promote the development of this region. The starting point for the analysis was a review of **international** practice and study tours to countries that have been successful in renewable energy development for grid-based power generation. Two categories of policy instruments have proven effective, which the analysis has reviewed in detail—quantity-based instruments and price-based instruments. These instruments rely on market forces in combination with some administrative standards or prices to stimulate the market for developing renewable energy technology.

Quantity-based instruments establish a target quantity for renewable energy by a given date and allow the market to set the price. This approach has been adopted in some form by Australia, Denmark, Italy, the Netherlands and the United States. Price-based instruments guarantee a tariff that producers will obtain, allowing the market to determine the quantity. The foremost example of this approach is Germany, which is the world's leader in the development of wind power. Box 1 outline four cases that have been reviewed in detail. These consist of: two quantity-based models policies—the development of a Renewable Portfolio Standard (RPS) in Texas and the bidding model of the Non–Fossil Fuel Obligation (NFFO) in the United Kingdom; one price-based model—the German Feedlaw; and one combination Feedlaw/Bidding program in China's Zhejiang Province.

Theoretically, with perfect knowledge of the provincial supply curves and the externalities of coal use, the same impact should result whether the price or the quantity is determined. However, given real-world uncertainty, the two policies may have different outcomes. The real issue is not whether to use a Feedlaw rather than a quantity-based approach. What is more important is the extent to which either the target quantity or the Feedlaw price would lead to achievement of a sound and well defined economic and environmental objectives. In the case of China, the analysis needed to take account of the varying costs of coal production and its externalities as well as different resource endowments of its provinces. Also, the analysis should address the extent to which the development of wind energy would require additional incentives to establish a domestic manufacturing industry that would be necessary in order to achieve the projected reductions in the wind energy technology.

In addition to the economic analysis of benefits to the economy, the methodology for selecting the policy instrument required a financial analysis to assess the incremental financial costs of the policies and their impact on the distribution of costs and benefits among different groups in society—consumers, equity investors, renewable electricity producers, coal electricity producers, banks, government (taxes and so forth). Table A9.4 provides a comparison of assumptions for some of the important elements in the analysis. For example, the financial analysis used an actual cost of capital in marketplace at around six percent instead of the discount rate that is double that amount. It also includes corporate and value added taxes.

Box A9.1: Examples of Policies to Promote Renewable Energy for Power Generation

Renewable Portfolio Standard (RPS)

Concept: Legislation requires the production of an agreed quantity of electricity from a portfolio of renewable energy sources by a given target year, with penalties for underperformance.
Rents accrue to: Producers **Costs recovered by**: Consumers
Applied in: United States (State of Texas)
Comment: The Texas RPS has been one of the most successful programs for producing wind power. So far producers have exceeded their annual targets considerably. An important element in the success is the production tax credit, allowing wind projects to deliver power to the grid at less than US$0.03 per kWh, which is close to the avoided cost of fossil fuel generation. Compliance with the standard has been accomplished by long-term contacts (10–15 years) between retail companies and wind developers with strong penalties for underperformance.

Non–Fossil Fuel Obligation (NFFO)

Generators using renewable energy in England and Wales bid competitively to receive a premium price of electricity funded by a levy on electricity sales to final consumers.

Producers : Consumers
England and Wales

Feedlaw System

Concept: The term comes from the original German law that means "electricity feed-in law" that provided a price guarantee for producers of wind energy. The government sets a *Feedlaw* price at the social cost of coal. Utilities are required to accept wind energy production from all technically qualified producers.
Rents accrue to: Developers/equipment producers **Costs recovered by**: Consumers
Applied in: Germany and Spain
Comments: Germany leads the world in installed capacity for wind power, but also had the highest tariff under Feedlaw. The law originally applied only to wind energy, but now applies to other forms as well. In April 2000, the Government of Germany replaced the earlier law to correct for some of the problems of the old law, including high prices.

Feedlaw/Bidding Combination

The Feedlaw price provides developers with a guaranteed off-take price, but bidding is required for the right to develop renewable energy sites.

Producers/Government : Consumers
China (Zhejiang Province)

For the system to be effective, there are two requirements. First, the feed-in price should not be too far above the avoided cost. Second, for competition to be viable, actual production costs must be significantly below the *Feedlaw* price provide sufficient resource rents to make projects attractive to developers.

Table A9.3: Comparison of the Assumptions: Economic vs. Financial Analysis

Item	Economic	Financial
Cost of capital		
Equity	Opportunity cost of capital (12%)	18% (as internal rate of return)
Debt	Opportunity cost of capital (12%)	6.2% (current China lending rate)
Equity ratio	N/A	25%
Taxes		
Corporate Income Tax	None	33%
VAT	None	6.5% for small hydro and 8.5% for wind energy and landfill gas
Coal	Based on border price	Actual financial cost

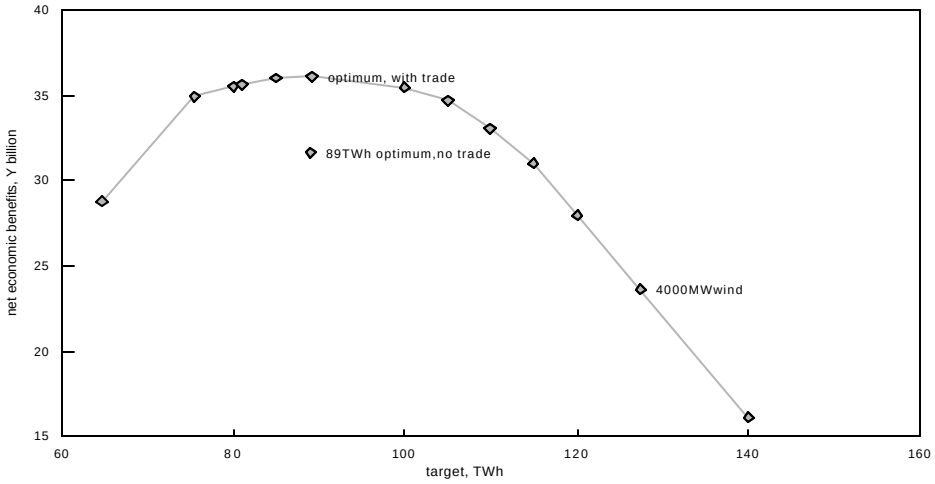
Results of the Quantity-Based Option. The analysis focuses on determining a quantity standard for each province in order to meet the national optimum quantity target and whether the quantity based option should be considered. It evaluates two approaches for provinces to achieve this standard as shown in Table A9.4. The first is a "no trade" scheme, whereby each province would meet its standard from its own resources. The second is a system of tradable green certificates that allows provinces with higher-cost renewable energy resources to meet their target by building facilities in other provinces with lower cost resources. This is the same as saying that one builds a set of renewable projects in China (totaling 89 TWh) that would yield the least aggregate production cost.

Table A9.4: Comparison of Quantity-Based Options for Meeting the 89 TWh Economic Optimum Target by 2010

Expected Benefits	Units	Economic analysis	Financial Analysis		
			No Trade	With Trade	Impact of trade
Annual flows, 2010					
Net benefits:(financial)	Y million	—	8,450	8,574	124
Incremental benefits (financial)	Y million	—	5,710	6,031	321
Environmental benefits (economic)	Y million	2,739	2,739	2,543	-196
SO_2 Emissions Reduction	1,000 tons	1,197	1,197	1,187	-9
TSP Emissions Reduction	1,000 tons	32.0	32.0	30.7	-1.3
NO_x Emissions Reduction	1,000 tons	237	237	225	-8
Reduction in Coal Consumption	million tons	38.9	38.9	39.4	0.5
Net Economic Benefits					
Annual: 2010	Y billion	9.93	9.93	11.0	1.14
As NPV	Y billion	31.4	31.4	36.1	4.7

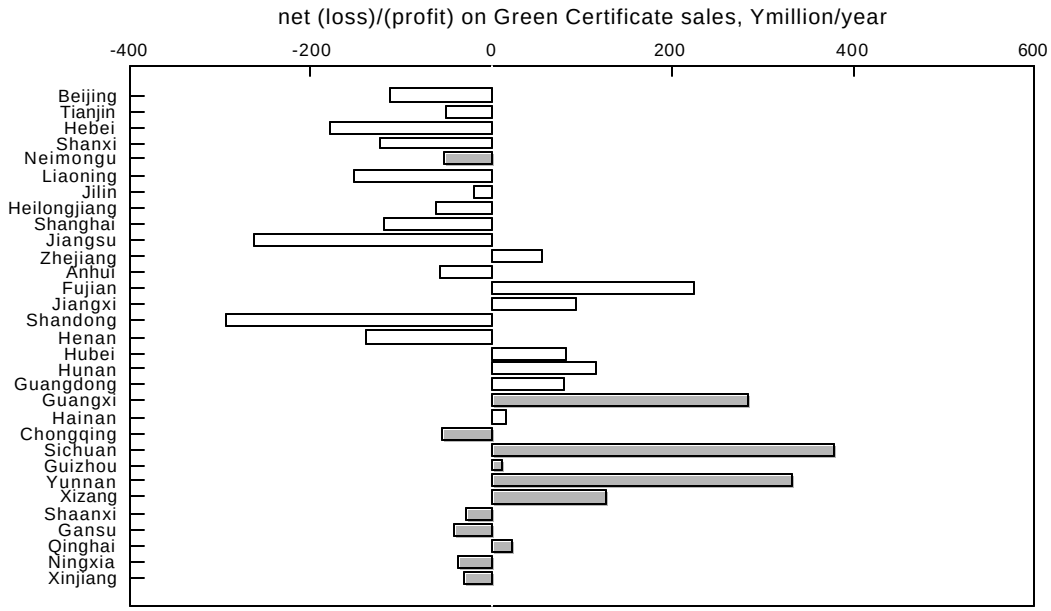
The simulation model tested the economic and environmental impact of six quantity targets for 2010, ranging from a low of 65 TWh to a high of 140 TWh. Figure 8 indicates the tradeoff between net economic benefits and quantity of renewable energy based electricity. The evaluation shows that the highest net benefits would result from setting a quantity standard of 89 TWh for 2010 with interprovincial trade in green certificates. This case would have an NPV of Y 36.1 billion, which would be Y 4.7 billion or about 15 percent higher than setting the optimum without a TGC system (valued at Y 31.4 billion).

Figure A9.5: Net Economic Benefits of Various Quantity Targets



Estimated Financial Impact of Trade in Green Certificates. The analysis of the quantity based option also reviewed the financial impact of trade in green certificates on the various provinces. The major winners are Xizang, Sichuan, Yunnan, and Guangxi. All of these are western provinces with good small hydro resources. Major losers are Shandong and Jiangsu, which would have a high obligation placed on them, but which have relatively few low-cost resources, meaning that to meet their obligation at least cost, they would become significant buyers of green certificates.

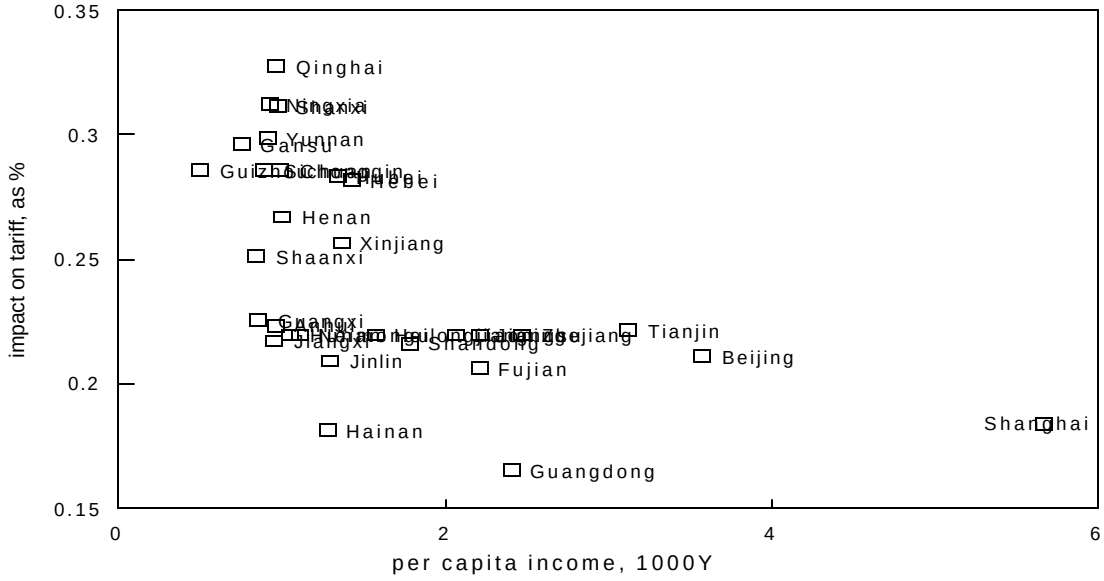
Figure A9.6: Estimated Profit and Loss on Green Certificates



Evaluation of the Tariff Impact on Consumers. Although the trading system of green certificates has net economic benefits for all provinces, the tariff impact of meeting the optimum quantity will vary. Essentially it will depend on the extent to which the consumer or the producer

captures the surplus associated with the sale of the green certificates. Given the varying income levels among provinces, this impact is a significant concern. To given an idea of the potential magnitude of the impact the simulation model created a worst-case scenario in which producers capture all of the surplus from the sale of green certificates. Figure 6 shows the results of this scenario for the various provinces. Although the figure shows that provinces on the lower end of the per capita income scale would bear the greatest burden, even the highest tariff impact would be very small, at a 0.35 percent increase.

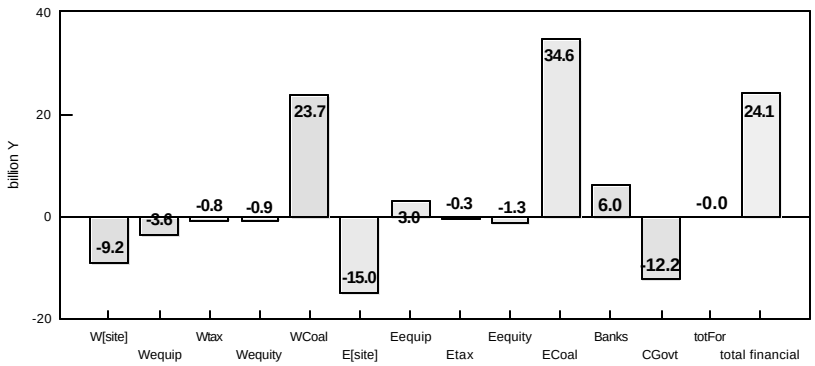
Figure A9.7: Estimated Worst-Case Tariff Impact with All of the Surplus Passed on to Producers



Financial Impact on Stakeholders. Figure 7 shows the impact on various stakeholders. The positive amounts indicate savings to the power sector and to some combination of consumers and producers, whereas the negative amounts indicate cost. However, a financial cost to the power sector is a financial benefit to the entity involved (and vice versa). Thus the saving to power consumers of Y23.7 billion also represents lost revenues (that is, a cost) to the coal industry. However, the additional site cost of Y9.2 billion in the west results in an increased financial flow to western construction industry. The expected tax impacts on local and provincial entities are small. However, there is an apparent significant tax gain to the central government. The model accounts for the subsidy on domestic coal as a "negative tax" to the GoC.[7] Therefore, as coal consumption declines, the subsidy diminishes by a corresponding amount. Alternatively it would accrue to the central government or the coal industry if the coal not used for power generation is exported instead, or used for some other purpose.

[7] This "subsidy" arises because the economic netback value of coal (calculated on the basis of the international price at the export port) is higher than the financial cost. This is in reality a resource rent that is presently captured by coal consumers who benefit from a coal price that is below economic cost.

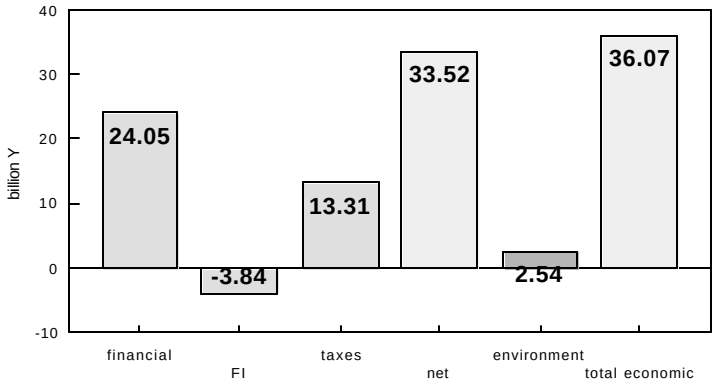
Figure A9.8: Distributional Financial Impact of the Quantity-Based Policy with Trade in *Green Certificates*



Note: W prefix=west; E prefix=east
Positive bars:=net financial savings to the power sector:
Negative bars:=net financial costs
"Site" = civil construction costs and local O&M costs
"Equip"=expenditures for manufactured equipment (such as small hydro turbines and coal boilers)
"Equity" = returns/subsidies to equity holders

Reconciliation of Economic and Financial Flows. Figure 8 summarizes the reconciliation of economic and financial flows resulting from the quantity standard with trade. The net benefit of Y 36.1 billion corresponds to the economic optimum quantity of 89 TWh in the base case. As the figure indicates, the loss incurred by financial institutions arises in the reconciliation because the rate of financial interest is below that of the assumed discount rate, and therefore provides an implicit subsidy to the power sector since lend at below the assumed opportunity cost of capital.

Figure A9.9: Economic and Financial Flows for a Target Optimum of 89 TWh with Trade



Evaluation of the Price-Based Option. In a single province, with perfect information and no uncertainty, setting the price instead of a standard should result in the same economic optimum of 89 TWh. For example, suppose Zhejiang Province were to set a Feedlaw price for all qualifying renewable energy resources at Y 40.1 per kWh, equal to the (economic) cost of coal generation plus the externality value of 6.2 fen/kWh. Then theoretically the same set of resources

should be developed as in the case of setting a quantity standard of 6,994 GWh, which is the economic optimum for Zhejiang. However, in a multiprovince situation, it is virtually impossible to design a Feedlaw that gives the same result as a quantity target with tradable green certificates. Any Feedlaw equalization measure necessarily would be an administrative rather than market process and the failures of the Soviet planned economy show that an administrative process cannot simulate the functioning of a real marketplace.

International experience suggests that a Feedlaw with a generous price can be highly effective in promoting renewable energy technology. The surplus goes to the producers, which creates incentives for technological innovation and cost reduction in turbine-generator equipment. This also creates a set of conditions that make it most likely for a domestic equipment manufacturing industry to be successfully established—which is of particular relevance for China where the potential for reducing equipment costs through domestic manufacture is substantial. Moreover, the certainty in Feedlaw price makes it easier to finance projects than in systems where cost recovery is through a market mechanism (such as tradable certificates) inevitably subject to greater uncertainty. Given all of these factors the Feedlaw approach could prove beneficial to the development of a wind energy industry in China

Combined Feedlaw/Bidding Approach. The Zhejiang system for small hydro combines the features of the Feedlaw price and the bidding variant of the quantity approach. The Feedlaw price provides certainty of revenues and the bidding ensures competitive prices. In principle it could be used everywhere. The system, however, needs two critical elements to be economically efficient. First the feed-in price should not be too far above the avoided cost, including externality cost. Second, for competition to work, project must be attractive to private developers, meaning that the actual production costs for most projects must be significantly below the Feedlaw price.

The Special Case of Wind Energy

Rationale. The development of wind power might deserve special consideration for two reasons. First its economic potential can only be achieved in the long run if incentives are provided in the short run. And second, whatever the costs of providing such incentives in the short run, they are likely to be outweighed by the long-term economic benefits. There are two main considerations for the development of a separate wind power development program. The first is the size of the annual wind energy market to support the establishment of a domestic wind technology industry that will bring about the substantial cost reductions. The second is whether the requisite wind energy market should be developed by setting a larger overall quantity target for renewable energy or through a technology-specific target implemented either by a Feedlaw or a quantity standard.

Need for a Technology-Specific Target. At the present stage of global technology, Chinese manufacturers could reduce the cost of wind turbines by around 30 percent. As the global technology advances, even larger cost reductions over present levels may be possible. However, to achieve such cost reductions in China, an assured market will be necessary in order to develop the necessary industrial infrastructure. Based on the global market for wind turbine-generator equipment, a domestic market size of at least 400 MW will be necessary. This suggests a 4,000 MW wind power target for 2010.

Policy Options for Achieving a 4000 MW Target. There are three basic options for achieving the 4,000 MW target for wind energy development First, a Feedlaw of 45 fen/kWh would induce 4,082 MW (generating 11.4 TWh), assuming the base case achievement of a 33 percent reduction in equipment cost by 2010. The second is the establishment of a separate wind energy quantity standard amounting to 11.4 TWh, which could be implemented independently of a general 89 TWh RPS for all other renewable energy generation. There is no reason why two types of green certificates could not be issued—one for wind and another for all other qualifying renewable energy sources. The third option is an increase in the overall renewable energy target in order to induce the wind energy target. The simulation model indicates that an overall target of 127 TWh by 2010 would achieve this result.

A Feedlaw approach to wind energy development is likely to require a price equalization scheme. Tariff increases to support wind energy development are likely to be unsustainable without a mechanism to spread the incremental costs among the provinces. For example, at a Feedlaw price of 50 fen/kWh, the tariff increase would be 17 percent in Neimongu, but only 0.3 percent in Guangdong. The funding of the equalization fund could take place through a national levy sufficient to raise the incremental costs of Y 3.4 billion, which would be distributed to wind project developers. However, matching the levy to the inherently unpredictable number of projects would be difficult.

The NPVs of the quantity standard and the Feedlaw are very close—Y 32.1 billion and 32.3 billion, respectively—whereas the NPV for an increase in the overall renewable energy target to 127 TWh has a significantly lower NPV (Y 25.3 billion). Thus, among the three options, that of increasing the overall quantity standard from 89 TWh to 127 TWh is clearly inferior, because it induces significant additional quantities of other noneconomic renewable energy technologies as well. Unlike the case of wind power, increasing the market size for small hydro is not likely to reduce the future costs of small hydro. There are two reasons for this. First, the civil costs are not a function of the scale of the overall market, only of individual project size. Second, an established industry for small hydro equipment already exists.

Conclusions

The conclusions of the analysis on the optimal scale-up quantity and policy instruments are based on a set of assumptions and tests of their robustness. However the findings are provisional and not meant to be definitive policy statements. Rather the report provides the GoC with an analytical tool, based on international best practice, which it can apply to the assumptions it finds to be the most realistic. An important contribution of the report to the analytical literature is the methodology for determining the target quantity for electricity supplied by renewable energy. Although there are many examples of policy instruments designed to meet a given target, the basis for setting the target has been, in many cases, not subject to the type of economic analysis the model in this report provides.

Based on the methodology and assumptions in this report, the preferred option for scaling up renewable energy–based power generation in China would be to set a single national quantity target of 89 TWh by 2010 rather than technology specific targets. The most viable policy instrument for achieving this target would be a requirement that every province meet a corresponding percentage of its total consumption from new renewable energy resources,

allowing for trade in green certificates to enable the provinces to attain their quantity standard at least cost. This option has the highest level of net economic benefits and provides an efficient mechanism for encouraging resource transfers to the western provinces. The establishment of a system for trading green certificates could take place gradually and would not require the immediate organization of a formal centralized market. In the early years of development, the system could work perfectly well through bilateral deals between producers and power companies who need to meet their renewable energy targets.

Wind energy is the only renewable energy source likely to need a technology specific target apart from the overall renewable energy target. This should be sufficiently large to induce the development of domestic manufacturing industry. Preliminary estimates indicate that in order for this to take place the size of the industry should reach 4,000 MW by 2010. The analysis shows that the benefits of meeting this target using either a quantity standard a special Feedlaw would be very close and it is advisable to look more closely into each of these options. The report finds that the alternative to each of these options—increasing the optimum renewable energy target from 89 TWh to 127 TWh—would be an inferior option because it could induce small hydro and other technologies that are uneconomic, but whose costs would unlikely decrease as a function of market size because they are already fully mature.

There are several important parameters in the economic and financial analysis that require further investigation during the pilot stage of the CRESP. On the economic side, there needs to be further study of the appropriate discount rate and the estimate of environmental damage costs cause by the use of coal. On the financial side, there were several limitations in the analysis that require further study.

Concerning the discount rate for the economic analysis, there are two issues that need to be resolved. The first is whether the standard rate of 12 percent used for investment projects is an accurate measure of the cost of capital in China. The second is whether there is some justification for using a different discount rate for renewable energy development considering the fact that averting environmental damage has a strong future orientation, whereas a high discount rate indicates a strong preference for the present. In addition, there is some environmental damage that might be irreversible. Many economists argue that the same rate must be used for all investment projects in a given country. However, others argue for a much lower rate for environmental projects in the order of 2–5 percent. There are precedents for differential rates in China, notably in the educational sector. However this subject is beyond the scope of the economic analysis for this project and deserves further study and discussion during the pilot phase of CRESP. Another area for further study is the estimation of environmental damage costs. The values used in this report are based on studies from outside China and available estimates vary widely.

There were several limitations in the financial analysis that could have an impact on the estimation of financial flows of to the various stakeholders. First, renewable energy projects located in western provinces are assumed to be developed by companies owned, located and registered in these provinces. Some uncertainty exists, however, whether the concomitant tax revenues actually accrue to the western governments, because they depend on the location, ownership and registration of the corporate entities in question, rather than the location of the project itself. Such revenues would diminish under the current tax system to the extent that

companies registered, located and owned in the East would build such projects in the West. Second, based on international experience, the transaction cost of the proposed program is assumed to be small; however this assumption needs further research and confirmation. Third, the taxes calculated in the financial analysis are based on statutory rates. However, in the past, actual taxes, especially income taxes, have been subject to negotiation between individual companies and tax authorities so that the actual tax revenues may be smaller than in this report's financial analysis.

ECONOMIC AND FINANCIAL ANALYSES OF SUBCOMPONENTS OF SUPPORT FOR WIND, BIOMASS AND SMALL HYDRO COMPONENT

Economic Analyses

Cost-benefit analyses were carried out to estimate the EIRRs of the two investment subcomponents of the proposed project (a) Fujian Pingtan Wind Power Generation Project (100 MW); and (b) Jiangsu Rudong Biomass Generation Project (25 MW). This annex summarizes the methodology, assumptions and results of the cost-benefit analyses.

Economic Costs

The economic costs of the investment components include (a) total investment costs of the renewable power generation projects and associated power network connection facilities, (b) O&M costs of the generation projects and related transmission and distribution facilities; (c) fuel costs for the biomass generation project; and (d) cost associated with electricity losses incurred during transmission and distribution and station uses. All the costs exclude taxes and duties and financing costs. The conversion factor is considered as 1.0 when estimating the economic costs from financial costs because the distortions in the exchange and wage rates in the overall costs are not significant enough to justify the use of shadow prices. The currency used in these analyses is RMB yuan (Chinese currency) at exchange rate with the U.S. dollar of Y8.28 to US$1.

Economic Benefits

Two major benefits considered for the analyses are: (a) direct benefits from the sales of electricity valued by the sales prices as a proxy of consumer willingness to pay; and (b) emission reductions benefits that are estimated based on the New York Externality Model (Rowe and others 1994).

Economic internal rate of return

The detailed estimates of EIRR for the components are shown in the following tables 9.1 for the Pingtan wind farm and 9.2 for the Rudong Biomass project. The results show that EIRRs of all the project components are larger than 10.0 percent and the economic viability of these project components are justified.

Table A9.5: Cost Benefit Analysis for the CRESP—Fujian Pingtan Wind Power Project

Year	Power Sales		Investment Costs	O&M Costs	Working Capital	Subtotal	Incremental Benefits				Net Benefits
							Sales		Environmental Benefits	Subtotal	
	Peak	Off-Peak					Peak	Off-Peak Desiel			
	(GWh)	(GWh)	(million Yuan)	(million Yuan)	(million Yuan)		(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005	0.0	0.0	336.4	0.0	0.0	336.4	0.0	0.0	0.0	0.0	-336.4
2006	0.0	0.0	504.6	0.0	0.0	504.6	0.0	0.0	0.0	0.0	-504.6
2007	129.8	129.8	0.0	16.8	2.1	18.9	63.1	63.1	21.8	148.0	129.1
2008	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2009	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2010	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2011	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2012	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2013	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2014	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2015	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2016	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2017	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2018	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2019	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2020	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2021	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2022	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2023	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2024	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2025	129.8	129.8	0.0	16.8	0.0	16.8	63.1	63.1	21.8	148.0	131.2
2026	129.8	129.8	0.0	16.8	-2.1	14.7	63.1	63.1	21.8	148.0	133.3
	2596.0	2596.0	841.0	336.4	0.0	1177.4	1261.8	1261.8	436.1	2959.8	1782.3
PV @ 10%		830.2	657.1	107.6	1.2	765.9	403.6	403.6	139.5	946.6	180.7
EIRR											**13.6%**

Table A9.6: Cost Benefit Analysis for the CRESP—Rudong Biomass Power Project

Year	Power Sales		Investment Costs	Fuel Costs	O&M Costs	Working Capital	Subtotal	Incremental Benefits				Net Benefits
								Sales		Environmental Benefits	Subtotal	
	Peak	Off-Peak						Peak	Off-Peak Desiel			
	(GWh)	(GWh)	(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)		(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)
2004	0	0	0.0	0.0	0.0000	0.000	0.0	0.0	0.0	0.0	0.0	0.0
2005	0	0	153.2	0.0	0.0000	0.000	153.2	0.0	0.0	0.0	0.0	-153.2
2006	0	0	102.1	0.0	0.0000	0.000	102.1	0.0	0.0	0.0	0.0	-102.1
2007	68.9	68.9	28.4	40.4	7.6607	0.958	77.4	46.7	46.7	11.6	105.0	27.7
2008	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2009	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2010	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2011	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2012	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2013	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2014	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2015	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2016	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2017	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2018	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2019	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2020	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2021	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2022	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2023	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2024	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2025	81.0	81.0	0.0	47.5	7.6607	0.000	55.1	55.0	55.0	13.6	123.5	68.4
2026	81.0	81.0	0.0	47.5	7.6607	-0.958	54.2	55.0	55.0	13.6	123.5	69.4
	1607.9	1607.9	283.7	942.5	153.2	0.0	436.9	1091.1	1091.1	270.1	2452.3	1072.9
PV @ 10%		509.8	222.7	298.8	49.0	0.5	272.3	346.0	346.0	85.6	777.6	206.4
EIRR												**20.8%**

Financial Analysis

This section summarizes the results of the analysis of the financial soundness of the four investment project components. It consists of two parts: (a) at the project level: financial soundness of the project—the financial rate of return of the project; and (b) at the entity level: the financial structure, efficiency, and viability of the project entity.

The financial analyses of the two investment subcomponents are based on the latest feasibility studies of the project components approved by the GoC and the project entities' audited historical financial accounts, as well as their latest financial projection. All the project components will be financed by IBRD loans, local loans and equity investments from the shareholders. The terms and conditions of the IBRD loans and local loans used in these analyses were those in late 2004. All the major assumptions are consistent with the current Chinese financial and taxation regulations as well as common practices in the project areas.

Financial rate of return of the projects

Fujian Pingtan Wind Farm

Major assumptions:

- Installed capacity: 100.5 MW
- Period of construction: 2 years
- Life of the project: 20 years
- Depreciation rate: 6.7 percent (1/15)
- Residual fixed asset value: 5 percent
- O&M: 1.5 percent (the first 10-year period) and 2.5 percent (the second 10-year period) of total investment costs
- Property insurance: 0.25 percent of the total value of the total investment costs
- Total generation: 273.26 GWh
- On-grid price: Y 0.441 per kWh (excluding including VAT)
- Value added tax: 8.5 percent (50 percent concession)
- Station use and line losses: 5.0 percent

Results. The FIRR of this component was estimated at 6.52 percent, slightly higher than the investor's hurdle rate of 6.0 percent. The net present value at 6 percent was estimated at Y 1.33 million with a pay-back period of 12.32 years.

Jiangsu Rudong Biomass Power Generation Project

Major assumptions:

- Installed capacity: 25 MW
- Period of construction: 2 years

- Life of the project: 20 years
- Depreciation rate: 6.7 percent (1/15)
- Residual fixed asset value: 5 percent
- O&M: 3.0 percent of total investment costs
- Total generation: 180.00 GWh
- On-grid price: Y 0.615 per kWh (excluding including VAT)
- Value added tax: 17 percent
- Corporate income tax: 33.0 percent
- Station use and line losses: 10.0 percent

Results. The FIRR of this component was estimated at 10.56 percent, higher than the investor's hurdle rate of 6.0 percent. The net present value at 6 percent was estimated at Y 115.30 million with a pay-pack period of 9.74 years.

Financial projection of the project entity

The five year financial projections are carried out for (a) Long Yuan Power Group Co., the project entity of Fujian Pingtan Wind Power project, and (b) Jiangsu Guoxin Renewable Energy Development Company. The projected major financial indicators for each company are summarized in following tables 9.3 for Long Yuan and 9.4 for NED.

Table A9.7 Projected Major Financial Indicators of Long Yuan Electric Power Group Corporation

Longyuan Electric Power Group Company
Main Fiancial Indicators
Unit: million yuan
As of 31 December

Item	2003	2004	2005	2006	2007	2008	2009
Operating Revenue	183.2	196.7	199.3	281.4	469.4	586.1	603.6
Operating Income	9.9	6.7	7.9	56.7	35.4	146.4	158.8
Annual Capital Expenditure	1456.1	594.4	425.3	1442.4	728.6	0.0	0.0
Rate Base	517.1	1257.3	1464.0	2016.2	3131.1	3510.3	3240.4
Long-term Debt	734.9	1119.3	1390.6	2324.5	2601.4	2377.3	2151.8
Debt Service	301.4	142.0	124.6	176.4	285.3	377.0	364.6
Cash in Banks	160.9	150.5	254.9	190.4	252.4	249.7	225.2
Rate of Return on Net Fixed Assets (%)	28.2	14.6	13.0	12.1	7.3	9.6	10.9
Debt Service Coverage Ratios (times)	0.8	2.0	2.3	1.9	1.7	1.6	1.7
Current Ratio (times)	1.4	1.3	1.6	1.5	1.7	1.7	1.7
Debt as % of Debt and Equity (%)	35.5	36.3	39.5	48.1	48.4	46.4	44.5

Table A9.8 Projected Major Financial Indicators of Jiangsu Guoxin New Energy Development Company

Rudong Company
Main Fiancial Indicators
Unit: million yuan
As of 31 December

Item	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*
Operating Revenue	0.0	0.0	99.1	116.6	116.6	116.6	116.6
Operating Income	0.0	0.0	12.2	20.6	20.6	20.6	20.6
Annual Capital Expenditure	177.8	119.0	29.1	36.0	36.2	36.2	36.5
Long-term Debt	101.3	202.5	178.3	165.5	165.5	154.5	143.5
Cash in Banks	0.0	0.0	0.3	0.3	0.3	0.3	0.3
Rate of Return on Net Fixed Assets (%)	0.0	0.0	1.8	5.4	6.0	6.5	7.0
Debt Service Coverage Ratios (times)	0.8	2.0	2.3	1.9	1.7	1.6	1.7
Current Ratio (times)	0.0	0.0	2.2	7.3	15.9	21.6	27.5
Debt as % of Debt and Equity (%)	57.0	68.2	64.0	59.4	56.7	52.6	48.5

Additional Annex 9A: Economic and Financial Analysis for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

Economic Analyses

Cost-benefit analyses were carried out to estimate the EIRRs of the two investment subcomponents of the proposed project and the two potential investment subcomponents. These four investment components include (a) Fujian Pingtan Wind Power Generation Project (100.5 MW); (b) Inner Mongolia Wind Power Generation Project (100.5 MW); (c) Jiangsu Rudong Biomass Generation Project (25 MW) and (d) Zhejiang Small Hydropower Development Project (46 small hydropower station with a total incremental capacity of 82.66 MW). This annex summarizes the methodology, assumptions and results of the cost-benefit analyses.

Economic Costs

The economic costs of the investment components include (a) total investment costs of the renewable power generation projects and associated power network connection facilities, (b) O&M costs of the generation projects and related transmission and distribution facilities; (c) fuel costs for the biomass generation project; and (d) cost associated with electricity losses incurred during transmission and distribution and station uses. All the costs exclude taxes and duties and financing costs. The conversion factor is considered as 1.0 when estimating the economic costs from financial costs because the distortions in the exchange and wage rates in the overall costs are not significant enough to justify the use of shadow prices. The currency used in these analyses is RMB yuan (Chinese currency) at an exchange rate with the U.S. dollar of Y8.28 to US$1.

Economic Benefits

Two major benefits considered for the analyses are: (a) direct benefits from the sales of electricity valued by the sales prices as a proxy of consumer willingness to pay; and (b) emission reductions benefits that are estimated based on the New York Externality Model (Rowe and others 1994).

Economic Internal Rate of Return

The detailed estimates of EIRR for the components are shown in following tables 9A.1 for Huitengxile and 9A.2 for the Zhejiang projects. The results show that EIRRs of all the project components are larger than 10.0 percent and the economic viability of these project components are justified.

Table A9A.1: Cost-Benefit Analysis for the CRESP—Inner Mongolia Wind Power Project

Year	Power Sales		Investment Costs	O&M Costs	Working Capital	Subtotal	Incremental Benefits				Net Benefits
							Sales		Environmental Benefits	Subtotal	
	Peak	Off-Peak					Peak	Off-Peak Desiel			
	(GWh)	(GWh)	(million Yuan)	(million Yuan)	(million Yuan)		(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)	(million Yuan)
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005	0.0	0.0	328.4	0.0	0.0	328.4	0.0	0.0	0.0	0.0	-328.4
2006	11.0	11.0	492.5	0.0	0.0	492.5	4.6	4.6	1.8	11.0	-481.6
2007	134.5	134.5	0.0	16.4	2.1	18.5	55.8	55.8	22.6	134.2	115.7
2008	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2009	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2010	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2011	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2012	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2013	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2014	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2015	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2016	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2017	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2018	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2019	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2020	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2021	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2022	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2023	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2024	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2025	134.5	134.5	0.0	16.4	0.0	16.4	55.8	55.8	22.6	134.2	117.8
2026	134.5	134.5	0.0	16.4	-2.1	14.4	55.8	55.8	22.6	134.2	119.8
	2701.0	2701.0	820.9	328.4	0.0	1149.2	1120.3	1120.3	453.8	2694.4	1545.1
PV @ 10%		868.6	641.4	105.0	1.2	747.6	360.3	360.3	145.9	866.4	118.8
EIRR											**12.5%**

Table A9A.2: Cost Benefit Analysis for the CRESP—Zhejiang Small Hydro Projects

No.	Subproject	Location	Economic Internal Rate of Return (%)
1	Anji Laoshikan I	Anji County	21
2	Anji Xiaofeng	Anji County	33
3	Anji Xiaofeng	Anji County	35
4	Songyang Wutongyuan	Songyang County	18
5	Songyang Qingshiba	Songyang County	25
6	Songyang Youtou	Songyang County	23
7	Jiangshan Xiakou	Jiangshan County	31
8	Changshan Changting	Changshan County	22
9	Tiantai Tongbai	Tiantai County	28
10	Dongyang Nanjiang I	Dongyang City	33
11	Dongyang Nanjiang II	Dongyang City	28
12	Lishui Yaxi I	Liandu District	10
13	Wencheng Xiaojiuxi	Wencheng County	18
14	Xianju Hebu	Xianju County	20
15	Wencheng Jimengkeng	Wencheng County	17
16	Wencheng Shaqiang	Wencheng County	24
17	Songyang Dougubu	Songyang County	16
18	Songyang Hexi	Songyang County	16
19	Jiangshan Jinlong I	Jiangshan City	19
20	Jiangshan Jinlong II	Jiangshan City	19
21	Jiangshan Fushiling	Jiangshan City	26
22	Jiangshan Tangyuankou	Jiangshan City	26
23	Jiangshan Qingshi	Jiangshan City	25
24	Jiangshan Hejiao	Jiangshan City	22
25	Jiangshan Pishiqu	Jiangshan City	23
26	Jiangshan Ying'an	Jiangshan City	21
27	Jiangshan Ao'tang	Jiangshan City	16
28	Jiangshan Qinghu	Jiangshan City	17
29	Jiangshan Tongjia	Jiangshan City	20
30	Jiangshan Hangji	Jiangshan City	19
31	Jinhua Shizhutou	Wucheng District	16
32	Jinhua Banxi I	Wucheng District	17
33	Jinhua Banxi II	Wucheng District	17
34	Jinhua Banxi III	Wucheng District	17
35	Jinhua Banxi IV	Wucheng District	18
36	Jinhua Laohujia	Wucheng District	17
37	Jinhua Shuangxi	Wucheng District	18
38	Jingning Zhangchun	Jingning County	17
39	Dongyang Dongmen	Dongyang City	13

40	Xianju Yuxi I	Xianju County	18
41	Xianju Yuxi II	Xianju County	16
42	Xianju Dacheng	Xianju County	20
43	Quzhou Hengfeng	Kecheng District	16
44	Pan'an Houjia	Pan'an County	10
45	Pan'anxi Xialu	Pan'an County	12
46	Changshan Zhaoxian	Changshan County	13

Financial Analysis

This section summarizes the results of the analysis of the financial soundness of the two potential investment project components. It consists of two parts: (a) at the project level: financial soundness of the project—the financial rate of return of the project; and (b) at the entity level: the financial structure, efficiency, and viability of the project entity.

The financial analyses of the four investment components are based on the latest feasibility studies of the project components approved by the GoC and the project entities' audited historical financial accounts, as well as their latest financial projection. All the project components will be financed by IBRD loans, local loans and equity investments from the shareholders. The terms and conditions of the IBRD loans and local loans used in these analyses were those in late 2004. All the major assumptions are consistent with the current Chinese financial and taxation regulations as well as common practices in the project areas.

Financial rate of return of the projects

Inner Mongolia Wind Power Project

Major Assumptions:

- Installed capacity: 100.5 MW
- Period of construction: 2 years
- Life of the project: 20 years
- Depreciation rate: 6.7 percent (1/15)
- Residual fixed asset value: 5 percent
- O&M: 1.5 percent (the first 10-year) and 2.5 percent (the second 10-year) of total investment costs
- Property insurance: 0.25 percent of the total value of the total investment costs
- Total generation: 273.26 GWh
- On-grid price: Y 0.382 per kWh (excluding including VAT)
- Value added tax: 8.5 percent (50 percent concession)
- Corporate income tax: 1st and 2nd Year: 0.0 percent, after that, 15 percent (concession rate)
- Station use and line losses: 5.0 percent

Results. The FIRR of this component was estimated at 7.00 percent, slightly higher than the investor's hurdle rate of 6.0 percent. The net present value at 6 percent was estimated at Y 28.21 million with a pay-pack period of 11.68 years.

Zhejiang Small Hydropower Development Project

The FIRRs of all the 46 subprojects were estimated based following major assumptions and the results are summarized in following table:

Major assumptions

- Life of the project: 20 years
- Depreciation rate: 5.0 percent (1/15)
- Residual fixed asset value: 5 percent
- O&M: 1.0 percent of total investment costs
- On-grid price: Y 0.425 per kWh (excluding including VAT)
- Value added tax: 17 percent
- Corporate income tax: 33.0 percent
- Station use and line losses: 2.0 percent

Major Results. The FIRR of all the subprojects are higher than the investor's hurdle rate of 6.0 percent as shown in following table 9A.3.

Table A9A.3 Financial Rate of Return of All the Subprojects—Zhejiang Small Hydropower

No.	Power station	Location of the subprojects	Financial internal rate of return (%)
1	Anji Laoshikan I	Anji County	9
2	Anji Xiaofeng Wangjiazhuang	Anji County	7
3	Anji Xiaofeng	Anji County	7
4	Songyang Wutongyuan	Songyang County	8
5	Songyang Qingshiba	Songyang County	11
6	Songyang Youtou	Songyang County	11
7	Jiangshan Xiakou	Jiangshan County	16
8	Changshan Changting	Changshan County	9
9	Tiantai Tongbai	Tiantai County	12
10	Dongyang Nanjiang I	Dongyang City	16
11	Dongyang Nanjiang II	Dongyang City	13
12	Lishui Yaxi I	Liandu District	7
13	Wencheng Xiaojiuxi	Wencheng County	7
14	Xianju Hebu	Xianju County	10
15	Wencheng Jimengkeng	Wencheng County	7
16	Wencheng Shaqiang	Wencheng County	11
17	Songyang Dougubu	Songyang County	7
18	Songyang Hexi	Songyang County	7

19	Jiangshan Jinlong I	Jiangshan City	8
20	Jiangshan Jinlong II	Jiangshan City	8
21	Jiangshan Fushiling	Jiangshan City	11
22	Jiangshan Tangyuankou	Jiangshan City	11
23	Jiangshan Qingshi	Jiangshan City	11
24	Jiangshan Hejiao	Jiangshan City	10
25	Jiangshan Pishiqu	Jiangshan City	10
26	Jiangshan Ying'an	Jiangshan City	9
27	Jiangshan Ao'tang	Jiangshan City	7
28	Jiangshan Qinghu	Jiangshan City	7
29	Jiangshan Tongjia	Jiangshan City	9
30	Jiangshan Hangji	Jiangshan City	8
31	Jinhua Shizhutou	Wucheng District	7
32	Jinhua Banxi I	Wucheng District	8
33	Jinhua Banxi II	Wucheng District	8
34	Jinhua Banxi III	Wucheng District	8
35	Jinhua Banxi IV	Wucheng District	8
36	Jinhua Laohujia	Wucheng District	7
37	Jinhua Shuangxi	Wucheng District	8
38	Jingning Zhangchun	Jingning County	7
39	Dongyang Dongmen	Dongyang City	7
40	Xianju Yuxi I	Xianju County	8
41	Xianju Yuxi II	Xianju County	7
42	Xianju Dacheng	Xianju County	8
43	Quzhou Hengfeng	Kecheng District	7
44	Pan'an Houjia	Pan'an County	7
45	Pan'anxi Xialu	Pan'an County	7
46	Changshan Zhaoxian	Changshan County	7

Financial projection of the project entity

The five year financial projections are carried out for Inner Mongolia North Long Yuan Wind Power Generation Co., the project entity of Inner Mongolia Wind Power Project. The projected major financial indicators for each company are summarized in Table 9A.12. No financial projections for the entities in Zhejiang has been carried out, but it is included as part of the due diligence requirement in the agreed framework.

Table A9A.4: Projected Major Financial Indicators of Inner Mongolia North Long Yuan Wind Power Generation Company Ltd.

Inner Mongolia Beifang Longyuan Wind Power Generation Company Ltd.
Main Fiancial Indicators
Unit: million yuan
As of 31 December

Item	2004	2005	2006	2007	2008	2009	2010
Energy Sales (GWh)		338	608	876	1087	1221	1355
Average Price (Yuan/kWh) - without VAT		0.387	0.398	0.410	0.422	0.435	0.448
Average Price - 2004 Price Level (Yuan/kWh)		0.382	0.382	0.382	0.382	0.382	0.382
Operating Revenue		131.0	242.1	359.3	459.1	531.2	607.2
Operating Income		41.2	71.5	94.4	126.8	192.2	225.7
Annual Capital Expenditure		814.5	832.5	815.9	987.2	503.6	553.9
Rate Base		476.3	835.1	1584.9	2290.0	3016.1	3554.0
Long-term Debt		911.8	1511.8	2051.7	2691.7	2771.7	2911.7
Debt Service		96.6	124.4	147.4	90.2	82.4	143.1
Cash in Banks		20.2	52.1	86.2	120.1	166.7	238.5
Rate of Return on Net Fixed Assets (%)		9.9	9.8	7.1	6.5	7.0	6.9
Debt Service Coverage Ratios (times)		0.9	1.1	1.4	3.2	5.1	3.2
Current Ratio (times)		1.1	1.9	2.8	4.0	4.5	6.6
Debt as % of Debt and Equity (%)		71.6	72.3	71.6	71.5	67.4	63.9

Annex 10: Safeguard Policy Issues

CHINA Renewable Energy Scale-up Program

Overview

The wider social benefits of increased renewable energy use are clearly understood by most stakeholders and, indeed, underpin the rationale for the project. The MMP approach to support increased use of renewable energy has been widely discussed among government and the public sector, the power sector, renewable energy equipment and services suppliers and civil society. Several large-scale meetings have been held to discuss the findings of the economic analysis and the MMP while there has been unprecedented openness during preparation of the REL. There is wide acceptance for the concept, recognizing that whereas most groups stand to gain, as does society as a whole, some stand to experience slightly lower growth—such as coal producers—as renewable energy displaces more conventional power generation (see Annex 9). These stakeholders will continue to be involved during project implementation, as the law and regulations are further developed.

There has been extensive consultation with local stakeholders who have participated fully during preparation of the Support for Wind and Biomass in Pilot Provinces Component as part of the safeguards process. Stakeholder perceptions of the investment subprojects are generally positive since they clearly understand the expected local benefits from improved quality of electricity supply, employment opportunities and, in Jiangsu, from the sale of an otherwise troublesome waste.

Project alternatives have been compared. CRESP is underpinned by analysis that establishes that renewable energy can be the least economic cost solution for power production in China when environmental externalities are taken into consideration. The projects are intended to demonstrate the scale-up of renewables and their economic and environmental advantages over coal-fired electricity generation.

For phase I, several options were discussed with the government to select a limited number of provinces with good renewable energy resources and interest in developing them. At the same time the government is interested in GEF support to those technologies that are at or approaching economic viability for electricity generation to scale-up and increase impact. A selection process that examined all 32 provinces and autonomous regions resulted in the selection of the four pilot provinces: Fujian, Inner Mongolia, Jiangsu, and Zhejiang not only for their interest in the project, but also for the range of technologies that could be piloted.

Several other sites were considered by all the four provinces, but rejected on grounds of resource availability and site suitability. Sites chosen have been selected as the most promising for demonstration at this time. Environmental and social impact analyses have been carried out for each of the investment subprojects and are presented in environmental impact assessments (EIA) and Resettlement Action Plans (RAPs). The analyses have reviewed the project and the site, and identified the main impacts during construction and operation. In addition, participatory and awareness raising techniques have been employed during the process of preparing the EIAs and RAPs.

The Borrower and implementing agencies have agreed to implement environment management plans (EMPs), acceptable to the Bank, for each subproject, which include mitigation action plans, supervision plans and monitoring plans. The sponsors appear both capable and committed to implementing and monitoring the plans.

For the two investment subcomponents, environment assessments (EAs) and RAPs have been disclosed as follows:

Table A10.1: Disclosure of EAs and RAPs for Fujian and Jiangsu

	Fujian	Jiangsu
Date of EA and RAP to Infoshop	November 24, 2004	November 24, 2004
Disclosure in China: • Date • Location	• June 30, 2004 (RAP) • October 26, 2004 (EIA) • Pingtan County Offices	• November 2, 2004 (EIA and RAP) • Rudong County project office

Summaries of safeguards issues and remedies are given below, by subproject.

Pingtan Wind Farm

Potential local environment impacts during construction will be noise, dust, vehicular movement, excavation and movement of spoil, temporary vegetation loss and the effects of a small workforce being located on the site. Potential impacts associated with the transmission line routing are minor. Construction duration is expected to be 24 months. Impacts and mitigation are as follows:

- Noise. Some construction noise is expected to exceed 60 dBa in some nearby villages, but will be temporary and reversible. Construction noise will be limited in areas near habitation by the use of machines meeting noise emission standards and by limiting construction to the day time;
- Dust and vehicular movement will occur, but is not expected to have a significant impact in the surrounding villages. Movement of spoil will be within the site and there is no net surplus of spoil requiring disposal;
- Some of the shelter trees will be cut down on the permanently acquired land and some of the temporarily acquired land. Lost trees will be replanted on temporarily acquired land;
- Although unlikely, it is possible that a hitherto uncatalogued archaeological site will be uncovered during construction. Chance find procedures have been identified in the EIA;

During operation, potential impacts will be noise, visual and potential bird strike. Impacts and mitigation are as follows:

- Noise levels have been examined quantitatively. With the original turbine layout design, three villages would have been potentially subject to a nighttime background noise level above the standard of 50 dBa and two (of the same three) would have been subject to daytime background noise above the standard of 60 dBa. Layout adjustments proposed in the EIA bring all sensitive sites below nighttime and daytime standards;
- Visual impact will result from the presence of the turbines and other installations. This is partially mitigated by the presence of trees, but also appears to be of no importance to locals, based on their responses to surveys. In other areas of China, wind farms have become tourist or educational attractions;
- The site does not lie on a migratory bird route or is a migratory habitat. There are no rare or protected species at the site. Potential impacts are expected to be minimal, based on experience with the existing wind farm.

Permanent land acquisition includes land for wind machines, roads and substations, totaling 31.6 hectares, of which rural collective land is 26.3 hectares, and 5.3 hectares is state-owned shelter plantation. 0.3 hectares is required for the 110 kV line, predominantly rural collective land. A further 28.6 hectares will be required for temporary purposes during construction, of which 23.1 hectares will be agricultural land and 5.5 hectares will be shelter plantation. Thirty one households and 147 people are affected, with none needing relocation or losing more than 4.3 percent of its income from land that is requisitioned. Compensation rates, determined by local regulations are adequate, and a grievance procedure is in place.

East China Investigation and Design Institution (ECIDI) prepared the EIA and RAP, which have been reviewed and revised to meet Bank's requirements. No potential indirect and/or long-term impacts are expected from future activities in the project area. Environmental monitoring will be carried out by the project sponsors and reported to the Pingtan Environment Protection Bureau.

The important stakeholders for the wind farm are the national, Fujian (provincial) and Pingtan (county) government, the project sponsors, the provincial power company (which will purchase the power), and local communities. Before preparation of the project began, the project sponsors solicited opinions from people in the affected townships and the state-owned shelter plantation firm. County government also discussed the proposal with staff from provincial bureaus of land administration, forest, environment and power supply. During preparation of the EIA and RAP there have been extensive local consultations, including surveys in the surrounding villages.

As part of preparation of the EIA, meetings have been held on the project's impacts and information has been released to the local news media.

The sponsor has met township and village leaders and representatives of project affected people. Project affected villagers have participated in the preparation of the RAP and are expected to continue to participate in its implementation. A grievance process has been established. Notices of the project have been displayed in the Pingtan County government offices and the draft EIA has been displayed for comment in the Pingtan County government offices.

Rudong Biomass Power Plant

Potential local environment impacts during construction will be noise, dust and vehicular movement (and associated air pollution) and the effects of a small workforce being located at the site.

- Noise. Some construction noise is expected to reach 66 dBa at the site boundary. Construction noise will be limited in areas near habitation by the use of machines meeting noise emission standards and by limiting construction to the day time;
- Dust resulting from excavation and movement of spoil will be within the site and will be piled and covered. Construction areas will be screened. Air pollution from construction vehicles is expected to be minor;
- Potential impacts on water during construction are expected to be minor and confined to use for living purposes and potential run off from the site. Mitigation is to confine and treat wastewater and minimize runoff;
- Although unlikely, it is possible that a hitherto uncatalogued archaeological site will be uncovered during construction. Chance find procedures will be included in the environment management plan.

Potential impacts during operation will be from noise, atmospheric emissions, water use and transport of biomass fuel into the plant and ash out of it. There is an increased fire hazard resulting from the storage of large quantities of straw.

- Noise. Main noise producing equipment will be placed at the center of the site, as far from the site boundary as possible and will be insulated where possible. Within the plant, control rooms will be insulated to protect the staff. Predicted noise at the site boundary is expected to meet day- and nighttime standards;
- Atmospheric emissions. Atmospheric emissions of SO_2, NO_x and particulates resulting from combustion will be within permitted levels and will be emitted through a 100 meter high stack;
- Water use. Likely water pollution will stem from water treatment (for boiler feedwater), oily residue, and sewage. Heavy metal antifouling agents will not be used in cooling tower water. Treated water will be disposed of to the Mafeng River. Treated sewage will be used for irrigation;
- Transport of fuel and ash. Biomass will be moved into the plant by road and river. Impacts are increased traffic, accident hazard and some vehicular pollution. Ash will be transported out of the plant for agricultural fertilizer by road. Procedures for road traffic safety and to reduce the hazards from the load are required;
- Fire hazard. Storage of large quantities of biomass increases the fire hazard through deliberate, accidental or spontaneous means. Extensive fire protection equipment is included in the feasibility study; an emergency response group is to be included in the staffing of the plant.

Land from Mabei Village will be acquired for the project, totaling 10.5 hectares (including 6.8 hectares of paddy field, 3.1 hectares of mulberry garden and 0.2 hectares of land designated for construction). Ten residential houses will be removed and 30 tombs will be relocated. A total of

91 people from 25 households are affected by the project, with an average loss of 30–36 percent of their land.

Nanjing Bailing Environmental Protection Ltd. prepared the EIA, and ECIDI prepared the RAP, which have been reviewed and revised to meet Bank's standard. New Energy Office in Rudong County will be responsible for implementing the EMP, the Environmental Protection Bureau of Nantong will be responsible for supervising the implementation of the EMP, and the Environmental Monitoring Station of Rudong County will be responsible for monitoring. A detailed training plan is also proposed to build capacity of the above institutions on EMP. No potential indirect and/or long-term impacts are expected from future activities in the project area.

The important stakeholders for the biomass power plant are the national, Jiangsu (provincial), and Rudong (county) governments, as well as the project sponsors, the provincial power company (which will purchase the power), and local communities. The sponsors have encouraged local participation through meetings, surveys and public awareness initiatives, including through television and radio. During site selection and design, project sponsors and the Rudong County government have met township and village heads and village representatives. Relevant departments of local government have also been consulted.

In preparation of the EIA, meetings and a survey were undertaken covering local institutions (schools, hospitals etc) local government departments (irrigation and environment) and the village committees. Their views have been recorded and responses provided. Local government, towns, villages and villagers have participated in the RAP process. A survey has been carried out. The implementing agency intends to prepare a resettlement information booklet and to hold further meetings with stakeholders. A feedback and grievance procedure have been established.

Additional Annex 10A: Safeguard Policy Issues for Additional Appraised Projects

CHINA Renewable Energy Scale-up Program

Overview

The wider social benefits of increased renewable energy use are clearly understood by most stakeholders and, indeed, underpin the rationale for the project. The MMP approach to support increased use of renewable energy has been widely discussed among government and the public sector, the power sector, renewable energy equipment and services suppliers and civil society. Several large-scale meetings have been held to discuss the findings of the economic analysis and the MMP while there has been unprecedented openness during preparation of the REL. There is wide acceptance for the concept, recognizing that whereas most groups stand to gain, as does society as a whole, some stand to experience slightly lower growth—such as coal producers—as renewable energy displaces more conventional power generation (see Annex 9). These stakeholders will continue to be involved during project implementation, as the law and regulations are further developed.

There has been extensive consultation with local stakeholders who have participated fully during preparation of the Support for Wind and Biomass in Pilot Provinces Component as part of the safeguards process. Stakeholder perceptions of the investment subprojects are generally positive since they clearly understand the expected local benefits from improved quality of electricity supply, employment opportunities and, in Jiangsu, from the sale of an otherwise troublesome waste.

Project alternatives have been compared. CRESP is underpinned by analysis that establishes that renewable energy can be the least economic cost solution for power production in China when environmental externalities are taken into consideration. The projects are intended to demonstrate the scale-up of renewables and their economic and environmental advantages over coal-fired electricity generation.

For phase I, several options were discussed with the government to select a limited number of provinces with good renewable energy resources and interest in developing them. At the same time the government is interested in GEF support to those technologies that are at or approaching economic viability for electricity generation to scale up and increase impact. A selection process that examined all 32 provinces and autonomous regions resulted in the selection of the four pilot provinces: Fujian, Inner Mongolia, Jiangsu, and Zhejiang not only for their interest in the project, but also for the range of technologies that could be piloted.

Several other sites were considered by all the four provinces, but rejected on grounds of resource availability and site suitability. Sites chosen have been selected as the most promising for demonstration at this time. Environmental and social impact analyses have been carried out for each of the investment subprojects and are presented in environmental impact assessments (EIA) and RAPs. The analyses have reviewed the project and the site, and identified the main impacts during construction and operation. In addition, participatory and awareness raising techniques have been employed during the process of preparing the EIAs and RAPs.

The Borrower and implementing agencies have agreed to implement environment management plans (EMPs), acceptable to the Bank, for each subproject, which include mitigation action

plans, supervision plans and monitoring plans. The sponsors appear both capable and committed to implementing and monitoring the plans.

The EA and RAP for Inner Mongolia and the EA and RAP framework for Zhejiang have been disclosed as follows:

Table A10A.1: Disclosure of EAs and RAPs for Inner Mongolia and Zhejiang

	Inner Mongolia	Zhejiang
Date of EA and RAP to Infoshop	November 24, 2004	November 24, 2004
Disclosure in China: • Date • Location	• October 31, 2004 (EIA and RAP) • Chahaeryouyi County Offices	• November 22, 2004 (EIA and RAP framework) • Offices of ZHPDMC

Potential impacts for each of the potential sub projects are described below.

Huitengxile Wind Farm

Potential local environment impacts during construction will be primarily loss of grassland. Potential impacts associated with the transmission line routing are expected to be minor and will be evaluated in detail at appraisal. To mitigate the grassland loss, the following mitigation measures are proposed:

- Soil and rocks will be removed manually;
- Machinery and equipment will be confined to designated places;
- Vehicles will run on specified roads and not on grassland;
- About half of the soil removed during construction will be backfilled into the wind turbine foundation and the remaining spoil will be removed to a designated site;
- After completion of the construction, both sides of the roads will be afforested.

During operation, potential impacts will be noise, visual impacts, bird strike, and electromagnetic radiation. Impacts and mitigation are as follows:

- The noise level of wind turbines is projected to be about 90 dBa at the machines. The nearest residential area is 3 km away, and the operators will primarily work in the control room, limiting noise impact.
- The site is not a route for migrant birds. Based on the experience of operating the existing wind farms, operation of the wind farm is not expected to have impacts on indigenous species.
- Local residents believe that wind farm operation adds to the landscape. The local authorities plan to use the wind farm as a tourist attraction, as are the existing ones.

- The intensity of the electromagnetic radiation during wind farm operation is expected to be much lower than the standard, resulting in no negative impacts on human health. The survey with local residents showed that existing wind farm operations do not interfere with local radio and television.

Permanent land acquisition includes land for wind machines, roads and substations totaling 23.7 hectares, 0.4 hectares is required for the 110 kV line, and a further 15.3 hectares is required for temporary purposes during construction. All these land areas are grassland owned by Huitengxile State Farm, which has 130 staff. No individual farmer will be affected, nor are there indigenous people living in the State Farm. All compensation will be paid to the State Farm, at adequate rates determined by local regulations, and a grievance procedure is in place. Since the wind farm will occupy less than 1 percent of the land areas of the State Farm, it will have little impact on its economic operations.

Inner Mongolia Electric Power Survey and Design Institute prepared the EIA and RAP, which have been reviewed and revised to meet Bank's standards. Wulanchabu Environment Research Institute will be responsible for monitoring environment impacts.

The important stakeholders for the wind farm are the national, Inner Mongolia (provincial) and Wulanchabu (county) government, the project sponsors, the provincial power company (which will purchase the power), and local communities. The project sponsors and county government solicited opinions from people in the affected areas and the State Farm. During preparation of the EIA and RAP there have been extensive local consultations, including meetings and surveys in the surrounding villages. The results demonstrated that local communities are quite supportive of the wind farm, which they believe will create local employment opportunities and tourist attractions. The villagers, however, emphasized the need to protect grassland. Their concerns have been taken into account in project design and implementation.

Zhejiang Small Hydro

The Zhejiang small hydro subcomponent consists of eleven newly built and seven rehabilitation small hydro subprojects. The Bank and the provincial government have reached an agreement on a framework approach that sets up the criteria and procedures for meeting the safeguards and fiduciary requirements for the small hydro projects. The PPO, staffed by Zhejiang Hydro Power Development Management Center (ZHPDMC) has prepared a framework EIA and RAP, which have been reviewed and revised to meet Bank's satisfaction.

EIA Framework. Each subproject should prepare its EIA in accordance with the agreed upon framework, which defines the contents, procedures, and implementation responsibilities. The purpose is to ensure that the EIA of each subproject will be in compliance with both the Chinese laws and regulations and the procedures required for Category B projects in the World Bank's OP/ BP 4.01.

Project Screening. The subproject company is responsible for preparing initial EIA. Based on GoC's regulation, EIA is required for all newly constructed subprojects. EMPs will be based on the draft EIAs. The framework has defined the project screening criteria.

Subproject EIAs. The EIA of each subproject should comply with the Chinese regulations on "Code for Environmental Impact Assessment of Water Conservancy and Hydropower Project"

HJ/T88-2003. The framework outlined an EMP format on environmental mitigation, supervision, and monitoring plans for both newly built and rehabilitation projects.

For newly built small hydro projects (under 25 MW), potential local environment impacts during construction may be waste water, solid wastes, noise, dust, and soil erosion. Potential impacts during operation include land occupation and losses from reservoir inundation, noise, sewage, low temperature water irrigation, and decreased water flow downstream. Sponsors will be required to prepare an EIA and EMP.

For rehabilitation projects, potential local environmental impacts during construction will be impacts on the consumers with lower water supply during reconstruction, waste water, solid wastes, noise, dust, and soil erosion. Potential impacts during operation include noise, and land losses from increased reservoir inundation. Sponsors will be required to prepare an EIA and EMP.

EIA Review, Approval, and Disclosure. The PPO will be responsible for approving the EMPs. After being revised incorporating recommendations from the public consultation process, the EMPs will be submitted to the PPO for approval. The county, city, or district project office is responsible for disclosing the approved EMP in the affected residential areas of the project or in the nearby villages.

RAP Framework

Each subproject will prepare its RAP in accordance with this framework, which defines resettlement principles, implementing institutions and resettlement standards. The purpose is to ensure RAP of each subproject consistent with the Chinese laws and regulations as well as the requirements set in OP/BP4.12 of the World Bank.

Project screening. The resettlement survey will be organized jointly by the, city, or district project office and the design unit. The project company, the county department for resettlement and other relevant functional departments, township (town) people's government, representatives of villages and groups, resettlers, and property owners all should participate and jointly develop the project resettlement investigation materials.

The PPO decides whether an RAP is required based on the resettlement survey results and agreed upon criteria. If there are more than people subject to resettlement under the subproject an RAP must be prepared. For newly constructed projects, if there are no relocations, or fewer than 10 people need relocation, a simplified RAP is required. For rehabilitation projects, if there are no relocations (including laid-off employees) and land acquisition, there is no need to prepare RAP. The framework gives an RAP format for each subproject to follow.

According to preliminary surveys, all the subprojects of this project involve no households being moved, but only land acquisition.

Resettlement standards and compensation criteria. The design and construction of each subproject should be consistent with the Chinese legislation for land acquisition compensation and resettlement. The compensation criteria and calculation method for affected areas and people (including land and property) are set out in the legal framework, which is demonstrated in the framework.

Public Consultation. Both EIA and RAP frameworks outlined the requirements for public consultation and disclosure. The environment divisions and resettlement team of the county, city, or district project office are responsible for notifying, organizing, carrying out, and recording public consultations, in accordance with the criteria and procedure outlined in the frameworks.

Dam Safety

For both new and rehabilitated projects, the Dam Safety safeguard policy (OP/BP 4.37) may be triggered. The framework requires that the measures set out in OP/BP 4.37 (safety inspections by an independent panel) should be met when appropriate. Chinese Reservoir Dam Safety Inspection Guidelines establish procedures for dam safety, which is overseen by the provincial water resources committee, which acts as a regulator. These procedures have been compared with those set out in OP/BP 4.37, and it has been determined that they comply with the requirements of OP/BP 4.37 with the exception of the need for a single safety committee to act throughout the lifetime of the dam; this requirement has been included in the agreed PIP.

Annex 11: Project Preparation and Supervision

CHINA Renewable Energy Scale-up Program

Table A11.1: Project Processing Timetable

	Planned	Actual
PCN review	08-10-2000	08-07-2000
Initial PID to PIC	08-18-2000	08-31-2000
Initial ISDS to PIC	11-23-2000	11-24-2004
Appraisal	12-01-2004	12-01-2004
Negotiations	02-14-2005	3-14-2004
Board/RVP approval	06-21-2005	
Planned date of effectiveness	09-30-2005	
Planned date of midterm review		
Planned closing date	03-31-2010	

Key institutions responsible for preparation of the project:

National Development and Reform Commission,
China Long Yuan Electric Power Group Company
North Long Yuan Wind Power Company
Zhejiang Hydro Power Management Development Center
Jiangsu Guo Xin Investment Group and Jiangsu Guo Xin New Energy Development Co. Ltd.

Bank staff and consultants who worked on the project included:

Table A11.2: Project Staff and Consultants

Name	Title	Unit
Noureddine Berrah	Task Team Leader	EASEG
Richard Spencer	Senior Energy Specialist	EASEG
Susan Bogach	Senior Energy Specialist	EASEG
Leiping Wang	Senior Energy Specialist	EASEG
Xiaodong Wang	Energy Specialist	EASEG
Carlos Escudero	Lead Counsel	LEGEA
Mei Wang	Senior Counsel	LEGEA
Xiaoping Li	Procurement Specialist	EAPCO
Haixia Li	Financial Management Specialist	EAPCO
Bernard Baratz	Environment Specialist (Consultant)	
Clifford Garstang	Legal (Consultant)	
Enno Heijndermans	Renewable Energy Specialist (Consultant)	
Youxuan Zhu	Resettlement Specialist (Consultant)	
Miao Hong	Renewable Energy Specialist (Consultant)	
Weigong Cao	Power Engineer (Consultant)	
Cristina Hernandez	Program Assistant	EASEG
Chunxiang Zhang	Program Assistant	EASEG

Bank funds expended to date on project preparation:

1. Bank resources: US$471,037
2. Trust funds: US$728,818
3. Total: US$1,199,855

Estimated Approval and Supervision costs:

1. Remaining costs to approval: US$47,000
2. Estimated annual supervision cost: US$150,000

Annex 12: Documents in the Project File

CHINA Renewable Energy Scale-up Program

1. Project Documents
- a. Project Concept Document (July 2000)
- b. Project Brief to GEF (March 2001)

2. Project Implementation Plans
- a. CRESP Phase 1—Institutional Development and Capacity Building (February 6, 2005)
- b. Pingtan Phase II Wind Farm Project (January 31, 2005)
- c. 100 MW Huitengxile Wind Farm (January 25, 2005)
- d. Rudong Biomass Power Plant (January 30, 2005)
- e. Zhejiang Small Hydro (January 15, 2005)

3. Procurement Plans
- a. Project Management Office
- b. Pingtan Wind Farm
- c. Huitengxile Wind Farm
- d. Rudong Biomass
- e. Zhejiang Small Hydro

4. Procurement Capacity Assessment Report

5. Financial Management Assessment of CRESP
- a. CRESP
- b. Fujian Component
- c. Inner Mongolia Component
- d. Jiangsu Component
- e. Zhejiang Component

6. Economic and Financial Analysis of CRESP.
- a. Volume 1: The Economically Optimal Quantity of Grid-connected Renewable Energy (September 2003).
- b. Volume 2: Options for Implementation (October 2003)

7. Environmental Impact Assessment Report
- a. Environmental Impact Assessment Report—CRESP Phase II Project of Changjiang'ao Wind Power Field in Pingtan of Fujian
- b. Environmental Impact Assessment Report—100 MW Huitengsile Wind Power Project in Inner Mongolia (June 2004)
- c. Environmental Impact Assessment Report and Environmental Management Plan—CRESP Biomass Plant from Straw Combustion in Rudong, Jiangsu (October 2004)
- d. Environmental Impact Assessment Framework—Zhejiang Provincial Small Hydropower

8. Resettlement Action Plan
- a. Resettlement Action Plan for Pingtan Changiang'ao Wind Power Farm Project

b. Resettlement Action Plan for 100 MW Huitengsile Wind Power Project in Inner Mongolia (June 2004)
c. Resettlement Action Plan Jiangsu Rudong Straw-fired Power Project
d. Resettlement Policy Framework Zhejiang Provincial Recycle Energy Scaling-up Program for Small Hydropower (November 2004)

9. Feasibility Studies

a. Feasibility Study for Pingtan Changjiang'ao Phase II Wind Farm Project (May 2004)
b. Straw Power Generations in Rudong, Jiangsu Province (November 2004)
c. Feasibility Research Report on the Project of the Straw Power Generation in Rudong, Jiangsu Province.

10. Letters, Decrees, Policy Papers

a. Letter of Sector Development Policy. November 2, 2004
b. NDRC document No. 1248 decreeing participation in CRESP. (Chinese and English translation). December 2003
c. Position Paper on the Renewable Energy Law. June 9, 2004
d. Policy Options for the Renewable Energy Law. March 8, 2004

11. Various Reports and Studies

a. A New Renewables Policy for China—Implementation. A Brown, CC Naish & GM Staunton (AEA Technology). May 2001.
b. Analysis of Feasibility of Inclusion of Decentralized Renewable Electricity Systems into a Mandated Market Share Mechanism for China. Energy Research Institute of Netherlands (ECN). October 2003
c. Study of Integration of Decentralized Renewable Energy into CRESP. September 2002
d. Renewable Energy Technology Assessment in China. Iberdrola. November 2000
e. Workshop Report on Renewable Energy Portfolio Standard for China. E Heijndermans. Beijing. August–September 2000.
f. CRESP Concept Details—Targets (December 19, 2001)
g. CRESP Pilot Provinces Component (December 19, 2001)
h. CRESP Concept in Brief
i. CRESP Meeting the Incremental Financial Cost of Renewables Investments
j. Participatory Planning Workshop Report. November 17–18, 1999

Annex 13: Statement of Loans and Credits

CHINA Renewable Energy Scale-up Program

Table A13.1: Statement of Loans and Credits

			Original Amount in US$ Millions						Difference between expected and actual disbursements	
Project ID	FY	Purpose	IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig.	Frm. Rev'd
P057933	2005	CN-TAI BASIN URBAN ENVMT	61.30	0.00	0.00	0.00	0.00	60.70	5.25	0.00
P075730	2005	CN-HUNAN URBAN DEV	172.00	0.00	0.00	0.00	0.00	172.00	0.00	0.00
P075035	2004	CN-GEF-Hai Basin Integr. Wat. Env.Man.	0.00	0.00	0.00	17.00	0.00	16.03	1.68	0.00
P073002	2004	CN-Basic Education in Western Areas	100.00	0.00	0.00	0.00	0.00	93.17	-6.83	0.00
P065035	2004	CN-Gansu & Xinjiang Pastoral Development	66.27	0.00	0.00	0.00	0.00	58.54	8.13	0.00
P065463	2004	CN-Jiangxi Integrated Agric. Modern.	100.00	0.00	0.00	0.00	0.00	94.50	7.69	0.00
P066955	2004	CN-ZHEJIANG URBAN ENVMT	133.00	0.00	0.00	0.00	0.00	131.67	5.42	0.00
P069852	2004	CN-Wuhan Urban Transport	200.00	0.00	0.00	0.00	1.00	188.00	129.76	0.00
P084003	2004	CN-GEF GUANGDONG PRD URB ENV	0.00	0.00	0.00	10.00	0.00	10.00	0.00	0.00
P081749	2004	CN-Hubei Shiman Highway	200.00	0.00	0.00	0.00	1.00	198.00	9.00	0.00
P077615	2004	CN-GEF-Gansu & Xinjiang Pastoral Develop	0.00	0.00	0.00	10.50	0.00	10.00	2.43	0.00
P077137	2004	CN-4th Inland Waterways	91.00	0.00	0.00	0.00	0.46	90.09	3.63	3.56
P075602	2004	CN-2nd National Railways (Zhe-Gan Line)	200.00	0.00	0.00	0.00	1.00	198.00	16.50	16.50
P075728	2004	CN-GUANGDONG/PRD UR ENVMT	128.00	0.00	0.00	0.00	0.64	126.72	-0.64	0.00
P040599	2003	CN-TIANJIN URB DEV II	150.00	0.00	0.00	0.00	0.00	143.82	12.01	0.00
P058847	2003	CN-3rd Xinjiang Hwy Project	150.00	0.00	0.00	0.00	0.00	86.51	21.93	0.00
P067337	2003	CN-2nd GEF Energy Conservation	0.00	0.00	0.00	26.00	0.00	14.60	22.52	0.00
P076714	2003	CN-2nd Anhui Hwy	250.00	0.00	0.00	0.00	0.00	229.57	34.65	0.00
P070441	2003	CN-Hubei Xiaogan Xiangfan Hwy	250.00	0.00	0.00	0.00	0.00	106.52	-18.48	0.00
P070191	2003	CN-SHANGHAI URB ENVMT APL1	200.00	0.00	0.00	0.00	0.00	181.09	19.17	0.00
P068058	2003	CN-Yixing Pumped Storage Project	145.00	0.00	0.00	0.00	0.00	131.95	1.63	0.00
P071147	2002	CN-Tuberculosis Control Project	104.00	0.00	0.00	0.00	0.00	68.21	-35.79	0.00
P064729	2002	CN-SUSTAINABLE FORESTRY DEV. PROJECT	93.90	0.00	0.00	0.00	0.00	65.32	16.50	0.00
P060029	2002	CN-Sustain. Forestry Dev(Natural Forest)	0.00	0.00	0.00	16.00	0.00	12.08	7.40	0.00
P068049	2002	CN-Hubei Hydropower Dev in Poor Areas	105.00	0.00	0.00	0.00	0.00	74.03	27.70	0.00
P070459	2002	CN-Inner Mongolia Hwy Project	100.00	0.00	0.00	0.00	0.00	69.51	11.17	0.00
P058846	2002	CN-Natl Railway Project	160.00	0.00	0.00	0.00	0.00	25.32	11.99	0.00
P051859	2001	CN-LIAO RIVER BASIN	100.00	0.00	0.00	0.00	0.00	45.08	23.77	0.00
P047345	2001	CN-HUAI RIVER POLLUTION CONTROL	105.50	0.00	0.00	0.00	0.00	71.64	-33.86	0.00
P058845	2001	CN-Jiangxi II Hwy	200.00	0.00	0.00	0.00	54.77	43.17	19.27	0.00
P056516	2001	CN-WATER CONSERVATION	74.00	0.00	0.00	0.00	0.00	25.66	10.16	0.00
P056596	2001	CN-Shijiazhuang Urban Transport	100.00	0.00	0.00	0.00	0.00	78.21	62.48	0.00
P056199	2001	CN-3rd Inland Waterways	100.00	0.00	0.00	0.00	0.00	64.31	13.31	0.00
P045915	2001	CN-Urumqi Urban Transport	100.00	0.00	0.00	0.00	0.00	42.47	42.47	0.00

P056424	2000	CN-TONGBAI PUMPED STORA	320.00	0.00	0.00	0.00	100.00	90.89	108.29	0.00
P058844	2000	3rd Henan Prov Hwy	150.00	0.00	0.00	0.00	0.00	35.04	23.38	0.00
P058843	2000	CN-Guangxi Highway	200.00	0.00	0.00	0.00	19.70	48.67	41.87	0.00
P042109	2000	CN-BEIJING ENVIRONMENT II	349.00	0.00	0.00	25.00	0.00	263.42	204.09	0.00
P064924	2000	CN-GEF-BEIJING ENVMT II	0.00	0.00	0.00	25.00	0.00	22.81	22.18	10.14
P045264	2000	CN-SMALLHLDR CATTLE DEV	93.50	0.00	0.00	0.00	0.00	2.69	0.21	0.00
P064730	2000	CN-Yangtze Dike Strengthening Project	210.00	0.00	0.00	0.00	0.00	97.48	97.48	0.00
P045910	2000	CN-HEBEI URBAN ENVIRONMENT	150.00	0.00	0.00	0.00	0.00	100.08	54.58	0.00
P049436	2000	CN-CHONGQING URBAN ENVMT	200.00	0.00	0.00	0.00	3.70	134.45	89.15	0.00
P060270	1999	CN-ENTERPRISE REFORM LN	0.00	5.00	0.00	0.00	0.00	0.64	2.04	1.81
P038121	1999	CN-GEF-RENEWABLE ENERGY DEVELOPMENT	0.00	0.00	0.00	35.00	0.00	21.14	32.52	14.46
P041268	1999	CN-Nat Hwy4/Hubei-Hunan	350.00	0.00	0.00	0.00	0.00	32.81	28.65	0.00
P058308	1999	CN-PENSION REFORM PJT	0.00	5.00	0.00	0.00	0.00	0.84	0.78	0.00
P046829	1999	CN-RENEWABLE ENERGY DEVELOPMENT	100.00	0.00	0.00	0.00	0.00	3.98	90.98	2.07
P046564	1999	CN-Gansu & Inner Mongolia Poverty Red.	60.00	100.00	0.00	0.00	13.30	15.17	18.99	-15.73
P046051	1999	CN-HIGHER EDUC. REFORM	20.00	50.00	0.00	0.00	0.00	4.62	6.22	0.00
P043933	1999	CN-SICHUAN URBAN ENVMT	150.00	2.00	0.00	0.00	0.00	76.97	94.66	37.19
P042299	1999	TEC COOP CREDIT IV	10.00	35.00	0.00	0.00	0.00	31.56	-16.08	0.00
P041890	1999	CN-Liaoning Urban Transport	150.00	0.00	0.00	0.00	0.00	12.25	12.25	-1.82
P036953	1999	CN-HEALTH IX (Shiyong Wang, Back-up)	10.00	50.00	0.00	0.00	0.40	28.38	23.27	2.65
P003653	1999	CN-Container Transport	71.00	0.00	0.00	0.00	18.61	2.61	21.22	1.68
P049665	1999	CN-ANNING VALLEY AG.DEV	90.00	30.00	0.00	0.00	0.00	10.99	12.11	0.00
P051705	1999	CN-Fujian II Highway	200.00	0.00	0.00	0.00	0.00	43.45	43.45	0.00
P057352	1999	CN-RURAL WATER IV	16.00	30.00	0.00	0.00	0.00	14.57	13.58	12.84
P051856	1999	ACCOUNTING REFORM & DEVELOPMENT	27.40	5.60	0.00	0.00	0.00	15.78	15.68	0.00
P051888	1999	CN-GUANZHONG IRRIGATION	80.00	20.00	0.00	0.00	0.00	17.62	17.94	0.00
P056216	1999	CN-LOESS PLATEAU II	100.00	50.00	0.00	0.00	0.00	9.00	11.13	-1.70
P050036	1999	Anhui Provincial Hwy	200.00	0.00	0.00	0.00	9.60	20.23	29.83	0.00
P003539	1998	CN-SUSTAINABLE COASTAL RESOURCES DEV.	100.00	0.00	0.00	0.00	2.06	39.44	41.50	0.13
P003566	1998	CN-BASIC HEALTH (HLTH8)	0.00	85.00	0.00	0.00	0.00	28.61	24.44	0.00
P003606	1998	ENERGY CONSERVATION	63.00	0.00	0.00	22.00	0.00	25.38	17.63	0.00
P035698	1998	HUNAN POWER DEVELOP.	300.00	0.00	0.00	0.00	161.90	4.62	166.52	7.84
P003614	1998	CN-Guangzhou City Transport	200.00	0.00	0.00	0.00	20.00	95.30	115.30	95.30
P003619	1998	CN-2nd Inland Waterways	123.00	0.00	0.00	0.00	37.00	12.60	49.60	6.91
P036414	1998	CN-GUANGXI URBAN ENVMT	72.00	20.00	0.00	0.00	10.19	56.68	65.83	41.42
P045788	1998	CN-Tri-Provincial Hwy	230.00	0.00	0.00	0.00	0.00	15.14	15.14	0.00
P049700	1998	CN-IAIL-2	300.00	0.00	0.00	0.00	0.00	1.21	1.21	1.21
P040185	1998	CN-SHANDONG ENVIRONMENT	95.00	0.00	0.00	0.00	1.40	15.22	16.62	-3.11
P046952	1998	CN-FOREST. DEV. POOR AR	100.00	100.00	0.00	0.00	0.00	16.90	-81.62	12.88
P037859	1998	CN-GEF Energy Conservation	0.00	0.00	0.00	22.00	0.00	0.71	22.06	0.00
P051736	1998	E. CHINA/JIANGSU PWR	250.00	0.00	0.00	0.00	86.00	23.26	109.26	13.50
P044485	1997	SHANGHAI WAIGAOQIAO	400.00	0.00	0.00	0.00	0.00	61.00	48.17	52.21
P003650	1997	TUOKETUO POWER/INNER	400.00	0.00	0.00	0.00	102.50	22.56	125.06	22.56
P036405	1997	CN-WANJIAZHAI WATER TRA	400.00	0.00	0.00	0.00	75.00	10.62	85.62	5.17
P003637	1997	CN-NAT'L RURAL WATER 3	0.00	70.00	0.00	0.00	0.00	0.43	3.62	3.20
P003594	1996	CN-GANSU HEXI CORRIDOR	60.00	90.00	0.00	0.00	0.00	69.70	62.52	0.00

P003602	1996	CN-HUBEI URBAN ENVIRONMENT	125.00	25.00	0.00	0.00	47.32	8.91	58.27	5.28
P034618	1996	CN-LABOR MARKET DEV.	10.00	20.00	0.00	0.00	0.00	4.27	6.35	0.00
P003596	1995	CN-Yangtze Basin Water Resources Project	100.00	110.00	0.00	0.00	1.92	0.08	4.47	4.47
P003639	1995	CN-SOUTHWEST POVERTY REDUCTION PROJECT	47.50	200.00	0.00	0.00	0.01	0.39	24.43	24.43
P003540	1994	CN-LOESS PLATEAU	0.00	150.00	0.00	0.00	0.00	0.00	-0.68	0.00
P003632	1993	CN-ENVIRONMENT TECH ASS	0.00	50.00	0.00	0.00	0.00	0.63	1.17	0.85
		Total:	10,621.37	1,302.60	0.00	208.50	769.48	4,698.29	2,534.96	377.90

Table A13.2: China Statement of IFC's Held and Disbursed Portfolio (millions of U.S. dollars)

		Committed				Disbursed			
		IFC				IFC			
FY Approval	Company	Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2002	ASIMCO	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00
2003	Anjia	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00
2004	Antai	40.00	0.00	0.00	30.00	21.71	0.00	0.00	16.29
2003	BCIB	0.00	0.00	11.60	0.00	0.00	0.00	0.00	0.00
2005	Babei	11.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00
1999/00/02	Bank of Shanghai	0.00	24.67	0.00	0.00	0.00	24.67	0.00	0.00
2002	CDH China Fund	0.00	10.92	0.00	0.00	0.00	2.42	0.00	0.00
2003	CSMC	0.00	8.92	0.00	0.00	0.00	8.92	0.00	0.00
2004	CUNA Mutual	0.00	12.00	0.00	0.00	0.00	1.47	0.00	0.00
1998	Chengdu Huarong	5.16	3.20	0.00	5.47	5.16	3.20	0.00	5.47
1992	China Bicycles	4.50	0.00	0.00	0.00	4.50	0.00	0.00	0.00
2004	China Green Ener	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	China II	28.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	China Re Life	0.00	15.41	0.00	0.00	0.00	15.41	0.00	0.00
1994	China Walden Mgt	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
2004	Colony China	0.00	17.31	0.00	0.00	0.00	0.43	0.00	0.00
2002	Darong	10.00	1.50	0.00	8.00	4.44	1.50	0.00	3.56
1994	Dynamic Fund	0.00	7.79	0.00	0.00	0.00	6.13	0.00	0.00
2005	Fang Xin SHMT	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	Fang Xin Limited	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00
2005	Fang Xin SHDX	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	Fang Xin SHPM	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	Fang Xin SZFX	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	Fenglin	19.00	6.00	0.00	18.00	7.27	6.00	0.00	6.79
2003	Great Infotech	0.00	3.50	0.00	0.00	0.00	2.80	0.00	0.00
2005	HiSoft Tech	0.00	4.00	0.00	0.00	0.00	3.00	0.00	0.00
2002	Huarong AMC	9.00	2.51	0.00	0.00	9.00	0.49	0.00	0.00
2004	IB	0.00	52.18	0.00	0.00	0.00	52.18	0.00	0.00
2002	IEC	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	Jiangxi Chenming	60.00	12.90	0.00	0.00	0.00	12.90	0.00	0.00
1998	Leshan Scana	3.07	1.35	0.00	0.00	3.07	1.35	0.00	0.00
2001	Maanshan Carbon	7.50	2.00	0.00	0.00	7.50	2.00	0.00	0.00
2001	Minsheng Bank	0.00	23.50	0.00	0.00	0.00	23.50	0.00	0.00
2001	NCCB	0.00	26.58	0.00	0.00	0.00	26.46	0.00	0.00
1996/04	Nanjing Kumho	34.00	2.23	0.00	0.00	34.00	2.23	0.00	0.00

2001	New China Life	0.00	13.21	0.00	0.00	0.00	5.83	0.00	0.00
1995	Newbridge Inv.	0.00	1.95	0.00	0.00	0.00	1.95	0.00	0.00
1997	Orient Finance	4.76	0.00	0.00	5.95	4.76	0.00	0.00	5.95
2003	PSAM	0.00	1.93	0.00	0.00	0.00	0.00	0.00	0.00
2003	SAIC	12.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
2000	SEAF SSIF	0.00	4.50	0.00	0.00	0.00	1.84	0.00	0.00
2004	SIBFI	0.00	0.08	0.00	0.00	0.00	0.08	0.00	0.00
1998	Shanghai Krupp	24.50	0.00	0.00	52.49	24.50	0.00	0.00	52.49
	Shanghai Midway	0.00	16.02	0.00	0.00	0.00	16.02	0.00	0.00
1999	Shanxi	12.61	0.00	0.00	0.00	12.61	0.00	0.00	0.00
1993	Shenzhen PCCP	3.76	0.00	0.00	0.00	3.76	0.00	0.00	0.00
2002	Sino Gold	0.00	4.00	0.00	0.00	0.00	4.00	0.00	0.00
1995	Suzhou PVC	0.00	2.48	0.00	0.00	0.00	2.48	0.00	0.00
	Wanjie High-Tech	12.27	0.00	0.00	0.00	12.27	0.00	0.00	0.00
1996	Weihai Weidongri	0.37	0.00	0.00	0.00	0.37	0.00	0.00	0.00
2004	Wumart	0.00	4.13	0.00	0.00	0.00	4.13	0.00	0.00
2004	X Colony China	0.00	0.96	0.00	0.00	0.00	0.01	0.00	0.00
2003	XACB	0.00	19.94	0.00	0.00	0.00	3.25	0.00	0.00
2004	Xinao Gas	25.00	10.00	0.00	0.00	25.00	10.00	0.00	0.00
1993	Yantai Cement	3.13	0.00	0.00	0.00	3.13	0.00	0.00	0.00
2003	Zhengye-ADC	15.00	0.00	0.00	7.00	6.14	0.00	0.00	2.86
2002	Zhong Chen	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00
	Total portfolio:	399.63	344.68	11.60	126.91	194.19	273.66	0.00	93.41

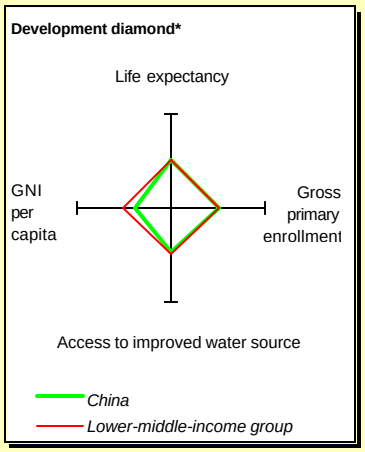
Table A13.3: Statement of IFC Approvals Pending Commitment

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic.
2005	Babei Silk Tie	0.00	0.00	0.00	0.01
2004	CCB-MS NPL	0.00	0.00	0.00	0.00
2003	Cellon	0.00	0.01	0.00	0.00
2004	Chenming LWC	0.00	0.00	0.00	0.16
2004	China Green	0.00	0.00	0.01	0.00
2005	Fang Xin SHDX	0.00	0.00	0.00	0.00
2005	Fang Xin SHMT	0.00	0.00	0.00	0.00
2005	Fang Xin SHPM	0.00	0.00	0.00	0.00
2005	Fang Xin SZFX	0.00	0.00	0.00	0.00
2002	Huarong AMC	0.02	0.00	0.00	0.00
2002	IEC	0.00	0.00	0.01	0.00
2005	MS Shipping	0.02	0.01	0.00	0.00
2004	NCFL	0.00	0.02	0.00	0.00
2005	NHC	0.00	0.00	0.05	0.00
2003	Peak Pacific 2	0.00	0.01	0.00	0.00
2004	SIBFI	0.00	0.00	0.00	0.00
2002	SML	0.00	0.00	0.00	0.00
2002	Sino Mining	0.01	0.00	0.00	0.01
2005	Vetroarredo	0.01	0.00	0.00	0.00
2002	Zhong Chen	0.00	0.00	0.00	0.03
	Total pending commitment:	0.06	0.05	0.07	0.21

Annex 14: Country at a Glance

CHINA Renewable Energy Scale-up Program

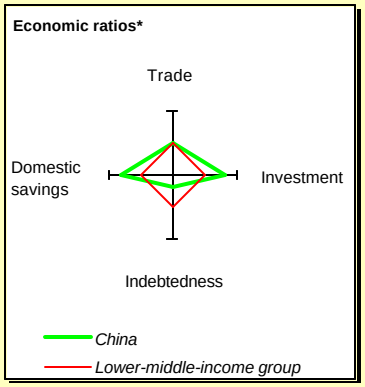
POVERTY and SOCIAL	China	East Asia & Pacific	Lower-middle-income
2003			
Population, mid-year *(millions)*	1,288.4	1,855	2,655
GNI per capita *(Atlas method, US$)*	1,100	1,080	1,480
GNI *(Atlas method, US$ billions)*	1,411.6	2,011	3,934
Average annual growth, 1997-03			
Population *(%)*	0.8	1.0	0.9
Labor force *(%)*	0.9	1.1	1.2
Most recent estimate (latest year available, 1997-03)			
Poverty *(% of population below national poverty line)*	5	..	..
Urban population *(% of total population)*	39	40	50
Life expectancy at birth *(years)*	71	69	69
Infant mortality *(per 1,000 live births)*	30	32	32
Child malnutrition *(% of children under 5)*	10	15	11
Access to an improved water source *(% of population)*	75	76	81
Illiteracy *(% of population age 15+)*	9	10	10
Gross primary enrollment *(% of school-age population)*	114	111	112
Male	114	112	113
Female	114	111	111



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

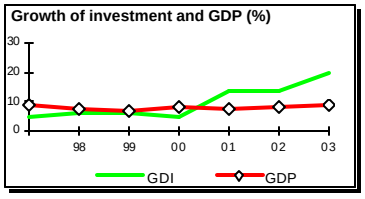
	1983	1993	2002	2003
GDP *(US$ billions)*	227.4	431.8	1,266.1	1,412.3
Gross domestic investment/GDP	33.8	43.3	40.4	44.4
Exports of goods and services/GDP	8.3	17.1	28.9	34.3
Gross domestic savings/GDP	34.5	41.8	43.4	47.0
Gross national savings/GDF	35.1	41.8	43.2	47.6
Current account balance/GDP	1.7	-2.1	2.8	3.2
Interest payments/GDP	0.2	0.6	0.3	0.3
Total debt/GDP	4.2	19.9	13.3	13.7
Total debt service/exports	10.1	9.4	7.9	7.2
Present value of debt/GDP	..	..	12.8	..
Present value of debt/exports	..	..	41.8	..

	1983-93	1993-03	2002	2003	2003-07
(average annual growth)					
GDP	9.5	8.6	8.3	9.1	7.7
GDP per capita	7.9	7.6	7.6	8.4	7.0
Exports of goods and services	6.8	15.6	29.4	26.8	12.3

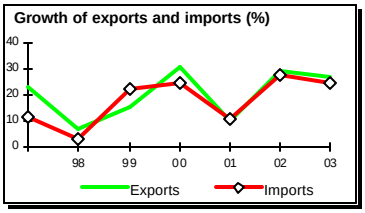


STRUCTURE of the ECONOMY

	1983	1993	2002	2003
(% of GDP)				
Agriculture	33.0	19.9	15.4	14.6
Industry	44.6	47.4	51.1	52.3
Manufacturing	36.5	34.5	35.4	39.3
Services	22.4	32.7	33.5	33.1
Private consumption	51.3	45.2	43.4	40.4
General government consumption	14.1	13.0	13.2	12.6
Imports of goods and services	7.5	18.6	25.9	31.8



	1983-93	1993-03	2002	2003
(average annual growth)				
Agriculture	4.2	3.4	2.9	2.5
Industry	11.9	10.4	9.8	12.6
Manufacturing	11.5	10.3	10.0	17.0
Services	10.7	8.2	7.5	6.6
Private consumption	11.0	7.1	6.3	6.6
General government consumption	9.7	8.5	7.0	5.5
Gross domestic investment	9.2	9.3	13.7	19.8
Imports of goods and services	9.9	13.4	27.5	24.8

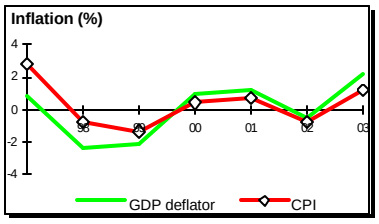


Note: 2003 data are preliminary estimates.

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

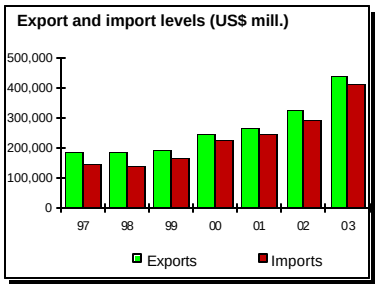
PRICES and GOVERNMENT FINANCE

	1983	1993	2002	2003
Domestic prices				
(% change)				
Consumer prices	4.5	14.7	-0.8	1.2
Implicit GDP deflator	1.1	14.6	-0.6	2.2
Government finance				
(% of GDP, includes current grants)				
Current revenue	23.0	13.7	18.3	18.7
Current budget balance	..	2.2	1.0	1.3
Overall surplus/deficit	-0.7	-0.7	-3.3	-2.5



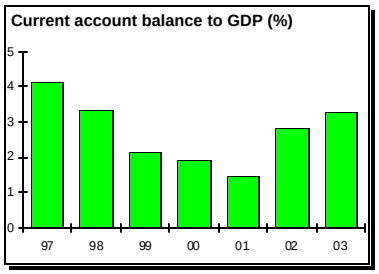
TRADE

	1983	1993	2002	2003
(US$ millions)				
Total exports (fob)	22,226	91,744	325,565	438,228
Food	2,853	8,399	14,623	17,533
Fuel	4.666	4.109	8.372	11.110
Manufactures	12.606	75.078	297.085	403.560
Total imports (cif)	21.390	103.959	295.203	412.760
Food	3.122	2.206	5.237	5.959
Fuel and energy	111	5,819	19,285	29,214
Capital goods	3,988	45,023	137,030	192,869
Export price index *(1995=100)*	41	81	78	82
Import price index *(1995=100)*	69	88	86	95
Terms of trade *(1995=100)*	60	93	90	86



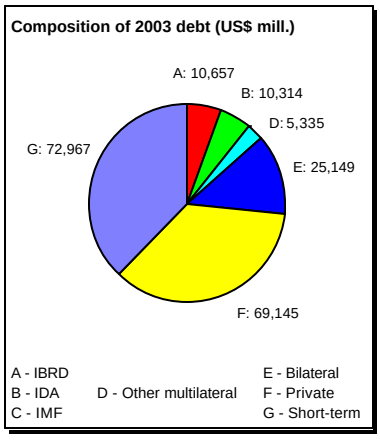
BALANCE of PAYMENTS

	1983	1993	2002	2003
(US$ millions)				
Exports of goods and services	24.804	102.643	365.395	485.003
Imports of goods and services	22.545	111.776	328.013	448.924
Resource balance	2.259	-9.133	37.383	36.079
Net income	1.158	-1.284	-14.945	-7.838
Net current transfers	511	1.172	12.984	17.634
Current account balance	3,928	-9,245	35,422	45,875
Financing items (net)	-1,233	11,012	40,085	71,148
Changes in net reserves	-2.695	-1.767	-75.507	-117.023
Memo:				
Reserves including gold *(US$ millions)*	..	27.336	297.735	416.208
Conversion rate *(DEC. local/US$)*	2.6	8.0	8.3	8.3



EXTERNAL DEBT and RESOURCE FLOWS

	1983	1993	2002	2003
(US$ millions)				
Total debt outstanding and disbursed	9.609	85.928	168.337	193.567
IBRD	4	4.549	11.254	10.657
IDA	67	5.160	9.423	10.314
Total debt service	2.691	10.166	30.596	37.064
IBRD	3	544	2,981	2,690
IDA	1	38	180	219
Composition of net resource flows				
Official grants	73	272	311	..
Official creditors	623	4.615	-1.206	-3.092
Private creditors	363	8.217	-4.550	-1.769
Foreign direct investment	916	27,515	53,074	55,507
Portfolio equity	0	3,818	..	..
World Bank program				
Commitments	438	2.315	1.058	1.250
Disbursements	71	1.845	2.020	1.616
Principal repayments	0	248	2.502	2.459
Net flows	71	1,597	-482	-843
Interest payments	3	333	660	450
Net transfers	68	1.264	-1.142	-1.293



Annex 15: Incremental Cost Analysis

CHINA Renewable Energy Scale-up Program

A. CONTEXT AND BROAD DEVELOPMENT GOALS

Context

Reducing the dominance of coal is a major objective of the GoC's main planning instruments for the energy sector: the 10th and 11th Five-Year Plans (FYPs), covering 2001–2005 and through energy conservation and substitution by gas and renewable energy. This results from recognition of the negative effects of emissions from the coal combustion needed to fuel economic growth—the damages to human health from air pollution and the damages to agricultural crops and natural resources caused by acid rain. In addition to severe impacts on the national environment, China's growing consumption of fossil fuels is projected to make it, by 2015, the leading producer in the world of GHG emissions. Most of the increase in carbon emissions to 1.8 billion tons in 2020 will come mostly as a result of a rapid increase of fossil energy consumption.[8] Electricity production alone is projected to generate a significant share of these emissions, as shown in Table 1 below.

Table A15.1: Forecast Electricity Generation and Emissions in China, 2000–15

	2000	2005	2010	2015
Electricity Generation (TWh)	1303	1676	2161	2855
Thermal Electricity Generation (TWh)	1071	1361	1743	2302
Estimated Emissions (million tons)				
Carbon	266	337	432	571
NO_x	2.7	3.4	4.4	5.8
SO_x	7.0	8.8	11.3	15.0
TSP	0.4	0.6	0.7	1.0

Note: Based on forecasts from the State Power Corporation of China (2001).

In addition to environmental benefits, development of renewable energy creates economic gains. In many remote areas, renewable energy is the least cost source of electricity for local populations or to supplement grid supplies, as shown by China's successful small hydropower program.[9] Renewable energy facilities in rural areas contribute to local employment and the tax base. In addition, development of internationally competitive renewable energy industries would generate export opportunities. China already exports small hydropower equipment. China is also beginning to export photovoltaic equipment stimulated in part by the WB-GEF REDP (Loan 4488-CHA), which has helped address quality issues: several manufacturers now produce low-cost modules meeting international standards, which have found a ready export market. Experience also suggests that the Chinese small hydropower, wind and biomass sectors are highly responsive in meeting changing patterns of demand both quantitative and qualitative.

The technical potential for renewable electricity in China includes about 160 GW of wind power; more than 75 GW of commercially exploitable small hydropower; approximately 125 GW (300

[8] Asian Development Bank, "ALGAS: People's Republic of China," Manila, October 1998. As noted above, such studies have consistently underestimated the actual energy consumption growth in China in recent years.

[9] Defined as installations with capacity less than 25 MW. Large hydropower is not included as renewable energy for the purpose of this annex.

Mtce) biomass energy; about 6.7 GW of known geothermal energy resources; and an abundance of solar insolation. It is difficult to estimate the economic market potential of the resources for electricity generation, because detailed data on resources throughout the country is very limited.[10]

Recognizing the potential contribution of renewable energy and to utilize abundant renewable energy resources, the NDRC has prepared a medium and long-term plan for renewable energy development, which has been incorporated into the national economic development plan. Its targets are set out in Table 2. There is now general consensus in China to implement a market-based policy, mandating that a share of electricity consumption comes from renewable sources along lines introduced in Australia, the Netherlands, UK and states in the US (the so-called Renewable Portfolio Standard or RPS) or imposing an obligation on electricity suppliers to buy renewable energy based electricity at a government determined price (the so-called Feed-in Tariff) introduced mainly in Spain and Germany. The term mandated market policy (MMP) is used here to refer to both systems.

Table A15.2: Proposed Targets in NDRC's Long-Term Renewable Energy Plan, 2005–20

Case	Capacity in 2020 (GW)	Replacement (Mtce)	TWh equivalent
Small Hydro (<25MW)	75	78	200
Wind	20	15	52
Biomass	20	28	150
PV	1	—	2
Total	116	121	404

Note: See Letter of Sector Development Policy, NDRC, November 2, 2004, in Annex 1A of this PAD.

An analysis of the economic optimum for renewable energy was performed for CRESP.[11] The analysis looked at the amount of renewable electricity that is economically viable based on the avoided cost of conventional electricity, first without consideration of externalities, then with inclusion of local and global externalities.[12] The avoided costs of conventional generation, with and without externalities, and the market potential for renewable electricity were estimated separately for Eastern and Western China.

The CRESP analysis arrived at an estimate of four levels of potential renewable energy based generation by 2010. First, with business as usual (BAU), which refers to the quantity of renewable energy that is likely to be built even in absence of any policy, case would be 35 TWh/yr. The second analysis shows that 79 TWh/yr of renewable electricity is economically viable at the avoided cost of conventional generation, without consideration of environmental externalities. This estimate rises to 89 TWh/yr with consideration of local externalities for air emissions. This 89 TWh/yr is considered the economic optimum from an environmental

[10] It is proposed to improve data on market potential and resource cost curves through resource measurement and assessment activities during Phase 1.

[11] See *Economic and Financial Analysis of the China Renewable Energy Scale-up Program (CRESP)—Vol. I: The economically optimum quantity of grid-connected renewable energy, September 2003 (Report to the World Bank and GoC)* on file

[12] Local externality damage estimates include the effects of air emissions from coal combustion of NO_x, SO_x, and TSP on human health and the effects of acid rain. National average damage costs were estimated in 2010 as US$1,095/ton of NO_x, US$835/ton of SO_x and US$3,540 per ton of TSP. Damage costs were estimated by province and were considerably higher in eastern provinces than in western provinces.

perspective. It rises further to 101 TWh/yr with consideration of both local and global externalities, as shown in Table 3 below. It is important to note that, since these results are based on partial data, estimates are tentative and likely to be conservative, especially for wind power.

Table A15.3: Preliminary Illustration of Market Potential for Main Renewable Electricity Technologies in China, by 2010

Technology	Business As Usual	At Avoided Cost with No Externalities	At Avoided Cost + Local Externalities	At Avoided Cost + Local and Global Externalities
	TWh/yr	TWh/yr	TWh/yr	TWh/yr
New Small Hydro		60.4	66.9	77.6
Small Hydro Rehab		10.7	11.6	12.0
Wind		0	0	0.3
Bagasse Cogeneration		7.9	7.9	7.9
Landfill Gas		0.6	2.8	3.6
Total	36	79.6	89.15	101.4

The GoC decision to go beyond what the CRESP analysis suggests is the economic optimum is based on the recognition that future contributions from renewables will be conditional on their cost in relation to the alternative. China also sees a considerable industrial potential in years to come and recognizes the need to invest in capacity now. In short, GoC believes that the benefits from investing in renewable energy now are higher, or the costs are lower, or both, than those suggested by the CRESP economic analysis.

Under any case with effective MMP, the potential to replace coal is considerable, in the medium to long term. Further investigation of resources for renewable electricity is likely to reveal that the potential is even greater.

Broad Development Goals

China recognizes that large-scale exploitation of renewable energy will require reduction in costs and efficiency gains through technological advancements, economies of scale, indigenous manufacturing and lower transaction costs. It recognizes that the government needs to play an important role in developing policies that remove market barriers, attract investment by the public and private sector, and develop internationally competitive domestic manufacturing capabilities in renewable energy technologies. This objective was first articulated in the 10th FYP and has been carried through into the 11th FYP (2006–10).

The higher goals of the program seek to address global environment and air quality issues. Increased renewable energy production provides a positive contribution to global environment and improved air quality while reducing the economic cost associated with harmful effects of the use of coal and GHG emissions. The program will also contribute to the GoC objective of economic development in the lagging regions, since much of the renewable energy resource is in those areas.

The GOC considers an MMP as an essential tool to catalyze large-scale renewable energy development. The MMP is required to address the failure of the market price for thermal electricity to reflect the costs of damage borne by society, resulting from pollution caused by burning fossil fuels (externalities). The GoC stated its intention to implement an MMP to

accelerate renewable electricity in the Energy Sub-Plan of the 10th FYP and has taken the first step in implementing it by introducing the REL. The law was enacted by Chinese National People's Congress on February 28, 2005; implementing regulations are required as the law is due to take effect on January 1, 2006.

CRESP is designed to facilitate the effective implementation of an MMP and gradually create the conditions for sustainable scale-up of renewable energy. It would support introduction and implementation of REL and regulations, as well as a range of other measures to strengthen commercial capacity to scale up renewable energy markets. In later phases, CRESP would also support development of trading mechanisms to allow the development of the renewable resources located in China's less developed regions, to meet cost effectively the electricity needs of developed regions with large power markets and financing capabilities. Development of trading schemes would minimize MMP cost and link the MMP to carbon trading mechanisms.

B. BARRIERS

The main barriers that have been identified during project preparation by Chinese experts are set out in the following paragraphs.

Lack of policies to address the failure of the market to reflect externality costs. In most countries with large-scale renewable electricity generation, suppliers have been required by law or regulation to purchase renewable electricity. In China, there is not yet such a legal requirement, and effective implementation of environmental laws cannot be taken for granted. It has been difficult to develop a national renewable electricity policy in China for several reasons:

- Responsibilities are fragmented among many agencies including the NDRC, Ministries of Science and Technology (MOST), Agriculture (MOA) and Water Resources (MOWR);
- There is inadequate information on resources, especially to derive the resource cost curves required to develop national policies, estimate value of renewable resources to the grid, calculate incremental costs, and set targets;
- The economy and power sector in China are in transition from being centrally planned to being market-oriented and deregulated;

High costs. High costs and limited prospect of their reduction are also limiting the market size. Each is explained in more detail below:

- Financial cost per kWh from renewables is relatively high when compared with electricity from coal. The higher financial cost is one of the main factors limiting the market size. The cost gap between thermal and renewable electricity is the result of three factors:

  (a) Relatively immature renewable technologies face barriers to their deployment, or have yet to benefit from market growth and transformation in China or from international technology and market development, or a combination of all three;

  (b) The externalities of fossil fuel are not included in the financial price of electricity;

  (c) The lack of high quality local renewable energy equipment and support services increases the cost and perception of risk in projects.

- Unlikely cost reduction prospects under "business as usual" deter early movers:

(a) There is insufficient competition because projects have been developed at the county or prefecture level for small hydro projects (favoring local manufacturing) and there are limited arrangements for competition in wind projects;

(b) Price regulation based on the debt repayment formula is cost plus (which does not encourage price reduction) and front loads electricity prices for technologies with high capital and low operation costs.

Weak manufacturing and service industry. Though it has been effective in some respects, most notably small hydro, the renewable energy industry is not geared to commercial or competitive requirements. Equipment is often of low quality and performs poorly, whereas the service industry is inadequate to design, engineer, operate, maintain or service installations. PPAs are inadequate and not enforced. Resource data are piecemeal, inaccurate in most instances and often not public. Commercial banks are not familiar with renewable energy projects, except small hydropower for community use. Project approval processes are complex and not transparent. In sum, the "market infrastructure" needed to support commercial project development is not in place.

Poor operating record and reputation. Many of China's existing wind farms and small hydropower plants and grids have been poorly maintained and are operated inefficiently. Poor plant performance has contributed to the view that renewables are not a viable option for adequately meeting significant amounts of demand.

Mismatched distribution of renewable resources and ability to pay. Much of the resource is located in poor western provinces with limited electricity markets and capacity to pay for renewable electricity development. For example, wind resources in Inner Mongolia could supply the large North China power grid through existing interconnections, but there is no mechanism available to spread the cost of development of these resources to consumers outside the small Inner Mongolia grid (compartmentalized grids).

Little experience with some promising renewable electricity technologies. There has been little experience in China with some promising technologies, including small hydro rehabilitation, biomass generation for sale to the grid, and large wind farms using "third generation" wind technology.

C. GLOBAL OBJECTIVE

The program objective is to enable commercial renewable electricity suppliers to provide energy to the electricity market efficiently, cost-effectively and on a large scale.

The core of the program is GEF-financed support for institution and capacity building for the scale-up of renewable energy based electricity generation capacity.

Phase 1

The first phase will contribute to the program's global objective through development and implementation of the legal and regulatory framework to create and gradually increase the share of renewable energy based electricity generation, and support its effective implementation in four provinces. Now that the REL has been enacted, associated regulations will be prepared and promulgated during this phase. Effective implementation and enforcement, which have always

been problematic and uneven for environmental laws, will be piloted in four provinces, namely Fujian, Inner Mongolia, Jiangsu, and Zhejiang and supported by well targeted and sustained TA. Technology transfer at the national level will be supported through capacity building and TA, focusing particularly on wind and biomass. Investments in important technologies will be undertaken in the four pilot provinces to demonstrate the viability of large-scale renewable energy based electricity generation. Expected duration is 3–4 years. GEF will provide a US$40.22 million grant to support the institutional development and capacity building component during the first phase, with cost-sharing from participants expected to contribute a further US$48.6 million for a total cost of about US$88.82 million.[13]

Triggers to move from GEF phase 1 to 2 will be based on indicators of institutional progress and scale-up of renewable energy development and are expected to include: (a) issuing of required regulations to implement the REL; (b) measures of progress in implementing the law and regulations and the investments in the pilot provinces; and (c) full commitment and disbursement of at least half of the GEF grant for the first phase.

Phase 2

Phase 2 will continue to support the program's global objectives through institutional development and capacity building to decrease further cost, and improve the financing framework and provide assistance for implementation in about 10 provinces. TA will be provided for the implementation of the REL and regulations in an increased number of provinces as required. Continued support for technology transfer, quality improvement and cost reduction will be provided for wind and other selected technologies, building on Phase 1 results and market needs. Further lending to support investment (additional loans and repeater projects mainly to reduce processing time and, exceptionally, SILs) will be discussed, on a need basis, with GoC to bridge the gap for financing needs to sustain scale-up in phase 2. Expected duration is 3–4 years. Total cost for TA is expected to be about US$120 million (of which about US$50 million GEF grant).

Phase 2 to phase 3 triggers will be determined during appraisal of phase 2, but are likely to include measures of progress in the implementation of the law and achievement of the program performance indicators, measures of investment (Bank- and non-Bank–financed) in renewable energy in the phase 1 and 2 provinces, and measures of progress in cost reduction.

Phase 3

The third phase will contribute to the full achievement of the program's global objective through support to the remaining (less developed) provinces in their implementation of the REL and regulations. TA would continue to be provided for institutional strengthening and capacity building to meet international and best practice standards in constructing and operating renewable energy based electricity production facilities in the country. Continued support for localization, quality improvement and cost reduction will be provided to bring selected technologies to competitiveness with fossil fuel based electricity generation. Further lending to support investment (additional loans and repeater projects mainly to reduce processing time and, exceptionally, SILs) will be discussed, on a need basis, with GoC. Expected duration is 3-4

[13] The cost-sharing is based only on the **direct** costs borne by the participants in the GEF supported activities, using a ratio of 1:3, which is based on experience gained during implementation of Renewable Energy Development Project. Indirect and other contributing programs' costs are a lot more important, but very difficult to estimate.

years. Total cost for TA is expected to be about US$150 to 200 million (of which about US$50 million GEF grant).

Bank Investment Support

Bank investment support in each phase will be on an "as required" basis determined during phase preparation and processed as SILs. Their impacts in terms of investment and scale-up of renewable energy will be assessed for their contribution toward achievement of the objectives of the program according to GEF program triggers to move from one phase to the next.

D. BASELINE CASE

Under the baseline case, NDRC and different ministries and agencies would continue to support renewable electricity development, focusing mainly on the supply side. These activities would not be well coordinated, as no single national policy framework for renewable electricity would be adopted. The REL might be in place, but would at best be only partially implemented. Barriers related to lack of market would remain unaddressed. Many projects that are economically viable without considering externalities would not be developed.

The NDRC would continue to support wind power development, through its concession program and some supply oriented measures. Limited attention would be given to the market for power produced from the concessions, and how the incremental wind power costs would be met.

Small hydropower development would also slow, as the MWR has stopped state support to installation of small hydropower. There would be little small hydropower rehabilitation, as the county and township governments would not be aware of opportunities, nor have the technical support and access to financing required to make investments. Significant development of biomass generation would not take place because of lack of technical support, locally available equipment, financing and PPAs.

Fragmented TA activities on various aspects of the law would be carried out with international support from UNDP, ADB, bilateral donors Energy Foundation and others, but no implementing framework would be adopted or provisions put in place to ensure its effectiveness. Locally manufactured equipment would remain of poor quality and outdated technology as there is insufficient market to justify investment in technology improvement (development and transfer).

Barrier Removal Activities in Baseline

Barrier removal activities would take place, as summarized in Table A15.4 below. These include activities by GoC agencies, as well as internationally assisted activities (for example, the UNDP/GEF *Capacity Building for Rapid Commercialization of Renewable Energy*, the World Bank/GEF REDP, the Gesellschaft für [[XX]] GTZ's wind energy support program, support of about US$0.5 million/year from the Energy Foundation for renewable electricity policy development, and many other activities).

The concession program—which targets 3,000 MW of new wind capacity over 10 years—provides a mechanism for developers to propose projects and be connected to the grid under a PPA. The program is still in its early stages and so its effect on removal of barriers, especially to newer technologies, is difficult to assess.

Table A15.4: Expenditures for Barrier Removal Activities, including GoC and International Assistance, in Baseline Case 2001–10

Activity	Baseline Costs US$ million		Expected Result
	Phase 1 Period	**Phase 2 and 3 Period**	
Policy Development	8.2	11.0	Adoption of REL through limited TA activities, but ineffective implementation.
Policy Implementation	5.0	8.0	Agencies implement limited supply side policies (for example, financial incentives) at provincial, national and local level.
Technology Development	8.0	4.0	• Small hydropower technology continues to be outdated and inefficient. Current local wind turbine assembly companies sell small volume of turbines, but large-scale, up-to-date technology manufacturers do not establish local production because of limited market opportunities. Technologies for biomass generation are not produced locally. • TA activities will take place on awareness creation and development of renewable electricity, but the lack of market opportunities will limit development of market infrastructure. Approval procedures remain cumbersome; banks continue to regard renewable investments as risky.
Demonstration Investment	20.0	25.0	Some biomass generation activities planned. Limited demonstration investment planned for wind and small hydro rehabilitation.
Coordination	1.0	1.0	There will be some joint activities, but little true coordination among Chinese agencies or among international donors.
Total	**42.2**	**49.0**	**Government support and donor activities continue to focus on the supply side. Fundamental market barriers remain, even for projects that are economically viable today.**

Incremental Investments in Renewable Electricity Projects

The total result expected in the business as usual case would be 35 TWh/yr of new renewable electricity, from 7.0GW capacity by 2010. Capacity installed would be mainly of new small hydropower, in those provinces where the government takes a strong role in encouraging this development for social and economic reasons. It is possible that significant wind capacity may be added, but the prospects remain uncertain.

Emission Reduction Benefits in Baseline

Under the above estimates, during the 20-year lifetime of the investments emission reductions from renewable electricity generation installed 2001–2010 will amount to about 300 million tons of carbon; 2.2 million tons of NO_x; 11 million tons of SO_x, and 300,000 tons of total suspended particulates (TSP).

E. GEF Alternative—Phase 1

Under the GEF Alternative, Phase 1, legal and regulatory framework will be prepared for the MMP along with support for its implementation in the pilot provinces to initiate actions to achieve program objectives countrywide. Phase 1 barrier removal activities would aim to result

in a high proportion of those investments that are economically viable at the avoided cost, not including environmental externalities. This represents a conservative approach, but assumes the MMP will not be fully introduced until the end of phase 1.

Incremental Barrier Removal Activities under Phase 1

Phase 1 components and barrier removal activities will be completed as described below and summarized in Table 5.

National Level Institutional Strengthening and Capacity Building: US$20.82 million GEF, US$33 million counterpart funds

National level institutional strengthening and capacity building consists of six subcomponents as follows:

- MMP research (US$1 million GEF). Studies on further development of the MMP and its implementation will include (a) distributing national targets between provinces; (b) setting the tariff level for renewables; (c) transforming the policy from price-based to quantity-based (based on early versions of the law the price-based mechanism has been chosen at least as an interim measure); (d) sharing incremental costs between provinces; (e) developing trading schemes to minimize MMP cost; (f) linking the MMP to carbon trading mechanisms; and (g) further preparing the medium- to long-term plan for renewable energy development. Financing will support consultants to undertake the studies;
- Support to MMP implementation (US$1.25 million GEF). Studies, capacity building and training to support implementation of the REL will include (a) preparation of regulations that outline detailed implementation mechanisms; and (b) capacity building and training for implementing agencies, regulators and others affected by the law. Financing will support consultants and training activities to implement this subcomponent
- Technology improvement for wind (US$16.17 million GEF, expected counterpart funds US$27 million). There will be four activities under this subcomponent as follows:

  (a) Technology development by selected manufacturers. This activity will provide grants to companies to share the costs of projects to accelerate the transfer of variable speed; pitch controlled and related wind technology to China using licensing, joint ventures, technology development using international consultants or other means. Grants will be provided to share up to 50 percent of the cost of projects. Beneficiaries will be selected competitively based on proposals submitted by manufacturers that will be encouraged to collaborate with design institutes or other sources of know-how. Beneficiaries will be selected competitively based on proposals that will be evaluated and ranked by disinterested national and international experts. Selection will be guided by the market-driven and results-oriented nature of the proposals, and their ability to yield results in the Chinese market within five years;

  (b) Standard setting. Current Chinese standards for wind turbines are limited in scope and requirements and are not equivalent to international standards set by the International Standards Organization (ISO) or the International Electrotechnical Commission (IEC). This activity will support the development and adoption of standards by Standardization Administration of China. Financing will be provided for consultant support and the formation of an technical standards committee;

(c) Wind testing center. The project will provide assistance to a testing organization selected by the government to establish a wind testing facility through capacity building of staff, support to develop procedures and to become accredited as a test center by an internationally recognized standards body such as ISO (ISO 25) or IEC (IEC 17025). Financing will be provided for consultant support, training and the purchase of testing equipment;

(d) Certification. A certification body will be supported through capacity building, training and consultant support with a "twinning" agency to bring it up to the standards that will permit it to certify wind turbine design and performance. Consultant support will also be provided to the CNCAA to assist it in deciding whether to opt for mandatory or voluntary certification of turbines in China;

(e) Establishment of a National Wind Resource Assessment Center. The project will support development of resource assessment methodologies, national wind resource assessment standards and a national wind resource database. It will also support overlay of wind mapping with GIS data to convert resource measurements to identifiable projects. It will also facilitate knowledge transfer and best practices on international status of wind resource assessment, and support the pilot provinces in planning and implementing wind resource assessment activities. A focal point for the Center will be identified during project start-up;

(f) Long-term capacity building. Efforts to increase the supply of skilled and knowledgeable designers, engineers, manufacturing specialists and wind farm developers and operators will be supported. Two universities will be supported to set up master's level and renewable energy engineering courses, primarily focused on wind and biomass. Universities will be selected based on their track record and reputation for quality, the relevance of the courses they propose, the courses' ability to meet market needs and cost-sharing. There will also be a fellowship program to allow more senior engineers to study abroad at existing centers of excellence;

(g) Studies on interconnection to the grid and turbine micrositing. The project will support studies on connection of wind farms to the grid and their impacts on grid stability. It will raise awareness of power grid operators and wind developers of interconnection requirements and transfer international best practice and knowledge. It will conduct studies on the impact of wind farms on grid stability in one province. Training on turbine micrositing, which has for some time been a weak point in wind farm design, will be provided to complement existing activities.

- Technology improvement for biomass (US$2.4 million GEF, expected counterpart funds US$6 million). This subcomponent will provide grants to companies to share the cost of projects to improve the quality and reduce the cost of biomass technologies, particularly those related to boilers and equipment handling. Grants will be provided to share up to 50 percent of the cost of projects. Beneficiaries will be selected competitively based on proposals that will be evaluated and ranked by disinterested national and international experts. Selection will be guided by the market-driven and results-oriented nature of the proposals, and their ability to yield results in the Chinese market within five years. Supporting studies will also be undertaken in this area;

Province-level TA (US$10.6 million GEF, expected counterpart funds US$9.0 million)

The province-level institutional strengthening and capacity building consists of five subcomponents as set out below. It will take place in the pilot provinces (Fujian, Inner Mongolia, Jiangsu, and Zhejiang).

- MMP implementation (US$2.4 million GEF). Although REL will be passed at national level, implementation will be delegated to the participating pilot provinces. They will be required to prepare regulations and decrees, promulgate them and ensure their compliance. In addition they will also need to prepare provincial renewable energy development strategies, plans and financial incentive policies; testing renewable energy promotion models and creating awareness among stakeholders. This subcomponent will finance consulting services and training for provincial counterparts and renewable energy market participants;
- Resource assessments (US$4.2 million GEF). The purpose of this subcomponent is to provide detailed information to the public on the renewable energy resources in each of the provinces. For each province, a cost-resource curve for the main renewable resources and a database with resource information will be prepared and published. Measurement standards will also be prepared, to permit like-for-like comparisons. In Fujian, high-resolution wind resource measurements and wind farm siting data will be prepared. In Inner Mongolia, assessments on the wind, solar energy, biomass and municipal solid waste resource and wind farm siting in 12 counties will be undertaken and published. In Jiangsu, wind and biomass resources will be assessed and published. In Zhejiang, small hydro resources capable of producing electricity below 3,000 hours/year will be evaluated (above 3,000 hours/year is already known). Areas of biomass concentration and wind resource will also be assessed.
- Cost-shared support for scaling up renewable energy (US$3 million GEF, expected counterpart funds US$9 million). This subcomponent will help provinces carry out studies and pilot or demonstration projects in renewable energy technologies other than the one in which the investment subproject will take place. Grants will be provided for cost-shared activities, awarded on a competitive basis across the four pilot provinces. Fujian will carry out studies to identify pilot tidal and geothermal projects. Inner Mongolia will prepare biomass projects and study the potential for grid connected PV. Jiangsu will demonstrate building-integrated PV systems and strengthen its existing renewable energy development center. Zhejiang will develop standards for integrating solar water heaters into buildings and prepare biogas projects. This component will also support preparation for a pilot offshore wind farm expected to be implemented during phase 2.
- Capacity building for market participants (US$1 million GEF). Capacity building for market participants not directly involved in projects in the pilot provinces will be carried out under this component. It will include training for developers, banks, technology and service providers covering the project cycle. Financing will also be provided under this subcomponent for studies on improvements to procedures for project approval, and integration of renewable energy into electricity grids and identifying and removing bottlenecks in renewable project development.

Supporting Investment Scale-up (US$2.2 million GEF, expected counterpart funds US$6.6 million)

Based on the lessons of previous renewable energy projects, this subcomponent aims to make resources available to build a strong pipeline of bankable renewable energy projects. The

companies implementing the investment projects will be provided resources to carry out feasibility studies, resource assessments and other preinvestment activities on a cost-shared basis. Training and capacity building, and access to international experience and best practice will also be eligible activities. In Zhejiang, the Zhejiang Hydro Power Development Management Center (ZHPDMC) will implement this subcomponent in coordination with the small hydro companies. In Inner Mongolia, GEF funds will be provided to Long Yuan and not the company implementing the wind farm, to avoid risk of commingling GEF and PCF funds in the Huitengxile wind farm subproject described below;

Program Management and Coordination (US$3.38 million GEF)

Program management will include day-to-day procurement, financial and contract management for all tasks carried out under the TA program. It will include representation of the PMO in the pilot provinces. Additional tasks expected to be carried out by the PMO at least initially include coordination with other GoC renewable energy initiatives, monitoring and evaluation of the impact of REL and CRESP, preparation of annual reports and plans on behalf of NDRC, providing liaison between the Institutional Development and Capacity Building Component and other stakeholders, including the World Bank, and preparation of phase 2 of CRESP. Also included under this component are national-level studies, to be initiated by the PMO, to address further policy development issues as they arise including, for example, development of a long-term biomass strategy.

Unallocated (US$3.22 million GEF)

An unallocated amount of US$3.22 million is retained. US$3 million of the funds are earmarked for the companies undertaking Bank-financed investment subprojects in Inner Mongolia and Zhejiang. The balance will be put toward activities where the budget proves inadequate or in response to unforeseen requirements.

Table A15.5: Incremental Expenditures for Barrier Removal Activities, including GoC and International Assistance, under GEF Alternative Phase 1

Activity	**Subcomponents**	CRESP Costs Phase 1 **(million US$)**		**Expected Result**
		Total	**GEF**	
National Level Institutional Strengthening and Capacity Building		53.82	20.82	Development and adoption of national renewable electricity policy, based on MMP, and including supporting measures such as mechanisms to pass on incremental cost, streamlined approvals.
	Policy development—*(MMP research)*	1.0	1.0	• Establish tariff level for the renewable • Minimize MMP cost and link MMP to trading mechanisms
	Policy implementation—*(Support to MMP implementation*)	1.25	1.25	Build capacity and strengthen implementing agencies, regulators and affected parties for implementation of REL, including drafting of regulations for the law.

Activity	Subcomponents	CRESP Costs Phase 1 (million US$)		Expected Result
		Total	**GEF**	
	Market and technology development)— *(Technology improvement—wind)*	43.17	16.17	▪ Cost-sharing to catalyze investments and accelerate the transfer of technology to develop local wind technology through joint venture and licensing agreements with local design centers and sources of know-how. ▪ Adoption of international standards (ISO or IEC) for local wind turbines. ▪ Establishment of an internationally accredited (ISO 25 or IEC 17025) wind testing facility run by certified staff. ▪ Development of a certification body to certify or provide permit for wind turbine design and performance. ▪ Long-term capacity building to increase skill levels in design, engineering, manufacturing, and operation of wind farms. ▪ Studies on interconnection and micrositing.
	Market and technology development— *(Technology improvement—biomass)*	8.4	2.4	Cost-sharing to catalyze investments in development of biomass combustion technology (boilers and equipment handling)
Province-level capacity building and institutional strengthening		19.6	10.6	
	Policy implementation— *(MMP implementation)*	2.4	2.4	▪ Prepare regulations and decree to implement REL and ensure its compliance in four pilot provinces. ▪ Prepare provincial renewable energy development strategy, testing renewable energy promotion models and creating awareness among stakeholders.
	Market and technology development— (Resource assessment)	4.2	4.2	Prepare resource assessment standards and for each province a resource-cost curve, in a database to be published and disseminated for public use.
	Demonstration investment— *(Cost-shared support for scaling up RE)*	12	3	Conduct studies and develop pilot or demonstration projects in of renewable energy technologies for projects other than the one allocated technology for each four provinces.
	Market and technology development— *(Capacity building for market participants)*	1.0	1.0	▪ Training of stakeholders (banks, developers, technology and service providers) during pilot projects. ▪ Conduct studies on improvement in project procedure, approval process, integration of renewable energy into electricity grids and identifying and removing bottlenecks in renewable project development.
Supporting Investment Scale-up		8.8	2.2	Assist project companies in building pipeline of renewable energy projects.
Program management		3.38	3.38	Program management tracks activities, coordinates, monitors, corrects activities as necessary to ensure Phase 1 objective reached. Coordinates other GoC renewable energy activities.
Unallocated		3.22	3.22	

Activity	Subcomponents	CRESP Costs Phase 1 (million US$)		Expected Result
		Total	**GEF**	
	Total	**88.82**	**40.22**	**Commercial renewable electricity suppliers demonstrate that a conducive environment has been created for renewable electricity generation in China's four provinces.**

Incremental Investments in Electricity Projects as a Result of Phase 1

It is expected that Phase 1 would remove barriers to a substantial proportion of investments that are economically viable without consideration of environmental externalities. Most of the incremental investments would focus on biomass and small hydro rehab. The result would be to scale up renewable electricity development from business as usual (BAU) generation of about 35 TWh/yr (7.0 GW) by 2010 in the baseline to an estimated 60 TWh/yr (10.8 GW) by 2010. This would increase incremental renewable electricity generation over the baseline by 53 percent.

Incremental Emission Reduction Benefits as a Result of Phase 1

Under the estimates of incremental investments outlined above, reductions of carbon emissions from renewable electricity generation added between 2001 and 2010 will increase from 300 million tons under the baseline to 455 million tons in the GEF Alternative-Phase 1. In addition, there will be an incremental reduction over the baseline of 1.2 million tons of NO_x; 5.9 million tons of SO_x and 162,000 tons of TSP. All emission reductions are measured over the 20-year lifetime of the investments.

F. GEF Alternative—Phases 2 and 3

GOC plans to install 116 GW of additional renewable energy capacity (small hydro wind, biomass and PV systems) by 2020 that will displace approximately 221 million tons of coal per year and contribute around 404 TWh per year of electrical generation. CRESP Phases 2 and 3 would contribute to that target but, given the differing time span and uncertainties surrounding it, it is difficult to make an estimate of its contribution.

Incremental Barrier Removal Activities in Phases 2 and 3

Activities to be carried out in Phases 2 and 3 and their timings will be defined in Phase 1. Currently foreseen activities under CRESP Phases 2 and 3 are summarized in Table 6 below. These phases focus on implementing the policy framework more widely and technology development support and are assumed to take place by 2015. Both aim at major long-term barriers high costs and the mismatch of location of resources and ability to pay. Support for other activities continues, but the focus shifts to implementation of the MMP policy framework.

Table A15.6: Incremental Expenditures for Barrier Removal Activities, including GoC and International Assistance, under GEF Alternative Phases 2–3

Activity	CRESP Costs Phases 2 and 3 (million US$)		Expected Result
	Total	**GEF**	
Policy development	15.0	4.0	Follow through on MMP and development of supporting measures.
Policy implementation TA	28.0	20.0	Implementation of MMP policy framework nationally, including all necessary instruments for compliance monitoring and verification and support at provincial level for implementation.
Technology and market development	204.0	54.0	A number of local suppliers of internationally competitive suppliers of wind turbines, small hydro turbines, steam turbines and boilers for biomass and control equipment would operate and sell equipment in China and for export.
Investments	225.0	0.0	Second stage of support for investment of technologies such as continued hydro rehabilitation, biomass cogeneration, further wind. In this phase, TA and investment support would be extended to about 10 provinces.
Support for investment scale-up	40.0	10.0	Further renewable energy investors receive support to scale up and professionalize their operations.
Program management, coordination and contingency	13.0	12.0	Program management tracks activities, coordinates, monitors, corrects activities as necessary to ensure Phase 2/3 objective reached. Parallel or related projects would be underway initiated by GoC/GEF Partnership. These projects would make a measurable contribution to development of renewable energy. Five percent of funds available for unforeseen activities.
Total	525.0	100.0	**Commercial renewable electricity suppliers provide energy to the electricity market efficiently, cost-effectively, and on a large scale throughout China.**

Incremental Investments in Electricity Projects as a Result of Phases 2 and 3

A conservative assumption would be that incremental investments in electricity projects in phase 2 would be that suggested by the CRESP economic analysis. This would imply that, with the MMP in place, the economic optimum of renewables, including local externalities, would be achieved since the external costs of coal would be reflected in the price paid for renewables. On that basis, there would be a scaling up from 55 TWh to 89 TWh/yr (based on installed capacity in 2010 of 17.5 GW) during Phase 2. An estimated 150 TWh/yr from 29.6GW of installed renewable electricity capacity is taken as the tentative end of Phase 3 target, though this will be further refined during phase preparation. This assumption is conservative given the GoC's own target of 404 TWh in 2020. Most of the investments would be shared between new and rehabilitated small hydropower, biomass and wind.

Incremental Emission Reduction Benefits as a Result of Phases 2 and 3

Assuming the investments described above are made as a result of phases 2 and 3, incremental reductions of carbon emissions from renewable electricity generation between phase 1 and 2 of

166 million tons and a further 486 million tons between phase 2 and 3, incremental increases over the baseline of 320 million tons and 800 million tons, respectively. In addition, phase 2 would yield an incremental reduction over Phase 1 of 1.3 million tons of NO_x; 6.9 million tons of SO_x and 160,000 tons of TSP. Phase 3 would yield further incremental reductions of 3.6 million tons of NO_x, 19 million tons of SO_x and 580,000 tons of TSP. All emission reductions are measured over the lifetime of the investments.

G. GEF ALTERNATIVE: SUMMARY OF RESULTS OF WHOLE PROGRAM

Table 7 below summarizes expected results and costs of the Program, incremental to the Baseline.

Table A15.7: Incremental Results and Costs of CRESP, over the Baseline, 2000–15

		Phase 1	Phases 2 & 3	Program
Program Indicators:				
Increased Renewable Electricity (TWh/yr)		25	90	115
Increased Capacity (GW)		4.8	17.8	22.6
Reduced emissions*:	Carbon (million tons)	154	652	806
	NO_x (million tons)	1.2	5.0	6.2
	SO_x (million tons)	5.9	24.9	30.8
	TSP (thousand tons)	162	668	830
Program Costs:				
Total Costs		88.82	525	613.82
GEF Incremental Costs		40.22	100	140.2

* Over 20-year lifetime of facilities.

Global Benefits

According to the illustrative results above, during CRESP's lifetime, there would be an incremental reduction of carbon emissions above the Baseline of about 320 million tons. At a GEF cost for the Program of US$140 million, carbon cost would be about US$0.17 per ton during the 20 years lifetime of facilities. In addition, the CRESP Phase 2 and 3 activities would lay a solid basis for continued installation of renewable electricity facilities after the Program terminates. These indirect benefits have not been calculated, but would reduce the incremental costs of carbon further.

A sensitivity analysis has been performed on emission reduction on different targets. The business as usual case with 36 TWh target is taken as a low case, but would result in zero incremental emissions (and presumably no GEF program could be justified). The CRESP case for economically optimum target (79 TWh) without environmental externalities is selected as a "minimum likely" on the basis that phases 2 and 3 will not go ahead without the framework in place to achieve that level. As an upper bound, the GoC target of 404TWh/year by 2020 is selected as the high case (see Table 8). The analysis indicates a range of GEF cost US$0.07 to US$0.64 per ton of carbon for 2015.

Table A15.8: Sensitivity Analysis of GEF Alternative Emission Reductions Cost To 2010 Targets

Case	Business As Usual	Economically Optimum Case	GoC
Target by 2010 (TWh/yr)	36	79	404
Lifetime Incremental Reduction (20 years) million tons of Carbon	0	220	2,020*
Program Cost (million US$)	0	140	140
GEF Cost/ton Carbon (US$)	0	0.64	0.07

* The emission factor of 0.235 kg/KWh (average of two coal power plants from Inner Mongolia and Zhejiang) for carbon was adopted from P. Meier, *Economic and Financial Analysis of the CRESP—Vol. 1* (September 2003) to calculate the lifetime emissions reductions of carbon from GoC targets.

H. SUSTAINABILITY

After implementation of the CRESP, a policy framework is in place to address the failure of the market to incorporate renewable electricity. If the financial market price of conventional electricity is still below the financial price of renewable electricity at the end of the Program, the MMP framework and target would still be in place, encouraging further renewable electricity growth. Therefore, sustainability is ensured. At the point where renewable electricity is financially competitive, the MMP tool is no longer required and renewable electricity growth would be sustained by market forces. If a market develops for international trading in global environmental benefits and China chooses to participate, this would further ensure the sustainability of the results from the program.

I. INCREMENTAL COSTMATRIX

Table A15.9: Incremental Cost Matrix

Component/ Activity	Cost Category	Phase 1 (US$ M)	Phases 2/3 (US$ M)	Domestic Benefits	Global Benefits
National Level Policy Development	Baseline	8.20	11.0	Continuation of supply side measures, market develops slowly. No adoption of coordinated national policy, based on MMP. No mechanism to pay for incremental costs on a large scale.	
	GEF alternative	9.20	15.0		Introduction of MMP and mechanism to pay incremental cost opens large-scale market, which in turn leads to cost reduction and long-term sustainability.
	GEF Incremental cost	1.00	4.0		
National Level Policy Implementation	Baseline	5.00	8.0	Agencies implement limited supply side policies (for example, financial incentives) at provincial, national and local level.	
	GEF alternative	6.25	12.0		Implementation of MMP framework nationally, including all necessary instruments for compliance monitoring and verification
	GEF Incremental cost	1.25	4.0		
Technology Improvement	Baseline	8.00	4.0	▪ Technology continues to be outdated and inefficient. International manufacturers do not establish local joint ventures because of limited market opportunities. ▪ Lack of market opportunities limits development of market infrastructure. Approval procedures remain cumbersome, banks continue to regard renewable investments as risky.	
	GEF alternative	51.57	204.0		▪ Local suppliers of internationally competitive wind turbines, boilers for biomass, and similar equipment produced in China and for the local market and for export. ▪ Large-scale market results in rapid development of market infrastructure—for example, renewable financing is mainstream activity by commercial banks, resource data is publicly available, etc
	GEF Incremental cost	16.57	54.0		

Component/ Activity	Cost Category	Phase 1 (US$ M)	Phases 2/3 (US$ M)	Domestic Benefits	Global Benefits
Province-Level Policy and Capacity Building	Baseline	0.00	0.0	No effort on implementation of MMP (as there is no MMP to implement, on resource assessment or on building capacity in the provinces	
	GEF alternative	19.60	16.0		▪ MMP implemented in four pilot provinces ▪ Resource assessments carried out ▪ Capacity of market participants built
	GEF Incremental cost	10.60	16.0		
Investment, Including Pilot and Demonstration Activities	Baseline	20.00	25.0	Investment activities continue with bilateral and multilateral support. Limited investment, mainly in pilot or demonstration projects, with no real impact on market development.	
	GEF alternative	172.00	225.0		Investment and barrier removal activities open large markets for important technologies including small hydro wind and biomass (GEF alternative investment amount based on known/expected World Bank financing plus GEF pilot)
	GEF Incremental cost	3.00	0.0		
Support for Investment Scale-up	Baseline	0.00	0.0	No support for companies wishing to scale up the level and quality of investment in renewable energy technologies.	
	GEF alternative	8.80	40.0		Cost-shared support for companies to carry out feasibility studies, resource assessments, training and obtain international best practice experience
	GEF Incremental cost	2.20	10.0		
Program Management, Coordination and Unallocated	Baseline	1.00	1.0	There will be joint activities, but little coordination or synergy among activities by Chinese or international agencies. No program management.	
	GEF alternative	7.60	13.0		Program management tracks activities, coordinates, monitors, corrects activities as necessary to ensure Phase 1 objective reached. US$3.22 million of unallocated amount is retained for unforeseen requirements.
	GEF Incremental cost	6.60	12.0		

Component/ Activity	Cost Category	Phase 1 (US$ M)	Phases 2/3 (US$ M)	Domestic Benefits	Global Benefits
Summary Baseline		42.20	49.0	Installation of 7 GW generating 35 TWh/yr from renewables. Emission reductions of 2.2 million tons NO_x, 11.1 million tons SO_x and 300,000 tons TSP over lifetime of plant.	Carbon emissions reduced by 300 million tons.
Summary GEF Alternative		483.20	525.0	Phase 1: Installation of 11.9 GW generating 60 TWh/yr from renewables. Emission reductions of 3.4 million tons of NO_x, 17.0 million tons of SO_x, and 462,000 tons of TSP. End of program: Installation of 29.6 GW generating 150 TWh/yr from renewables. Emission reductions of 8.4 million tons NO_x 41.8 million tons SO_x, and 1.1 million tons of TSP.	Phase 1: carbon emissions reduced by 454 million tons over the 20-year lifetime of the projects. End of program: carbon emissions reduced by 320 million tons (over lifetime of project) an increment of 364 million tons. Results would be greater if China participates in international carbon trading.
Incremental Cost and benefit		**40.22**	**100.0**	Phase 1: Installation of 4.9 GW generating 25 TWh/year. Emission reductions of 1.2 million tons of NO_x, 5.9 million tons of SO_x and 162, 000 tons of TSP End of program: Installation of 22.6GW generating 115 TWh/year. Emission reductions of 6.2 million tons NO_x, 30.8 million tons SO_x and 829,000 tons of TSP	Phase 1: carbon emissions reduced by 155 million tons. GEF incremental cost of carbon emission reduction is US$0.26 per ton. End of program: carbon emissions reduced by 806 million tons. GEF incremental cost of carbon emission reduction is US$0.17 per ton.

Note: GEF alternative cost amounts include baseline funding plus additional funds that result from GEF activities.

Annex 16: STAP Roster Review

CHINA Renewable Energy Scale-up Program

A. STAP REVIEWER COMMENTS

INDEPENDENT TECHNICAL REVIEW
By Dr. Jan Hamrin
Executive Director, Center for Resource Solutions

In general, this project is a well thought out, comprehensive approach to the development of cost-effective, grid-connected renewable electricity technologies in China. Most of the suggested modifications mentioned below are focused on making explicit what is implied in the program plan. There are also some small additions that might sharpen the potential effectiveness of the planned actions.

Important Issues

Scientific and technical soundness of the project

Has the most appropriate and effective approach been used to remove the barriers? Generally, the approach to reducing the barriers is sound. I would recommend, however, the Bank look at one of the main barriers that is not addressed—development of a local industry, both equipment manufacturers and project developers (such as resource assessors, business plan developers, financial experts). Work on clarifying regulations and enforcing PPAs should go a long way toward creating an independent power producer (IPP) industry, but TA should probably be provided to help train market entrants on important issues—calculating good resource assessments (especially for wind energy), business plan development, financing, and so forth A separate but related component of this can be to preselect a group of interested and willing financial institutions that can receive training on financing for renewable energy projects. This is important because the Bank aims to catalyze commercial investments in renewable energy, and this will require financing from China's banking sector and/or international banks and investors.

Discussion: The section that discusses the barriers to further renewable energy development in China—although a good summary—is missing one barrier that is reflected throughout the entire document—the lack of any renewable energy industry in China—either domestic manufacturing or joint ventures with foreign companies. The reasons for the lack of a renewable energy (RE) manufacturing base are all of the barriers listed in this section. Yet if all of these barriers are changed overnight, there would still a significant lack of capacity to: fully assess renewable resources (particularly wind), design and conduct detailed feasibility studies, develop a complete business plan, obtain financing and, most importantly, procure equipment at the lowest possible cost without relying on imports.

The lack of a well-developed indigenous industry includes not just renewable energy manufacturers, but IPPs that can operate facilities. The STAP report correctly points out that

PPAs are poorly developed and not enforced, but again, if this changed overnight, the lack of IPPs in the market would still constrain the development of the projects. In this sense, the Bank has a role in catalyzing the entrance of IPPs in the market—a role not clearly spelled out in the STAP report.

Has the most appropriate and effective approach been used to reduce the costs of the technologies? Again, the focus on changing market conditions—through an MMS—is critical, but a component that is not made explicit (though implied) is the creation of an indigenous manufacturing base. The reliance on imported technologies raises the costs of renewable energy, and a way to reduce those costs is domestic manufacturing. If the Bank encouraged the GoC to adopt investment incentives, such as tax holidays and concessional loans on manufacturing equipment (combined with a strong effort to ensure this equipment meets international standards), this would be quite helpful. This TA will be relatively small over the course of the entire project. Although local equipment will lower the cost of the technologies, other financial incentives will lower the cost of the electricity generation itself. In addition to the VAT on equipment being reduced to 6 percent (as it is for small hydro), a modest effort could help ensure that the custom duties of importing parts of a wind turbine are made less than the duties on an entire turbines (as it the case now). For example, a recent report by Tsinghua University illustrates the potential cost reductions of smart incentive policies. I am not suggesting that the Bank try and change all of what is listed below—it is just to demonstrate the potential. I understand that the Bank is uncomfortable with subsidies as they can distort market investments; however incentives in renewable energy (particularly in the U.S. and Europe) are often passed on the basis that these subsidies do not approach the level of direct and indirect public support for fossil fuels. This is particularly true for China. Listed below are some examples for wind generation:

1. *Income Tax:* If the current income tax rate of percent were reduced to 15 percent and 0, the cost of wind generation per kWh would be reduced by 4.3 percent and 8 percent, respectively.

2. *VAT:* If the current 17 percent value added tax on *electricity sales* were reduced to 6 percent and 0, the cost of wind generation would decrease by 9.6 percent and 14.6 percent, respectively (this incentive is tied to generation because the exemption only comes when a kWh is sold);

3. *VAT II:* If the current 17 percent VAT on *wind-generation equipment sold to developers* were reduced to 6 percent and 0, the cost of wind power would decline by 8 percent and 12.4 percent, respectively.

4. *Low-Interest Loans:* If the interest rate of a long-term loan were reduced from 15 percent to 7 percent, the overall cost of wind power would be reduced by 21.7 percent.

3.2 Strategic Choices: This section compares the range of options for promoting renewable energy development and talks specifically of financial incentives. The second to last paragraph, incorrectly talks about the failures of subsidies. Yes, all of the problems discussed can happen with renewable energy incentives, but our experience has shown that subsidies can be effective

in spurring RE development without being indiscriminate and open to abuse. The U.S. production tax credit—in combination with other market policies—has accelerated the installation of thousands of megawatts of wind energy.

In addition, when combined with a mandated market, such as the RPS, one can calculate the costs of the subsidy with a fair degree of accuracy. In addition, one can calculate the benefits in terms of jobs created and costs of renewable electricity reduced (not just through subsidies, but through economies of scale encouraged by the subsidy).[14] I believe that intelligently designed incentives are important in bringing projects to fruition, particularly incentives related to the previous point above—the development of a local RE manufacturing base.

Was the potential market determined on the basis of renewable energy technology data and databases? Yes, a good analysis of the economic potential under different time frames and cost assumptions was performed and contrasted with the resource potential that is much higher. A range of policy targets was also tested against the base case and various policy scenarios.

Has an evaluation of the demand-side mechanisms to support after-sales service been undertaken? I'm not sure what this means, but my comment would be that CRESP aims to create the demand for renewable energy, so right now, there is not very much after-sales service to evaluate.

An exception is the solar hot water industry, a well-developed technology in China. In 1990–1998, the total heat collection area used for solar water heaters increased by ten times. Today, about 1,000 enterprises are engaged in the development, manufacturing, marketing and installation of solar water heaters. The industry, with an annual growth rate of 20–30 percent, is also exporting to Southeast Asia and Europe. In terms of after-sales service, this is a major problem. Many of the manufacturers pay little attention to after-sales service and have no system to service consumer problems. For example, the U.S. had 40 solar water heater manufacturers and 116 technical service firms in 1997. That 1:3 ratio is completely reversed in China and approaches 4:1. Consumers are rightfully concerned that there will be no place to turn if they have trouble with their systems. Many Chinese companies are small businesses with loose distribution networks and few quality guarantees.

To expand the market, the industry needs to provide more technical support, perhaps through an expansion of their service business network. *And this is with a mature, commercial technology.* With CRESP overall, this is an issue that the Bank will have to address and gets to the point above about creating a market infrastructure. Even if the policy signals are there—through an MMS, for example—the Bank will need to develop the market infrastructure.

Adequacy of the introduced financial incentives? The Bank's work on policy reform (MMS) is the most important component. Financing incentives, however, must follow. I suggest the Bank consider using its loan/grant money to guarantee a loan from a local financial institution to help

[14] In addition, the Bank must not forget any of its fossil fuel projects in China are subject to subsidization, in this case from the GoC. Although a coal plant might be built on a market basis—with sales of its electricity sold at market levels—the fuel for that plant comes from state-owned and highly subsidized mines, thus artificially lowering the costs of coal generation. If these subsidies were taken into account, the price of renewable energy might look much more attractive.

catalyze financing. This might be a good use of World Bank resources to catalyze involvement of the Chinese financial sector in renewable energy. Aid has a similar guarantee program in eastern Europe and it has helped get energy efficiency projects off the ground there.

In addition, as mentioned earlier, the Bank should be looking at renewable energy industry development in China. This could take the form of financial incentives for domestic/joint venture firms to build manufacturing facilities for renewable energy generating equipment (for example, tax holidays and low-interest loans)

Comments on the design of demonstration project? I strongly support the pilot approach although a good deal of thinking will be needed in the selection process. The APL approach is important to help ensure strong Chinese participation at all levels.

On pages 11–12, the Bank outlines its plans for Phase 1 of CRESP—selecting three pilot provinces and developing the legal and institutional capacity to implement a provincewide MMS. What appears to be missing and what I believe to be critically important is renewable energy credit trading. The Bank correctly points out that credit trading is a way to lower the cost of an MMS and provide additional flexibility to support renewable energy where the resources are strongest. However, experience in the U.S. has shown that there are many technical and legal issues surrounding credit trading, and we believe the Bank will need to work on this issue from the very start.[15]

On page 34, in the key indicators section, the Bank mentions a renewable certificate database developed and a system for issuing credits tested. This is critically important, and I suggest carrying out some "mock" trades in the pilot province just to get the MMS administrators ready for this task. Of course, this will depend on the Bank's 1) selecting and training the RPS or trading program administrator on the provincial level and 2) developing the software to record and monitor trades and similar transactions. Modifying existing software from the Dutch or Texas programs might be the best way to proceed. Finally, the Bank should consider trying as quickly as possible to develop credit trading outside the province, so the company/utility facing the MMS burden can, if it is cost-effective, finance the construction of renewable energy facilities in other regions of the country (particularly the Western regions). This might be tried in Phase 1.

As the pilot program expands to 10 provinces and then beyond, it will be critical to sort out the conflicting roles of various state agencies, specifically SDPC, SETC and MOST. Although the Bank is working on setting up Phase 1, it also needs to sort out these longer-term issues that might not get resolved until Phases 2–3. What the Bank should be striving for is an independent, professional regulatory authority with responsibility over the important aspects of the power

[15] I included this in our last comments, but will reiterate here in case there is a different audience. We would make as clear as possible the criteria for selecting the pilot provinces. Maybe start with a matrix to score each potential pilot site with desired criteria. The Bank might want think ahead of time what kinds of specific commitment they might seek to help ensure success in the pilots. If only two provinces seem really interested, maybe drop the third and focus on the first two. The criteria include the level of environmental pollution, relative wealth, renewable resources, level of free market orientation (makes REC trading easier), and most importantly—demonstrable commitment from provincial planning commissions, people's congresses, local mayors. This could come in the form of a letter, promise of in-kind contributions, or the like.

sector, including the administration of the MMS policies. However, I don't believe this should be left to Phases 2–3; it should be going on concurrently with Phase 1, given the length of time it may be required to clarify who will have authority over the energy sector.

A second, related comment is that the CRESP program should work completely in tandem with the Bank's broader power sector reform efforts in China. It seems to me (although I am on the outside) that CRESP and the Bank's power sector reform team are working somewhat independently of each other. Experience in the U.S. and elsewhere shows that 1) MMS policies come within the context of broader utility restructuring and 2) that political opposition to MMS policies tend to be reduced when utilities feel they are getting more of what they want during the broader reform process.

This is important because I don't believe the power sector reform team is taking into account environmental or public benefit programs at all. The team is working very closely with SPC and its supporters in the government. If the power sector reform team and CRESP could have a unified message that within the context of utility restructuring, the GoC needs to take into account issues other issues[16] that would be very helpful to both Bank initiatives. This is particularly important because the MMS policy—the cornerstone of the CRESP approach—is fundamentally a political process that can be stopped if more powerful forces in SPC (in particular) and the GoC (in general) believe it is counter to their interests.

Will a process be put in place to monitor the project? I suggest that the Bank rely on outside experts that are already working in China, such as the Energy Foundation, CRS, UNDP and Chinese institutions, such as Tsinghua University, to help refine and improve the program. This might take the form of a working group that meets once or twice a year in China to review the status of the program.

Identification of global environmental benefits
Given the pivotal role of China in GHG emissions and the projections for China's GHG emission trajectory in the future, a program that could significantly impact the direction and magnitude of these emissions in the China's power sector is critically important. The global environmental benefit of this project—299 million tons—is a 63 percent increase from the baseline. In addition, if the project is a technical and economic success and contributes to the longer term cost reduction of renewable generating plants so that they are cost competitive, could result in significant replication in other regions of the world.

How the project fits within the context of the goals of the GEF
This project has a good fit with the GEF Operational Program #6.

Regional Context
This project also has an excellent fit within the regional context.

Replicability of the project
To the extent that this program is successful, it has tremendously positive replication potential throughout the world. The policy framework and approach being tested here is applicable

[16] These issues being reducing costs as much as possible and designing as market-oriented a power sector as possible.

anywhere in the world. Since China is an emerging economy, it can serve as a role model for both developed and developing countries. Though the form of China's government is very different from many other countries, the program can be easily tailored to other political systems.

Sustainability of the project

As stated in the project description, "if the financial market price of conventional electricity is still below the financial price of renewable electricity at the end of the program, the MMS target would still be in place, encouraging further renewable electricity growth. Therefore, sustainability is ensured. At the point where renewable electricity is financially competitive, the MMS tool is no longer required and renewable electricity growth would be sustained by market forces."

The greatest threat to the success of the project is a failure in electricity sector reform that undermines the ability to implement the policies recommended.

Other Issues

Page 9, The last line in the last paragraph is an overstatement. Moreover, there is not a real distinction between mandated markets and mandated market share. I would delete the mandated markets discussion in that both the NFFO and PURPA could fall under this heading as described though they are discussed in the next section.

Page 10: It is important to point out that the difference between a feed-in law and an RPS is that with the former, one will know the price of renewable electricity—but not how much will be produced. With an RPS, one will know how much will be produced, but not what the price will be. The RPS is in favor today because more than the feed-in law, it aims to stimulate competition and minimize cost. Experience has shown, however, that feed-in laws have done a better job of creating local manufacturing and development infrastructure. In the end, the Bank will need to help China develop an MMS policy that works in the Chinese context. That might mean some combination of MMS policies from Europe and the U.S. (see Table 1 a further comparison between feed-in laws and RPS policies—an expanded version of this analysis is available from CRS).

Table A16.1: Comparing the RPS and Feed-in Law Policies

Policy Objective	RPS and Related Policies	Feed-in Laws
Incentives for cost minimization	significant competitive pressures	few inherent incentives to minimize cost
Ability to maintain targets for renewable energy	direct result of purchase obligation	cannot know in advance whether feed-in tariff will stimulate a specific amount of supply
Assurance of resource diversity	possible with bands and tiers, but administrative drawbacks	easier to implement than under RPS
Political viability	depends on circumstances—unclear in China	depends on circumstances—unclear in China
Local industry development	needs companion policies to ensure local	experience shows that feed-in tariffs can create local manufacturing and

	development	development infrastructure
Compatibility with industry and regulatory structure	with an appropriate phase-in, RPS appears compatible with industry and regulatory structure in China	compatible with existing regulatory and industry structure, but perhaps not competitive electricity market of the future
Policy stability	provides lesser certainty than feed-in tariffs	often provides high degree of stability
Competitive parity	yes—same standard applies to utilities and developers	only if cost-sharing mechanisms are established
Integration of renewable energy supplies	incentives for full integration and barrier reduction	fewer incentives than under RPS to reduce institutional barriers
Simplicity	more challenging policy to design and administer, and more complex contractual and development process for generators	high degree of design, administration, enforcement, contractual, and development simplicity

Secondary Issues

Linkages to other focal areas
No comment.

Linkages to other programs
This project potentially has linkages to projects throughout the world. The comprehensive nature of the approach, if successful, could form a model for both emerging economies and developing countries throughout the region.

Other beneficial or damaging environmental effects
All of the major environmental effects have been noted in the STAP document. However, the beneficial effects of the project related to NO_x, SO_x, particulates and mercury have not yet been quantified. When they are, I believe these will be very significant for China. The SO_x benefits will be significant for the whole region, whereas the other air pollution benefits will be local with their significance depending upon the location of the generation they displace.

Degree of involvement of stakeholders in the project
It appears that this has been significant involvement of stakeholders in the project, though participation alone is not enough. The project will benefit when it can be less dogmatic and more supportive of input and program design evolution by the stakeholders who are involved. It will be virtually impossible for outsiders, including officials from Beijing, to really understand the local dynamic that is critical to program implementation and ultimately to the program's success.

Capacity building aspects
The central focus of this project is on capacity building.

Innovativeness of the project
The focus on capacity building and a comprehensive policy framework make this program innovative within the Bank itself. If successful, it should set a new and beneficial standard for program design.

Conclusions
This program proposal is well thought out. Successful execution will be challenging though the potential rewards make it well worth the effort.

B. BANK PROJECT TEAM RESPONSE

Table A16.2: Bank Project Team Response

ISSUE AND RESPONSE	REFERENCE IN PROGRAM BRIEF
SCIENTIFIC AND TECHNICAL SOUNDNESS	
I would recommend, however, that the Bank look at one of the main barriers that is not addressed—development of a local industry, both equipment manufacturers and project developers (resource assessors, business plan developers, financial experts, etc.)....A separate but related component of this can be to pre-select a group of interested and willing financial institutions that can receive training on financing for renewable energy projects.	
CRESP aims to create a market, the most important element needed to foster an industry. When CRESP succeeds in creating a market, these investments will follow. Two CRESP components would also help the development of an industry to serve this market. One, Technology Cost Reduction and Quality Improvement, is targeted mainly at assisting local equipment manufacturers to improve the quality and reduce the cost of their products, through cost-sharing early technology development investments. Principal beneficiaries will be manufacturers, equipment suppliers, and standards, testing and certification institutes. The other component, Development of Market Infrastructure, is designed to help the "software" (service industry) develop. It will support the development of enterprises so that they can offer the full range of services from resource assessment, through design, engineering, construction, commissioning, acceptance, to operations, maintenance, rehabilitation and decommissioning. This component is also targeted at the financial services sector, in particular the commercial banks, and would offer financing to undertake studies, product development and TA for: risk management instruments, (for example guarantees and insurance); project financing structures; contract arrangements; project bundling; fund formation; and evaluating and appraising renewable energy investments. Assistance would be provided to build up the network of supporting information, including a public resource database, consulting skills and access to financing that local and international IPPs must have to develop projects efficiently The Program Brief has been amended to bring out the role of these components in supporting the development of a local industry.	Section B4
The section that discusses the barriers to further renewable energy development in China—although a good summary—is missing one barrier that is reflected throughout the entire document—the lack of any renewable energy industry in China—either domestic manufacturing or joint-ventures with foreign companies.	
We—and those Chinese experts who participated in the November 1999—believe that the barriers listed underlie the lack of the renewable energy industry. The main barrier is the lack of policies to create a market and pay the incremental costs. As shown by the small hydropower industry in China, if the market exists, the industry will grow. The small hydro industry in China is well developed, with more than 20GW of small hydro installed, mostly based on locally designed and implemented projects using locally manufactured equipment. The wind industry is less advanced, but there are a number of joint ventures with major international companies as well as some local component manufacture and service industries. The newer	Section B3.1 Section B4

technologies, including those relating to landfill gas, are less well developed. In parallel with market creation through the MMS policy, the Technology Cost Reduction and Quality Improvement and Development of Market Infrastructure Components would encourage new entrants as well as improve the capacity of the existing industry. *Power purchase agreements are poorly developed and not enforced, but again, if this changed overnight, the lack of IPPs in the market would still constrain the development of the projects. In this sense, the Bank has a role in catalyzing the entrance of IPPs in the market—a role not clearly spelled out in the … report.* The Policy Development and Market Infrastructure Components will explicitly address the issues of how to ensure that the market created by the MMS is open to private sector developers, (IPPs), and how to support the development of domestic IPPs for renewable electricity. *If the Bank encouraged the GoC to adopt investment incentives, such as tax holidays and concessional loans on manufacturing equipment (combined with a strong effort to ensure this equipment meets international standards)… local equipment will lower the cost of the technologies, other financial incentives will lower the cost of the electricity generation itself. In addition to the VAT on equipment being reduced to 6 percent (as it is for small hydro), a modest effort could help ensure that the custom duties of importing parts of a wind turbine are made less than the duties on an entire turbines (as it the case now).* The GoC and some provincial governments have adopted a number of investment incentives and are contemplating others, in parallel with the introduction of a Mandated Market Share (MMS). Examples of existing or planned incentives for wind include reduced customs duties on equipment imports and income tax on investments. As part of policy work in Phase 1, TA will be provided to study the existing financial incentives structure, possibly recommend additional incentives, and ensure that the combined package of financial incentives, price to be paid by the utility, and contracting terms are attractive to investors. Financial incentives are an integral part of CRESP and ensuring that they are harmonized with the MMS is an important part of the Program. The Brief has been amended to bring this out more clearly *Section B3.2 Strategic Choices: This section…incorrectly talks about the failures of subsidies…our experience has shown that subsidies can be effective in spurring RE development without being indiscriminate, open to abuse, etc. The U.S. production tax credit—in combination with other market policies—has accelerated the installation of thousands of megawatts of wind energy…I believe that intelligently-designed incentives are important in bringing projects to fruition, particularly incentives related to the previous point above—the development of a local RE manufacturing base* The section makes the point that subsidies have drawbacks. The main point of the discussion on financial incentives, however, is the conclusion that on their own they have not tended to be successful in developing the market for renewables. The section goes on to make the case that incentives combined with an MMS appear to be the most successful approach. The Brief has been amended to express more clearly to	Section B4 (discussion on MMS Policy and Market Infrastructure Section A1 Section B4 (discussion on MMS Policy Framework), Section C2 Section B3.2

the intention of the CRESP, to use the MMS policy together with a package of financial incentives to create an attractive environment for investors. *Section B3.2 Strategic Choices: The last line in the last paragraph [of page 9] is an overstatement…Moreover, there is not a real distinction between mandated markets and mandated market share. I would delete the mandated markets discussion in that both the NFFO and PURPA could fall under this heading as described though they are discussed in the next section.* *Section B3.2 Strategic Choices: It is important to point out that the difference between a feed in law and an RPS is that with the former, one will know the price of renewable electricity—but not how much will be produced. With an RPS, one will know how much will be produced, but not what the price will be. The RPS is in favor today because more than the feed-in law, it aims to stimulate competition and minimize cost. Experience has shown, however, that feed-in laws have done a better job of creating local manufacturing and development infrastructure. In the end, the Bank will need to help China develop an MMS policy that works in the Chinese context.* The Program Brief has been amended to take the first comment into account, and to bring out more clearly the ideas expressed in the second comment, which the task team shares and intends to realize.	Section B3.2
EVALUATION OF DEMAND SIDE MECHANISMS TO SUPPORT AFTER-SALES SERVICE	
CRESP aims to create the demand for renewable energy, so right now, there is not very much after-sales service to evaluate…An exception is the solar hot water industry, a well-developed technology in China…With CRESP overall, this is an issue that the Bank will have to address and gets to the point above about creating a market infrastructure. Even if the policy signals are there—through an MMS, for example—the Bank will need to develop the market infrastructure. The Task Team made an early strategic decision to exclude heat-producing renewables applications from the Program. Note the comments above about the Market Infrastructure Component, which is aimed directly at creating the needed market infrastructure. *On pages 11–12, the Bank outlines its plans for Phase 1 of CRESP—selecting three pilot provinces and developing the legal and institutional capacity to implement a province-wide MMS. What appears to be missing and what I believe to be critically important is renewable energy credit trading. The Bank correctly points out that credit trading is a way to lower the cost of an MMS and provide additional flexibility to support renewable energy where the resources are strongest…I suggest carrying out some "mock" trades in the pilot province just to get the MMS administrators ready for this task.* Renewable energy credit trading is only applicable to one generic type of MMS, namely the Renewable Portfolio Standard (RPS). Other approaches use different means of ensuring the MMS is met at least cost and so putting in place and testing a trading mechanism may not be appropriate. The current plan, subject to confirmation of feasibility at appraisal and early implementation, is to introduce an RPS-type	Section D1 Section B4 Section B4

MMS with certificate trading. Issuing of certificates for verification, and possibly trading, and trading itself are included as activities in the provincial pilots during Phase 1. The Program Brief has been amended to reflect the comment and to bring out more clearly the intention as expressed in this response. *It will be critical to sort out the conflicting roles of various state agencies, specifically SDPC, SETC and MOST. Although the Bank is working on setting up Phase 1, it also needs to sort out these longer-term issues that might not get resolved until Phases 2–3. What the Bank should be striving for is an independent, professional regulatory authority with responsibility over the key aspects of the power sector, including the administration of the MMS policies…A second, related comment is that the CRESP program should work completely in tandem with the Bank's broader power-sector reform efforts in China. It seems to me (although I am on the outside) that CRESP and the Bank's power sector reform team are working somewhat independently of each other.*	
Fragmentation of responsibilities is recognized as an issue. Program oversight and policy guidance is furnished by a steering committee co-chaired by the MOF and State Development Planning Commission (SDPC) with members representing State Economic and Trade Commission (SETC) and Ministry of Science and Technology (MOST) and many other ministries and agencies are also represented on the steering committee. The PMO, will be responsible to this committee for the implementation of the project, and will work closely with a smaller working group of key officials from different agencies on policy development.	Section B3.1 (Lack of Policies) Section C4 Section E4.
During Phase 1, the institutional arrangements for implementation of the MMS policy at national and provincial level will be outlined. The GoC strategy is to set up formal power sector regulatory mechanisms at the Central and Provincial level. It may be necessary initially to designate an independent regulatory body for the MMS and certification, if restructuring is slow.	Section B2 (GoC Strategy) Section C2
The task team agrees on the close relationship of the MMS to power sector reform, and the need for collaboration with power sector reform. The PMO has already begun to work with the Working Party on the Electricity Law of the Legislative Committee of the National People's Congress. It is likely that the vehicle for the MMS will be through revision of the Electricity Law, which will also introduce the broader power sector reform. SDPC is responsible for power sector reform and the CRESP (together with MOF, in the case of CRESP). Within the Bank, the Task Team Leader for CRESP is also involved in power sector reform activities and the Task Team Leaders for the major reform activities are also team members for CRESP. The Program Brief will be amended to stress the close connection. *I suggest that the Bank rely on outside experts that are already working in China, such as the Energy Foundation, CRS, UNDP and Chinese institutions, such as Tsinghua University, to help refine and improve the program. This might take the form of a working group that meets once or twice a year in China to review the status of the program.* The CRESP will make every effort to involve outside experts in preparation and	

implementation of the CRESP, both through direct participation and parallel activities. Also, in addition to the steering committee, there is a regular meeting of donors, including the Bank, ADB, UNDP, bilaterals, and others every six months, which is able informally to provide feedback	Section C4

DEGREE OF INVOLVEMENT OF STAKEHOLDERS IN THE PROJECT	
The project will benefit when it can be less dogmatic and more supportive of input and program design evolution by the stakeholders who are involved. The Components in the CRESP specifically address the barriers identified by stakeholders in the Workshop held in November 99. Stakeholder consultation will be increasingly important as the program moves toward implementation. Substantial consultative and stakeholder participation is anticipated in the run up to appraisal and after effectiveness, particularly in the policy development and pilot components, but by no means confined to them. We will amend the Program Brief to describe better the planned process.	Section B4, (MMS Policy Framework and Pilot Phase)

Annex 17: Maps

CHINA Renewable Energy Scale-up Program