Document of
The World Bank

Report No: ICR00002077

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IBRD-47920, IBRD-48160, TF-54833)

ON TWO

LOANS

IN THE AMOUNT OF US$87 MILLION AND US$86.33 MILLION

AND

A GRANT FROM THE

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$40.22 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR

THE FIRST PHASE OF THE RENEWABLE ENERGY SCALE-UP PROGRAM and
THE FOLLOW UP PROJECT TO THE FIRST PHASE OF THE CHINA
RENEWABLE ENERGY SCALE-UP PROGRAM

June 24, 2012

China and Mongolia Sustainable Development Unit
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 24, 2012)

Currency Unit = RMB Yuan
US$1.00 = 6.32 RMB Yuan

FISCAL YEAR
[January 1 – December 31]

ACRONYMS AND ABBREVIATIONS

APL	Adaptable Program Loan
ASTAE	Asia Sustainable and Alternative Energy Program
CCS	China Classification Society
CEPRI	China Electric Power Research Institute
CGC	China General Certification Center
CGF	Competitive Grant Facility
CGF-PDP	Competitive Grant Facility – Pilot Demonstration Project
CNAS	China National Accreditation Service for Conformity Assessment
CRED	Center for Renewable Energy Development
CREIA	Chinese Renewable Energy Industries Association
CRESP	China Renewable Energy Scale-up Program
DANIDA	Danish International Development Agency
DRC	Development and Reform Commission
EIA	Environmental impact assessment
EIRR	Economic internal rate of return
EMP	Environmental management plan
ERI	Energy Research Institute
FIRR	Financial internal rate of return
FY	Fiscal year
FYP	Five-Year Plan
GDP	Gross domestic product
GEF	Global Environment Facility
GEO	Global Environmental Objective
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
GW	Gigawatt (1,000 megawatts)
GWh	Gigawatt-hour
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion and Result Report
IEC	International Electrotechnical Commission
IFFS	Investors Scale-up Support Facility
ISO	International Organization for Standardization
kW	Kilowatt
kWh	Kilowatt-hour
kWp	Kilowatts-peak
MOF	Ministry of Finance
MOST	Ministry of Science and Technology
MW	Megawatt (1,000 kilowatts)
MWh	Megawatt-hour
NDRC	National Development and Reform Commission
NEA	National Energy Administration
NGO	Nongovernmental organization
NO_x	Nitrogen oxide
NPC	National People's Congress
NPU	Northwestern Polytechnical University
PDO	Project Development Objective
PIP	Project Implementation Plan
PMO	Project Management Office
PV	Photovoltaic(s)
QAG	Quality Assurance Group
QSA	Quality of Supervision Assessment
R&D	Research and development
RAP	Resettlement Action Plan

RE	Renewable energy	TTL	Task Team Leader
REL	Renewable Energy Law	TW	Terawatt (1,000 GW)
REDP	Renewable Energy Development Project (Loan 4488-CHA)	TWh	Terawatt-hour
		UNDP	United Nations Development Programme
SAC	Standardization Administration of China	UNFCC	United Nations Framework Convention on Climate Change
SERC	State Electricity Regulatory Commission	VAT	Value added tax
SHP	Small hydropower	W	Watt
SIL	Specific investment loan	WTC	Wind Testing Centre
SO_x	Sulfur dioxide	WTTT	Wind Turbine Technology Transfer
tce	Ton of coal equivalent		
TF	Trust Fund	ZHMC	Zhejiang Hydropower Management Center
TI	Technology improvement		

Vice President:	Pamela Cox
Country Director:	Klaus Rohland
Sector Managers:	Mark Lundell and Vijay Jagannathan
Project Team Leaders:	Xiaodong Wang and Yanqin Song
ICR Team Leader:	Xiaodong Wang

CHINA
Renewable Energy Scale-up Program

CONTENTS

ICR DATA SHEET

A. Basic Information			
Country:	China	Project Name:	China Renewable Energy Scale-up Program (CRESP)
Project ID:	P067828, P067625	L/C/TF Number(s):	IBRD-47920, TF-54833
ICR Date:	06/24/2012	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	GOVERNMENT OF CHINA
Original Total Commitment:	US$87.00M, US$40.57M	Disbursed Amount:	US$77.00M, US$40.57M
Revised Loan Amount:	US$77.00M		
Environmental Category: B		**Focal Area**: C	
Implementing Agencies: Long Yuan Pingtan Wind Power Company Ltd. Jiangsu Guo Xin New Energy Development Company Ltd. National Development and Reform Commission (NDRC)			

Country:	China	Project Name:	Follow-up to CRESP Phase I
Project ID:	P096158	L/C/TF Number(s):	IBRD-48160
ICR Date:	06/24/2012	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	PEOPLE'S REPUBLIC OF CHINA
Original Total Commitment:	US$86.33M	Disbursed Amount:	US$84.68M
Revised Amount:	US$84.68M		
Environmental Category: B			
Implementing Agencies: Inner Mongolia North Long Yuan Wind Power Company Zhejiang Small Hydropower Development and Management Center			

B. Key Dates

Renewable Energy Scale-up Program (CRESP)—P067828

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	08/07/2000	Effectiveness:	11/30/2005	11/30/2005

Appraisal:	12/01/2004	Restructuring(s):		
Approval:	06/16/2005	Midterm Review:	03/09/2009	05/15/2009
		Closing:	09/30/2010	09/30/2010

China—Renewable Energy Scale-up Program (CRESP)—P067625				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	08/07/2000	Effectiveness:	11/30/2005	11/30/2005
Appraisal:	12/01/2004	Restructuring(s):		08/28/2007 09/24/2010 09/27/2011
Approval:	06/16/2005	Midterm Review:	03/09/2009	05/15/2009
		Closing:	09/30/2010	12/31/2011

Follow-up to CRESP Phase I—P096158				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	09/07/2005	Effectiveness:	06/16/2006	06/16/2006
Appraisal:	09/07/2005	Restructuring(s):		
Approval:	02/07/2006	Midterm Review:		05/04/2009
		Closing:	09/30/2010	09/30/2011

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes	Highly satisfactory
GEO Outcomes	Highly satisfactory
Risk to Development Outcome	Low
Risk to GEO Outcome	Low
Bank Performance	Satisfactory
Borrower Performance	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry	Highly Satisfactory	Government:	Highly Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance	Satisfactory	Overall Borrower Performance	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Renewable Energy Scale-up Program (CRESP)—P067828 and P067625			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating:**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	Satisfactory
Problem Project at any time (Yes/No):	No	Quality of Supervision Assessment (QSA)	Satisfactory
GEO rating before Closing/Inactive status	Highly satisfactory		
DO rating before Closing/Inactive status	Satisfactory		

China—Follow-up to China Renewable Energy Scale-up Program (CRESP) Phase I—P096158			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating:**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None
Problem Project at any time (Yes/No):	No	Quality of Supervision Assessment (QSA)	None
DO rating before Closing/Inactive Status	Moderately Satisfactory		

D. Sector and Theme Codes		
Renewable Energy Scale-up Program (CRESP)—P067828		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Renewable energy	100	100

Theme Code (as % of total Bank financing)		
Climate change	29	29
Environmental policies and institutions	29	29
Infrastructure services for private sector development	28	28
Rural services and infrastructure	14	14

China—Renewable Energy Scale-up Program (CRESP)—P067625		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Central government administration	24	24
Renewable energy	50	50

Subnational government administration	26	26

Theme Code (as % of total Bank financing)		
Climate change	22	22
Environmental policies and institutions	22	22
Infrastructure services for private sector development	23	23
Law reform	11	11
Rural services and infrastructure	22	22

Follow-up to China Renewable Energy Scale-up Program (CRESP) Phase I—P096158		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Renewable energy	100	100

Theme Code (as % of total Bank financing)		
Climate change	29	29
Environmental policies and institutions	29	29
Infrastructure services for private sector development	28	28
Rural services and infrastructure	14	14

E. Bank Staff		
Renewable Energy Scale-up Program (CRESP)—P067828		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	Jemal-ud-din Kassum
Country Director:	Klaus Rohland	David Dollar
Sector Managers:	Mark Lundell/Vijay Jagannathan	Junhui Wu
Project Team Leader:	Yanqin Song	Noureddine Berrah
ICR Team Leader:	Xiaodong Wang	
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	Noureddine Berrah	
	Enno Heijndermans	

China—Renewable Energy Scale-up Program (CRESP)—P067625		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	Jemal-ud-din Kassum
Country Director:	Klaus Rohland	David Dollar
Sector Managers:	Mark Lundell/Vijay Jagannathan	Junhui Wu
Project Team Leader:	Xiaodong Wang	Noureddine Berrah
ICR Team Leader:	Xiaodong Wang	
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	Noureddine Berrah	
	Enno Heijndermans	

Follow-up to China—Renewable Energy Scale-up Program (CRESP) Phase I—P096158		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	Jemal-ud-din Kassum
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	Noureddine Berrah	
	Enno Heijndermans	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

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

CRESP Phase I was designed to 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 to support its effective implementation in four pilot provinces.

Specifically, the Phase I Project Development Objective (PDO) was to (a) create a legal, regulatory, and institutional environment conducive to large-scale, renewable-based electricity generation; and (b) demonstrate early success in large-scale, renewable energy development with participating local developers in four provinces. For the purpose of this ICR, the PDO description from the PAD was used.

Revised Project Development Objectives (as approved by original approving authority)

No revision.

Global Environment Objectives (from Project Appraisal Document)

Same as PDO.

Revised Global Environment Objectives (as approved by original approving authority)

No revision.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Market framework in pilot provinces established through laws and regulations			
Value (quantitative or Qualitative)	None	Substantial Evidence	Not revised	• RE Law enacted • Implementing regulations issued
Date achieved	12-31-2000			12-31-2011
Comments (incl. % achievement)	During the early stage of preparation, the Chinese counterparts stressed that developing an RE Law would take three to five years in China. Therefore, the Bank proposed and the Chinese counterparts agreed to select 4 pilot provinces, which voluntarily agreed to develop RE aggressively even in the absence of a national RE Law. However, increased environmental awareness and China's commitment in RE Conferences in Bonn and Beijing to speed up RE development led to the preparation of the RE Law in less than a year, with support from the Bank and other bilateral and multilateral agencies. The RE Law was enacted before project effectiveness, and CRESP supported the preparation, implementation, and monitoring of the supporting regulations.			
Indicator 2:	Environment for development of renewables improved in pilot provinces			
Value (quantitative or qualitative)	None	Substantial Evidence	Not revised	• China committed to momentous RE development targets • Targets allocated to all provinces • National and provincial incentives for RE development established
Date achieved	12-31-2000			12-31-2011
Comments (incl. % achievement)	Environment for development of renewables substantially improved nationwide, evidenced by (a) increased RE targets by the Chinese government (15% non–fossil fuel in primary energy mix by 2020); and (b) huge increase of renewable electricity generation capacity and annual renewable electricity generation (wind power capacity has doubled every year since 2005 and ranked No. 2 in the world in 2010); and (c) approved RE Law and supporting regulations that are being implemented.			
Indicator 3:	Improved quality and reduced cost among manufacturers and service providers in wind and biomass			
Value (quantitative or	None	Substantial Evidence	Not revised	• Increased nationally and

qualitative)				internationally certified wind turbines • Diminishing operational problems of malfunctioning of biomass units • China wind manufacturers are among the world's leading manufacturers
Date achieved	12-31-2000			12-31-2011
Comments (incl. % achievement)	Chinese RE equipment, especially wind turbines, improved greatly, and the number of nationally and internationally certified turbines and exports, even to developed countries, increased significantly. Furthermore, due to the booming wind market, all internationally recognized international manufacturers established manufacturing capacity in China, increasing competition and pressure on prices and quality. Four out of the top 10 global wind manufacturers are now Chinese wind manufacturers, and two of them participated in the CRESP's quality improvement program.			
Indicator 4:	Increased renewable electricity over baseline (TWh/year), and increased renewable capacity over baseline (GW).			
Value (quantitative or qualitative)	7 GW 35 TWh/year	11.9 GW 60 TWh/year	Not revised	50 GW 146 TWh/year
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	Target of additional renewable electricity capacity and production has been significantly surpassed. The increased capacity is 320% higher than the target, while the increased electricity production is 143% higher than the target. Power generation increases are less than installed capacity increases because the major increase in capacity is due to wind, which has a lower capacity factor than biomass and small hydropower (SHP).			
Indicator 5:	Reduced annual emissions (million tons): Carbon NO_x SO_x Particulates			
Value (quantitative or qualitative)	0 tons carbon 0 tons NO_x 0 tons SO_x 0 tons particulates	23 million tons carbon 171,000 tons NO_x 852,000 tons SO_x 23,000 tons particulates	Not revised	32 million tons carbon 336,000 tons NO_x 307,000 tons SO_x 146,000 tons particulates
Date achieved	12-31-2000			12-31-2010

Comments (incl. % achievement)	Except for SO_x, all avoided emissions targets were substantially exceeded: (a) avoided carbon is 39% higher than the target; (b) avoided NO_x is 96% higher than the target; and (c) avoided particulates emissions are 525% higher than the target. Avoided SO_x emissions are 64% lower than the target because of the unexpected and dramatic reduction of the power system SO_x emission factor from 9,600 tons/TWh in 2000 to 2,100 tons/TWh in 2010. The emission factor was reduced so dramatically because during project implementation, the government made flue gas desulfurization equipment mandatory for all power plants and imposed closing of all small and highly polluting power plants as electricity shortages eased.

(b) GEO Indicator(s)

Same as PDO indicators.

(c) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Enactment of RE Law and issuing of regulations to implement the law at national level by 2009			
Value (quantitative or qualitative)	None	100%	Not revised	100%
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	The RE Law was adopted by the 11th meeting of the Standing Committee of the 10th National People's Congress (NPC) on February 28, 2005 and became effective on January 1, 2006, 9 months before appraisal. An amendment of the RE Law was adopted by the 12th meeting of the Standing Committee of the 11th NPC on December 26, 2009 and became effective April 1, 2010. By end 2009, 22 regulations were issued by the NDRC, Ministry of Finance (MOF) and other ministerial level agencies.			
Indicator 2:	Issuing of regulations for implementation of RE Law and their effective implementation in pilot provinces (Fujian, Inner Mongolia, Jiangsu, and Zhejiang) by 2009			
Value (quantitative or qualitative)	None	Full	Not revised	Full
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	By 2009, the RE Law and all implementation regulations (22 in total and mostly supported by CRESP) were in place and applied to all provinces, including the pilot ones.			
Indicator 3:	Issuing of national standards for wind turbines, availability of testing facilities, and certification by 2009			
Value (quantitative or qualitative)	Partial	Full	No revised	Full

Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	The target was fully achieved as (a) all the 8 Chinese wind standards developed under the project were approved by the Standardization Administration of China (SAC); (b) 2 wind turbine testing centers accredited and carried out 15 and 21 wind turbine tests respectively; (c) 2 certification bodies were accredited for wind turbine certification. The Standards Committee, testing centers, and certification bodies are expected to continue their work in the future. The Standards Committee will operate with support from the government (Ministry of Science and Technology, MOST) and the private sector (wind turbine manufacturers), and the testing centers and certification bodies will operate on a commercial basis.			
Indicator 4:	Companies participating in cost-shared technology and services development activities (with emphasis on biomass and wind) by 2009.			
Value (quantitative or qualitative)	0	15	Not revised	23
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	The target was surpassed by 53%. By the end of 2008, 23 different companies carried out cost-shared technology and services development projects. The projects not only achieved the intended outputs (products or services developed), but also the intended outcomes (products or services successfully commercialized) as 19 projects led to substantial sales of the products or services developed before the closing date.			
Indicator 5:	Pipeline of renewable energy projects under development in the provinces by 2009.			
Value (quantitative or qualitative)	0	400 MW	Not revised	1,329 MW
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	By the end of 2008, 1,329 MW of RE projects were planned and developed in pilot provinces, with CRESP support. This is 232% higher than the target. It must be noted that this number includes only the projects that received CRESP support. The total pipeline in all provinces is a lot higher.			
Indicator 6:	100 MW wind farm at Changjiangao, Pingtan Island, Fujian, selling 260 GWh/year into local grid by 2008.			
Value (quantitative or qualitative)	0	100 MW 260 GWh/year	Not revised	100 MW 300 GWh/year
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	100 MW (50 Vestas 2 MW wind turbines) operational December 31, 2007 (100% on target), selling 280 GWh to the grid in 2008, 301 GWh in 2009 and 2010. The capacity factor increased from 33.0 to 35.5% (one of the highest in China). The annual electricity generation at 294.1 GWh (average over the last 3 years) is 13% higher than the target.			
Indicator 7:	25 MW straw-fired biomass power plant at Yinxing Village, Rudong County, Jiangsu selling 162 GWh/year into local grid by 2009.			
Value (quantitative or qualitative)	0	25 MW 162 GWh/year	Not revised	25 MW 141.2 GWh/year

Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	The 25 MW straw-fueled power plant realized in Yinxing Village, Rudong County, Jiangsu, generated 141.2 GWh in 2010. Capacity target met (100% on target). The plant location was changed from the originally planned Mabei Village in the same county. However, the unit encountered some teething problems mainly inadequate fuel feeding system and moisture content of fuel, and the latter has been solved with CRESP support. And the solutions benefitted projects encountering similar programs in the country. Electricity generated was about 13% lower than the target in 2010, but only 2% lower than the target in 2011. It is expected that the target will be reached in 2012.			
Indicator 8:	100 MW wind farm at Huitengxile, Desheng County, Inner Mongolia selling 245 GWh/year into local grid by 2008.			
Value (quantitative or qualitative)	0	100 MW 245 GWh/year	Not revised	100 MW 79 GWh/year
Date achieved	12-31-2000			12-31-2011
Comments (incl. % achievement)	100 MW (80 Suzlon x 1.25MW wind turbines) were operational in September 2011 (100% on target) and generated 79.71 GWh in 2011. The commissioning was delayed because of ownership issues (authorities prefer autonomous region ownership rather than state ownership), procurement difficulties, and a delay in turbine supply. Electricity generation is expected to reach the target in 2013.			
Indicator 9:	28 MW of capacity of SHP in Zhejiang built or rehabilitated, selling an incremental 95 GWh/year to local grids.			
Value (quantitative or qualitative)	0	28 MW additional capacity 95 GWh/year additional electricity production	Not revised	23.5 MW additional capacity 103.78 GWh/year (in 2010) additional electricity production
Date achieved	12-31-2000			12-31-2010
Comments (incl. % achievement)	The installed capacity supported by the loan was 16% lower than the target, since one rehabilitation project and one new project were dropped. The electricity generated and sold to the grid is 9% higher than the target. However, because of the early success of SHP projects, several developers requested and secured CRESP support through the CRESP Investor Scale-up Support Facility (ISSF) to develop or rehabilitate an additional 16.4 MW (4 new projects with a total capacity of 14.3 MW and 4 rehabilitation projects with an additional capacity of 2.13 MW). With these additional projects, the target is substantially surpassed.			

G. Ratings of Project Performance in ISRs

		P067828/P067625				
No.	Date ISR Archived	GEO	DO	IP	Actual Disbursements (US$ millions)	
					Project 1	Project 2
1	10/25/2005	S	S	S	0.00	0.35
2	12/14/2006	S	S	S	0.44	2.35
3	12/26/2007	S	MS	S	73.10	2.90
4	01/24/2009	S	S	S	77.00	5.75
5	02/06/2010	S	S	S	77.00	14.22
6	06/28/2011	HS	S	S	77.00	27.83

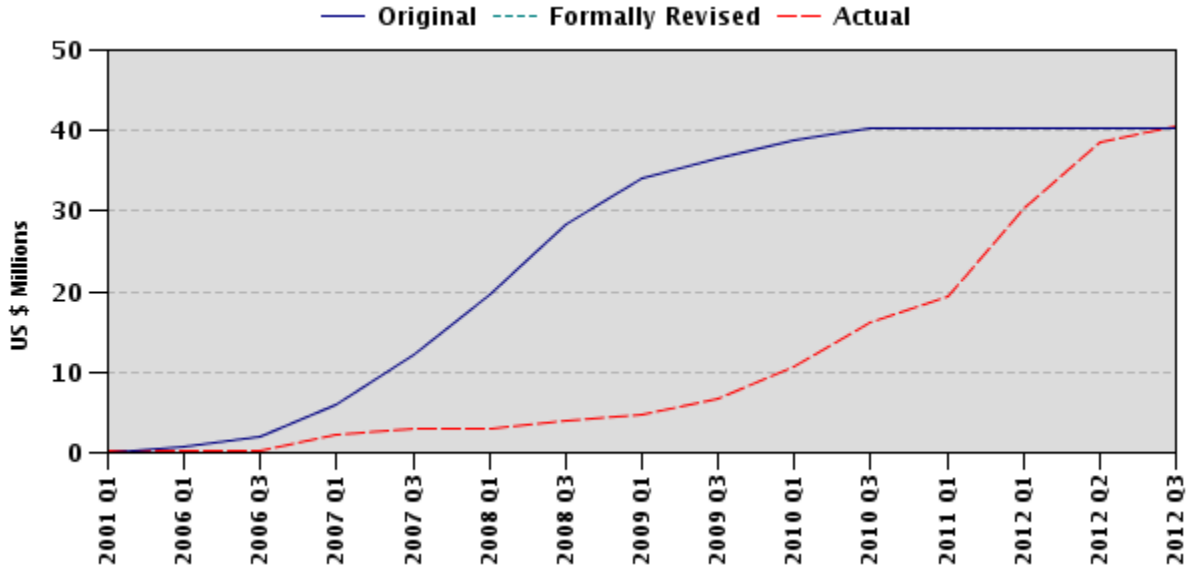
P096158				
No.	Date ISR Archived	DO	IP	Actual Disbursements (US$ millions)
1	04/20/2006	S	S	0.00
2	12/07/2006	S	S	2.22
3	01/07/2008	MS	MS	13.66
4	01/24/2009	MS	MS	16.89
5	02/09/2011	MS	MS	46.70
6	06/27/2011	MS	MS	84.68

H. Restructuring

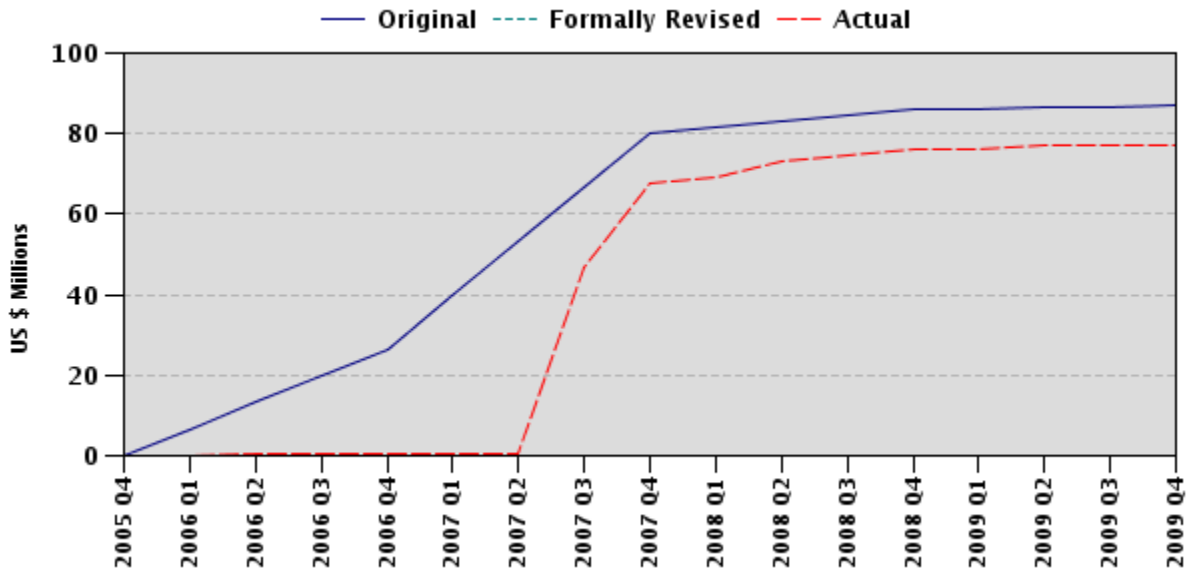
Restructuring Date(s)	Board Approved		ISR Ratings at Restructuring			Amount Disbursed at Restructuring in US$ millions		Reason for Restructuring & Key Changes Made
	PDO Change	GEO Change	DO	GEO	IP	Project1 P067828	Project 2 P067625	
08/28/2007	N	N	MS	S	S	73.1	2.9	• To make changes of a few subcomponents to adapt to the changing conditions of RE development and meet government's request; and • To reallocate the grant proceeds to allow the shifting of resources to high-priority activities.
09/24/2010	N	N	S	S	S	77	20.4	• To reallocate the grant proceeds to allow the shifting of resources to high-priority activities; and • To extend the closing date of the grant from September 20, 2010, to September 30, 2011, to enable the completion of these high-priority activities
09/27/2011	N	N	S	HS	S	77	29.92	To extend the closing date from September 30, 2011, to December 31, 2011, to enable the Project Management Office (PMO) to disseminate achievements and lessons learned of CRESP through promotion, reporting and workshops, including the project closing workshop.

I. Disbursement Profile

P067625



P067828



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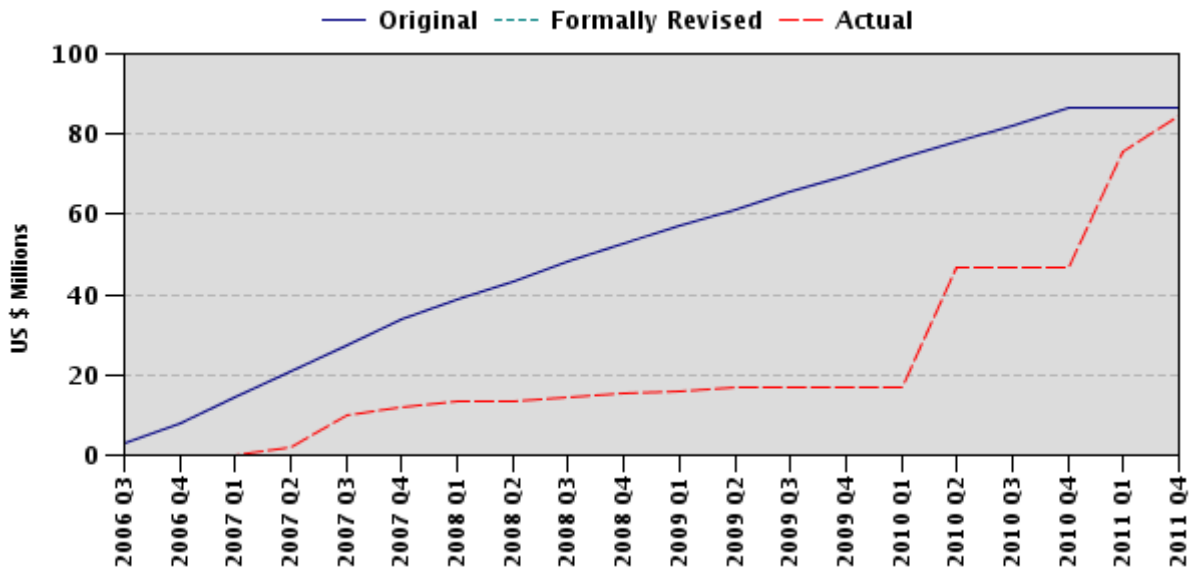

Original
Formally Revised
Actual
US $ Millions
100
80
60
40
20
0
2006 Q3
2006 Q4
2007 Q1
2007 Q2
2007 Q3
2007 Q4
2008 Q1
2008 Q2
2008 Q3
2008 Q4
2009 Q1
2009 Q2
2009 Q3
2009 Q4
2010 Q1
2010 Q2
2010 Q3
2010 Q4
2011 Q1
2011 Q4

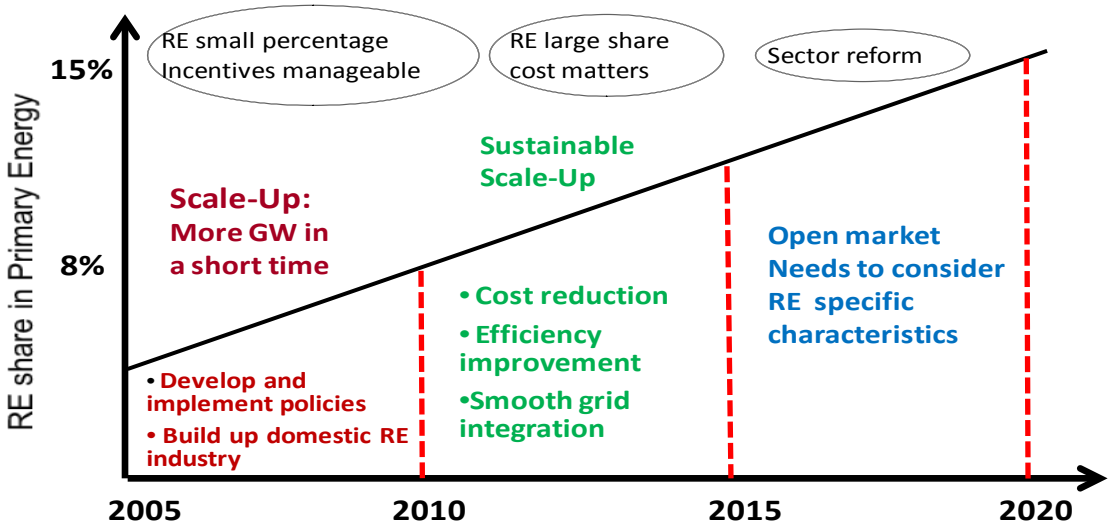
1. Project Context, Development and Global Environmental Objectives, and Design

Project Context

The China Renewable Energy Scale-up Program (CRESP) is a Bank/Global Environment Facility (GEF)/Government of China partnership to scale up renewable energy-based electricity. Such a partnership allows long-term policy dialogues and engagements with the government to support renewable energy scale-up at the national level and the goals of the government's Five-Year Plans (FYP). The CRESP outcome indicators targeted the scale-up of renewable electricity capacity and production at the national level and were closely linked with the 11th FYP targets.

The backbone of the undertaking is a three-phase GEF grant to develop a legal and policy framework and support technology improvements, standards and certification, and preparation for innovative renewable energy projects. The development objective of this three-phase program is to enable commercial renewable electricity suppliers to provide energy to the electricity market efficiently, cost-effectively, and on a large scale. Figure 1 below demonstrates the vision of such a three-phase program (see below for the objective of the first phase, and Section 2.5 for the objective of the second phase and the envisioned third phase).

Figure 1. Vision of the Three-Phase China Renewable Energy Scale-Up Program



The first phase of the CRESP was designed as a programmatic and sector-wide approach to fully blend: (a) a GEF grant that aimed at developing a legal, regulatory, and policy framework to create demand for RE and improving quality and reducing costs to build a strong local manufacturing industry to increase supply; and (b) four investments in wind, biomass, and small hydro power (SHP) that were among the largest RE investments in China at the time. These investments were designed to demonstrate quality, efficiency, and sustainability of RE investments, which were below par in China at the time, for dissemination and replication in other similar projects in China. The GEF grant also helped troubleshoot and resolve implementation issues for the RE investments for replication, and supported feasibility studies and pilot demonstrations for scale-up investments.

At the project negotiation, it was decided that the four investments would be provided in two specific investment loans (SILs) because of portfolio constraints, per request from the Chinese government. As a result, the GEF grant and the first IBRD loan (consisting of two investments) were approved by the Board in June 2005, while the Follow-Up Project (second loan for CRESP, consisting of two additional investments) was approved by the Board in February 2006. This ICR covers the GEF grant (P067625), and the two Bank SILs associated with it (P067828 and P096158), as these three projects aimed at achieving the same DO and GEO of CRESP Phase I.

1.1 Context at Appraisal

At appraisal, China was preparing the 11th Five Year Plan (2006-11) and was assessing solutions and policies to address the following major challenges:

- Rapidly growing energy needs as primary energy consumption soared from 1.3 billion tons coal equivalent (tce) in 2000 to more than 2 billion tce in 2005 with coal consumption accounting for 69 percent of the total and oil imports reaching 144 million tons, about 40 percent of the oil consumption.
- Increasing local environmental degradation, which led to unacceptable damages to health and agriculture and serious curtailments of gross domestic product (GDP) (6–13 percent according to different studies).
- Increasing engagement with the international community on climate change as China signed the United Nations Framework Convention on Climate Change (UNFCC), and the country played a major role in the June 2004 International Renewable Energy Conference in Bonn and the following year in Beijing.
- Rising vested interests and resistance to the reform of the energy (particularly power) sector as little progress has been achieved during the 10th FYP despite bold policy decrees and regulations during the first two years of the plan.
- Failure to achieve renewable energy targets in the previous (8th and 9th) FYP periods.

Against this background, the Bank and GEF worked closely with the Chinese government to develop a long-term partnership to support the goals of the 11th FYP and increase, over the longer term, renewable energy contribution to power generation in a sustainable way. The first phase of the program, the object of this ICR, focused on mandating an RE market share by law and regulations and providing incentives to internalize environmental benefits stemming from the generation of green and nonpolluting electricity.

1.2 Original Project Development Objectives (PDO) and Key Indicators (as approved)

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

Specifically, the PDO for the first phase was to (a) create a legal, regulatory, and institutional environment conducive to large-scale, renewable-based electricity generation; and (b) demonstrate early success in large-scale, renewable energy development with participating local developers in four provinces. For the purpose of this ICR, the PDO description from the PAD, was used.

Key performance indicators were as follows:

- Increased renewable electricity capacity (GW) and production (TWh/year);
- Reduced emissions of carbon, NO_x, SO_x and particulates;

- Market framework established;
- Environment for development of renewables improved; and
- Improved quality and reduced cost among manufacturers and service providers in wind and biomass.

1.3 Original Global Environmental Objectives (GEO) and Key Indicators (as approved)

GEO is the same as PDO.

1.4 Revised PDO (as approved by original approving authority), Key Indicators, and Reasons and Justification

PDO was not revised.

1.5 Revised GEO (as approved by original approving authority) Key Indicators, and Reasons/Justification.

GEO was not revised.

1.6 Main Beneficiaries

The GEF-funded Institutional Development and Capacity Building Component supported a range of beneficiaries:

- Policy support activities benefitted all economic agents engaged in the RE supply and delivery chain as they clarified and eased market access and ensured sustainability;
- Technology improvement activities benefitted selected quality- and innovation-oriented Chinese wind and biomass equipment manufacturers and related service suppliers;
- Standards, testing and accreditation benefitted the RE industry;
- Knowledge activities benefitted selected universities, as well as the students and professionals who attended the programs. Ultimately, the industry will also benefit from the availability of skilled workers and professionals.

Beneficiaries of the IBRD-financed investment component are the sponsors of the investment projects, namely, in (a) Fujian: Longyuan Pingtan Wind Power Co., Ltd.; (b) Jiangsu: Jiangsu Guoxin New Energy Development Company Ltd.; (c) Inner Mongolia: Inner Mongolia North Long Yuan Power Company Ltd.; and (d) Zhejiang: the 16 investors in SHP projects, including 6 newly constructed plants and 10 rehabilitation projects.

The Chinese population would ultimately benefit from less polluting generation of electricity. Avoiding increasing reliance on coal will also bring about global benefits and contribute to climate change mitigation.

1.7 Original Components (as approved)

The project comprises two components: (a) an institutional development and capacity building component (first phase of the GEF program); and (b) an investment component.

The core of CRESP is the institutional development and capacity building component (developed in three phases). The first phase of the program aims to (a) create a legal, regulatory, and institutional framework for renewable energy development; and (b) support improved quality and

localization of renewable energy equipment and services. Both aspects are considered necessary to create an environment for significantly scaling up renewable energy development in China.

The investment component in this first phase includes investment in two 100 MW wind farms—one in Fujian and one in Inner Mongolia—a 25 MW straw-fueled biomass power plant in Jiangsu, and a 28 MW incremental SHP capacity from new and rehabilitated SHP plants in Zhejiang.

In addition, the institutional development and capacity building component includes support for building a strong pipeline of renewable energy projects to facilitate scale up. This is done through (a) support to investors of the investment projects; and (b) support for demonstration projects, including offshore wind.

1.8 Revised Components

Project components were not revised.

1.9 Other Significant Changes

A number of changes were made during the course of implementation to adapt the support to the rapidly changing conditions of the RE environment and the needs of clients and stakeholders. These changes were made to focus on new priorities, reflect lessons learned, and shift resources to emerging priorities. The GEF resources were allocated to other subcomponents and elements with a high potential for contribution to the program and achievement of the first phase PDO. All dropped activities were carried out through government or other bilateral RE programs.

The changes were at subcomponent levels, and did not affect the overall structure of the project. The main changes made were as follows:

- The envisaged support for wind resources assessment at the national and pilot provinces level was cancelled, since the government initiated a much larger wind resource assessment program for the whole of China. The Government of China program with a budget of US$44 million, validated the project concept's focus on resource assessment, and dwarfed the contribution from CRESP (US$2 million at the national level and US$4.2 million for the pilot provinces).

- The Wind Turbine Technology Transfer element was designed to provide support to wind turbine manufacturers to improve quality and develop Chinese brand name megawatt-size wind turbines. The subcomponent gained trust and support from industry partners and government agencies. During implementation and based on studies carried out by other international agencies, the government requested an extension of support to wind turbine component manufacturers. Additional budget allocations were made to this activity from other subcomponents and elements.

- At the request of the pilot provinces, part of the provincial budget was transferred to the Provincial Pilot Demonstration Projects to support additional pilot demonstration projects and/or to support preparation for offshore wind projects.

- To support investors better in implementing Bank-funded projects and in developing a more ambitious RE pipeline, a cost-shared grant scheme was developed for the preparation of additional renewable energy investments. The support included

A change was made to the Zhejiang SHP subcomponent early on, dropping 2 of the 18 subprojects identified at appraisal. One developer financed his project through local banks, while the other rehabilitation subproject was dropped by the Bank because of dam safety issues (which were reported to the regulator). The corresponding portion of the loan was cancelled. Of the remaining 16 subprojects, 10 were for rehabilitation and 6 were for new construction.

All changes were thoroughly discussed with clients and other stakeholders, and were documented and approved by Bank management.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

Background

Taking into account the context prevailing during project preparation in China (see Section 1.1), CRESP was designed by taking into account three concurrent facts: (a) China struggled for more than 10 years (during the 8th and 9th FYPs) to achieve the target for development of 1,000 MW of wind capacity; (b) GEF indicated its intention to pilot a programmatic approach to support selected countries in developing and implementing initiatives aiming at reducing greenhouse gas emissions; and (c) the Bank/GEF Renewable Energy Development Project (REDP) approved in 1999 had to be restructured in 2001 to reduce its wind investment capacity from 190 MW to 20 MW because of debates between government institutions, and ownership disagreements among different administrative level enterprises, and a lack of clarity on who (consumers at provincial, regional, or national levels) was responsible for covering the incremental costs between RE and fossil fuels.

The idea for a large-scale renewable energy program in China, under the WB/GEF Strategic Partnership for Renewable Energy was first discussed between the World Bank and the National Reform and Development Commission (NDRC) [1] in April 1999. Despite the problems encountered in relation to the REDP wind component, the Bank recognized the strong need for international support for RE development in China and expressed its interest to the government to continue to support RE scale-up through diversifying its energy portfolio. However, despite the full support by all agencies of the concept presented in April 1999, building consensus among different agencies and power operators took time. The Bank and GEF decided to accompany Chinese agencies as they gradually progressed and gained ownership of the program concept.

The first step consisted of, upon request from NDRC, preparing a Policy Advisory Note on renewable energy development as an input to the preparation of the 10th FYP. This "Concept Note on Renewable Energy in China's 10th Five Year Plan" was dated July 24, 1999.

From 1999 to 2004, NDRC, the World Bank and GEF developed CRESP. Preparation resolved extended debate on the novel concept of the programmatic approach, following a strengthened RE policy framework of mandated market policies. The long time it took for Chinese government agencies to build consensus around the project concept and clarification of the responsibilities

[1] At that time still called the State Development and Planning Commission (SDPC), which at the early stage of development of CRESP inherited all the responsibilities of the abolished State Economic and Trade Commission.

among concerned agencies primarily resulted from the prevailing macro-level context during the early 2000s. With the changes in the highest-level leadership, government agencies were going through a transformational process to shift from the command and control economy to the "socialist market economy" and to redefine their role and strengthen their administrative power. For example, the State Development and Planning Commission (SDPC) merged with the State Economic and Trade Commission in 2003, and the National Development and Reform Commission (NDRC) was created. As a result, the government implementing agency for the GEF grant has changed from SDPC to NDRC and later to the National Energy Administration (NEA).

During preparation, a large technical assistance and policy effort was mounted and supported mainly by GEF PDF B and C and the Asia Sustainable and Alternative Energy Program (ASTAE) to assist the government in clarifying concepts related to RE scale-up and designing and developing the RE Law. During the project preparation phase, studies were carried out, and knowledge and consensus building workshops organized on all RE development aspects: (a) international experience of many advanced countries on mandated market policies—renewable energy portfolio standards, feed-in tariff, or concessions; (b) applicability and selection of these RE mandated market policies in China; (c) development of an original concept for determining economically optimal RE targets; (d) trading of green certificates; (e) developing the RE Law; and (f) supporting investors in preparing projects to be financed by the Bank during the first phase. All these activities were instrumental in transferring knowledge and best practices to Chinese agencies, assisting them in making informed decisions, and building consensus to develop the RE Law.

During project preparation, the Chinese government expected that it would take three to five years to develop and pass a RE Law. Therefore, it was decided to pilot mandated market policies in four provinces and develop an RE Law for scale-up based on the experience gained. However, an increased environmental awareness and China's commitment at the International Conference for Renewable Energy in Bonn and later in Beijing led to the development of a national RE Law in less than one year. The law was passed before the approval of the first phase of CRESP and became effective January 1, 2006. As a result, CRESP focused on making the implementation of the RE Law a success.

Soundness of Background Analysis

In hindsight, background analysis of the project design (Section 1.1 and the above section) was sound and adequately identified the issues and barriers to be addressed.

Lessons Taken into Consideration during Preparation

The design of the project incorporated a combination of lessons emerging from international experience related to renewable energy development and lessons from earlier Bank operations in China and elsewhere.

Important lessons from international experience indicated that successful RE development programs required the following:

- Well-coordinated programs supported by law, policies, and implementing regulations;
- Adequate tariff levels "at a premium price" for RE, reflecting environmental externality, with long-term power purchase agreements;
- Mandatory off-take of electricity generated by grid operators;
- Passing incremental costs between RE and fossil fuels through to consumers;

- Setting up national RE targets;
- Education, R&D, and information dissemination programs;
- Establishment of appropriate standards, certification, and testing of RE equipment to ensure quality; and
- Reliable assessment of the available resources.

Lessons learned from REDP and other Bank RE projects (limited at that time) and taken into account in designing CRESP include the following:

- RE projects were usually resisted by utilities and required more time and resources to build consensus among stakeholders and concerned government agencies, since their responsibilities over RE development and oversight were not clearly delineated;
- Cost-shared sub-grant approach to support local RE manufacturers works well;
- Standards, testing, and certification and technology improvement programs are essential to improve quality and sustainability of RE development (the impact of REDP on China's photovoltaic (PV) industry has been well documented);
- Single responsibility on wind farm performance is important, and innovative procurement approaches are needed to meet Bank and country requirements (Shanghai wind farms developed under REDP).

All these lessons have been fully evaluated and incorporated into the project design.

Rationale for Bank Involvement

CRESP was a logical follow-up to REDP. The Bank/GEF established a solid basis and trust with NDRC and other concerned government agencies that was essential for effective policy dialogue and scale-up of RE investments. NDRC's request for preparing a Policy Advisory Note on renewable energy development during the preparation of the 10th FYP was a clear indication for the country's strong interest in building a long-term partnership with the Bank/GEF focusing on achieving their RE target. The opportunity presented by GEF's interest in engaging countries on program rather than project basis was unique and essential to limiting the dominance of coal in the power sector. The Bank had a clear comparative advantage in establishing the partnership.

With continued Bank involvement, China would also benefit from international experience in developing the appropriate policies and regulations, and gain knowledge related to technology improvement, as demonstrated during implementation of REDP. Bank involvement would also increase the prospect of sound development of RE investment projects leading to optimal use of resources and increased performance during operation.

Assessment of Project Design

Due to the lengthy preparation, several management changes occurred in the Bank and counterpart agencies between the original project concept note and presentation to the board, but the design of the project proved to be robust, and it stood several rounds of scrutiny at the Bank and at various levels of the Chinese government. The design of CRESP was confirmed each time as relevant and best fitted to achieving scale-up of RE-based electricity by high management levels at the Bank and NDRC. The RE Law that adopted mandated market policies, with support from CRESP and other donors, proved to be the deciding factor for the successful RE scale-up in China.

The long-term engagement with the Chinese government, through the partnership and programmatic approach, also proved to be robust. The Bank and the government established a mutual trust relationship, since the government agencies relied mostly on CRESP when they needed advice and assistance for policy and regulation development. The CRESP introduced international best practices and mobilized domestic expertise to meet government's requests. The recommendations made in many policy studies supported by CRESP have been adopted by policy makers into laws and regulations.

Adequacy of Government's Commitment

The government's commitment to renewable energy gained momentum over 2000-2003, and became unwavering after the Bonn RE Conference in 2004, and culminated with the enactment of the RE Law. The Bank and GEF played a catalytic role in cementing the commitment through all the analytical work, knowledge activities, and consensus building during the first years of preparation. Scale-up of RE in China during the last five years has been unprecedented. The country has become the world's leader in renewable energy capacity, ranking number 1 in SHP and wind capacity, number 3 in biomass, and is on its way to achieving leadership in solar PV capacity. This is a direct result of government's commitment to RE. The Chinese government quickly realized that RE is a real "green growth" opportunity. Not only can RE help diversify, secure, and green the energy portfolio in China, the government also turns this into a new market niche to build a strong local manufacturing industry for future economic growth.

Participatory Process

The basic ideas of CRESP—programmatic approach, scale-up and the focus of legal and regulatory framework—were presented and discussed in a "genesis workshop" attended by all concerned government agencies in late 1999, after GEF's announced willingness to pilot programs to scale up renewable energy development. The brainstorming session concluded that a project based on the proposed ideas is feasible, but would be highly challenging, since it requires fundamental changes in policy development and project approval processes.

Project preparation built consensus among stakeholders in China on the need for a mandated market policy for renewable energy development and to provide training to government officials, institutions, and renewable energy experts to make informed decisions. Consultations with a wide range of stakeholders, study tours, and studies on international experience were organized to discuss all aspects of the design of RE policy frameworks.

The participatory approach culminated in a participatory structured brainstorming workshop held in Beijing on January 21, 2003, to discuss with concerned government agencies and independent experts different mandated market policies and their applicability to China. Further extensive consultations were held with relevant stakeholders on different components of the project. Several of these consultations were organized jointly with bilateral and multilateral agencies and nongovernmental organizations (NGOs) involved in China. Finally, pilot provinces were consulted and involved in the selection of the RE projects to be financed by the Bank during the first phase of CRESP.

Assessment of Risk

The project was rated as high risk/high reward at the concept stage and proved to be challenging, since it took time to build consensus on the approach and to overcome interagency debates, which were even more intense than the ones experienced during REDP.

Availability of PDF B and C and ASTAE funding helped in carrying out all analyses, studies, and knowledge activities to address the issues and questions raised by Chinese counterparts during the preparation of the project. These activities reduced the risks identified at the concept stage as counterparts gained ownership of the program design and made progress in the preparation of the first phase.

This resulted in an overall rating of risk to achieving the PDO as substantial at appraisal. Some of the risks at appraisal, such as weak government commitment in legal basis for mandated market, insufficient number of developers, and banks not willing to lend to RE projects, were effectively addressed by the RE Law. Other risks, such as the commitment to market-based approach, materialized but did not hamper the PDO of the first phase. Some were addressed in the amendment of the RE Law and some, such as trade, will be, as envisaged during the original design, the focus of the second phase of CRESP under preparation.

Quality at Entry Rating by Quality Assurance Group (QAG) (if any)

Satisfactory. QAG assessed that the DO is of high relevance to China. The project builds on experience in China of piloting projects that are then scaled up. The combination of a GEF project with a Bank-financed project to combine the investment component with policy and institutional development is an important strength.

2.2 Implementation

The GEF project progressed slowly at the beginning because of a painstaking and lengthy consensus building effort among concerned Chinese government agencies and between the PMO and the Bank/GEF team. Disbursement of the grant was very slow because of diverging opinions between the PMO and the Bank/GEF team on procurement procedures and fragmentation of contracts, cost-sharing bidding procedures and their alignment with Chinese decision making, a piecemeal approach and pace of policy reforms, and the provincial pilot projects and their replication potential, to single out the four most important ones. These issues were therefore the major themes discussed during the midterm review of the project. The discussion led to a better understanding and consensus on the priority issues, agreement on cost-sharing procedures, and a better focus on grantee needs, alignment of the Bank/GEF team and National Energy Administration/Energy Research Institute (ERI) team on the scale-up strategy, and better focus on and replication of successful activities that contributed most to the global development objective of the project (see detailed recommendations at midterm review section below). This led to speedier implementation of all activities and allowed total disbursement during the last 18 months of the project.

The four investment subprojects evolved differently (see Annex 2 for details):

- The implementation of the Pingtan 100 MW wind farm was highly efficient. The entire preparation, detailed design, procurement, implementation, and contract management for the wind farm went very smoothly. The project was fully operational by the end of 2007, marking an impressive accomplishment. In particular, the project introduced an innovative concept of single responsibility on wind farm performance for procurement to

meet Bank and country requirements. This was possible through a very dynamic and hard-working project management team, and the commitment and support of the company's management and leadership, complemented by an effective procurement agent.

- The Rudong 25 MW biomass-fired power plant changed its location from Mabei Village to Yinxing Village, Rudong County, Jiangsu Province. The power plant experienced two operational problems during implementation—higher-than-expected moisture content of the fuel and the malfunctioning of the biomass straw feeder system (not funded by the loan). The first issue was successfully addressed, with GEF support. To mitigate the second problem, the project sponsor developed an effective manual feeding system. In 2011, the plant generated 157 GWh, corresponding to 98 percent of the target set at appraisal. In 2012, the output of the plant is expected to meet the generation target.
- The SHP projects in Zhejiang province went smoothly. The challenge for SHP projects lies in project financing, project management, and addressing safeguard issues. With the strong commitment and engagement of the local government and support from the Zhejiang Small Hydropower Development and Management Center, the Bank's financing was properly used and the Bank's safeguards policies were properly followed. During implementation, one rehabilitation project and one new construction project were dropped. However, the total electricity generation from the 16 sub-projects (rather than 18 sub-projects as planned) is higher than the original target. In addition, GEF resources supported these investors in preparing eight additional new and rehabilitation projects. These two factors more than compensated for the cancellation of the two sub-projects.
- The completion of the 100 MW Huitengxile wind farm in Inner Mongolia was delayed by a year, because of slow procurement and subsequent turbine supply problem. The project sponsor—Inner Mongolia North Long Yuan Wind Power Company—changed its ownership structure, as Long Yuan Company transferred its share to the Inner Mongolia Meng Dian Hua Neng Thermal Power Company Co. Ltd. in December 2008. Part of the delay at the beginning of the project was mitigated by accelerated implementation during the later years. Nonetheless, the closing date of the project was extended by one year. The wind farm became operational in September 2011, selling 79.71 GWh to the grid by the end of the year. Electricity generation is expected to reach the target by 2013.

Midterm Review

The midterm review concluded that the project was well on its way to achieving its development and global objectives, and to meeting, and even exceeding, the performance indicators agreed at appraisal. In particular, the cost-shared sub-grants and quality assurance activities to support technology improvements were progressing well.

However, the midterm review also found a few issues of project implementation that were capable of undermining its achievements and potential—especially at the provincial level. The main identified problems/risks were as follows:

- Reduced relevance and weakened policy impact of the studies and activities funded by the Grant because of the piecemeal approach and long contract implementation periods;
- The original approach that had been agreed with the government and adopted during the concept stage, that is, piloting different policy options at the provincial level, became irrelevant after the enactment of the RE Law in 2005 and its effectiveness in 2006—as it established a national framework;
- Some technical studies, both at the national and provincial levels, were stalled or faced major implementation hurdles for two reasons: (a) consultants were not being given

adequate access to data for claimed national security reasons; and (b) there was a reluctance to hire and utilize high-level expertise either nationally or internationally; and
- Lack of management funds and disruption of PMO functioning that would have led to further delays of new activities and weaker supervision of ongoing activities.

The agreed remedies aimed to increase focus on fewer activities, especially at the provincial level, and greater reliance on the cost-sharing approach with developers and institutions with strong implementation capabilities. The important recommended actions included the following:

- Speeding up implementation of the committed contracts to avoid a reduction in the relevance of the outputs because of late delivery.
- Using the uncommitted provincial resources for pipeline building, since provincial level policy and resource assessment work is less relevant because of related work at the national level.
- Shifting funding from activities funded by the government or other donors to emerging high-priority activities (such as short-term wind forecast).
- Reducing the number of PMO staff to a core team with adequate knowledge of the program and an established track record in implementation—complemented by qualified experts to assist with work scope formulation, reviews and evaluation of outputs, particularly for complex technical and policy issues.
- Extending the closing date of CRESP to allow implementation of all committed and planned activities.

The recommendations from the midterm review were successfully implemented.

Actions Taken in Response to Problems

Unwarranted delays were experienced during the first year after effectiveness, for the following reasons: (a) institutional divergence among government agencies; (b) inexperienced PMO staff and inadequate alignment of PMO staff skills with the project focus areas; and (c) coordination difficulties between PMO (national level) and provincial Development and Reform Commissions (DRCs). After the first year, further delays were encountered because of (a) the long time required to put contracts in place; (b) large number of small contracts; (c) consultants not meeting agreed deadlines and insufficient follow-up from the PMO; (d) implementation of the sub-grant projects much more difficult than anticipated and requiring more time; and (e) insufficient initiatives at the provincial level. The recommendations in the midterm review section above outlined the actions taken to address these issues.

In addition, the first phase of CRESP encountered an important issue that complicated and delayed the implementation arrangement. The NEA heavily relied on the Center for Renewable Energy Development (CRED) under the ERI in charge of major RE policy studies in China. Contracting other institutions was expected not to be able to achieve the desired impacts, because other contractors would not have had access to data and recommendations would not have been considered by the decision makers, weakening the project's impact on China's RE policy development. During the first phase of CRESP, the NEA made it clear that all work related to decision making had to be carried out by CRED, and it took 6 months to one year for the team to secure a waiver from Operational Procurement Review Committee (OPRC) to entrust major work related to the policy decision making to CRED on a single source basis to meet this need. Furthermore, the PMO needed to be restructured and staffed to ensure independence from ERI/CRED, directly under the leadership of the NEA.

Performance Ratings

Satisfactory. QAG rated the quality of Bank supervision as satisfactory. When QAG conducted a quality assessment of the lending portfolio in 2008, the project was suffering from the initial delay because of institutional issues and slow progress of PMO and government agencies along the learning curve. Nevertheless, QAG noted that the Bank has played a constructive role in helping the Borrower implement the project with good advice, and was impressed by the quality of the staff on the Bank team. After the midterm review and the second project restructuring, the project focused on a lower number of high-priority activities, and implementation accelerated. The project was successfully completed after an extension of one year and three months beyond the original closing date.

2.3 Monitoring and Evaluation (M&E) Design, Implementation, and Utilization

M&E Design

As described in Section F of the Results Framework, all the project indicators have been exceeded, except the SO_x emission reduction, because the emission factor was reduced so dramatically as a result of a mandate by the government to include flue gas desulfurization equipment for all power plants and to close all small and highly polluting power plants.

The CRESP program has been designed as a Bank, GEF, and Chinese government long-term partnership to scale up RE before China embraced RE and committed to a momentous development program. Therefore, the quantitative outcome indicators of the program were designed as economically justified renewable energy installed capacity and power generation nationwide (see the detailed methodology in Section 3.3 on economic and financial analysis of the program). At the time of project preparation, these targets were considered very ambitious. The fact that the actual results have well exceeded the original targets proved that the design of the indicators was robust.

However, the lessons learned from the indicator design are the following:

- Cost reduction of key renewable energy technologies proved to be difficult to estimate. Establishing a cost benchmark is problematic, because of (a) a lack of Chinese indices and lack of benchmarks for renewable energy cost; (b) the difficulty of gathering data on the cost of equipment, given the concerns over the commercial sensitivity of such information; and (c) the influencing of RE costs by factors outside the control of the project. Cost of RE is affected by demand and supply, such as surges of raw material costs and reduced demand from developed countries because of the financial crisis and RE policy changes in these countries.
- Emission reductions need to factor in declining emission factors because of the increasing use of pollution control measures and improved efficiency of coal-fired power plants.
- The impact of policy work is difficult to measure with quantitative indicators.

M&E Implementation

To assess progress towards the targets of the original indicators, the required data were collected at midterm and at the end of the first phase of CRESP. The data were collected from public sources (reports and papers) and from project information. The assessment was documented in detailed indicators reports at midterm and at the end of CRESP. Reliable data to benchmark the cost of renewable energy equipment could not be collected. All other required data and information have been collected. The collected data are considered reliable.

M&E Utilization

Almost all the project indicators have been surpassed. CRESP pioneered the RE cost supply curve methodology (see Section 3.3 for details) to estimate the economically justifiable RE targets at the national level as the program outcome indicators. This methodology provided analytical inputs to the 11th and 12th FYP RE targets. In addition, the M&E framework was sufficiently well developed to provide clear guidance of what CRESP set out to achieve. The indicators were useful for gauging project progress and helping the PMO and the Bank to focus on areas of implementation that were lagging. PDO indicators were used at the mid-term review to evaluate likelihood of achievement of the project and global objectives.

2.4 Safeguard and Fiduciary Compliance

Safeguards

There were no major safeguard issues encountered. The minor issues encountered and resolved during project implementation are discussed below.

Environment. Overall environmental performance of all four investment projects is satisfactory. In Fujian, Jiangsu, and Zhejiang, there were no significant issues with implementation of the environmental aspects of the project or environmental management activities.

Inner Mongolia wind farm. One significant environmental issue was experienced. Early on during construction, poor access to roads had led to trucks driving through grassland, which caused unacceptable impacts. Corrective efforts were made at the request of the Bank's supervision teams. In addition, the external environmental supervisor was engaged by the company only in 2010 to strengthen the Environmental Management Plan (EMP) implementation.

Resettlement. Land acquisition and resettlement for all investment projects have been satisfactorily implemented. All compensation have been paid to the affected people based on the Resettlement Action Plan (RAP), all relocated households have completed the construction of replacement houses, and all proposed rehabilitation measures indicated in the RAP have been implemented for the affected villages. Income and livelihood of the affected people have been restored and even increased compared with that before resettlement. Issues encountered during implementation, and their resolution, are discussed below.

- In Jiangsu, the change of the site for the Rudong Biomass Power Plant necessitated the preparation of new EMP and RAP. After changing the site location, the developer was unable to purchase the land required for fuel storage. The issue was resolved in a satisfactory manner, as the owners proposed and the developer agreed to lease rather than purchase the land required for fuel storage.
- In Inner Mongolia, the original estimate of land acquisition for access roads had to be updated, as the extent of land acquisition was different compared to the original, and the extent of temporary and permanent land occupation had to be clarified. The site plan was revised, and the updated RAP was submitted and approved by the Bank.

Fiduciary

Procurement. Procurement performance is rated as satisfactory.

Under the GEF project, procurement was carried out in accordance with Bank procurement policies and procedures. No major issues were encountered. The prior and post review identified minor procurement issues. In May 2009, a complaint was submitted to the Bank with regard to a Consultants' Qualifications (CQ) selection performed under a provincial activity in Jiangsu Province. The case was reviewed by the Bank's EAP Regional Procurement Secretariat team, and the assignment was canceled during the project's Midterm Review.

There were no major issues for the investment projects, other than the delays experienced in the completion of the bidding process in Inner Mongolia.

Financial management. Financial management performance under all three projects was satisfactory.

The financial management system developed for the lending and GEF projects was adequate and provided, with reasonable assurance, accurate and timely information that the loan and grant were being used for the intended purposes. The project accounting and financial reporting were in line with the regulations issued by the MOF and the requirements specified in legal agreements. In addition, the withdrawal procedure and fund flow arrangements were appropriate throughout the project implementation. The loan and grant proceeds have been disbursed to the project in a timely manner.

2.5 Post-Completion Operation/Next Phase
(including transition arrangement to post-completion operation of investments financed by present operation, operation & maintenance arrangements, sustaining reforms and institutional capacity, and next phase/follow-up operation, if applicable)

The investments financed under CRESP are diverse, and transition arrangements differed:

- The Fujian Pingtan 100 MW wind farm is operational since the end of 2007 by the Long Yuan Pingtan Wind Power Company Ltd., which is the largest and most successful wind developer in China and beneficiary of a Bank loan under REDP to develop two small wind farms in Shanghai. The arrangements they made for the operation of their wind farm are up to international industry standards and the wind farm has one of, if not the, highest capacity factors in the region. The success of this project has led to a potential request from Long Yuan Company for the Bank loan to invest in offshore wind farms.
- The Rudong 25 MW biomass unit was included in the investment program as a pilot unit because the assessment carried out by the bank during preparation indicated that technical and fuel supply issues were not addressed properly. The unit was first commissioned in 2009, and encountered serious problems with fuel-feeding equipment (not financed by the Bank) and quality of fuel (moisture and storage), common problems facing many other biomass power plants in China. As CRESP earmarked GEF funds to support the investors, these were used to assess the problems encountered and propose solutions to address them. The remedies, including a Biomass Fuel Supply Handbook, financed by ESMAP, were disseminated by the CRESP PMO and benefitted other units facing the same problems. The unit has been operated and maintained according to industry standards since 2010.
- The Zhejiang SHP component included rehabilitation and construction of several units. Most of them were completed early during project implementation and are operating satisfactorily and supervised by the Zhejiang Small Hydropower Development and Management Center, the most prestigious SHP center in China, under a contract financed by CRESP GEF grant. The Center provided technical assistance during construction and

supervised the operation after commissioning. It also provided guidance and training to investors to ensure sound operation and maintenance of the plants. In March 2011, experts and officials from the Ministry of Finance and Ministry of Water Resources visited one SHP subproject in Zhejiang, and heard the report on the practice of the first phase of CRESP. Inspired by this successful project and others, in July 2011, the government allocated dedicated budget from a special fund earmarked for renewable energy to support six provinces, including Zhejiang, to pilot capacity expansion and efficiency improvement in the rehabilitation of SHP in rural areas.

Looking forward, CRESP aims to move RE development in China from the successful quantitative scale-up under the first phase to qualitative and sustainable scale-up under the second phase. The objective of the second phase of CRESP is to support Chinese government's 12th FYP to enable efficient and sustainable scale-up of commercial renewable energy development through reduction of incremental costs, efficiency improvement, and smooth integration to power systems, thereby contributing to the government's target of reduction in carbon intensity, as shown in Figure 1. Preparation of the second phase of CRESP began during the last year of implementation of the first phase. The concept of the second phase has already been approved by the Bank management and the GEF Council. Afterwards, the envisioned third phase of CRESP, coinciding with the 13th FYP (2016–20), the last FYP to achieve the 15 percent non–fossil fuel target, is envisioned to fully integrate RE in competitive and open power markets.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design, and Implementation

The scale-up of renewable electricity efficiently, cost-effectively, and on a large scale is not only still highly relevant, but has become more urgent and essential as China's energy consumption continues to grow rapidly and coal remains predominant in electricity generation. China became the largest CO_2 emitter in the world despite its recognized successes in reducing energy intensity and as scale-up of renewable energy during the 11th FYP. RE development to combat climate change became a priority:

- In China as the country committed to increase the share of non–fossil fuel in its primary energy consumption to 15 percent in 2020, in which RE accounts for more than 12 percent, and reduce carbon intensity by 40–45 percent from 2005 to 2020;
- Globally as the international community increasingly allocates funds to promote low-carbon technologies for electricity generation;
- In the Bank Country Partnership Strategy to China as it focuses on energy efficiency and development and use of clean and renewable energy technologies.

At the CRESP closing workshop, high-level government officials praised the significant contributions that CRESP made to China's renewable energy scale-up, and reconfirmed that CRESP remains highly relevant to the government's priorities and commitment to renewable energy scale-up.

The design and implementation of the program were also reviewed during the early stages of the second phase and confirmed as still relevant by the following:

- Chinese authorities and the GEF focal point that allocate significant funds to undertake the second phase;
- GEF Secretariat and Council as they approved the concept of the second phase; and

- Bank management by the approval of the concept note of the second phase.

3.2 Achievement of Project Development Objectives and Global Environment Objectives

For the first phase of CRESP, the PDO and GEO are the same:

- 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 four provinces.

CRESP has made significant contributions to the legal, regulatory, and policy framework for scaling up renewable energy in China, and catalyzed government investment in and support to RE development on a large scale during the 11th FYP. The outputs, outcomes, and achievements of CRESP are categorized in the following three key pillars.

(1) Renewable Energy Policy Support:

CRESP has strongly influenced the development of RE legal, policy, and regulatory framework in China, through supporting policy studies and technical assistance to help develop and implement the RE Law. The RE Law and ensuing regulations triggered an "RE rush" that led to an unprecedented development of wind capacity, followed by PV, biomass, and other technologies.

During project preparation, CRESP provided critical inputs to the government in developing the mandated market policies and the RE Law, in particular, selecting the mandated market policies for China and designing the mechanism of cost sharing for incremental costs. The RE Law was passed quickly, leaving many details for implementation in the follow-up regulations.

During project implementation, the recommendations made in many policy studies supported by CRESP have been adopted by policy makers into laws and regulations. CRESP-supported policy studies have led to the issuance of nine supporting RE policies and regulations. For example, CRESP-supported studies on RE targets, RE quota, cost-sharing mechanisms, and financial incentives have provided essential inputs to the amendment of the RE Law.

In particular, the feed-in tariff regulations are the cornerstone of RE policies in China, and CRESP played an instrumental role in developing these regulations. For example, based on the results from the wind concession schemes, CRESP supported a wind pricing study laid a solid analytical foundation for and led to the issuance of *Notice of Improved Feed-in Tariff for Wind (2009).* Similarly, CRESP-supported biomass studies have provided critical inputs and led to the issuance *of Notice of Improved Feed-in Tariff for Biomass (2010) and Regulation on Subsidy for Biomass (2008).*

In addition, CRESP-funded technology strategies and roadmaps for key RE technologies have provided inputs to the 12th FYP RE programs. In particular, the SHP policy studies and Zhejiang SHP investments put SHP back on the national agenda. Furthermore, CRESP also supported RE planning and technology strategies in the four pilot provinces, and proposed a "green county" concept, which led to the issuance of the *Notice on Recommendation of Green County (2009).*

(2) Technology improvements for wind and biomass:

Building a strong local RE manufacturing industry is a top priority and a key driver for RE development in China. CRESP played an essential role in the rapid growth and quality improvement of the domestic wind, and to a less extent, biomass manufacturing industry, through cost-shared subgrants and establishment of standards, testing, and certification facilities. In particular, the cost-shared subgrant approach to support domestic wind and solar manufacturers worked well and proved to be cost effective under both the first phase of CRESP and REDP projects. Before CRESP started, Chinese wind manufacturers were struggling to produce megawatt-scale wind turbines and secure international quality certification. CRESP supported five local wind manufacturers to overcome these problems. At the end of the first phase of CRESP, four domestic wind manufacturers have won Level A certification for their megawatt-scale wind turbine design, and in particular, Sewind secured type certification for its 2 MW wind turbine design from internationally recognized wind turbine certification center.

CRESP also supported the development of 8 wind turbine standards based on best international practice. All of them were adopted as national standards by SAC. CRESP also supported the establishment of 2 wind turbine testing centers and 2 wind turbine certification centers accredited by ISO/IEC Guidelines. As a result, wind turbine testing and certification services up to international standards are now available locally and widely used by local manufacturing industry for marketing and quality assurance.

Furthermore, CRESP also supported (a) short-term wind forecasting in Inner Mongolia, a critical technique and method to smooth grid integration of wind power; and (b) the development of the first university curriculum on wind power engineering in China and academic and post-academic training.

Finally, CRESP also supported 10 biomass equipment manufacturers through cost-shared sub-grants to improve biomass gasification technologies and address biomass fuel management issues.

(3) RE investment support:

CRESP has contributed to large-scale RE investments by supporting 2 x 100 MW wind farms in Fujian and Inner Mongolia, a 25 MW biomass power plant in Jiangsu, and 16 SHP plants with a total installed capacity of 24 MW. These investments are among the largest RE investments in their categories at the time. The investments focused on quality, efficiency, and sustainability of the built infrastructure when many of RE projects were below par in China and exhibited low capacity factors and/or technical problems that hampered their connection to the grid. Equipment improvements, adequate designs, and technical standards developed under CRESP and financed by GEF grants were disseminated and profited numerous similar projects in China.

- The Fujian Pingtan 100 MW wind farm was among the largest wind farm investment at the time, demonstrating successful design, implementation and completion of a large-scale wind farm. The annual electricity generation exceeded the target, with the capacity factor as one of the highest in the country. The project set high standards for large-scale wind farms in China and is considered best practice in the country. The project introduced and facilitated transfer of international best available technologies, improved quality and reduced cost, and set up cost benchmarks through international competitive bidding;
- The Rudong 25 MW biomass-fired power plant is one of the first of its kind in China. The project proved to be a very useful pilot for addressing the kinds of issues that can be encountered in fuel supply, collection, and storage, as well as power plant operation. The experience has benefitted other similar biomass plants. See Annex 2 for details;

- The SHP projects in Zhejiang province enhanced technical and management capacity of local small and medium-size enterprises, increased their access to financing, and improved SHP technical design, environmental and social safeguard, and installed capacity at project sites. The implementation of the project proved that there is a huge potential for SHP capacity expansion and efficiency improvements through rehabilitation to increase electricity production and reduce emissions at low cost.

Finally, CRESP also assisted RE developers in identifying and preparing more than 1,000 MW of new RE investments through cost-shared sub-grant support to the investors and pilot demonstration of new RE technologies in various parts of the country under the GEF grant.

3.3 Efficiency

Economic and financial analysis of the CRESP Program:

The rigorous and innovative economic and financial analysis done for CRESP provided a solid analytical basis to set up economically justified RE targets. This analysis set the standard for economic and financial analysis of renewable energy development programs and projects in other countries. The economic and financial analysis had two main objectives: (a) to assess what quantity of renewable energy development could be justified by the avoidance of the environmental externalities of coal-based generation; and (b) to estimate the economic and financial impacts of increasing renewable energy generation by a mandated market policy.

One of the main thrusts of the study related to quantifying environmental externalities of coal-fired power generation and preparing renewable energy generation cost curves to establish the quantity of renewable energy development that was justified. The study established a methodology for this analysis that has since been used in the evaluation of renewable energy programs in countries, such as Croatia, Indonesia, Mexico, Serbia, and South Africa.

The analysis went beyond determining the effects of renewable energy development policies and targets on different elements of Chinese society—electricity consumers, actors in the energy sector, and the overall impact on the GDP. It also looked at the regional development impacts of renewable energy policies and targets, since many of the wind and hydro resources are in the less developed western provinces, while the main consumption of electricity is in the eastern part of the country. The economic and financial analysis quantified and compared the impacts of different mandated renewable energy policies and targets. Finally, the risks associated with renewable energy were assessed.

This comprehensive analysis was carried out over an extended period during project preparation, from 2000–03. There was constant interaction between the Chinese leadership, the Chinese expert team, and the Bank technical team on the implications of the analysis.

Economic and financial analysis of the investment projects:

The economic internal rates of return (EIRRs) and financial internal rates of return (FIRRs) were recalculated based on the same methodology used at appraisal and using costs and benefits prevailing at the completion of the project. The results of the calculation at ICR and appraisal are summarized in Table 1 and detailed in Annex 3.

The EIRRs and FIRRs of the Jiangsu biomass and the Inner Mongolia wind projects are lower than appraisal because of the unforeseen surge in commodity prices, which increased the

investment cost. In addition, biomass fuel prices from agriculture residues also increased during project implementation of the Jiangsu biomass project, a common problem for biomass power plants in China.

The Fujian wind farm was less affected by the surge in commodity prices, since it was completed very early during project implementation. It achieved higher EIRR and FIRR than appraisal because the actual capacity factor and wind feed-in tariff are higher than at appraisal.

The actual EIRRs and FIRRs for SHP rehabilitation and new construction are, except for one project, higher than at appraisal because rehabilitation projects and most projects constructed at early stage of implementation were not affected by the surge in commodity prices.

Overall, even the reduced EIRRs remain higher than NDRC's 8 percent discount rate. Some FIRRs are lower than the usually 8 percent expected by Chinese developers, but most of these projects were developed on a pilot basis.

Table 1: EIRRs and FIRRs at ICR and Appraisal

Project	EIRR (%)		FIRR (%)		Brief Explanation:
	ICR	Appraisal	ICR	Appraisal	
Fujian Wind Power	16.1	13.6	10.9	6.5	- Higher annual generation - Higher power purchase tariff
Jiangsu Biomass Power	11.6	20.8	5.0	10.6	- Operational problems 2008–10 - Higher fuel price
Inner Mongolia Wind Power	9.3%	12.5	5.1	7.0	- Overrun of investment cost - Delayed project commissioning - Less power generation
Zhejiang Small Hydropower	10-195	10-33	6-102	7-16	- Increase of investment costs - Rehabilitation not affected

3.4 Justification of Overall Outcome and Global Environment Outcome Rating

Rating: Achievement of PDO/GEO is rated Highly Satisfactory

With substantial support for legal, policy, and institutional frameworks under the CRESP starting in 2005, RE has experienced an unprecedented growth during the 11th FYP. China has become the world's leader in renewable energy capacity—now at 8 percent of total primary energy and targeted to reach 15 percent by 2020. In particular, China's wind capacity has doubled every year since 2005, from 1 GW in 2005 jumping to 62 GW in 2011, the largest in the world. The government's commitment to 30 GW of wind by 2020 at the International RE Conference has already been achieved 10 years ahead of time, and an extremely ambitious target of 150 GW by 2020 is under consideration. China also has the world's largest SHP capacity, and substantially increased its installed biomass power capacity to 5 GW in 2010. CRESP catalyzed these achievements primarily through its support and strong influence to the RE Law and policies, which is the deciding factor for the scale-up of RE in China. Many of the policy studies supported by CRESP have led to issuance of RE Law, supporting regulations, and RE Law amendment.

In addition, the Chinese wind manufacturing industry has leapfrogged from a marginal status in megawatt-scale wind turbines manufacturing at the beginning of the project to a global leader. Today, 4 out of the top 10 global wind manufacturers are Chinese. The growing status and size of the Chinese wind turbine manufacturing has influenced the global market by increasing competition and lowering wind turbine prices. The quality improvement and cost reduction of the Chinese wind manufacturing industry has benefitted China and the world. To this end, CRESP

made significant contributions to the rapid growth and quality improvements of the Chinese wind manufacturing industry through cost-shared sub-grants for technology improvements, and establishment of standards, testing, and certification centers for quality assurance.

Furthermore, the piloting of large-scale RE investments improved quality, efficiency, and technical standards and reduced costs of RE investments, which were disseminated and replicated in similar projects in China. CRESP also supported identification and preparation for more than 1,000 MW of new RE investments and pilot demonstration of innovative new RE technologies, which catalyzed large-scale RE investments in China.

In summary, the first phase of CRESP played an essential role in the scale-up of renewable energy in China. At the project closing, China's renewable energy scale-up has been accomplished in a short period, and the PDO and GEO have been achieved and surpassed. All the PDO/GEO indicators have been well exceeded, except the SO_2 emissions reduction because of the dramatic reduction of the emission factor of the power system. Therefore, a "Highly Satisfactory" rating is justified.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

The establishment of an enabling environment for large-scale development of renewable energy contributed to the huge scaling-up of renewable energy in general and wind in particular, creating employment in the renewable energy industry. According to the 2010 China Wind Power Outlook, the employment in the wind industry alone was 202,000 people in 2009 and this could reach more than 400,000 in 2020. According to the Chinese Renewable Energy Industries Association (CREIA) the renewable energy industry as a whole employed 1.12 million people in 2008 and is adding 100,000 jobs each year.

(b) Institutional Change/Strengthening

The CRESP program has substantially strengthened the institutional capacity of the following key stakeholders:

- **Government agencies and think tanks:** CRESP has improved their capacity in developing and implementing RE policies through introduction of international experience and provision of expertise and technical assistance.
- **RE manufacturing industry:** Under the cost-shared subgrant technology improvement component, CRESP improved the technology development capacity of the local manufacturing industry, which learned technology transfer mechanisms and international certification process for quality improvements under the project. As a result, some of the participating manufacturers now follow the same approach and process to develop more advanced and larger-capacity wind turbines on their own.
- **Wind turbine testing and certification centers:** Under CRESP, two wind turbine testing and two certification centers were established and operational. GEF grants supported, on a cost sharing basis, the centers, and the project required these centers to obtain China National Accreditation Service for Conformity Assessment (CNAS) accreditation according to ISO/IEC Guide 25. In addition, CRESP also created a market for their services, since five wind turbine manufacturers supported by the project need testing and certification services to obtain type certification.

- **RE developers:** The investment projects, support to investors, and pilot demonstrations all increased the capacity of RE developers through the introduction of international best practices to improve quality and efficiency.
- **Future generations:** CRESP has already made important impacts on long-term capacity of the major industry operators through support to university programs and post-academic training in wind power technologies.

(c) Other Unintended Outcomes and Impacts (positive or negative)

No unintended outcomes and impacts.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

A stakeholder workshop was held at project closing. High-level government officials attended the project closing stakeholder workshop, and commended the significant contributions that CRESP made to China's renewable energy scale-up. In particular, they highlighted that CRESP has strongly influenced RE policy development, RE Law and regulations in China; and played an essential role in the rapid growth and quality improvement of the domestic wind manufacturing industry. CRESP is the largest international cooperation partnership and GEF project in the renewable energy field. There is a strong government commitment in RE and ownership for the CRESP concept.

The PMO conducted a survey among sub-grant recipients, and also organized a separate workshop with project beneficiaries after the project closing workshop. Many of the respondents acknowledged that CRESP support has accelerated and improved wind development in China. All the beneficiaries expressed their gratitude to the support received through CRESP. They benefitted not only from the GEF funding, but also from learning international best practice and gaining credibility and reputation because of their involvement with the World Bank/GEF. All the beneficiaries confirmed that the cost-shared sub-grant approach is quite effective. The sub-grant recipients appreciated the support for prefeasibility and feasibility studies, because it reduces the financial risk of project preparation. The small amount of cost-shared grant to support prefeasibility and feasibility studies had a high leverage impact of actual investments materialized.

4. Assessment of Risk to Development Outcome and Global Environment Outcome

Rating: Low

The risks to sustaining the development outcomes are minimal, and longer-term sustainability of the achievements of the first phase of CRESP are highly likely.

CRESP supported the development of an enabling environment for scaling up renewable energy development. The developed conducive RE policy framework and the government's strong commitment to the ambitious RE targets will ensure that renewable electricity development will continue on an increasing scale. The legal and regulatory framework is in place and will continue to be developed, and the second phase of CRESP will continue to assist the government in adapting RE policies to the new barriers and challenges to achieve government's RE targets in a more efficient and market-oriented way.

The RE industry will continue to grow. The wind turbine testing and certification centers are expected to flourish, since their services would be more and more sought by wind manufacturers. Quality improvement and certification are essential to gain market share domestically and

internationally. With the growing market, the training institutions will also see an increasing demand.

Based on the above, it is concluded that the risk to sustaining the development outcome is negligible to low.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Highly Satisfactory

The concept and its relevance to China's situation in the early 2000s have been confirmed by Bank management and Chinese authorities after numerous reviews and assessments during the preparation phase. Engagement of the Chinese institutes about the CRESP concept could not have been delayed, otherwise China would have missed an opportunity to build the long-term partnership with GEF and the Bank for scaling up renewable energy. Faced with major challenges, the Bank was resilient and took advantage of the preparation period to build institutional knowledge, to support the prerequisite RE Law and policies for the success and sustainability of the scale up, and to pave the way to more market-oriented means to achieving economy and efficiency. All the policies explored and evaluated during the preparation period are now under consideration by the Chinese government and will be supported during the second phase.

The studies and analytical and knowledge transfer activities carried out during the preparation period led to building consensus and ownership of the concept by Chinese government agencies, resulting in the enactment of the RE Law before effectiveness, and to defining diversified lending investments that proved essential to RE scale-up. The continued engagement of government agencies during preparation and Bank management support at the highest level ensured the quality at entry of the program and investments related to the first phase.

The development of the RE Law is the cornerstone of RE policy and scale-up in China. During project preparation, the Bank team mobilized GEF PDF B, PDF C, and substantial amount of ASTAE funds to help the Chinese government prepare the RE Law. These large-scale TA activities stood on their own, and are beyond the support normally provided by the Bank during project preparation. The impact of these technical assistance activities proved to be a transformative catalyst for RE scale-up in China and changed the mindset of Chinese institutions. Because of this specific factor and others noted above, Bank performance in ensuring quality at entry is rated as highly satisfactory.

(b) Quality of Supervision

Rating: Satisfactory

The implementation of CRESP required intensive supervision, especially at the early stages of implementation as the PMO struggled with both the substance and process issues. It was critical to providing assistance to the PMO to continue the consultation process and engagement of all stakeholders and to avoid interference in implementation issues that were the responsibility of the grantees and investment implementing agencies. In between the formal biannual supervision missions, the Bank organized technical assistance missions by Bank staff and consultants to

provide implementation guidance, advise the PMO, and provide training where and when required. Gradually, the PMO came to a more balanced sharing of responsibilities as they focused more on analytical, technical assistance and knowledge transfer at the national level. The commitment and pooling of GEF/Bank/ASTAE resources were instrumental in keeping the project on track.

The first phase implementation suffered from frequent changes in project leadership from both sides—change in PMO leadership and transfer of the project from the NDRC to the NEA on the client side, and six task managers in five years on the Bank side due to staff retirement and move to other regions. The impact of this large turnover slowed the implementation somewhat, but did not seriously disrupt the Bank/client dialogue because the project progress and issues that were faced have been candidly and faithfully documented. The Aide Memoires and mission reports allowed new task managers to take stock of the progress achieved and issues that required their attention. In addition, the team has ensured continuity by retaining the first TTL as a consultant and a core project team.

Finally, the Bank showed a great deal of flexibility and willingness to make the necessary adjustments as experience was gained to adapt the implementation of the project to the evolving conditions of the country. Three examples are worth mentioning: (a) the reallocation of the resources assessment to other priority tasks when the government allocated substantial funds to the activities originally included in the project; (b) the increased focus on biomass technologies and fuel supply issues after the problems encountered by the biomass investment project and other pilot biomass projects in the country; and (c) the extension of subgrant schemes as they proved to be more results-oriented than studies and analytical work at the provincial level. All changes have been thoroughly discussed with Chinese counterparts, documented, and implemented after amending the legal documents.

The supervision of the project was reviewed by QAG and rated as Satisfactory. It is also rated as *satisfactory* at the ICR stage.

(c) Justification of Rating for Overall Bank Performance

Rating: Satisfactory

The Bank team focused on development effectiveness and sustainability of RE scale-up, and demonstrated flexibility to meet client's demand during project preparation and implementation. The Bank team also provided intensive assistance to the PMO and made best efforts to provide timely solutions to major issues encountered. Overall, the Bank performance is rated as *satisfactory*.

5.2 Borrower Performance

(a) Government Performance

Rating: Highly Satisfactory

The achievements catalyzed by CRESP could not have been achieved without an **unwavering commitment** of the government to RE scale-up once the consensus was achieved around the outcomes of the program. This is clearly indicated by the enactment, enforcement, and implementation of the RE Law with unprecedented speed and transparency. This commitment propelled the country to the forefront of global RE development.

In addition, the Government of China places a high priority on the CRESP program. At the outset of the program, the Letter of Sector Development Policy was provided to the Bank by the Vice Minister of NDRC in charge of infrastructure. It demonstrated the government's strong commitment to RE and its support for the long-term partnership of the CRESP program. During project implementation, senior government officials often requested CRESP support for analytical and advisory studies as inputs to key RE policies and regulations. The Vice Minister of the NEA and many senior government officials attended the project closing workshop and acknowledged the significant contributions that CRESP made to China's RE scale-up, which demonstrated strong ownership of the program from the government.

It is the government's unwavering commitment to RE and the early passage of the RE Law that led to the unprecedented achievement of RE scale-up in China. Therefore, the government performance is rated overall as Highly Satisfactory.

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

The CRESP PMO struggled in the first two years to digest the concept and define its role in implementing the GEF policy component and the investments linked to the first phase of the program. They also struggled with Bank procurement procedures and focused more on details than the broader objectives of the program. In particular, the PMO implemented a large number of small contracts. This led to a noticeable lag in disbursement of the grant. However, after reducing the number of staff and streamlining their procedures, they managed not only to effectively coordinate the sometimes challenging policy tasks, but they also took actions to complete all tasks in a satisfactory manner and achieve the effective disbursement after the extension of the closing date by one year.

Two achievements are worth noting: first, the efforts provided by some of the PMO staff during a supervision mission that allowed developing and securing Bank approval of the Wind Turbine Technology Transfer (WTTT) in two weeks; second, the PMO carried out all activities related to financial reporting and fiduciary supervision in a highly satisfactory manner. The PMO's performance is therefore rated as satisfactory.

As for the investors, the overall performance is rated as *satisfactory:*

(a) the performance of the Longyuan Pingtan Wind Power Co., Ltd. is rated *Highly Satisfactory* because of their innovative efforts in procuring, designing, and implementing the project in a short time without compromising the quality and performance of the infrastructure;
(b) the Jiangsu Guoxin New Energy Development Company Ltd. is rated *Satisfactory* as the company managed to take the needed action to correct teething problems;
(c) the Zhejiang Provincial Hydropower Development and Management Center's performance is rated as *Highly Satisfactory*, as the Center played a major role in guiding small public and private investors to design and implement the investment projects with strict adherence to Bank procurement and safeguards rules; and
(d) the Inner Mongolia North Long Yuan Power Company Ltd.'s performance is rated *Moderately Satisfactory* because of lengthy time it took to finalize the ownership and licensing of the project company, the weak commitment to environmental and social issues, which led to a serious delay in project implementation.

Overall, the performance of implementing agencies is rated as satisfactory.

(c) Justification of Rating for Overall Borrower Performance

Rating: Satisfactory

Despite the difficulties encountered during the implementation of the innovative project concept and the long delays at the beginning of project implementation, the government showed strong commitment to RE and took full ownership of this program. All government agencies and grant/loan beneficiaries deployed the needed efforts to deliver the project outputs and achieve its goals, and most of the time, surpass its outcomes and indicators. The Borrower's performance is therefore rated *satisfactory*.

6. Lessons Learned

The factors contributed to the success of CRESP are the following:

- **Long-term engagement with the government through the partnership program has paid off**: The CRESP program is the only window in the Bank's China energy portfolio that engages long-term RE policy dialogues and partnership with the NEA. The long-term engagement has built trust between the Bank team and the government, which often turns to the Bank team and the CRESP program for support and inputs to key policy decisions. This created a high demand from the government and a wide range of stakeholders for technical assistance and capacity building provided by the GEF grant.

- **A programmatic approach, which blends policy dialogue, technical assistance, and investments through IBRD/GEF funding, is the best conduit for scaling up RE in client countries. C**ombining policy support and technical assistance through a GEF grant with large-scale long-term financing for RE investments through IBRD loans in one package is the most effective and powerful tool to enable transformational changes to scale up renewable energy. Such a programmatic approach not only provides just-in-time assistance to the government on policy decision making for RE scale-up, but also helps troubleshoot and resolve implementation issues for the RE investments for replication and scale-up. This is particularly true at the beginning stage of RE development in a client country, but such a programmatic approach is not always possible, and sometimes can be substituted by projects blended with grants (bilateral) or concessional loans (e.g. Clean Technology Fund).

- **Flexible approach to adapt to government's priorities and changing environment is required**: This is because RE policies require frequent adjustments as RE technologies evolve and make progress towards competitiveness. The flexible design of CRESP contributed to its successful implementation. CRESP provided timely assistance to the Chinese government and adapted the GEF-funded activities to the decision-making process. Since the policy environment changed quite fast in China, flexibility and adaptation were essential to meet the government's requests and achieve the project's objective. This approach can be very useful in most countries engaging in RE scale-up with Bank assistance.

- **Cost-shared sub-grant approach is well suited to support knowledge transfer and technology improvements for domestic manufacturers**: The cost-shared sub-grant approach for technology improvement was tested and proven under REDP. CRESP again

validated the success of the cost-sharing approach. Cost-sharing activities led in all cases to a higher leverage of the grant, and increased ownership and commitment by implementing counterparts. For example, the cost-shared sub-grants for the Technology Improvement component leveraged three times the GEF grant from sub-grant recipients. Such a cost-sharing approach also works well for prefeasibility and feasibility studies for potential RE developers. This approach can be replicated in other countries as it leads to full ownership of the funded activities by the grantees and greater commitment to achieving their outcomes.

- **Improving manufacturing quality is essential for the transition to a world-class manufacturing industry**: The key to the success of the wind technology improvement component was to simultaneously address wind turbine standards, testing, and certification, and to support wind manufacturers in developing megawatt-scale wind turbines. Chinese manufacturers have long been recognized as low-cost producers, although the poor quality and a lack of certification up to international standards had undermined their reputation in the global market. Thanks to CRESP support, four domestic wind turbine manufacturers received Design Level A Certification by certification institutes up to international standards. The benefits of a strong and competitive local market, driving continuous product development and innovation have not only benefitted Chinese consumers, but will also extend benefits globally.

The important lessons learned are the following:

- **The piecemeal approach and fragmentation of policy study contracts resulted in lengthy delays and weakened policy impacts**: During project implementation, the PMO issued a large number of small contracts. Fragmentation of policy studies is detrimental to quality and leads to higher transaction costs and lower impacts on government policy making, especially when not linked to the planning process of the government. This is an important lesson learned for the second phase of CRESP, as alternative approaches to deliver policy technical assistance are being explored to limit the number of contracts and focus on major issues.

- **A core project management team, with contributions from world-class international and Chinese experts is most cost effective**: Relying on recruitment of a large number short-term staff is not conducive to high-quality management because of the reluctance of high-caliber experts to be involved in full-time and somewhat administrative activities. There is evidence from the first phase that hiring a core team to carry out management and due diligence tasks with contributions of international and Chinese world class experts is more cost effective and conducive to higher-quality management.

- **Programmatic approach needs intensive supervision from the Bank team**: CRESP required intensive supervision to provide guidance and advice to the PMO in implementing the large number of activities under CRESP. The supervision also included capacity building for the PMO. The supervision requirement exceeded the supervision budget. The required supervision could only be provided by combining supervision missions of different projects and through the financial support from ASTAE.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

The Borrower/implementing agencies agreed with most the content of the ICR. They made a few minor corrections. For example, one additional wind turbine standard supported by the project is now adopted by SAC. They pointed out that wind power capacity in China jumped to number 1 in the world last year. They also suggested that the threshold of prior review for consultancy services was too low.

(b) Cofinanciers

No comments.

(c) Other partners and stakeholders

No comments.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in US$ Million equivalent)

Renewable Energy Scale-up Program (CRESP)—P067828			
Components	**Appraisal Estimate (US$ millions)**	**Actual/Latest Estimate (US$ millions)**	**Percentage of Appraisal**
Institutional Strengthening and Capacity Building	**88.82**	**100.22**	**113**
Support for Wind and biomass in Pilot Provinces	**130.53**	**177.87**	**136**
Total Baseline Cost	219.35		
Physical Contingencies	5.03		
Price Contingencies	0.00		
Total Project Costs	224.38		
IDC	3.71		
Front-end fee IBRD	0.74		
Total Financing Required	**228.82**	**278.09**	**122**

Follow-up to the China—Renewable Energy Scale-up Program (CRESP)—P096158			
Components	**Appraisal Estimate (US$ millions)**	**Actual/Latest Estimate (US$ millions)**	**Percentage of Appraisal**
Huitingxile wind farm	**94.73**	**126.68**	**134**
Zhejiang SHP plant	**27.80**	**33.82**	**122**
Total Baseline Cost	122.53		
Physical Contingencies	4.72		
Price Contingencies	2.25		
Total Project Costs	**129.49**		
IDC	2.70		
Front-end fee IBRD	0.22		
Total Financing Required	**132.41**	**162.50**	**123**

(b) Financing

P067828—Renewable Energy Scale-up Program (CRESP)				
Source of Funds	**Type of Financing**	**Appraisal Estimate (US$ millions)**	**Actual/Latest Estimate (US$ millions)**	**Percentage of Appraisal**
Borrower		32.36	34.89	108
International Bank for Reconstruction and Development		87.00	77.00	88.5
Local Financial Intermediaries		20.64	65.98	320

P067625—China—Renewable Energy Scale-up Program (CRESP)

Source of Funds	Type of Financing	Appraisal Estimate (US$ millions)	Actual/Latest Estimate (US$ millions)	Percentage of Appraisal
GEF		40.22	40.22	100
Local Sources of Borrowing Country		48.60	57.89	119

P096158—Follow-up Project to the China Renewable Energy Scale-up Program (CRESP)

Source of Funds	Type of Financing	Appraisal Estimate (US$ millions)	Actual/Latest Estimate (US$ millions)	Percentage of Appraisal
Borrower		30.08	34.45	115
International Bank for Reconstruction and Development		86.33	84.68	98
Local Financial Intermediaries		16.01	43.37	271

Annex 2. Outputs by Component

CRESP Phase 1 was a complex project with a large number of, in many cases, related activities. CRESP Phase 1 comprised two components: (a) institutional development and capacity building component; and (b) investment component.

The successful investment component included investments in a 100 MW wind farm in Fujian, a 100 MW wind farm in Inner Mongolia, a 25 MW straw-fueled biomass power plant in Jiangsu and 28 MW incremental SHP capacity from new and rehabilitated SHP plants in Zhejiang. While supporting large-scale RE investments is very important, the core of CRESP Phase 1 lies in its institutional development and capacity building component that made the biggest difference in RE scale-up in China.

The institutional development and capacity building component comprised four subcomponents: (a) national level institutional development and capacity building; (b) provincial institutional development and capacity building; (c) capacity building investors and scale-up support; and (d) project management. The subcomponents were further subdivided in elements and sub-elements (see Table A2.1). Table A2.a presents the situation at closure of CRESP Phase 1.

Table A2.1. Structure Institutional Development and Capacity Building Component

Subcomponent Element Sub-element	GEF Budget (million US$)
(i) National Level Institutional Development and Capacity Building	
National Level Policy	2.99
Technology Improvement Wind	
Wind Turbine Technology Transfer (WTTT)	9.40
Establishment of Wind Turbine Testing Services	2.43
Development of Standards for the Wind Industry	0.26
Establishment of Wind Turbine Certification Services	0.53
Wind Power Electrical Engineering	1.31
Long Term Capacity Building Wind	1.95
Technology Improvement Biomass	1.61
(ii) Provincial Level Institutional Development and Capacity Building	
Support Implementation Renewable Energy Law	2.58
Pilot Demonstration Projects	6.38
(iii) Capacity Building Investors and Scale-up Support	
Support Investment Projects	1.76
Investors Scale-up Support Facility (ISSF)	3.32
(iv) Project Management	5.70
Total GEF	40.22

The outputs, outcomes, and achievements of the CRESP program can be summarized in the following three key pillars: (a) Renewable energy (RE) policy studies; (b) technology improvement for wind and biomass; and (c) RE investment support, including investment projects, pilot demonstration, and pipeline building.

(1) Renewable Energy (RE) Policy Studies

An effective RE policy framework is a prerequisite for RE scale-up. The national level policy activities comprised 25 tasks. Table A2.5 (at the end of this annex) lists these tasks, as well as outputs and outcomes of each task.

First, the national level policy activities contributed to the creation of a legal and regulatory environment conducive to large-scale development of renewable electricity generation. The outputs of the RE policy studies were used to develop regulations under the RE Law and as inputs to the amendment of the RE Law. CRESP-supported policy studies have led to the issuance of nine supporting RE policies (see Table A2.2). In particular, CRESP-supported studies on RE targets, RE quota, financial incentives, and cost sharing mechanism of incremental cost have provided essential inputs to the preparation for the Energy Law and the amendment of the RE Law, which was adopted at the 12th session of the Standing Committee of the 11th NPC on December 26, 2009 and became effective on April 1, 2010.

The feed-in tariff regulations are the cornerstone for RE policies in China. After the RE Law became effective in 2006, more rounds of wind concession bidding were carried out by the NDRC/NEA. They were quite effective in reducing costs and establishing cost benchmarks as a pricing finding mechanism to establish feed-in tariffs later on. However, they produced mixed results—some bidders were induced to bid too low, and the signed contracts were not materialized in some cases. Based on the results from the wind concession schemes, CRESP supported a wind pricing study laid a solid analytical foundation for and led to the issuance of *Notice of Improved Feed-in Tariff for Wind.*

The development of solar PV followed a similar path—evolving from concessions to feed-in tariffs, and a CRESP-supported solar PV study also made important contributions to the issuance of *Feed-in Tariff for Solar PV, Notice on Implementation for Golden Sun Project, and Interim Management Regulations on Financial Subsidy for Solar PV on Buildings.*

The feed-in tariffs for biomass went through several rounds of revision during implementation. First of all, the prices of biomass fuels (straw from agriculture residues) turned out to be much higher than originally anticipated for many biomass-fired power plants. As a result, the feed-in tariffs for biomass have been adjusted upward to factor in the fluctuation of biomass fuel prices. Second, the original biomass feed-in tariffs were designed as a fixed premium on top of baseline prices (based on coal-fired power plants) in each province, which resulted in a large discrepancy of biomass tariffs in different parts of the country. Again, CRESP-supported biomass studies have provided critical inputs and led to the issuance of *Notice of Improved Feed-in Tariff for Biomass and Regulation on Subsidy for Biomass.*

Second, CRESP-funded technology strategies and roadmaps for key RE technologies have provided inputs to the 12th FYP RE programs. In particular, the SHP policy studies and Zhejiang SHP investments put SHP back on the national agenda. SHP is the least-cost RE technology. Hence, developing SHP more quickly would allow for meeting the RE target without increasing the incremental cost of the program. However, currently there are no national-level financial incentive policies for SHP, and China still has a large untapped potential of SHP and rehabilitation. In addition, CRESP-supported biomass and biogas studies have led to issuance of government's regulations of the *Notice on Management Regulation of Agricultural and Forestry Biomass Combustion Power generation* and *Notice for Collection and Management of Livestock and Landfill Biogas for Power generation.* Finally, the CRESP-supported green county study, which focused on developing criteria for the "green county" denomination and related management regulations, has led to the issuance of the *Notice on Recommendation of Green County*.

Third, at the provincial level, RE policy activities were carried out in each of the four pilot provinces. Ten policy related tasks were carried out in Jiangsu, 10 in Zhejiang, 5 in Fujian, and 8 in Inner Mongolia. The pilot provinces used the GEF resources in particular to support their renewable energy planning through preparation of wind, PV, and biomass development plans and to support the preparation of the 12th FYP for renewable energy.

Table A2.2. Outputs and Outcomes of RE Policy Studies under CRESP

Output	Outcome
• Review and update national RE objective and target • Recommendations for management regulation for quota system of RE power generation • Recommendations for economic/financial incentive policies for RE	• Partly adopted by NDRC as background document report for amendment the RE Law; • Partly adopted as a background report for the State Council Decision on Accelerating the Strategic New Industries Cultivation and Development, the State Council Document, No. 32 (2010); • Provided inputs to issuance of Notice on Measures for Renewable Electricity Surcharge Subsidies and Quota Trade System from October 2007 to June 2008– Ordinance Code NDRC Price No. 3052 (2008).
• Recommendations for management regulation on sharing RE power generation costs • Recommendations for management regulation for RE development fund	MOF issued Notice on Implementation Plan of Promoting Renewable Energy in Infrastructure, MOF Economic Construction No. 306 (2009). The notice is being implemented.
Recommendations for wind pricing mechanism	NDRC issued Notice on Improved Price Policy for Grid-Connected Wind Power, NDRC Price No. 1906 (2009). The notice is being implemented.
• Recommendations for management regulation on biomass energy deployment and sector development • Biomass power generation cost study • Technical guideline for biomass power plants	• MOF issued Interim Management Regulation on Subsidy for Energized Biomass, MOF Economic Construction No. 735 (2008); • NDRC issued Agricultural and Forestry Biomass Generation, NDRC Price No. 1579 (2010). • NEA issued Notice on Management Regulation of Agricultural and Forestry Biomass Combustion Power generation, NEA No. 273 (2009)
• Recommendations for management regulations for solar PV distribution • Post evaluation of grid-connected solar PV • Recommendation of solar PV for the 12th FYP	• MOF issued Interim Management Regulations on Financial Subsidy for Solar PV on Buildings. MOF Build No. 129 (2009); • MOF, MOST, and NEA issued Notice on Implementation for Golden Sun Project—Ordinance Code MOF Build No. 397 (2009)

• Recommendations for management regulation of Green Energy County (GEC) • Suggestions for assessment standards and implementation policy of the GEC program	NEA issued NEA Notice on Recommendation of Green County, NEA New Energy No. 343 (2009)

(2) Technology Improvement (TI)

TI for Wind: Technology Improvement of wind turbines focused on quality improvements, cost reduction, and efficiency enhancement through supporting local wind turbine manufacturers to produce megawatt-scale wind turbines and assisting in establishment of wind turbine standards, testing, and certification systems. The TI wind component, therefore, included (a) WTTT support and (b) Quality Control (standards, testing and certification). In addition, the Technology Improvement component supported the development of short-term wind power output forecasting capabilities and development of a pool well-trained wind energy practitioners (long-term capacity building).

Wind Turbine Technology Transfer

Under WTTT, CRESP supported 5 Chinese wind turbine manufacturers (Windey, Sewind, Dongfang, Goldwind, and Sinovel) to develop Chinese brand name megawatt-size wind turbines type-certified to international standards. The wind turbines developed by these manufacturers under CRESP all obtained design certification GL Level A or equivalent, and Sewind even obtained type certification by TUV Nord (November 2011). For the others, type certification is still ongoing and expected to be obtained in 2012.

Support was provided by cost-sharing projects designed by the manufacturers. The five manufacturers were competitively selected to participate. Requiring certification at international level was very demanding and proved to be much more difficult than anticipated. The benefits, however, outweighed the costs and challenges. It set a clear target, reaching type-certification up to international standards, which was applied to all participants. Certification bodies would assess whether or not the target was met. The intended outcome was not only the success of the wind turbines development in the market, but also the establishment of design capabilities that could be used for developing other wind turbines that meet international quality standards.

Windey developed a 1.5 MW wind turbine, Sewind a 2 MW wind turbine, Dongfang and Goldwind 2.5 MW wind turbines and Sinovel a 3 MW wind turbine. Total sales of the wind turbines developed with CRESP support were 3,516 (Sewind 1,098, Goldwind 627, Windey 893, and Sinovel 898, while Dongfang produced only 2 prototypes). This achievement is above expectations.

During implementation of the WTTT subelement, the scope was increased to also support one manufacturer of wind turbine main shaft bearings and one manufacturer of equipment for the installation of wind turbines in the intertidal area. The manufacturers were uniquely qualified or the only interested party. With the support from CRESP, Wafangdian Bearing Group Co., Ltd. developed a main shaft bearing for the Sinovel 3 MW wind turbine and obtained the ability to develop main shaft bearings for the large wind turbines of other manufacturers. At the end of CRESP, the manufacturer supplied 40 main shaft bearings to Sinovel and had contracts for an additional 500. The manufacturer procured the required equipment, software, and training. Provided that the required quality levels can be maintained, localization of the manufacturing of main shaft bearings will have long-term cost-effective impacts and reduce the dependence on

imported main shaft bearing. Bearings for large wind turbines are at times hard to obtain because of high international demand and restricted supply.

With the support from CRESP, Sinovel developed installation equipment for intertidal wind turbines. An intertidal installation process was developed, including two 40 ton and two 150 ton cranes. The four units were used to conduct a trial placement of an offshore installation platform also developed within the project. This technology has been installed and operated at the first Chinese intertidal wind farm in Shanghai, and will likely be used for future intertidal projects by Sinovel and possibly other developers.

Quality Control

Standards: Standards development under CRESP Phase 1 aimed to develop Chinese standards in line with existing IEC standards for wind, and facilitate China to become an active partner in developing future IEC standards for wind. The latter would automatically mean that future international standards would easily be adopted as Chinese standards. To develop Chinese standards in line with existing IEC standards, CRESP Phase 1 established a Standards Committee consisting of renowned Chinese wind standards experts and one international wind standards expert.

The Standards Committee formulated eight wind standards (Table A2.3), all of which have formally adopted as Chinese (GB) standards. CRESP also facilitated China to become a member of the IEC/TC88 Working Group, which is responsible for formulating IEC wind-related standards. The IEC/TC88 Working Group is now working on preparing an IEC standard for wind turbine blades based on the Chinese standard for wind turbine blades (GB/T25384-2010 Turbine blades of wind turbine generator system). The participation of China in the TC88 is considered important for China and is continued with financial support from the MOST and wind turbine manufacturers in China. The envisaged outcome of an infrastructure for development of wind standards has been achieved.

Table A2.3. Standards Developed with CRESP Support

S.N.	Standard No.	Standard Name	Effective Date
1	GB/T 25383-2010	Wind Turbine—Rotor Blades	Mar. 01, 2011
2	GB/T 25384-2010	Wind Turbine—Full-Scale Structure Test of Rotor Blade	Mar. 01, 2011
3	GB/T 25385-2010	Wind Turbine—Operation and Maintenance Requirements	Mar. 01, 2011
4	GB/T25389.1-2010	Wind Turbine—Low-speed Permanent Magnet Synchronous Generator—Part 1: Technical Conditions	Mar. 01, 2011
5	GB/T25389.2-2010	Wind Turbine—Low-speed Permanent Magnet Synchronous Generator—Part 2: Test Method	Mar. 01, 2011
6	GB/Z 25426-2010	Wind Turbine—Measurement of Mechanical Load	Jan. 01, 2011
7	GB/Z 25458-2010	Wind Turbine—System for Conformity Testing and Certification—Rules and Procedures	Jan. 01, 2011
8	GB/T 18451.1-2012	Wind Turbine—Design Requirements	Oct. 1, 2012

Under another element, China Electric Power Research Institute (CEPRI) and WINDTEST developed and tested an industrial professional standard (NB standard) for measurement of wind farm power quality.

Testing: As China's wind industry boomed, the government asked CRESP to support two wind turbine testing centers and two certification bodies instead of one of each. Furthermore, the support focused more cost-shared sub-grants instead of consultant services contracts and procurement of goods, given the success of the former approach. The latter change was made to increase flexibility and make cost sharing by the recipients easier.

CRESP supported two testing institutions in China to acquire the technical skills, procedures, and equipment to perform tests required for type certification of wind turbines. These skills are not only required for type testing, but also useful for wind turbine manufacturers in developing and testing of their wind turbines. CRESP Phase 1 supported the Wind Test Centre (WTC) and Wind Power Integration Research and Evaluation Centre under the CEPRI to obtain CNAS accreditation for measuring (a) power performance; (b) power quality; (c) mechanical load; and (d) acoustic noise. WTC obtained CNAS accreditation for these tests on June 20, 2011, and CEPRI on July 19, 2011. As of August 31, 2011, WTC had contracts for conducting 40 tests (of which 15 were completed), and CEPRI completed 47 tests and has contracts for type certification tests for 8 wind turbine manufacturers. This indicates that the envisaged outcome of accredited wind testing centers operational on a sustainable basis has been achieved.

CRESP also supported the development of an innovative wind test center in Inner Mongolia. The test center offers wind turbine manufacturers to test their turbines at the wind rich test site in Inner Mongolia. The cost of testing is recovered from sales of electricity generated by the prototypes. The wind test center in Inner Mongolia has a cooperation agreement with CEPRI, which has been accredited to carry out the required tests.

Certification: Certification (or conformity assessment) of wind turbines is a procedure by which a third party gives written assurance that a wind turbine or a wind turbine component conforms to specified requirements (IEC standard or otherwise). Certification is important to provide transparency for control of quality. CRESP supported two certification bodies in China to obtain internationally recognized formal accreditation for design and type certification of wind turbines and wind turbine components. The certification bodies are the China General Certification Center (CGC) and the China Classification Society (CCS). Both are accredited by the CNAS according to ISO/IEC Guide 65:1996 and the Chinese equivalent. Certification of wind turbines by both CGC and CCS are based on the IEC standard IEC 61400-22 Conformity Testing and Certification, which is the successor of IEC WT 01. CGC and CCS cannot certify wind turbines based on the GL standard (Germanischer Lloyd standard). As of August 2011, CGC had 96 contracts for design certification, 12 contracts for type certification, 89 contracts for component certification, and 8 contracts for project certification. CCS has 6 contracts for design certification, 6 contracts for type certification, and 95 contracts for component certification.

Short-Term Power Output Forecasting

To strengthen local short-term power output forecasting capabilities, a sophisticated approach was adopted, comparing forecasts made by Garrad Hassan and by CEPRI. SgurrEnergy, an independent third party, compared the forecasts of 8 wind farms with actual performance. The outcome was that the accuracy of the forecasting of power output was moderate for both institutions. CRESP cost shared the development of the model by CEPRI by providing a

subgrant. CEPRI continues to use the model developed to provide short-term power output forecasting services on a commercial basis.

Long-Term Capacity Building Wind

In Germany with an installed wind capacity of 27 GW, 90,000 technical experts are employed. For the planned 200 GW in China, an estimated 400,000 technical experts will be required. The objective of the long-term capacity building wind subelement was to create a pool of well-trained wind energy professionals needed by a fast-growing wind industry in China. CRESP supported two training centers to develop post-academic training courses for wind practitioners and one university to develop a Master of Science (M.Sc.) program for wind power engineering.

The M.Sc. program developed by the North China Electric Power University is fully operational. The first students with a M.Sc. Wind Power Engineering will be delivered in 2012. Northwestern Polytechnical University (NPU) and Suzhou Long Yuan BaiLu developed post-academic training courses and modules for wind practitioners. CRESP supported the development of training materials and equipment, and the training of trainers. Under CRESP, NPU provided training to 731 people in 11 training courses. In addition, 357 people were trained in 5 seminars in China (290 people) and 4 seminars in Germany (67 people). Suzhou Long Yuan BaiLu trained 165 technical wind experts. The M.Sc. and post-academic training courses will continue to be conducted after closure of CRESP Phase 1.

TI for Biomass: The Competitive Grant Facility (CGF) Biomass was intended to get new and improved biomass energy equipment into the market. This would be achieved by encouraging manufacturers to invest in development of new, or improvement of existing, biomass energy equipment. In order to be successful in the market, the equipment must be of superior quality and/or lower cost. To encourage manufacturers to invest in technology improvement, CRESP Phase 1 offered to cost share projects that aimed to do this. Projects were selected on a competitive basis. During CRESP Phase 1, two rounds of tender were organized, and a total of 10 projects were selected for support from CRESP. Among those 10 projects, 5 developed biomass briquetting equipment, 4 developed gasifier equipment (the gasifier itself, cracking of producer gas tar and water treatment system for gasifier effluent), and 1 developed equipment for collection of crop residues. All but one project were rated satisfactory or highly satisfactory. The intended output was the new or improved equipment. Nine out of the 10 projects achieved the intended output. The intended outcome was new or improved equipment will be successfully adopted in the market. At least two projects are considered highly successful, while two were considered successful in terms of outcomes. For the other projects, it was too early to judge the outcome. See Table A2.4 for detailed outputs and outcomes under technology improvements.

Table A2.4. Outputs and Outcomes Localization Activities under CRESP

Outputs	Outcomes
Wind turbines design and type certified according to international standards.	Improved manufacturing quality for the transition to a world class manufacturing industry.
	Reduced cost of wind power from local manufacturing rather than import.
	Continued quality assurance by the wind turbine testing and certification centers.
Chinese wind turbine standards based on and in compliance with international standards.	Improved manufacturing quality up to international standards for the transition to a world class manufacturing industry.

Wind turbine testing centers and certification bodies accredited according to ISO/IEC Guide 65 requirements.	Wind turbine testing and certification services available on a commercial basis and used.
	Wind turbine manufacturers increasingly use the testing and certification services as these are available locally and required for certification and quality improvement.
Short-term wind forecasting capabilities internationally benchmarked.	Short-term forecasting services available on a commercial basis to help smooth grid integration bottlenecks.
Academic and post-academic wind training courses.	Trained university students and wind practitioners.
	Wind education established as a discipline.
	High-quality and acknowledgeable personnel available for fast-growing industry.

(3) RE investment support

Scale-up through pilot demonstration

Demonstration of renewable electricity technologies contributes to scaling up renewable electricity investments. Under the Competitive Grant Facility—Pilot Demonstration Project (CGF-PDP), CRESP supported the identification and preparation of renewable energy demonstration projects in the pilot provinces. To select the projects receiving CRESP support, a tender system was used. First, project ideas were submitted to the respective provincial DRCs that selected the most promising project ideas. The proponents of the selected project ideas were requested to prepare full-fledged project proposals. A proposal evaluation committee selected 8 projects to receive funding under this facility. Projects included biomass gasification, biogas, biomass-fueled CHP, PV, ecological buildings and heat pumps. One project (heat pump in Inner Mongolia) had to be cancelled, since required approvals could not be obtained.

Although CRESP supported only identification and preparation, all 7 projects supported were realized. The outputs and outcomes are summarized in Table A2.6 (at the end of this annex). The total renewable electricity capacity of these 7 projects is 7.5 MW. Particular noteworthy is the support for the 5 MW fixed bed biomass gasification plant in Jiangsu. This is the largest biomass gasifier in China. The plant was commissioned in August 2011 and is operating without difficulties.

In addition to the competitive selected projects, 5 additional demonstration projects were supported using the reallocated funds from the provincial policy support. These projects included tidal power in Zhejiang, biogas in Inner Mongolia, and offshore wind in Jiangsu, Zhejiang, and Fujian. The total capacity of the envisaged projects is 370 MW. At present, it is not yet known how much will actually be build.

Scale-up through pipeline building

During implementation of CRESP, it was decided to provide pipeline building support through subgrants to the investors using the Investors Scale-up Support Facility (IFFS). Under this facility investors could propose pipeline building projects. The PMO would review the proposals and approve funding as far as the allocation for each investor would allow.

Under this facility, 14 projects were approved: 3 ISSF projects for Jiangsu Guoxin, 9 IFFS projects in Zhejiang, 1 ISSF projects for China Long Yuan Power Group, and 1 ISSF project for Inner Mongolia North Longyuan Wind Power Corporation. The outputs and outcomes of the 14 projects are summarized in Table A2.7 (at the end of this annex). These 14 projects resulted in an additional renewable electricity capacity of 149 MW (actually build) and may lead to an additional 918 MW renewable electricity generation capacity (envisaged).

Investment Component

Fujian Wind. The China Long Yuan Power Group Corp. installed 50x2.0 MW Vestas wind turbines on Pingtan Island in Fujian (total capacity 100 MW). All 50 units were operational on December 31, 2007.

Both the outputs and outcomes have been achieved and surpassed. The annual electricity generation exceeded the projected value of 260 GWh in the feasibility study. This project has resulted in improved experience and expertise in international competitive bidding, enhanced capacity, and scale-up of renewable energy investments by the project sponsor—China Long Yuan Power Group Corp.

The GEF grant under the Institutional development and capacity building component was used to contract consultants to provide management support to the developer in the bidding process. In addition, the CRESP GEF resources were also used to finalize the wind farm improvement program initiated under the REDP.

Jiangsu Biomass. A 25 MW straw-fired biomass power plant was installed at Yinxing Village, Rudong County, Jiangsu, which started commercial operation on July 1, 2008. The plant sold 141.2 GWh of renewable electricity into the grid in 2010.

The location was changed from Mabei Village to Yinxing Village, Rudong County, Jiangsu Province. Approval procedures were properly followed.[2]

The Jiangsu Rudong Biomass Power Plant faced two issues during implementation—higher-than-expected moisture content of the fuel and breakdown of the straw-feeding equipment. The first issue was addressed with GEF support by using residual heat from the boiler to dry the fuel prior to use. The second challenge faced was the breaking down of the straw preprocessing system and feeding system in 2009. Guoxin attempted to resolve the issue with the original manufacturer, which was unable to find a solution. Thereafter Guoxin approached four other companies to try to resolve the issue. However, because of the very specific nature of the system being used, the automatic straw-feeding equipment was not replaced. The second issue was more challenging, since there is limited experience in processing rice straw in China and around the world. Little progress has been made to date in the research organized by the project company and supported by equipment suppliers and some universities and research institutes. In the meantime, Guoxin developed an effective manual feeding system, and the unit is currently operating satisfactorily.

In 2011, the plant generated 157 GWh, corresponding to 98 percent of the target set at appraisal, and in 2012, the output of the plant is expected to meet the generation target.

[2] In additional to the local approval, No Objection Letter (NOL) was issued by the Bank (sector manager) as the provided EIA/EMP, RAP, and FSR were revised and satisfactory to the Bank.

Jiangsu Guoxin gained a wealth of experience by implementing this project. This experience is being applied in new biomass power projects of the owner.

The GEF resources from the institutional development and capacity building component for Jiangsu, Guoxin, were used to contract consultants to provide management support, including support in the bidding process, for construction, supervision, and fuel supply chain optimization.

Zhejiang SHP. The SHP investment under CRESP set out to establish an incremental SHP capacity of 28 MW and sell an incremental 95 GWh/year into the local grid.

The IBRD loan financed the construction of 6 new SHP projects and the rehabilitation of 10 SHP projects in Zhejiang. The total capacity of the 6 newly constructed SHP projects was 13.6 MW and the incremental capacity of the 10 rehabilitated SHP plants was 9.91 MW (the total capacity of the rehabilitated SHP plants increased from 26.38 MW to 36.29 MW). The total incremental capacity was, therefore, 23.51 MW, which is 4.49 MW below the target of 28 MW. This shortfall is caused by cancellation of 2 subprojects (one new and one rehabilitation).

The 6 new projects generated electricity of 40.07 GWh and the 10 rehabilitated projects 119.71 GWh in 2010, of which 63.71 GWh was incremental electricity generation. The total incremental electricity of the Zhejiang SHP projects financed from the IBRD loan sold to the grid in 2010 was thus 103.78 GWh. This exceeds the target. The target will be exceeded further, since three new plants (two rehabilitated and one new) have not yet operated at full capacity because construction was only completed in 2010. Once fully operational, these three plants are expected to generate electricity of 16.8 GWh. The shortfall in incremental capacity is more than compensated by the additional SHP projects under the ISSF.

The outcome includes cost benchmarks and proof of the cost effectiveness of SHP rehabilitation, as well as increased capacity and scale-up of SHP investments by the SHP developer beneficiaries.

GEF resources under the institutional development and capacity building component were used in Zhejiang to support the Zhejiang Hydropower Management Center (ZHMC), which oversaw the implementation of the 16 new and rehabilitation SHP projects. The ZHMC provided technical advice to these small SHP developers, organized training, guided the investors to strictly adhere to Bank's safeguards requirements and monitored implementation of EMP and RAP, organized procurement for the investors according to the Bank's procurement guidelines, and monitored implementation progress and reported to the CRESP PMO.

Inner Mongolia Wind: The Inner Mongolia North Longyuan Wind Power Company installed 80x1.5MW Suzlon wind turbines at Huitengxile, Desheng County, Inner Mongolia. All turbines were operational in September 2011, and the wind farm sold 79.71 GWh to the grid in 2011. The annual electricity generation is expected to reach the target by 2013.

Huitengxile, Desheng County, Inner Mongolia, gained knowledge and experience in international competitive bidding, and improved capacity of its staff and scaled up renewable energy investments.

GEF resources from the institutional development and capacity building component for the Inner Mongolia investor were used to provide assistance in the bidding process and in monitoring the implementation of the EMP and RAP. In addition, CRESP supported training for staff of the investor by the Suzhou Longyuan Bailu Wind Power Vocational Training Center.

Table A2.5: Outcome of National Level Policy Activities

Task	Main Deliverables	Activity Status, Outcome, and Follow-up
Task 1: Review and update the national general objectives, regional deployment strategy, and major projects for RE development by 2010 and 2020	1) RE industrial development report 2008 2) RE industrial development report 2009 3) Recommendations for general objectives of RE development	• Deliverable 1 and 2 were published, and contributed to increasing public awareness of the status of RE industry. • Deliverable 3 provided the quantitative analysis reason for modifying general objectives of RE development in 2020. • The deliverables were submitted to the NEA and were partly adopted by the NPC as a background report for Amendment of the RE Law.
Task 2: Develop methodology for provincial RE planning and case studies on RE development planning in two provinces	1) International experience applicability on Chinese provincial-level planning 2) Methodology of provincial RE planning	• Two case studies were conducted in Guizhou and Yunnan provinces. • The case studies were well received and are expected to be replicated in other provinces, using the methodology developed under this task.
Task 3: Propose pricing mechanism and cost sharing system for RE electricity	1) Study on pricing mechanism for renewable electricity 2) Analysis and recommendations on cost Sharing Mechanism for Renewable Power 3) Management regulations on renewable electricity tariffs (proposal) 4) Management regulation on sharing RE power generation cost (proposal)	• A study tour took place in May 2007 to Italy and Demark (Task 10) and an international workshop on January 15, 2010 in Beijing, China (Task 11). • The deliverables were submitted to and accepted by the NDRC and NEA. The deliverables were partly adopted by the NPC as a background report for Amendment of the RE Law. • NDRC issued *NDRC Notice on Improved Price Policy for Grid-Connected Wind Power, NDRC Price No. (2009) 1906* and *NDRC Notice on Improved Price Policy for Agricultural and Forestry Biomass Generation, NDRC Price No*. (2010) 1579.
Task 4: Develop management regulations for RE development		
Task 4.1: Management regulations development on RE resource investigation	1) Status of RE resource investigation and management 2) Management regulations for RE resource	• The deliverables were submitted to the NEA for reference.

Task	Main Deliverables	Activity Status, Outcome, and Follow-up
and assessment	investigations and assessment (proposal)	
Task 4.2: Management regulations on biomass energy development and utilization	1) International best practice in biomass development and policy recommendations for China 2) Management regulations on biomass energy deployment and sector development (proposal)	• The deliverables were submitted to the NEA and MOF. • Based on the deliverables, the MOF issued *Interim Management Regulation on Subsidy for Energized Biomass,* MOF Economic Construction No. (2008) 735.
Task 4.3: Develop management regulations on solar water heaters (SWH)	1) International practice of solar thermal applications and suggestions for China 2) Suggestions on promoting SWH deployment	• The deliverables were submitted to the NEA.
Task 4.4: Develop management regulations on solar PV distribution	1) World solar PV sector development and implications for China 2) Management regulations on medium and small scale solar PV projects (proposal)	• The deliverables were submitted to the NEA.
Task 4.5: Formulating implementation plans to promote wind power development	1) Analysis on China wind power industry development and policy recommendations 2) Development of standards, conformity testing and certification of wind turbines 3) Management regulation for development of wind power industry (proposal)	• The deliverables were submitted to and accepted by the NEA.
Task 5: Propose the quota system for RE development	1) Management regulation for quota system of RE power generation (proposal) 2) Specification of RE quota management regulation	• The deliverables were submitted to the NEA, and were partly adopted by the NPC as a background report for Amendment of the RE Law. • The deliverables were also partly adopted as a background report for *the State Council Decision on Accelerating the Strategic New Industries Cultivation and Development*, the State Council Document, No. (2010) 32.
Task 6: Develop the economic incentive measures to promote RE development	1) Chinese RE industry development report 2) Evaluation on the implementation of economic incentive policy for RE and updated suggestions	• The deliverables were submitted to the NEA. • The deliverables were partly adopted by the NPC as a background report for Amendment of the RE Law.

Task	Main Deliverables	Activity Status, Outcome, and Follow-up
	3) Suggestions on updating the guidance catalogue for RE industries development 4) Management regulation for RE development fund	
Task 7: Work plan for wind power public technical testing platform	1) Current status of international and national wind power public testing platform 2) Work plan for establishment and operation of national wind power public technical testing platform	• The deliverables were submitted to the NEA and accepted.
Task 8: Develop award criteria for the Green Energy County (GEC) and related management regulations	1) Analysis and evaluation of energy sources development status in rural areas of China 2) Energy development analysis and assessment for typical counties in China 3) Management regulation of GEC program (proposal) 4) Suggestions for assessment standards and implementation policy of the GEC program	• The deliverables were submitted to the NEA. • NEA accepted the deliverable and issued *NEA Notice on Recommendation of Green Energy County*, NEA New Energy No. (2009) 343.
Task 9: Develop other regulations for the implementation of RE Law		
Task 9.1: Feasibility study on the green electricity trade mechanism in China	1) Policy recommendation on practicing green electricity trade mechanism in China	• The deliverable was submitted to the NEA.
Task 9.2: Study and propose policies to promote exploitation and utilization of RE in rural areas	1) Policy suggestions and development strategy on RE development in rural areas	• The deliverable was submitted to the NEA. • The study was used as a reference for the national working meeting on energy in rural areas.
Task 10: Organize an international study tours on pricing mechanism and cost sharing system for RE electricity	1) A study tour on pricing mechanism and cost sharing system for RE electricity in Italy and Demark from May 6 to 12, 2007 2) Summary report for the study tour	• The study tour enabled enhanced knowledge of experiences and lessons from EU on pricing mechanism and cost sharing system for RE electricity. • The study tour was an important reference for the decision makers and experts in finalizing the NDRC

Task	Main Deliverables	Activity Status, Outcome, and Follow-up
		Notices mentioned under Task 3.
Task 11: Organize an international workshop on RE electricity pricing	1) An international workshop on pricing mechanism and cost sharing system for RE electricity in Beijing, China on January 15, 2010 2) Summary report for the workshop	• More than 100 stakeholders attended and exchanged ideas during the workshop, which provided a platform to discuss RE electricity pricing practices in other countries, and it is expected to be a good reference for Chinese decision makers and experts while deciding on the pricing system.
Task 12: Policy study on small hydropower development	1) Status of SHP development 2) Policies for managing the development and utilization rights of hydropower resources 3) Policies for grid-connected and on-grid SHP electricity price 4) Economic incentive policy for SHP	• The deliverables were submitted to the NEA. • Based on these deliverables, the NEA organized relevant ministries to investigate the status and policies for SHP to promote SHP development.
Task 13: Develop the RE Law training materials	1) Knowledge on RE technologies and industrial development 2) Knowledge on RE policies and regulations in China	• The deliverables were published and distributed to the public as training materials in task 14. • The activity contributed to improving knowledge on RE policy, technologies, and industrial development.
Task 14: Conduct the RE Law training and outreach	1) Two training classes were conducted successfully in Shanghai and Beijing for 3 days each class 2) Brochure of knowledge on RE Law	• More than 150 people from government, university, enterprise and media participated in the training classes • The brochures were distributed through training classes and two RE exhibitions in 2009. The activity contributed to improved awareness of RE Law, RE policy, technologies and industrial development.
Task15: Track and evaluate the RE Law implementation effects and make relevant recommendations	1) Evaluation methodology and survey plans 2) Evaluation of implementation effects of the RE Law 2009	• The deliverables were partly adopted by the NPC as a background report for the amendment of RE Law • [Task Ongoing]
Task 16: Strategy study on geothermal energy development	1) Strategic study on geothermal energy development in China	• The deliverable was submitted to the NEA and task 19 was conducted as the follow-up study per the request of the NEA.
Task 17: LCA study based on	1) Final report on LCA study based on selected	• The deliverable was submitted to the NEA.

Task	Main Deliverables	Activity Status, Outcome, and Follow-up
selected biomass power technologies	biomass power technologies	• The deliverable was an reference for the NEA to propose the 12th Five-Year Development Plan for biomass energy.
Task 18: Study and propose technical guideline for biomass power plants	1) Development status and related problems of biomass direct-fired power generation projects in China 2) Technical guideline on the construction of agricultural and forestry biomass combustion power generation project (proposal)	• The deliverables were submitted to the NEA. • NEA accepted the deliverable and issued NEA Notice on Comments Collection for Management Regulation on the Project of Agricultural and Forestry Biomass Combustion Power Generation, NEA New Energy No. (2009) 273 and then the Management Regulation will be issued.
Task 19: Management regulation on low and medium-temperature geothermal energy utilization and development	1) Final report on management regulations on mid-low temperature geothermal resource	• The deliverable was submitted to the NEA. • NEA is discussing with relevant ministries based on the deliverable.
Task 20: Study and develop technical guideline on biogas power generation projects	1) Investigation report on biogas power generation in China 2) Technical guideline for the construction of biogas power generation project (proposal)	• NEA accepted the deliverables and issued *NEA Notice on Comments Collection for Management Regulation on Scale-up of Biogas Power Generation from Livestock Farms and Refuse Landfill, NEA New Energy No. (2010) 49* and then the Management Regulation will be issued.
Task 21: Roadmap study of cellulosic ethanol industrialization development in China	1) Survey report on development of industrialization of domestic and foreign cellulosic ethanol technology 2) Roadmap of cellulosic ethanol industrialization in China	• The deliverables were submitted to the NEA. • The deliverable was a reference for the NEA to propose the 12th Five-Year Development Plan for cellulosic ethanol.
Task 22: Recommendations on PV development for the 12th Five-Year Plan	1) Global solar power generation status, trends and policy analysis 2) China solar power generation status, trend and policy analysis 3) 12th Five-Year Development Plan for solar power	• The deliverables were submitted to the NEA. • Deliverable 3 was accepted by the NEA and will be issued as the 12th Five-Year Development Plan for solar power.
Task 23: Post-evaluation on	1) Case Study report for selected projects	[Task Ongoing]

Task	Main Deliverables	Activity Status, Outcome, and Follow-up
grid-connected PV projects		
Task 24: Development and policy study on new energy city	1) Research on the evaluation criteria for new energy cities	[Task Ongoing]
Task 25: Provide support service for framework strategy for smart grid development in China	1) Status of smart grids in Europe 2) Smart grid: the US perspective 3) Two workshops organized in Dec. 2010 and Jan. 2011	• The deliverables were submitted to the State Electricity Regulatory Commission (SERC). • It was an important reference for SERC to propose the 12th Five-Year Development Plan for smart grid construction.

Table A2.6. CGF-PDP Projects

	Project	Output	Outcome
1	Biogas Power Generation from Agricultural and Herding Waste in Zhejiang	1 MW biogas power system at Xingtai pig farm able to supply annually 3 GWh electricity to the grid prepared.	Capacity build system build, technology demonstrated and renewable electricity supplied to the grid.
2	Ecological Energy-Saving Building Demonstration Project in Zhejiang	Eco building at Fujian Shengyuan Electronic Technology Co. Ltd. headquarter, including 11.2 kWp PV on rooftop, 6.4 kWp wall mounted PV, 96 m2 solar water heaters; air and water source heat pumps and excellent insulation prepared.	Capacity build, system build, technologies demonstrated and additional business created.
3	Fixed Bed Biomass Gasifier in Jiangsu	5 MW biomass gasification power plant using 10 500 kW gas engines prepared.	Capacity build, system build, technology demonstrated and renewable electricity supplied to the grid.
4	Rooftop PV System and Comparative Testing of Different PV Modules in Jiangsu	Project for developing and testing 100 kW grid connected inverter prepared.	Capacity build, new product developed and successfully put into the market, system demonstrated.
5	Biomass-Fueled Combined Heat and Power Generation in Fujian	1.5 MW biomass-fueled CHP at Xikou Town in Fujian prepared.	Capacity build, system build, technology demonstrated and steam and power produced and sold.
6	PV Water Pumping Technology in Inner Mongolia	Project with 3 PV water pumping systems prepared (1 500 W, 3 1,000 W, and 6 2,000 W systems).	Capacity build, system build, technology demonstrated and water supply services provided.
7	Concentrating Solar PV in Inner Mongolia	200 kW second generation concentrating PV installed at Inner Mongolia Yitai company. Concentrating PV has been compared with 5 kW non-concentrating PV.	Capacity build, technology demonstrated, information generated.

Table A2.7. Outputs and outcomes ISSF Projects

	Project	Output	Outcome
1	Preparatory Work for 3 Biomass and 2 wind Projects by Jiangsu Guoxin Investment Group, Ltd.	Jiangsu Guoxin staff trained on study tour.	Only staff trained, no pipeline developed. Project cancelled.
2	Preparatory Work for 1 Biomass and 1 wind power development Projects by Jiangsu Guoxin Investment Group Limited	Project preparation work for Yancheng 30 MW biomass power project and 70.5 MW Dongling wind farm.	The Yancheng biomass power plant and Dongling wind farm have both been constructed.
3	Scale-up the Use of Biomass for Electricity Generation through Drying of Biomass Fuels by the Waste Heat of Boiler Flue Gas by Jiangsu Guoxin Investment Group, Ltd.	Biomass drying system developed and tested.	Biomass drying system will be used on all future biomass combustion projects of Jiangsu Guoxin. Efficiency of these projects is higher, making these projects financially more viable.
4	Zhejiang Small Hydro Investors Capacity Building: Study Tour to Australia for Experience Exchange and Learning on Hydro Resources Protection, Development and Management	SHP investors trained.	Better understanding of SHP project development and operation and of new technologies.
5	Preparatory Work for Zhejiang Huanglong Hydro Plant by Zhejiang Tiantai Tongbai Power Engineering Management Bureau	Feasibility Study and Blueprint Design	1.6 MW SHP plant build, produced 5,700 MWh in 2010
6	Preparatory Work for Yuxi Hydro Plant in Songyang County by Hexi Hydropower Development Co. Ltd.	The Design of Construction Drawing	6.4 MW SHP plant build produced 15,820 MWh in 2010
7	Preparatory Works for Dongshan Hydro Plant in Anji County by Anji County Laoshikan Reservoir Management Bureau	Feasibility Study, Preliminary Design, and Design of Construction Drawing	3.15 MW SHP plant build produced 8,500 MWh in 2010

	Project	Output	Outcome
8	Preparatory Works for Dachen Hydro Plant in Xianju County by Xianju County Yong'anxi Hydropower Development Co. Ltd.	Project Proposal and Preliminary Design Report, and Design of Construction Drawing	3.15 MW SHP plant build, commissioned in 2011
9	Preparatory Works for Expansion of Shuangxi Hydro Plant by Xianju Hydropower Generation Company by Xianju County Hydropower Development Company	Project Proposal and Preliminary Design Report, and Design of Construction Drawing	SHP plant rehabilitated, capacity increased from 3 to 4 MW produced 8,100 MWh in 2010
10	Preparatory Works for Rehabilitation of Daguangming Hydro Plant in Lishui City by Lishui City Liandu District Yaxi I Power Station	Preliminary Design Report, and Plan of Automation Improvement	SHP plant rehabilitated capacity increased from 0.5 MW to 1.25 MW produced 1,500 MWh in 2010
11	Preparatory Works for Reconstruction of Tongbai Hydro Plant Cascade II by Tiantai Tongbai Power Engineering Management Bureau	Feasibility Study Report and Technical Consulting Service	SHP plant rehabilitated. Capacity did not change (0.4 MW) produced 1,000 MWh in 2010
12	Preparatory Works for Rehabilitation of Jimenkeng Hydro Plant in Wencheng County by Wencheng County Water Conservancy & Hydropower Service Company	Project Survey, Preliminary Design Report, Project Consulting and Bidding Agent Service	SHP plant rehabilitated. Capacity increased from 0.25 MW to 0.63 MW. Produced 900 MWh in 2010.
13	Preparation and Predevelopment of Intertidal Wind Farms in Rudong by China Long Yuan Power Group Corp.	Investor used the CRESP support to test 2 foundation types and to develop equipment to install the foundation and masts.	Investor proceeded with implementing a 32 MW test wind farm including 9 different wind turbine types.
14	Preparatory of Wind Farms in Four Potential Areas in Inner Mongolia by Inner Mongolia North Longyuan Wind Power Company	The investor completed preparation work of 3 wind farms and started the preparation of the fourth wind farm.	It is expected that all four wind farms will be realized.

Annex 3. Economic and Financial Analysis

Economic Analysis

The economic analyses of the investment subcomponents were conducted at appraisal to justify their economic viability. Cost-benefit analyses were carried out to estimate the EIRRs of the four investment subcomponents, including (a) Fujian Pingtan Wind Power Generation Project (100MW); (b) Jiangsu Rudong Biomass Power Generation Project (25MW); (c) Inner Mongolia Huitengxile Wind Power Generation Project (100MW); and (d) Zhejiang Small Hydropower Development Project. Using the same methodology, the EIRRs were recalculated at the time of ICR.

Fujian Pingtan Wind Farm: The EIRR was recalculated at 16.1 percent, higher than estimated during project preparation (13.6 percent). The increase is mainly caused by (a) higher annual generation than planned; and (b) higher on-grid tariff applied in the region. The annual utilization hours of Fujian Pingtan Wind Farm was about 3,000 hours, 400 hours higher than the estimate at appraisal, while the on-grid tariff is 0.539 Y/kWh (VAT excluded), about 0.07 Y/kWh higher than the estimate at appraisal.

Table A3.1. EIRR Calculation for Fujian Pingtan Wind Farm Generation Project

Year	Power Sales	Project Cost			Project Benefits			Net Benefits
		Capital Cost	Operation Cost	Total Cost	Power Sales	Environmental	Total Benefits	
	GWh	million Yuan						
2006	0.0	385.2	0.0	385.2	0.0	0.0	0.0	-385.2
2007	0.0	577.8	0.0	577.8	0.0	0.0	0.0	-577.8
2008	280.1	0.0	19.2	19.2	151.0	28.8	179.8	160.6
2009	301.0	0.0	11.4	11.4	162.3	30.9	193.2	181.9
2010	301.1	0.0	18.1	18.1	162.4	30.9	193.3	175.2
2011	301.6	0.0	19.2	19.2	162.6	31.0	193.6	174.4
2012-2027	301.6	0.0	19.2	19.2	162.6	31.0	193.6	174.4
Total	6009.1	962.9	374.2	1337.2	3240.0	617.4	3857.4	2520.2
PV 2010		1417.8	191.3	1609.1	1691.3	322.3	2013.6	404.5
Economic Internal Rate of Return (EIRR) =								16.1%

Main Assumptions:

Annual Utilization Hours	3115	after 2010
Willingness to Pay (Y/kWh)	0.539	(VAT excluded)
O&M Cost	2.0%	of capital cost
Plant Use (%)	3.2%	
Discount Rate (%)	12%	

Jiangsu Rudong Biomass Power: The EIRR was recalculated at 11.6 percent, less than estimated during project preparation (20.8 percent). The low EIRR is mainly caused by (a) operation problems occurred from 2008 to 2010 which resulted in a low generation in these years; and (b) higher fuel price than expected—the average straw price at plant gate was about 300 Y/ton in 2011 (equivalent to 950 Y/tce), about 40 percent higher than the estimate at project preparation.

Table A3.2. EIRR Calculation for Jiangsu Rudong Biomass Power Generation Project

Year	Power Sales	Project Cost				Project Benefits			Net Benefits
		Capital Cost	Operation Cost		Total Cost	Power Sales	Environmental	Total Benefits	
			Fuel	O&M					
	GWh	million Yuan							
2005	0.0	12.8	0.0	0.0	12.8	0.0	0.0	0.0	-12.8
2006	0.0	9.6	0.0	0.0	9.6	0.0	0.0	0.0	-9.6
2007	0.0	154.3	0.0	0.0	154.3	0.0	0.0	0.0	-154.3
2008	19.0	86.7	10.9	12.8	110.3	11.9	2.0	13.9	-96.4
2009	103.9	31.6	43.9	11.8	87.3	65.3	10.7	76.0	-11.3
2010	141.2	0.0	52.1	6.3	58.4	89.7	14.5	104.2	45.7
2011	157.1	0.0	64.2	6.3	70.5	100.7	16.1	116.8	46.4
2012-2027	157.1	0.0	64.2	6.3	70.5	100.7	16.1	116.8	46.4
Total	2934.7	295.0	1197.6	138.0	1630.6	1878.9	301.5	2180.5	549.9
PV 2010		398.6	571.7	80.4	1050.7	894.8	143.8	1038.6	-12.1
Economic Internal Rate of Return (EIRR) =									**11.6%**

Main Assumptions:

Annual Utilization Hours	7000	after 2011
Willingness to Pay (Y/kWh)	0.641	(VAT excluded)
O&M Cost	2.1%	of capital cost
Plant Use (%)	10.0%	
Fuel price (Y/ton)	300	
Discount Rate (%)	12%	

Inner Mongolia Wind Farm: The EIRR was recalculated at 9.3 percent, less than estimated during project preparation (12.5 percent). The low EIRR is mainly caused by (a) an overrun of investment cost by about 20 percent; (b) delayed project commissioning schedule; and (c) less generation than estimated as a result of grid integration bottleneck—the power cutoff was about 20 percent of its available generation in the first three quarters in 2011.

Table A3.3. EIRR Calculation for Inner Mongolia Wind Farm Power Generation Project

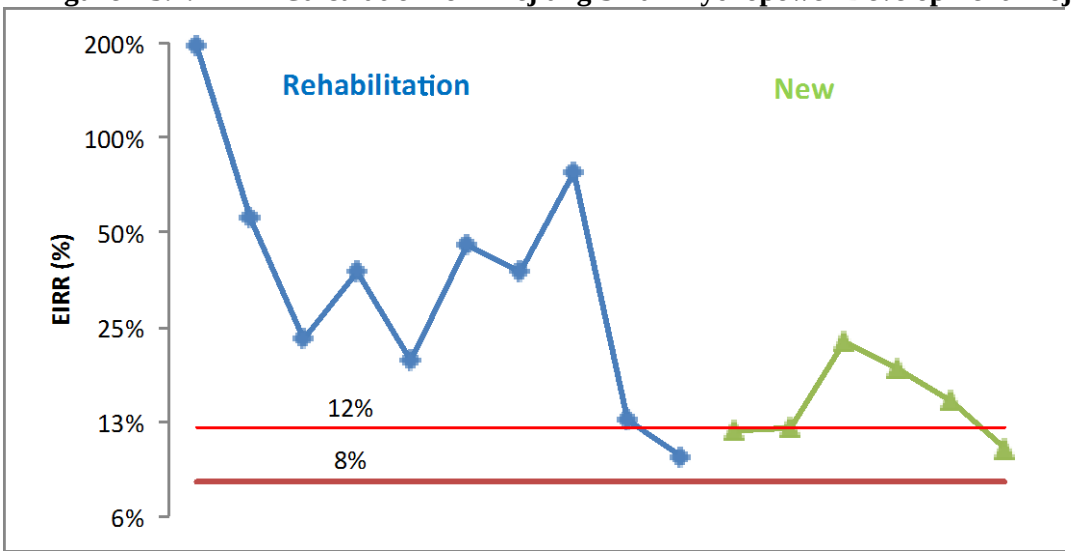
Year	Power Sales	Project Cost			Project Benefits			Net Benefits
		Capital Cost	Operation Cost	Total Cost	Power Sales	Environmental	Total Benefits	
	GWh	million Yuan						
2009	0.0	230.0	0.0	230.0	0.0	0.0	0.0	-230.0
2010	4.1	298.3	10.6	308.9	1.9	0.4	2.3	-306.5
2011	74.7	411.7	18.8	430.5	35.1	7.7	42.8	-387.7
2012	239.7	76.6	20.3	96.9	112.7	24.6	137.3	40.4
2013	243.1	0.0	20.3	20.3	114.3	25.0	139.2	118.9
2014	246.5	0.0	20.3	20.3	115.9	25.3	141.2	120.9
2015	250.0	0.0	20.3	20.3	117.5	25.7	143.2	122.9
2016-2030	250.0	0.0	20.3	20.3	117.5	25.7	143.2	122.9
Total	4808.1	34.6	1016.6	415.7	1432.2	2260.0	494.0	2754.0
PV 2010		984.5	161.1	1145.6	798.9	174.6	973.5	-172.1
Economic Internal Rate of Return (EIRR) =								**9.3%**

Main Assumptions:

Annual Utilization Hours	2590	after 2015
		Power Cut-off is assumed to be reduced to 0 by 2015
Willingness to Pay (Y/kWh)	0.470	(VAT excluded)
O&M Cost	2.0%	of capital cost
Plant Use (%)	3.5%	
Discount Rate (%)	12%	

Zhejiang SHP: The EIRRs were recalculated for all 16 SHP stations, including 10 rehabilitation and 6 new projects. The EIRRs of the 10 rehabilitated projects were ranged from 10 to 195 percent while the EIRRs of the 6 new projects were ranged from 10 to 22 percent. The EIRRs of most rehabilitated projects were higher than estimated during project preparation (for all projects ranging from 10 to 33 percent).

Figure A3.1. EIRR Calculation for Zhejiang Small Hydropower Development Project



Financial Analysis

The financial analyses of the four investment subcomponents were carried out using the same methodology adopted during the project preparation, and the FIRRs were recalculated. It was found that:

- The FIRR of Fujian Pingtan Wind Power Generation Project was recalculated at 10.9 percent, higher than the estimated at project appraisal (6.5 percent).
- The FIRRs of both Jiangsu Rudong Biomass Power and Inner Mongolia Huitengxile Wind Power Generation Project were recalculated at 5.0 and 5.1 percent, respectively, lower than the estimated at project appraisal (10.6 percent for the Jiangsu Rudong Biomass Power project and 7.0 percent for the Huitengxile wind farm without carbon financing).
- The FIRRs of Zhejiang Small Hydropower Development Project varied: they were ranged from 6 to 102 percent for the 10 rehabilitated projects and ranged from 6 to 16 percent for the other 6 new projects. The FIRRs of most SHP projects were higher than or close to those estimated during project preparation (between 7 and 16 percent for all projects).

Summary

The EIRRs and FIRRs for the four investment subcomponents were summarized and compared in Table A3.4.

Table A3.4. Economic and Financial Analysis Summary

Project	EIRR		FIRR		Brief Explanation
	ICR	Appraisal	ICR	Appraisal	
Fujian Wind Power	16.1%	13.6%	10.9%	6.5%	- Higher annual generation - Higher on-grid tariff
Jiangsu Biomass Power	11.6%	20.8%	5.0%	10.6%	- Operation problems 2008–10 - Higher fuel price
Inner Mongolia Wind Power	9.3%	12.5%	5.1%	7.0%	- Overrun of investment cost - Delayed project commissioning - Less generation
Zhejiang Small Hydropower	10–195%	10–33%	6–102%	7–16%	- Advantage of rehabilitation

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team Members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Noureddine Berrah	Lead Energy Specialist	EASEG	TTL
Richard Spencer	Senior Energy Specialist	EASEG	
Susan Bogach	Senior Energy Specialist	EASEG	Economist
Leiping Wang	Senior Energy Specialist	EASEG	
Xiaodong Wang	Energy Specialist	EASEG	
Carlos Escudero	Lead Counsel	LEGEA	Lawyer
Mei Wang	Senior Counsel	LEGEA	Lawyer
Xiaoping Li	Procurement Specialist	EAPCO	Procurement
Haixia Li	Financial Management Specialist	EAPCO	Financial Management
Ximing Peng	Energy Specialist	EASEG	
Bernard Baratz	Environment Specialist (Consultant)	EASEG	
Clifford Garstang	Legal (Consultant)	LEGEA	Lawyer
Enno Heijndermans	Renewable Energy Specialist (Consultant)	EASEG	
Youxuan Zhu	Resettlement Specialist (Consultant)	EASEG	Resettlement
Miao Hong	Renewable Energy Specialist (Consultant)	EASEG	
Weigong Cao	Consultant	EASEG	Power Engineer
Cristina Hernandez	Program Assistant	EASEG	Project Processing
Chunxiang Zhang	Program Assistant	EASEG	Project Processing
Supervision/ICR			
Richard Jeremy Spencer	Lead Energy Specialist	EASVS	TTL
Ranjit J. Lamech	Sector Leader	EASIN	TTL
Dejan Ostojic	Sector Leader	EASIN	TTL
Xiaodong Wang	Senior Energy Specialist	EASIN	TTL
Yanqin Song	Energy Specialist	EASCS	TTL
Ximing Peng	Senior Energy Specialist	EASCS	
Defne Gencer	Energy Specialist	EASIN	
Noureddine Berrah	Consultant	EASCS	
Enno Heijndermans	Renewable Energy Specialist (Consultant)	EASIN	
Fang Zhang	Financial Management Specialist	EAPFM	Financial Management
Guoping Yu	Procurement Specialist	EAPPR	Procurement
Jingrong He	Procurement Analyst	EAPPR	Procurement
Mei Wang	Senior Counsel	LEGES	Lawyer
Weigong Cao	Consultant	EASCS	Power Engineer
Xiaoping Li	Senior Procurement Specialist	EAPCO	Procurement
Xin Ren	Environmental Specialist	EASCS	Environmental

Bernard Baratz	Consultant	EASCS	Environmental
Youxuan Zhu	Consultant	EASCS	Resettlement
Cristina Hernandez	Program Assistant	EASIN	Project Processing
Kun Cao	Program Assistant	EACCF	Project Processing

(b) Staff Time and Cost

P067828		
Stage of Project Cycle	**Staff Time and Cost (Bank Budget Only)**	
	No. of staff weeks	**US$ Thousands (including travel and consultant costs)**
Lending		
FY2000	22.51	70.56
FY2001	22.93	98.05
FY2002	12.81	61.45
FY2003	6.28	30.21
FY2004	15.84	140.46
FY2005	17.10	108.38
Total:	97.47	509.13
Supervision/ICR		
FY2006		
FY2007	10.25	73.05
FY2008	7.20	54.86
FY2009	13.81	88.09
FY2010	10.34	58.11
FY2011	12.49	67.72
FY2012	1.60	3.39
Total:	55.69	345.22

P067625		
Stage of Project Cycle	**Staff Time and Cost (Bank Budget Only)**	
	No. of staff weeks	**US$ Thousands (including travel and consultant costs)**
Lending **Total:**	0.00	0.00
Supervision/ICR		
FY2006	4.45	40.10
FY2007	2.0	30.60
Fy2008	0.0	27.95
FY2009	11.68	35.24
FY2010	14.2	89.72
FY2011	14.49	91.34
FY2012	7.46	59.79
Total:	54.28	374.74

P096158		
Stage of Project Cycle	**Staff Time and Cost (Bank Budget Only)**	
	No. of staff weeks	**US$ Thousands (including travel and consultant costs)**
Lending		
FY2006	6.8	50.95
Total:	6.8	50.95
Supervision/ICR		
FY2007	8.45	86.98
FY2008	3.81	28.18
FY2009	10.46	46.31
FY2010	13.48	110.63
FY2011	18.46	83.15
FY2012	7.06	39.43
Total:	61.72	394.68

Annex 5. Beneficiary Survey Results

At the end of CRESP Phase 1, the CRESP PMO conducted a survey to assess the benefits of CRESP Phase 1 for subgrant recipients. The five remaining PMO staff also made a self-assessment. The results of these assessments are presented in Annex 5.

Subgrant Recipients Survey Results

In total 36 questionnaires were returned to the PMO. Table A5.1 gives a breakdown by facility.

Table A5.1. Responses to questionnaire

Facility	Number of Responses
Wind Turbine Technology Transfer (WTTT)	7
Wind Turbine Testing (WTTC)	4
Wind Turbine Certification (WTCC)	2
Biomass Technology Transfer (CGF-Biomass)	9
Provincial Demonstration Projects (CGF-PDP)	11
Investor Scale-up Support Facility (ISSF)	3
Total	36

The questionnaire included questions such as the following:

- Why was the support from CRESP through the subgrant important to you?
- What would have been different without the support from CRESP?
- What did you like about the support provided by CRESP?
- What did you not like about the way the support was provided?
- If CRESP had to do the subgrant project again, what should CRESP do differently?
- What is in your opinion the importance of CRESP for the renewable energy industry in general?

In addition, the questionnaire included 10 statements for which the respondents were asked to what extent they agreed with these statements from 0 to 10 in which 0 means total disagreement and 10 total agreement. These statements were as follows:

- Without support from CRESP, we would have done exactly the same.
- With the support from CRESP, we did more than we would have done without the support from CRESP.
- With the support from CRESP, we did a better job than we would have done without the support from CRESP.
- The technical conditions for the support from CRESP were clear.
- The technical conditions for the support from CRESP were too demanding.
- The subgrant approach worked well.
- The PMO was strict, but very helpful during the implementation of the subgrant project.
- CRESP was very important to the development of the renewable energy industry in China.
- Achieving the agreed milestones was more difficult than anticipated.
- A different support than provided by CRESP would have been more useful to us.

Summary of Results

Clearly the financial support provided by the project is considered the most important. However, many of the respondents highlighted that they benefitted from international experience and expertise by involving more international experts than they would have done without the support from CRESP. Despite the reluctance to hire international experts initially, many respondents mentioned the involvement of international experts is one of the success factors. Furthermore, they also appreciated the advice provided by the international experts contracted by the PMO to assess progress and check achievement of milestones. This feedback reinforced the idea that requires subgrant recipients to involve more international experts not only to gain cutting-edge global knowledge but also to be in contact with relevant international organizations and institutions for future follow-up. In the future, the PMO should insist more involvement of international experts to guide the development process.

Many of the respondents acknowledged that CRESP support has accelerated and improved wind development in China. The beneficiaries highlighted that CRESP support improved the technology development capacity of local manufacturing industry, taught Chinese manufacturers technology transfer mechanisms and international certification process. As a result, some of the participating manufacturers now follow the same approach and process to develop more advanced and larger capacity wind turbines on their own. Furthermore, the support from the World Bank/GEF also helped them gain credibility and reputation.

The use of subgrants to support project identification and preparation worked extremely well. Almost all of the projects for which CRESP supported preparation work have been or will be realized. The subgrant recipients appreciate this support because it reduces the financial risk of project preparation, which is considered the highest risk of a project. The relative small amount of support had a high leverage impact of actual investments. This is a very efficient way to scale up renewable energy investments and is recommended for replication in CRESP Phase 2 or in other projects.

The PMO has not only a fiduciary role, but also provides guidance and advice to the subgrant recipients. In particular the latter role was highly appreciated by the subgrant recipients.

When replicating the subgrant approach under other project it is advised to study the details of the approach adopted by CRESP. Many of the details contributed to the success.

Overall the responses were very positive and indicate that a continuation of this kind support under CRESP Phase 2 would be appropriate.

Details on the outcomes by facility are provided below.

Wind Turbine Technology Transfer (WTTT)

The five beneficiary wind turbine manufacturers mention that the financial support was the important. However, it was not only the money. Three respondents mention specifically that the reputation, both national and international, was important and that they felt honored to be selected to participate. Some mentioned that participation accelerated development and that the certification requirement helped to substantially improve quality. The CRESP support also provided access to international experts who provided valuable advice.

According to the respondents, without the support of CRESP they might not have gone through certification. Development of the turbine might have been quicker, but this would have been a mistake. All consider certification important as a quality statement and as a marketing advantage.

Certification also opened up the export market for the certified wind turbines. Sewind mentioned that they experienced a lot of difficulties during the two years of type certification. Without CRESP they would not have designed the W2000 type wind turbine and obtain type certification.

On the question of what they liked most about the way the CRESP support was provided, three respondents stated that they liked most the advice from the foreign experts, while two liked most the financial support provided. Two respondents stated that they also liked the project design with clear milestones and a step-by-step approach. Also the management by the PMO was very much appreciated. When they ran into one of the many problems, the PMO always communicated very effectively and suggested solutions.

Suggestions for improvement of the WTTT facility include more financial support (Dongfang and Sinovel), more intensive involvement of CRESP team for smoother implementation (Sewind), strengthen the project management team (Goldwind) and make payments based on completion of tasks and not as a percentage of actual cost after reaching a milestone (Windey).

Without the support of CRESP, the respondents would have done something different. Because of the support of CRESP, they did more and did a better job at it. The conditions of the support from CRESP were clear, but type certification was demanding. Reaching the specified milestones was somewhat more difficult than anticipated. The subgrant approach worked very well, and the PMO was very helpful in implementing the WTTT projects.

The responses from the Wafangdian Bearing Group were very detailed and clear. The most striking points are the following:

- The financial support was important. Wafangdian had already invested Y 1.5 billion in the development of bearings for MW size wind turbines. CRESP support released some of the funding pressure.
- Without the support from CRESP, engaging foreign experts and procurement of advanced design software (RomaxDesign) would have been much more difficult. Wafangdian would have to rely more on its own experts and would have been restricted to domestic design software. This would have delayed development and might have impacted quality.

For developing installation equipment for intertidal wind turbines, Sinovel appears to be interested only in the financial support provided. The CRESP contribution may have contributed to implementing the project faster and better.

Wind Turbine Testing (WTTC)

The CRESP support was more important to the China Wind Test Centre (WTC) than to CEPRI. The support was valuable to CEPRI, since it (a) provided financing; (b) provided the chance to establish cooperation with many domestic and international wind power organizations; and (c) received good guidance. However, without the support from CRESP, CEPRI would still have tried to acquire the required skills and equipment to conduct all tests needed for type certification, but this may have taken longer and might have been less successful. WTC, by contrast, might not have obtained CNAS accreditation, since it would have been difficult to purchase the required equipment, obtain required training, and establish the required quality system.

CEPRI appreciated the support provided by the PMO and found that the step-by-step approach was helpful. The support was, however, demanding in that it required a lot of documentation to

be provided. WTC mentioned that in addition to the financial support, it valued the international technical communication and exchange and capacity building of its staff.

The subgrant for short-term wind power forecasting also used the WWTC subgrant facility. With the support provided, CEPRI refined the short-term wind power forecasting system and applied it to the Inner Mongolia power grid. The CRESP support was important for the financial resources provided and for the guidance provided by the international experts. Without the support from CRESP it would have been impossible to compare the results from CEPRI with the results from reputable international short-term wind power forecasting systems. CEPRI would have preferred to apply its tool to other gird systems than the Inner Mongolia grid system because of the particular problems of Inner Mongolia, such as power restrictions.

Also for the establishment of the Inner Mongolia wind test base, the WWTC subgrant facility was used, although this work was financed from the Inner Mongolia provincial budget. The Inner Mongolia Test Power Company considered the most important aspect from the CRESP support the technical advice and the financing. Through the CRESP support, a business plan has been developed based on international best practices. This will be very helpful in operating the wind test base. Although the financial support was relatively small, it was very important in the early stage of the project. It reduced the business risk of the investor and increased confidence in the project. Without the support from CRESP, the establishment of the wind test base would have been postponed.

Wind Turbine Certification (WTCC)

For the CGC, the financial support from CRESP was most important. Through the financial support from CRESP CGC had more exposure to cutting-edge technology through training and exchange with international institutions, and could procure the required software and equipment. Further, through the support from CRESP CGC had more cooperation with international institutions and is now closer to mutual recognition of certification. Both certification bodies agree that without the support from CRESP obtaining accreditation would have taken longer. CGC recognized the flexibility the subgrant approach provided with respect to selecting partners and contractors. To the question what CRESP should have done differently, CGC replied that more attention could have been given to promote the certification by Chinese institutions outside China, including developers, utilities, research institutions, banks, insurers, and other financial institutions.

For the CCS, CRESP support made not a big difference. Without the support from CRESP, they would very much have done the same, maybe at a little slower pace.

Biomass Technology Transfer (CGF-Biomass)

Four subgrant projects supported the development of biomass briquetting machines. These projects provided a relative small support of US$40,000 to US$50,000. The financial support from CRESP, although small, was important to these subgrant recipients. One of the respondents mentioned that CRESP helped to complete the project early, and helped to improve the companies' reputation and credibility. One also mentioned that the financial support is important because of the high risk of investment in quality improvement. It is not always possible to recover the investment in quality improvement. These companies are relatively small. Therefore, payments and a payment schedule are important. They mentioned that the first payment (30 percent) was fast (upon signing the subgrant agreement), but that the second payment was too slow (upon proof of meeting milestones and proof that cost had been incurred). Improvements

suggested (other than more money and bigger initial payment) include that coordination between subgrant recipients should have been established.

CRESP also supported two research projects of the East China University of Science and Technology. One project for the development of a gasifier and one project for catalytic cracking of the gasifier tar. As CRESP provided the only source of funding, these projects could not have been done without the support from CRESP.

The National Bio Energy Company stated that without the support from CRESP, the outputs would have been the same (as the biomass industry needed the equipment developed), although obtaining the outputs may have taken longer. The subgrant recipient did not like that demonstration could not be included in the project.

Beijing Dahuajiva Small Town Investment Consulting Company received a subgrant to develop a biomass gasification system for village power generation. Without the support from CRESP, this project would not have taken place as a funding gap would have remained. The CRESP support was only a small part of total funding needs.

The Jiangsu Huijia Environment Protection Development Company received a subgrant to develop a wastewater treatment system for wastewater from scrubbing gasifier gas containing tars. Because of the CRESP support, the project could be completed earlier.

Provincial Demonstration Projects (CGF-PDP)

The PMO received 11 responses from CGF-PDP subgrant recipients. From the responses, it is clear that outreach received adequate attention. The outreach was done through site visits (including local school students), reports, leaflets, presentations at workshops and conferences, DVDs, a website, patents, and TV programs. Through this attention to outreach, a large number of people know about these demonstration projects.

Replication of the demonstration projects is still limited. The Gaoyou 4 MW biomass gasifier for power generation in Jiangsu is claimed to be replicated at Jiangsu's Dongtai, Jurong, and Xuzhou where five 6 MW biomass gasifiers for power generation will be installed. The PV water pumping project in Inner Mongolia has been replicated at Inner Mongolia's Xilingoler for 10 solar water pumping systems of 2 kW capacity for drinking water supply and five 20 kW capacity systems for irrigation in Hohot's Wuchuan County. All these systems are operational and working well. The building integrated PV (BIPV) project at Guanya Power Equipment company in Nanjing was replicated by the Tenghui BIPV project.

The recipient of the subgrant for the Zhejiang biogas power project mentioned that if they had to do the project again they would, among others, address the grid connection and tariff issue before commencing with the project.

The additional projects under the provincial demonstration projects were to prepare renewable energy investments in the pilot provinces and offshore wind projects. One of the 5 projects will not be realized because of land acquisition problems in Inner Mongolia. The other projects will very likely be realized. The Jiantiao 21 MW tidal power plant has been listed as Zhejiang Province Key Project for 2011–15. The Zhejiang DRC approved the feasibility study. The developer is waiting for approval of implementation. According to the respondents, it is (a) 100 percent certain that the 100 MW offshore wind farm in Fujian will be build; (b) 100 percent certain that the 100 MW pilot offshore wind farm in Hangzhouwan in Zhejiang will be build (the

wind farm has been listed on the offshore wind farm plan prepared by the local authority); and (c) very likely that the 150 MQW intertidal wind farm in Rudong County in Jiangsu province will be realized.

Other noteworthy comments are from Longyuan the developer of the 21 MW tidal power plant in Zhejiang. Longyuan found in particular the midterm evaluation and the acceptance process (of milestones reached) efficient. They would, however, have liked to reduce the cost for international consultants.

Investor Scale-up Support Facility (ISSF)

Inner Mongolia North Longyuan Wind Power Company used the ISSF for the preparation of 4 additional wind farms. Of these, the Wuliji 49.5 MW phase 1 wind farm has been approved (Wuliji is in total 300 MW) and the Huitengxile 24 MW wind farm is under construction. The company expects that also the other two projects (Huitengliang 49.5 MW phase II project and Wulate Qianqi 200 MW wind farm) and remaining phases of Wuliji will be approved.

The CRESP support was important, since it reduced the project preparation risk and provided technical training and advanced international management experience. It also contributed to standardization of project preparation procedures. This contributed to scaling up the companies' involvement in renewable energy. The developer proposes to focus in CRESP Phase 2 more on training of technical and management staff, in particular for improvement of existing wind farms. Technical training is considered fundamental for the companies' growth.

In Zhejiang the ISSF was used to prepare 8 SHP projects. Five of these projects are operational, while the other three are under construction. The Zhejiang Hydropower Management Center considers the ISSF support flexible and suitable for different projects. The conditions for disbursement are clearly defined, and the process is well defined in the Project Implementation Plan (PIP). It only considered that disbursement took too long. Recommendations for Phase 2 include focusing on improving the performance of existing projects, including the development of new industry models, management, safety measures and restoring of environmental damage.

The response from Jiangsu Guoxin was, like all the others, very positive and specifically acknowledged the help provided by the PMO.

PMO Staff Survey Results

PMO staff reduced from 16 at the start of CRESP to 5 at the end of CRESP. Two PMO staff members were there from start to finish.

The PMO is of the opinion that CRESP Phase 1 was successful. The original goals of CRESP Phase 1 were achieved, and the project had a significant impact on China's renewable energy industry and significantly accelerated its development. CRESP played an important pioneering role in renewable energy. CRESP was involved in all of the most important milestones and aspects of renewable energy development in China in recent years. This includes work on RE policy studies, wind turbine technology transfer, wind turbine standards, testing and certification, and long-term capacity building. This established a solid foundation for further development of the renewable energy industry in China. Through this work, CRESP brought advanced international concepts to China, most notably type certification.

The PMO considers the national policy studies and technology improvement for wind had the biggest and most important impacts in China. The provincial level activities are considered of limited impact.

The main problem in implementing CRESP was the workload. One of the reasons for the tremendous workload was the fragmentation of a large number of small contracts. Other reasons included the limited capacity of some of the provincial implementation bodies. The PMO highlighted that the subgrant system overall worked very well.

The PMO feels very proud of the financial management system established by the PMO. The system developed and used by the PMO served as a best practice example for other World Bank projects in China and abroad. The electronic version of the contract files is another major achievement of the CRESP PMO that is well beyond what may be expected from an implementing agency. This will serve as an example for other projects and may be developed further for use in other projects.

If the PMO had to redesign CRESP Phase 1 again, the PMO would:

- Reduce the number of cost categories.
- Reduce the number of contracts.
- Only have a national program without pilot provinces.

World Bank supervision was helpful in the successful implementation of CRESP Phase 1, with good supervision quality. However, supervision could have been more efficient by planning supervision missions better.

Annex 6. Stakeholder Workshop Report and Results

The NEA, Ministry of Finance (MOF), and the World Bank jointly organized a stakeholder closing workshop at the end of CRESP Phase 1 to present achievements and share lessons learned. The workshop was held in Beijing on December 15, 2011.

The workshop was well attended by more than 100 participants, including senior government officials (including the Vice Minister of the NEA, two deputy Director Generals from the NEA, a Director General from the MOF, senior officials from NPC's Environmental and Resources Protection Committee, the National Development and Reform Commission, the Ministry of Agriculture, the Ministry of Water Resources, the Standardization Administration, and the Certification and Accreditation Administration, government's think tanks, and provincial governments), project beneficiaries (including RE manufacturers, RE developers, research institutes, academic), RE industry associations, the World Bank team, and other international organizations (such as the UNDP, GTZ, and DANIDA). The closing workshop also presented awards to selected project beneficiaries in recognition of the achievements and outcomes as a result of CRESP support.

Both the NEA and MOF gave high marks to the significant contributions that the CRESP program made to China's renewable energy scale-up, and thanked the World Bank for its assistance. The senior government officials reiterated that renewable energy is a high priority to the government, and the fast-growing renewable energy development in China offers a good opportunity for close international cooperation, taking advantage of the cutting-edge global best practices with a focus on the most relevant renewable technologies, policies, and innovations in China. They also told all the relevant parties to get ready for CRESP Phase II preparation and implementation.

Senior officials from the NEA presented the overall achievements and lessons learned from CRESP Phase I, demonstrating the strong government's ownership of the CRESP program. According to Chinese experts, CRESP Phase I has brought about over Y 9 billion investment in China in the renewable energy related industries, with annual incremental production more than Y 10 billion. The positive social, economic, and environmental benefits also include 3.5 billion kWh electricity added from renewable sources and about 9 million tons of greenhouse gas reduced for each year.

The participants highlighted the following achievements of the CRESP program:

- CRESP has strongly influenced RE policy development, RE Law and regulations in China, through supporting policy studies and technical assistance to help develop and implement the RE Law. The recommendations made in many policy studies supported by CRESP have been adopted by policy makers into laws and regulations. In particular, feed-in tariffs for power and biomass, important studies under CRESP, have been instrumental to scale up RE development in China;
- CRESP has played an essential role in rapid growth and quality improvement of the domestic wind, and to a less extend biomass, manufacturing industry, through supporting domestic manufacturers with cost-shared subgrants. Before the CRESP project started, Chinese wind manufacturers were facing difficulties producing megawatt-scale wind turbines and securing international quality certification. At the end of CRESP Phase I, four domestic wind manufacturers supported by the CRESP program have won Level A certification for their megawatt-scale wind turbine design, and in particular, Sewind has won type certification for its 2 MW wind turbine design from internationally recognized

wind turbine certification center. The program also supported the development of 8 wind turbine standards based on international standards, and establishment of the wind testing and certification centers in China. Today, China has four out of the top 10 wind manufacturers in the world. The quality improvements and cost reduction of Chinese wind manufacturing industry has benefitted China and the world.

- CRESP has contributed to large-scale RE investments by supporting 2 x 100 MW wind farms in Fujian and Inner Mongolia, a 25 MW biomass power plant in Jiangsu, and 16 SHP plants with a total installed capacity of 24 MW. These investments are among the largest RE investments at the time. These projects substantially improved the capacity of RE developers. In particular, the 100 MW wind farm in Fujian set high standards of large scale wind farms in China and is considered as a best practice in the country. The project introduced and facilitated transfer of international best available technologies, improved quality and reduced costs of such plans, and set up cost benchmarks through international competitive bidding. The SHP projects in Zhejiang province enhanced technical and management capacity of local small and medium-size enterprises, increased their access to financing, and improved SHP technical design, environmental and social safeguard, and installed capacity at project sites. CRESP Phase I also assisted RE developers in identifying and preparing more than 1,000 MW of new RE investments through the support to the investors and supported the four pilot provinces (Jiangsu, Zhejiang, Fujian, and Inner Mongolia) for demonstration of 24 renewable energy projects under the GEF grant.

The participants also discussed the following lessons learned:

- The commitment to a long-term partnership between the government and World Bank/GEF is a critical success factor of CRESP Phase 1.
- The conducive and effective RE policy framework is the driver for RE scale-up in China.
- The cost shared subgrant approach worked very well and proved to be a cost-effective way to leverage the GEF grant and build true ownership.
- Improving manufacturing quality is essential for the transition to a world-class manufacturing industry. The simultaneous support for technology development, improved standards, development of testing services and development of certification services produced outcomes far greater than support of any of these activities in isolation.
- The piecemeal approach and fragmentation of policy study contracts resulted in lengthy delays and weakened policy impacts.
- Supporting RE policies in pilot provinces has become irrelevant with the issuance of the RE Law.
- For the investment projects the key lessons were as follows:
    - Focus should be on electricity generation (kWh) and not just installed capacity (kW).
    - Good quality, low cost, and high efficiency are essential for scale-up.
    - International competitive bidding helps get the best cost-to-quality ratio.
    - Allocating GEF resources for troubleshooting during implementation is of great help.
- A core project management team, with contributions from world-class international and Chinese experts is most cost effective.

The stakeholder workshop also had a lively discussion on the preliminary design and priorities for CRESP Phase II, which will incorporate these lessons learned and many useful suggestions made by the participants.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

Summary of Borrower's ICR

The Borrower prepared a detailed Recipient Completion Report (Borrower ICR). The Recipient Completion Report described project outputs and outcomes by theme, changes during implementation, risks and sustainability, Borrower's and Bank's performance, and success factors, and lessons learned. The Recipient Completion Report is summarized as follows:

Outcomes: The renewable energy policy studies have provided important inputs and recommendations on improving China's renewable energy regulations, development planning at the national and provincial level, electric power pricing, quota system, and industrial policy. The CRESP-supported policies studies led to the issuance of 9 supporting policies:

- Preparation for the Energy Law;
- Amendment of the RE Law;
- Notice on Measures for Renewable Electricity Surcharge Subsidies and Quota Trade System from October 2007 to June 2008—Ordinance Code NDRC Price No. 3052 (2008);
- Interim Management Regulation on Subsidy for Energized Biomass, MOF Economic Construction No. 735 (2008);
- MOF, Notice on Implementation Plan of Promoting Renewable Energy in Infrastructure, MOF Economic Construction No. 306 (2009);
- Interim Management Regulations on Financial subsidy for Solar PV on Buildings. MOF Build No. 129 (2009);
- MOF, MOST, and NEA Notice on Implementation for Golden Sun Project—Ordinance Code MOF Build No. 397 (2009);
- NDRC Notice on Improved Price Policy for Grid-Connected Wind Power—Ordinance Code NDRC Price No. 1906 (2009); and
- NEA, Notice on Recommendation for Green Energy County. NEA New Energy No. 343 (2011).

The Borrower's ICR highlighted the following policy impacts:

- Development of overall renewable energy development targets and technology development roadmaps to promote the sustainable development of the renewable energy industry in China.
- Gradual establishment of a suitable differentiated tariff system for renewable energy products to promote large-scale development of renewable energy.
- Development of a renewable energy development foundation to encourage a stable source of funding and investment mechanisms for renewable energy development.
- Development and promulgation of renewable portfolio approach to implement the RE Law and especially the power purchase of electricity generated from renewable energy.
- Improvement of incentive policies and regulatory measures for renewable energy industry development to facilitate healthy and rapid development of renewable energy industry in China.

- Demonstration of the green energy county program to promote efficient renewable energy development and utilization in rural areas.

On the provincial level, 32 policies were supported, some of which have been adopted by local governments, and the implementation measures for the RE Law have been issued in pilot provinces and effectively implemented. With the support of CRESP, a solid basis has been laid for the renewable energy scale-up development in Jiangsu Province, Zhejiang Province, Fujian Province, and Inner Mongolia.

The wind turbine technology transfer activities (WTTT) was successful in not only exceeding the targets for the 5 participating wind turbine manufactures, but also progressively building up their in-house design and engineering capabilities. Although all projects were considered successful, the real winners will be those who can apply these capabilities to future technology development. All the companies chose the same technology transfer route by developing partnerships with European partners to improve design and engineering capabilities to bridge the knowledge gap with international competitors. They applied the capabilities and knowledge gained through such partnerships to design megawatt-scale wind turbines. The design capacity building has led to the development of further turbines with longer blades and higher-rated capacities—a strong indicator of the success and sustainability of the wind turbine technology transfer.

A similar development took place at Wafangdian Bearing Company. CRESP supported the development of the main shaft bearing for the 3 MW from Sinovel. With the capabilities developed, the bearing manufacturer can now develop main shaft bearing for other wind turbines and is sufficiently confident to develop main shaft bearings for 3.6 and 5 MW wind turbines.

The Chinese wind sector has undoubtedly met the challenge. In a very short period, just three years of this Technology Improvement Program, the manufacturers have moved forward tremendously. The technology gap has been closed, and costs have certainly come down as localization and competition has increased. There has been considerable capacity building with much reduced dependence on overseas support in all areas.

The growing status and size of the Chinese turbine manufacturers is having a global impact. Turbine prices have come down, in particular in new and developing markets such as Brazil. Domestic manufacturers can offer their turbines at up to 30 percent lower cost than equivalent imported machines. The Chinese offering has certainly influenced the market, directly through sharpening prices and competition, but also through adding greatly to the global manufacturing capacity.

In conclusion, CRESP Institutional Development and Capacity Building created a legal, regulatory, and institutional environment conducive to large-scale, renewable-based electricity generation. Renewable electricity capacity and electricity production has significantly been increased, and the rate of increase is accelerating. China has established ambitious renewable energy targets and is well on its way to meeting these targets. The renewable energy industry in general and the wind industry in particular have gone through very rapid growth, and until recently saw big industrial players entering the wind turbine manufacturing market to produce large-scale wind turbines. The project objectives are fully achieved.

Indicators: CRESP reached or substantially surpassed the indicator targets established at appraisal, except for the SO_2 emissions reduction because of a dramatically reduced emission factor as a result of large-scale deployment of flue gas desulphurization.

Sustainability: The Borrower considers many of the achievements of CRESP Phase 1 sustainable. The Borrower mentions in particular the wind turbine testing and certification centers, the long-term capacity building training courses, and the provincial demonstration projects (in particular the 5 MW fixed bed gasifier developed by Gaoyou and Aoke Ruifing). The Borrower also believes that many of the projects for which CRESP supported project preparation will be realized. In particular, the Zhejiang Jiantiao 21 MW tidal power plant and the 100 MW Fujian offshore wind farm are mentioned in this respect. The sustainability is further expected to be safeguarded by CRESP Phase II.

Borrower Performance: The Borrower is of the opinion that during operation of CRESP, the PMO has functioned well. Comprehensive internal procedures have been developed and used. The financial management was done very well. The PMO produced reports in line with World Bank reporting requirements and summary reports for internal use and use by the World Bank supervision team. Over the years, CRESP has been audited frequently. No problems were found. In the most recent financial audit results, CRESP received the highest satisfaction rating from the World Bank and the highest ranking by the National Audit Office. Out of the 49 World Bank programs, 11 received top ranking appraisal, which include the CRESP. The PMO established a contract management and filing system that can serve as example for other project within and outside China.

The first phase CRESP has not only successfully introduced a verification mechanism for the financial subgrants, but also achieved very good financial management performance, which is highly appraised in a number of financial audits by China's National Audit Office. CRESP PMO played an incredible important role as a coordinator between the various departments of Government of China and the World Bank.

World Bank Performance: The CRESP PMO has a very pleasant cooperation with the World Bank. In addition to trainings in procurement and payment at the beginning of the program, regular inspection and a supervision process also help capacity building progress in the PMO. The success of CRESP phase I implementation owes much to the efforts of the World Bank. Although the PMO is very grateful to all support provided by the World Bank, the PMO proposed some changes for Phase II. These recommendations include the following:

- Supervision can be less frequent, for example, 1–2 times a year. More frequent and long missions take too much time from the PMO's normal project management tasks and reduce work efficiency. Adequate working time, combined with effective progress inspection, shall benefit the smooth implementation of the project.
- Before each supervision mission, the World Bank should provide a detailed work schedule and requirements, so that the PMO can plan the supervision missions better and prepare the required inputs before the mission arrives.
- World Bank staff should reserve more time for field visits instead of staying in Beijing too much. Field visits will increase understanding and will help to solve problems quickly.

Success Factors:

- 2005 Renewable Energy Law. CRESP benefitted greatly from the quick passing of the RE Law in February 2005. The CRESP PAD envisaged enactment of the law in 2009. With the early enactment renewable energy, development proceeded much faster than anticipated.
- Active Involvement of Renewable Energy Enterprises. Driven by national incentive policies, renewable energy industry is booming in China. Both public and private

investments have entered the field of renewable energy. A large number of Chinese institutes and companies have actively engaged in the renewable energy technology research and development, equipment manufacturing, and market penetration activities. Many renewable energy bases have been developed. Because of the support at government and corporate levels, new energy and renewable energy will lead a new round of energy industry growth.

- The Right Timing. Timing can be everything and it appears that the timing and vision of the Wind Technology Improvement Program was right. The Chinese wind industry is undoubtedly on a very steep learning curve, growing in size and in technology at a rate not seen elsewhere. And it has the advantage of an established global knowledge base. As an ever present theme, the Wind Technology Improvement Program aimed to benefit from this knowledge base by introducing overseas expertise to all the activities. It was its effectiveness in the bringing of expertise to bear across the full breadth of the sector, which stood out.
- Integrated Programmatic Approach. In demanding the level of quality dictated by the requirement for design approval, the turbine development also linked across to the work on standards and certification authorities. Without this joining together of the strands of manufacture with standards and skills capacity building, the result would have been greater risk and a slower pace of development. The CRESP program added value by addressing skills and capacity building across the wind sector. It introduced expertise at a critical period of rapid growth, reducing the chances of the Chinese industry suffering from avoidable mistakes.
- International Cooperation. With the strengthening of international cooperation in multiple formats, including international study tours, exchange workshops and seminars, concept and technology transfer, joint R&D, and international technical assistance, renewable energy technology gap between China and advanced countries are getting flat. In some areas, China owns more advanced technologies. Companies have improved their capacity because of the international exchanges, and they have gained experience and achieved fast growth. The international cooperation activities have effectively contributed to the smooth implementation of CRESP.

Lessons Learned:

- Use flexibility in design and implementation. Some project activities planned were obsolete because of the very fast development of renewable energy in China. The PMO in consultation with the World Bank cancelled some activities and redesigned new ones. This flexibility is desirable.
- Separation of national and provincial activities did not work well. The national and provincial level activities were difficult to coordinate. The national level activities were implemented under the coordination of the NEA; while the implementation of local-level projects was coordinated by the four pilot provincial Energy Bureaus. According to this model, the PMO has to establish two level teams to works with central and local government. Because various ideas and different goals, it was difficult for the PMO in project coordination and hence affected implementation quality of some projects. This complexity should be avoided.
- Avoid fragmentation. CRESP Phase I had too many small activities. This increased workload, reduced focus, and led to suboptimal use of the outputs.
- Avoid too much turnover of staff. The PMO staff moved frequently. In the CRESP project implementation, some project manager staff left for various reasons, for some posts staff members changed four times. This has affected the continuity of project

management to a certain extent and resulted in a negative impact on PMO normal operation.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

The only written comments received are from the subgrant recipients. See Annex 5.

Annex 9. List of Supporting Documents

1. **Project Documents**
   a. World Bank Project Appraisal Document. First Phase of CRESP. May 19, 2005 (Report No. 30698-CN)
   b. World Bank Project Appraisal Document. Follow-up Project to the First Phase of CRESP. January 5, 2006 (Report No. 33018-CN)

2. **Project Implementation Plans**
   a. PIP CRESP Phase 1 Institutional Development and Capacity Building (July 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. **Closing Reports**
   a. CRESP Phase 1 Policy Summary Report. May 2011.
   b. CRESP Indicators Report. October 2011.
   c. CRESP Subgrant Report. October 2011.

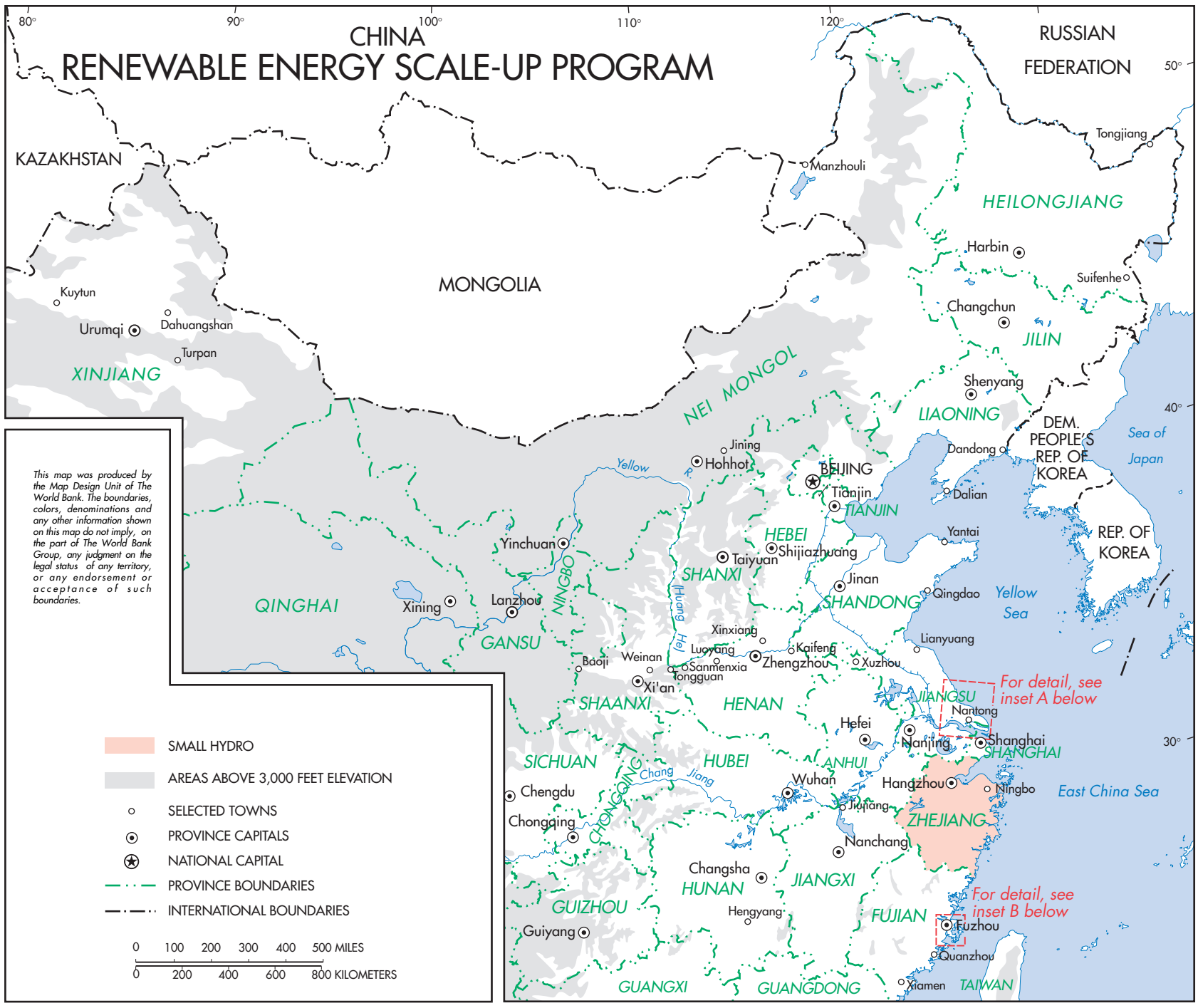
4. **Supervision Reports (Aide Memoires)**
   a. Aide Memoire CRESP supervision mission September 6–23, 2011
   b. Aide Memoire CRESP supervision mission April 4–17, 2011
   c. Aide Memoire CRESP supervision mission July 12–30, 2010
   d. Aide Memoire CRESP supervision mission March 15 – April 2, 2010
   e. Aide Memoire CRESP supervision mission October 12–30, 2009
   f. Aide Memoire CRESP supervision mission April 20 – May 15, 2009
   g. Aide Memoire CRESP supervision mission January 12–24, 2009
   h. Aide Memoire CRESP supervision mission October 27 – November 7, 2008
   i. Aide Memoire CRESP supervision mission January 21–30, 2008
   j. Aide Memoire CRESP supervision mission August 13–24, 2007
   k. Aide Memoire CRESP supervision mission January 29 – February 9, 2007
   l. Aide Memoire CRESP supervision mission June 19–23, 2006

5. **Legal Documents**
   a. World Bank GEF Trust Fund Agreement. CRESP Phase 1. August 11, 2005.

6. **Project Reports**
   a. Status of smart grids in Europe. Math Bollen. January 2011.
   b. Smart Grids: The US Perspective. Mladen Kezunovic. January 2011.
   c. Study Report on Development of Standards, Conformity Testing and Certification of Wind Turbines.
   d. Analysis on China Wind Power Industry Development and Policy Recommendations.
   e. CRESP Work Plan for Wind Power Public Technical Testing Platform. Romax Technology Ltd.
   f. 2008 China Biomass Industry Report. CREIA.
   g. 2008 China Wind Industry Report. CREIA, December 2008.
   h. Pricing Mechanisms and Cost Sharing Systems for Renewable Energy Electricity. Arrhenius. July 2008.

i. Study on Apportionment Mechanism of Renewable Energy Development Fund. Liu Shu Jie. December 2008.
j. Models on Renewable Power Pricing and Cost Sharing. Zhou Sheng. March, 2009.
k. Study on Biomass Power Pricing Mechanism. Yuan Zhenhong. March, 2009.
l. Suggestions on Promoting Rural Energy Development in Poor Area. September 2008.
m. Feasibility Study on Establishment of Wind Electricity Trade System in China. Wang Jixue.
n. Feasibility Study of Green Power Market in China. December 2008.
o. Develop Award Criteria for the Green Energy County. Wang Gehua. September 2008.
p. CRESP Renewable Energy Industrial Development Report 2009.

CHINA
RENEWABLE ENERGY SCALE-UP PROGRAM



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- SMALL HYDRO
- AREAS ABOVE 3,000 FEET ELEVATION
- SELECTED TOWNS
- PROVINCE CAPITALS
- NATIONAL CAPITAL
- PROVINCE BOUNDARIES
- INTERNATIONAL BOUNDARIES

0 100 200 300 400 500 MILES
0 200 400 600 800 KILOMETERS

- BIOMASS POWER PLANT
- WINDFARM SITES
- 00 MW INSTALLED CAPACITY
- AREAS ABOVE 3,000 FEET ELEVATION
- MAIN ROADS
- RAILROADS
- RIVERS
- SELECTED CITIES
- COUNTY CAPITALS
- PROVINCE CAPITALS
- COUNTY BOUNDARIES
- PREFECTURE BOUNDARIES
- PROVINCE BOUNDARIES

INSET A

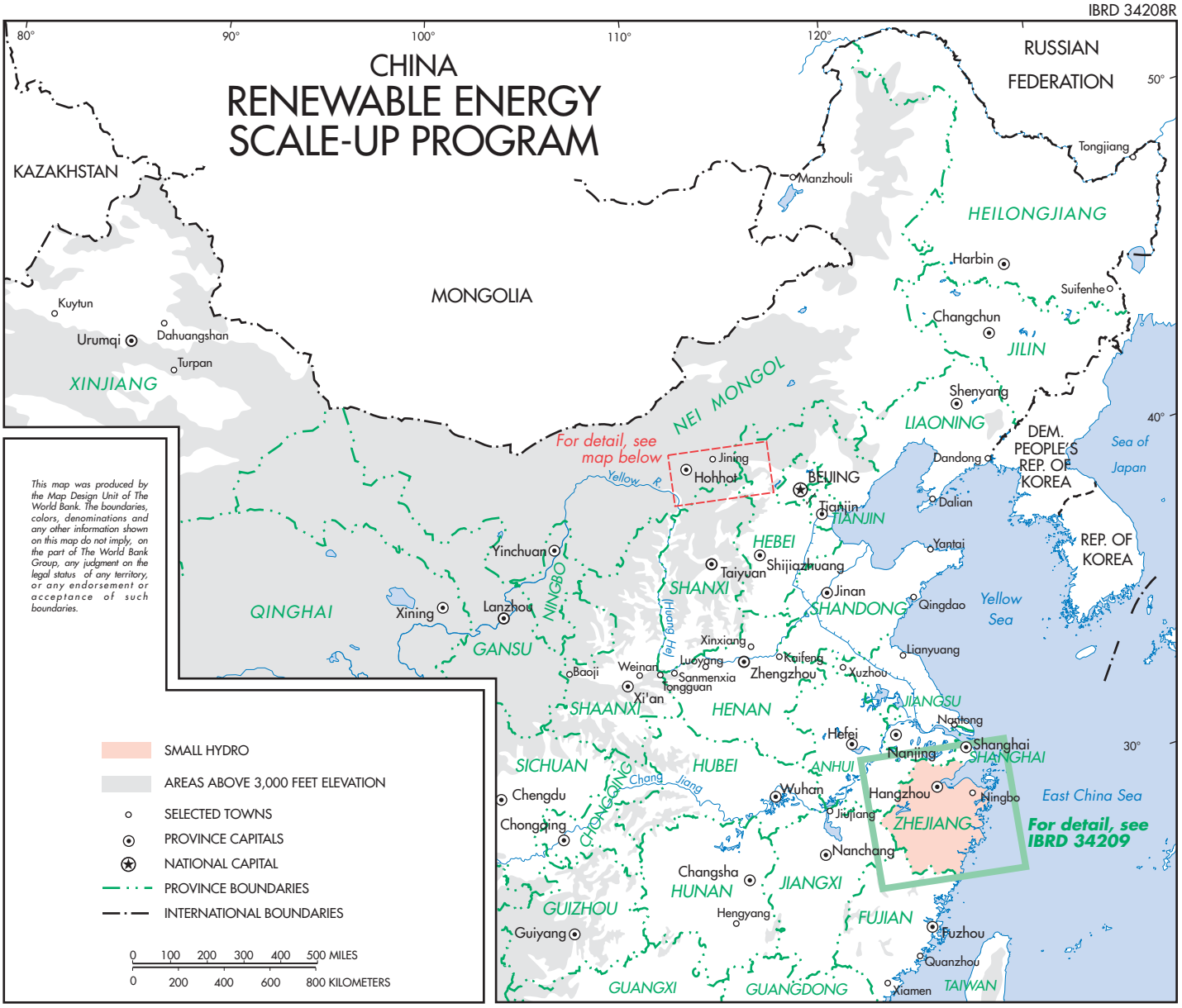
INSET B

MAY 2005

IBRD 33786

IBRD 34208R

CHINA
RENEWABLE ENERGY SCALE-UP PROGRAM



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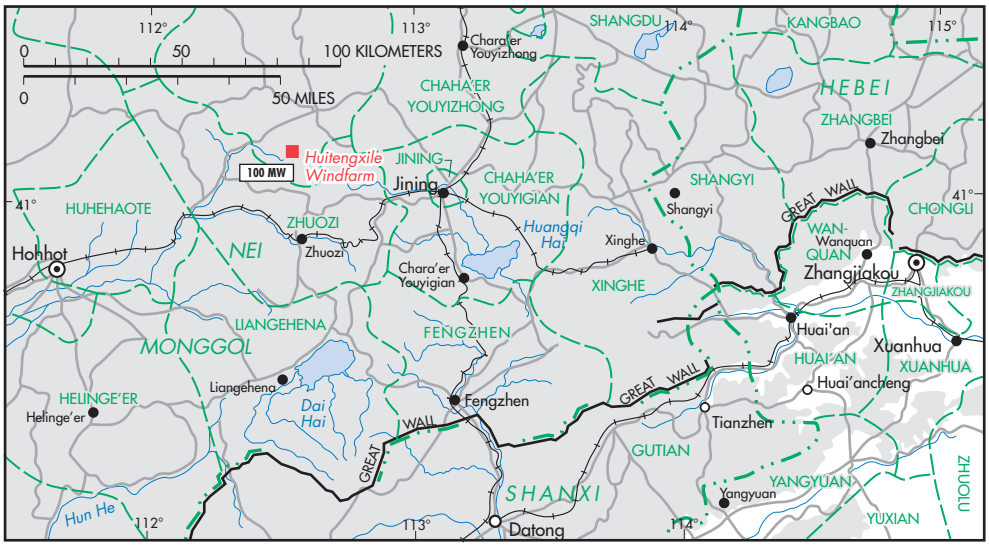

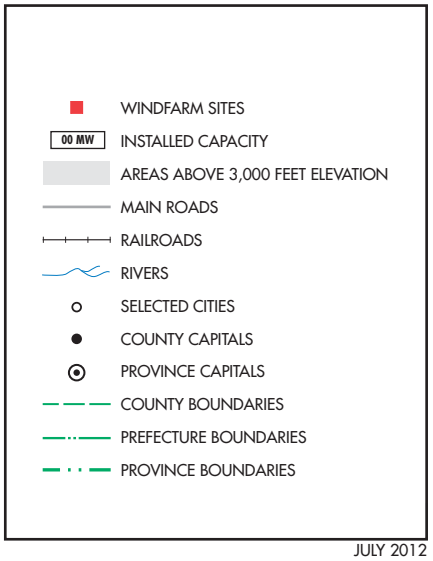

JULY 2012

CHINA
RENEWABLE ENERGY SCALE-UP PROGRAM

SMALL HYDRO
AREAS ABOVE 3,000 FEET ELEVATION
SELECTED TOWNS
PROVINCE CAPITALS
NATIONAL CAPITAL
PROVINCE BOUNDARIES
INTERNATIONAL BOUNDARIES

0 100 200 300 400 500 MILES
0 200 400 600 800 KILOMETERS

80° 90° 100° 110° 120°
50° 40° 30°

RUSSIAN FEDERATION
KAZAKHSTAN
MONGOLIA
Manzhouli
Tongjiang
HEILONGJIANG
Harbin
Suifenhe
Kuytun
Urumqi
Dahuangshan
Turpan
XINJIANG
Changchun
JILIN
Shenyang
LIAONING
NEI MONGOL
For detail, see IBRD 34208
Jining
Hohhot
Yellow R.
BEIJING
Tianjin
TIANJIN
DEM. PEOPLE'S REP. OF KOREA
Dandong
Dalian
Sea of Japan
HEBEI
Yinchuan
Shijiazhuang
Taiyuan
Yantai
REP. OF KOREA
NINGBO
SHANXI
Huang He
Jinan
SHANDONG
Qingdao
Yellow Sea
QINGHAI
Xining
Lanzhou
GANSU
Xinxiang
Luoyang
Kaifeng
Zhengzhou
Xuzhou
Lianyuang
Baoji
Weinan
Sanmenxia
Tongguan
Xi'an
SHAANXI
HENAN
JIANGSU
Nantong
Hefei
Nanjing
Shanghai
SHANGHAI
SICHUAN
HUBEI
ANHUI
Chengdu
Chongqing
CHONGQING
Chang Jiang
Wuhan
Jiujiang
Hangzhou
Ningbo
East China Sea
ZHEJIANG
For detail, see map below
Nanchang
Changsha
HUNAN
JIANGXI
GUIZHOU
Hengyang
FUJIAN
Guiyang
Fuzhou
Quanzhou
Xiamen
TAIWAN
GUANGXI
GUANGDONG

118° 119° 120° 121° 122°
31° 30° 29° 28°

JIANGSU
To Changzhou
Tai Hu
SHANGHAI
To Xuanzhou
To Shanghai
ANHUI
2, Xiaofengwangjiazhuang
1000 | 410
1, Laoshikan I
3500 | 1307
HANGZHOU
Hangzhou Wan
Tianmu
Fuchun Jiang
Caoe Jiang
Xinanjiang
Payang Jiang
5, Changting
1800 | 420
8, Nanjiang II
1600 | 300
7, Nanjiang I
6100 | 1200
Qu Jiang
Jinhua Jiang
18, Xixialu
4000 | 736
17, Yuxi I
1000 | 278
6, Tongbai
10000 | 1949
Ling Jiang
11, Hebu
2000 | 680
Dong Hai
14, Jinlong II
1600 | 422
13, Jinlong I
3200 | 817
3, Wutongyuan
1260 | 324
9, Yaxi I
7200 | 2290
4, Xiakou
15000 | 1438
16, Pishiqu
800 | 270
15, Hedui
2000 | 545
JIANGXI
12, Hexi
3200 | 1153
Longquan Xi
10, Xiaojiuxi
2500 | 606
FUJIAN
To Fuzhou

0 20 40 60 80
KILOMETERS

HYDROPOWER STATIONS
IDENTIFICATION:
Description
Installed Capacity (kw) | Output (10^3 kw • h)
PROVINCE CAPITAL
PRIMARY ROADS
RAILROADS
PREFECTURE BOUNDARIES
PROVINCE BOUNDARIES

JULY 2012
IBRD 34209R