Document of
The World Bank

Report No: ICR00003235

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-98703)

ON A

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$13.39 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

PROVINCIAL ENERGY EFFICIENCY SCALE-UP PROJECT

June 29, 2017

Energy and Extractives Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective: December 31, 2016)

Currency Unit = Chinese Yuan (CNY)
US$1.00 = CNY 6.90

FISCAL YEAR
July 1 – June 30

ABBREVIATIONS AND ACRONYMS

BEE	Building Energy Efficiency
BRICS	Brazil, Russia, India, China, and South Africa
CO_2	Carbon Dioxide
CO_2E	CO_2 Equivalent
CPS	Country Partnership Strategy
EE	Energy Efficiency
EMS	Energy Management Systems
EPC	Energy Performance Contracting
ESCO	Energy Service Company
FM	Financial Management
FYP	Five-Year Plan
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO	Global Environment Objective
GHG	Greenhouse Gas
ICR	Implementation Completion and Results Report
ISR	Implementation Status and Results Report
JIIC	Jiangxi Provincial Industrial and Information Commission
KPI	Key Performance Indicator
M&E	Monitoring and Evaluation
MOF	Ministry of Finance
MOHURD	Ministry of Housing and Urban and Rural Development
MTR	Midterm Review
NDRC	National Development and Reform Commission
PAD	Project Appraisal Document
PDO	Project Development Objective
PMO	Project Management Office
QCBS	Quality- and Cost-Based Selection
SIO	Subproject Implementation Office
SME	Small and Medium Enterprise
TA	Technical Assistance
(M)TCE	(Million) Tons of Coal Equivalent
(M)TCO_2E	(Million) Tons of CO_2 Equivalent

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People's Republic of China
Provincial Energy Efficiency Scale-up Project

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DATA SHEET

A. Basic Information			
Country:	China	Project Name:	Provincial Energy Efficiency Scale-up Program
Project ID:	P114182	L/C/TF Number(s):	TF-98703
ICR Date:	06/29/2017	ICR Type:	Core ICR
Lending Instrument:	Specific Investment Loan	Borrower:	MINISTRY OF FINANCE
Original Total Commitment:	US$13.39 million	Disbursed Amount:	US$13.23 million
Revised Amount:	US$13.39 million		
Environmental Category: C		**Global Focal Area: C**	
Implementing Agencies: JIANGXI PMO TF98703 SHANDONG PMO TF98703 SHANXI PMO TF98703			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	05/29/2009	Effectiveness:		08/08/2011
Appraisal:	07/22/2010	Restructuring:	05/17/2016	
Approval:	03/22/2011	Mid-term Review:	09/22/2014	
		Closing:	06/30/2016	12/31/2016

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Global Environment Outcome	Negligible to Low
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	Moderately Satisfactory	Government:	Satisfactory
Quality of Supervision:	Moderately Satisfactory	Implementing Agency/Agencies:	Satisfactory

Overall Bank Performance:	Moderately Satisfactory	**Overall Borrower Performance:**	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
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):	Yes	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Major Sector/**Sector Code (as % of total Bank financing)**		
Energy and Extractives		
Public administration - Energy and mining	77	77
Energy efficiency in Heat and Power	23	23
Major Theme/Theme Code (as % of total Bank financing)		
Climate Chance	100	100
Mitigation	100	100

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Victoria Kwakwa	James W. Adams
Country Director:	Bert Hofman	Klaus Rohland
Practice Manager/Manager:	Jie Tang	John A. Roome
Project Team Leader:	Jonathan Edwards Sinton	Ede Jorge Ijjasz-Vasquez, Vijay Jagannathan
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F. Results Framework Analysis

Project Development Objective and Key Indicators

1. The proposed Project Development Objective (PDO) of Provincial Energy Efficiency Scale-up Project (henceforth 'project') was to improve quality and sustainability of provincial energy efficiency programs in Shandong, Shanxi, and Jiangxi Provinces through technical assistance and institutional capacity building.

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Investment flows from energy service companies (US$ million).			
Value (quantitative or Qualitative)	0	429.00		736.54
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (172%).			
Indicator 2:	Coverage (# of enterprises) of energy efficiency monitoring & supervision information platform.			
Value (quantitative or Qualitative)	0	500		2,006
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (400%).			

Global Environment Objective and Key Indicators

2. The proposed Global Environment Objective (GEO) was to achieve energy savings and associated greenhouse gas (GHG) emission reductions through incremental energy efficiency investments and improved energy efficiency management enabled by provincial energy conservation programs that have been strengthened by the project.

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Cumulative lifetime energy savings (Mtce).			
Value (quantitative or	0	18.20		65.92

Qualitative)				
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (362%).			
Indicator 2:	Associated GHG emissions reductions (mCO2e).			
Value (quantitative or Qualitative)	0	44.40		173.93
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (392%).			

(b) 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:	A1.1 Development of supporting policies for energy service industry.			
Value (quantitative or Qualitative)	none	policies implemented		policies implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	This component led, among other outputs, to guidelines for measuring and calculating energy savings that are recognized standards in Shandong Province since January 14, 2016. The target was achieved (100%).			
Indicator 2:	A1.2 Number of EPC projects conducted.			
Value (quantitative or Qualitative)	0	225		736
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (327%).			
Indicator 3:	A2.1 Number of enterprises connected to the information platform.			
Value (quantitative or Qualitative)	0	200		1518
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. %	The target was substantially exceeded (759%).			

achievement)				
Indicator 4:	A2.2 Number of staff/officials trained to use the information platform.			
Value (quantitative or Qualitative)	0	400		1040
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (260%).			
Indicator 5:	A3.1 Number of enterprises adopting EMS.			
Value (quantitative or Qualitative)	8	200		1188
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Shandong Province developed a system for accrediting enterprises for the adoption of EMS. The target was substantially exceeded (594%).			
Indicator 6:	A 4.1 Number of energy conservation staff/officials trained			
Value (quantitative or Qualitative)	0	450		7307
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Professional training for EE monitoring and supervision officials at provincial levels was successfully provided. The target was substantially exceeded (1623%).			
Indicator 7:	B1.1 Development of supporting policies for energy service industry			
Value (quantitative or Qualitative)	none	policies implemented		policies implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Results from an ESCO survey and other research activities of this component helped create a five-year development plan for the ESCO industry. Target achieved (100%).			
Indicator 8:	B1.2 Number of EPC projects conducted.			
Value (quantitative or Qualitative)	0	105		50
Date achieved	05/31/2011	12/20/2016		12/20/2016
Comments (incl. % achievement)	Unlike the other Provinces, Shanxi was only able to report on subsidized EPC projects, which reduced the total count of EPC project conducted. The target was partially achieved (48%).			
Indicator 9:	B 2.1 Number of buildings obtaining energy efficiency building labels.			

Value (quantitative or Qualitative)	0	20		20
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Following energy audits in 400 buildings 20 received labels after rehabilitation. The target was achieved (100%).			
Indicator 10:	B 3.1 Number of enterprises connected to the information platform.			
Value (quantitative or Qualitative)	0	100		400
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (400%).			
Indicator 11:	B 3.2 Number of staff/officials trained to use the information platform.			
Value (quantitative or Qualitative)	0	300		480
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Training at the Shanxi Brigade for Inspection of Energy Conservation helped raise awareness about the platform and EE more broadly among enterprises, energy managers, supervision staff and administration officials. The target was exceeded (160%).			
Indicator 12:	B 4.1 Development of energy pricing adjustment policies to promote energy conservation.			
Value (quantitative or Qualitative)	none	policies implemented		policies partially implemented
Date achieved	05/31/2011	12/30/2016		10/31/2016
Comments (incl. % achievement)	A major study of coal-bed methane gas pricing was completed. Implementation of recommendations was under discussion at project closure. The target was partially achieved (50%).			
Indicator 13:	B 4.2 Development of taxation policies and other fiscal policies to promote energy conservation.			
Value (quantitative or Qualitative)	none	policies implemented		policies not implemented
Date achieved	05/31/2011	12/30/2016		12/30/2016

Comments (incl. % achievement)	A fiscal support study for an energy-saving fund was prepared. Financing for the fund came from a coal resource fee that was unexpectedly abolished, such that the fund could never materialize. The target was not achieved.			
Indicator 14:	B 5.1 Development of energy efficiency indices system.			
Value (quantitative or Qualitative)	none	system implemented		system implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	A system for EE indices was developed as part of the provinces effort to improve energy data monitoring. The target was achieved (100%).			
Indicator 15:	B 5.2 Number of staff trained.			
Value (quantitative or Qualitative)	0	150		949
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Training sessions on the Energy Consumption Statistics System sessions were offered every year focusing on three different sectors: coal and coal-related industry, heavy energy consumers, and SMEs. The target was substantially exceeded (633%).			
Indicator 16:	C 1.1 Development of supporting policies for energy service industry.			
Value (quantitative or Qualitative)	none	policies implemented		policies implemented
Date achieved	05/31/2016	12/30/2016		12/20/2016
Comments (incl. % achievement)	Work underlying this indicator led to three plans officially adopted as part of the 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry.' The target was achieved (100%).			
Indicator 17:	C 1.2 Number of EPC projects conducted.			
Value (quantitative or Qualitative)	0	75		96
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was exceeded (128%).			
Indicator 18:	C 2.1 Number of enterprises connected to the information platform.			
Value (quantitative or Qualitative)	0	200		518

Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (259%).			
Indicator 19:	C 2.2 Number of staff/officials trained to use the information platform.			
Value (quantitative or Qualitative)	0	400		2400
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (600%).			
Indicator 20:	C 3.1 Development of fiscal subsidies & rewarding policies to promote energy conservation.			
Value (quantitative or Qualitative)	none	policies implemented		policies implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	This work supported research on fiscal and price incentives and informed 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry'. The target was achieved (100%).			
Indicator 21:	C 3.2 Development of taxation policies to promote energy conservation.			
Value (quantitative or Qualitative)	none	policies implemented		policies implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	This work supported research on fiscal and price incentives and informed 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry'. The target was achieved (100%).			
Indicator 22:	C 3.3 Development of energy pricing adjustment policies to promote energy conservation.			
Value (quantitative or Qualitative)	none	policies implemented		policies implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	This work supported research on fiscal and price incentives and informed 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry'. The target was achieved (100%).			
Indicator 23:	C 4.1 Development of energy conservation monitoring implementation plan for key energy-consuming industry.			

Value (quantitative or Qualitative)	none	plan developed		plan developed
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The 'Application of Jiangxi provincial energy-saving monitoring' directly contributed to the introduction of 'Nanchang regulations on monitoring industrial energy saving'. Target was achieved (100%).			
Indicator 24:	C 4.2 Number of staff/officials trained in the EE monitoring and supervision system.			
Value (quantitative or Qualitative)	0	300		981
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	The target was substantially exceeded (327%).			
Indicator 25:	C 5.1 Development of energy efficiency appraisal methods and associated guidance for fixed-assets invest.			
Value (quantitative or Qualitative)	0	methods and guidance implemented		methods and guidance implemented
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	A total of 500 staff received training using the methods and guidance developed on the fixed-asset EE appraisal system, of which 200 were from enterprises. The target was achieved (100%).			
Indicator 26:	C 5.2 Number of energy efficiency fixed-asset appraisals conducted.			
Value (quantitative or Qualitative)	0	20		2171
Date achieved	05/31/2011	12/30/2016		12/20/2016
Comments (incl. % achievement)	Supported by the developed methods and guidance, as well as the standardization of energy audits, the target was substantially exceeded (10855%).			

Revised Project Development Objective (as approved)

The PDO remained unchanged throughout project implementation.

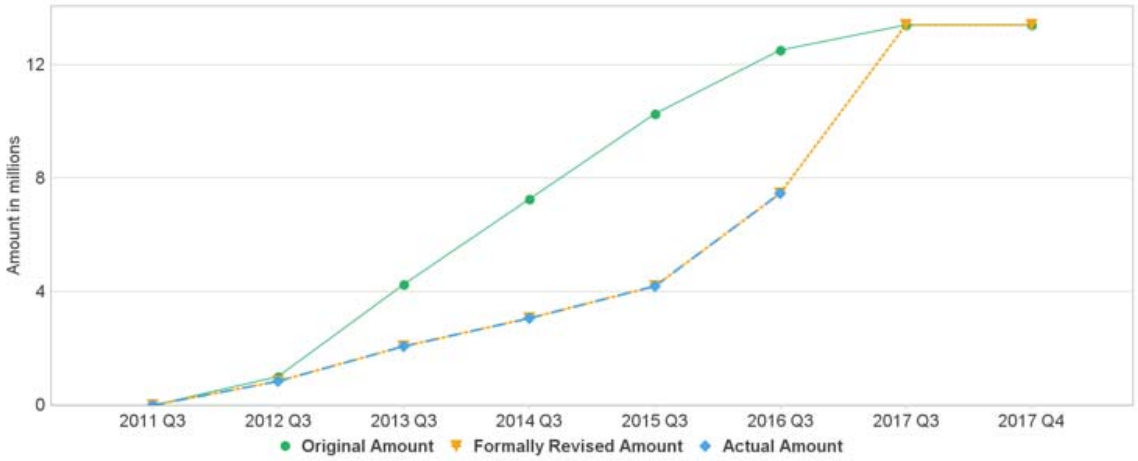
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (US$, millions)
1	09/22/2011	Satisfactory	Satisfactory	0.00
2	11/07/2012	Moderately Satisfactory	Moderately Satisfactory	1.65
3	06/22/2013	Moderately Satisfactory	Moderately Satisfactory	2.06
4	12/22/2013	Moderately Satisfactory	Moderately Satisfactory	2.68
5	06/24/2014	Moderately Satisfactory	Moderately Satisfactory	3.20
6	11/28/2014	Moderately Satisfactory	Moderately Satisfactory	3.78
7	06/09/2015	Moderately Satisfactory	Moderately Satisfactory	4.54
8	12/13/2015	Moderately Satisfactory	Moderately Unsatisfactory	5.62
9	04/11/2016	Moderately Satisfactory	Moderately Satisfactory	7.45
10	07/27/2016	Moderately Satisfactory	Moderately Satisfactory	8.90
11	12/23/2016	Satisfactory	Satisfactory	12.02

H. Restructuring

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
05/17/2016		MS	MS	7.45	A Level Two restructuring was approved on May 17, 2016, to extend the closing date of the grant by six months to December 31, 2016 from the original closing date of June 30, 2016. The extension was deemed necessary to enable the project to achieve its end targets and to enhance the positive impacts delivered by the project.

I. Disbursement Profile



1. Project Context, Global Environment Objectives, and Design

1.1 Context at Appraisal

Country and Sector Background

1. **At the time of project appraisal, China's leadership called for a reduction in carbon dioxide intensity (CO_2 emissions per unit of GDP) in its economy by 40-45% from 2005 to 2020.** Achievement of this objective would require sustained efforts to reduce energy intensity in the economy and increase the share of non-fossil fuels in the energy mix. China had set a domestic energy intensity reduction target of 20% per unit of GDP from 2006-2010 and a non-fossil fuel target of 15% of primary energy by 2020 under the 11th Five-Year Plan (FYP). Following the announcement of the target, responsibility contracts for achieving specific and quantified energy savings were established for all levels of government, down to cities and counties, and for key energy-using enterprises. While outdated and energy-intensive industrial and power plants were closed, structural adjustment programs started shifting the economy from industry- and export-driven growth to a more service-oriented economy.

Role of Provinces

2. **Provincial governments, and the prefectural and county governments under their direct administration, are the key levels for implementing most of China's core energy efficiency (EE) programs.** All provinces negotiated specific energy intensity reduction targets with the Central Government as their contributions to the national FYP goal, and provincial governors were held accountable for achievement of these targets. Provincial agencies were responsible for implementation of industrial energy conservation programs. Building EE and urban transportation initiatives were under the purview of city governments, but provincial government also played important coordinating roles in those sectors. Prominent themes of provincial EE efforts underway at the time of project appraisal were:

    (a) **Key Enterprise Energy Saving Program**. In the 11th FYP, the Central Government set mandatory energy savings targets for the top 1,008 energy-consuming enterprises in the country and provided guidelines for implementation. The 12th FYP (2011-2015) built upon this with the 10,000 Enterprise Program which covered more than 15,000 energy-consuming enterprises. Provincial governments oversaw the details of implementation. Provinces and prefectures extended this framework by signing energy savings responsibility contracts with thousands of additional key energy-using enterprises.

    (b) **Industrial Structural Adjustment Efforts.** With the aim of encouraging a structural shift in industry towards a less energy intensive economy, provinces aimed to: (a) encourage the development of high- and new-technology industries and the service sector: (b) eliminate particularly wasteful and sub-scale industrial capacity; and (c) limit new investments in energy-intensive projects through E assessments.

    (c) **Developing the EE Service Industry**. Provinces undertook measures to foster the EE service industry by supporting energy auditing, testing and consulting, EE technology

dissemination, EE project design and appraisal, and EE training for energy service companies (ESCOs) and energy managers at large enterprises.

(d) **Fiscal Incentive Programs and Energy Pricing.** Although fiscal and pricing policies broadly fell under the purview of the Central Government, provinces had leeway to provide incentives through the allocation of received funds from the Central Government towards activities encouraging EE, as well as through certain prices and tax which can be set sub- nationally within national guidelines.

Key Challenges

3. **Barriers to achieving national and provincial EE targets under the 11th and 12th FYP (2011-2015), as well as ensuring sustained EE improvements, can be summarized in three types, below.** The first two of these barriers reinforce each other and contribute to the third barrier.

(a) Inadequate information, including on successful energy conservation program design and operational experience elsewhere – with a danger of reinventing the wheel, as well as inadequate information on energy use trends and conservation opportunities in enterprises.

(b) Limited human capital in EE, resulting from a lack of expertise in dealing with EE, especially in EE program management.

(c) Absence of an EE market, as neither enterprises, ESCOs nor financiers have sufficient information and human capital to engage in EE.

Rationale for World Bank Assistance

4. **Building on a long and productive relationship between the World Bank and relevant authorities in China on EE issues, the World Bank was in a good position to support the Government of China in addressing the barriers to EE scale-up.** The World Bank already supported the development of Energy Performance Contracts (EPCs) and ESCOs, the EE lending business in major Chinese banks, low carbon city support, district heating system modernization and reform, residential building EE and planned new activities in the industrial sector and government building sectors. These efforts overlapped with the prominent themes in Provincial EE program, and contributed towards developing institutional capacity and EE markets. Moreover, the World Bank had experience customizing energy conservation program concepts to China's local circumstances, which was important for this project. One example was the introduction, adaptation, and scale-up of energy performance contracting (EPC) through the First and Second World Bank/GEF China Energy Conservation Projects. China now has the largest EPC investment volume in the world.

Contribution to higher-level objectives

5. **The objective of the proposed project was consistent with the Country Partnership Strategy** for FY2006-FY2010 (Report No. 35435-CN), approved by the Board on May 23, 2006. It supported one of five pillars of the Country Partnership Strategy (CPS)for China:

managing resource scarcity and environmental challenges. This pillar supported China's effort to meet its ambitious goals for creating a more resource-efficient, less polluting society under the 11th FYP, which was expected to continue during the 12th FYP. It also supported China's undertaking to improve EE, to expand use of renewable energy and to address climate change. The project was also consistent with the GEF climate change focal area and specifically consistent with the GEF strategic objectives to: (a) promote industrial EE; and to (b) promote energy-efficient technologies and practices in the appliance and building sectors.

1.2 Original Project Development Objective (PDO) and Global Environment Objectives (GEO) as well as Key Performance Indicators

6. The PDO of the Provincial Energy Efficiency Scale-up Project as defined in the Project Appraisal Document (PAD) was to improve quality and sustainability of provincial EE programs in Shandong, Shanxi, and Jiangxi Provinces through technical assistance and institutional capacity building.

PDO Key Performance Indicators

- Investment flows from ESCOs (US$, million)
- Coverage of EE monitoring and supervision information platforms (number of enterprises)

7. The GEO as defined in the PAD was to achieve energy savings and associated GHG emission reductions through incremental EE investments and improved EE management enabled by provincial energy conservation programs that have been strengthened by the project.

GEO Key Performance Indicators

- Cumulative lifetime energy savings (million tons of coal equivalent [Mtce])[1]
- Associated GHG emissions reductions (million tons of CO_2 [$MtCO_2$])

1.3 Revised PDO/GEO and Key Indicators, and Reasons/Justifications

8. The original PDO, GEO and key performance indicators (KPIs), including the targets, as stated in the Grant Agreements, did not change during the life of the project.

1.4 Main Beneficiaries

9. The PAD did not explicitly state who the intended beneficiaries were aside from stating that the project supported the three provinces of Shandong, Shanxi, and Jiangxi. However, deducing from the project components, the primary beneficiaries were:

[1] Starting with ISRs, cumulative energy savings were also reported in units of megawatt hours (MWh). These were calculated assuming a conversion factor of 8.14 MWh per ton of coal equivalent (tce).

(a) Staff working at the Project Management Offices (PMOs) of Shandong, Shanxi and Jiangxi as well as departments that benefitted from studies that were prepared under the project, such as the Provincial Finance departments.

(b) Staff and owners of organizations in the private sector benefitting from capacity building and investments in energy conservation. Particularly, staff and owners of large energy-consuming enterprises (those among China's top 10,000 key energy-consuming enterprises as well as those overseen by provincial policies).

(c) Staff and owners of ESCOs as well as provincial ESCO associations.

10. Additional beneficiaries included:

(a) Government agencies, including the National Development and Reform Commission (NDRC), that adopted new policies and regulations concerning EE informed by or based on project outputs;

(b) Technical organizations, which strengthened the capability to design and deliver the support needed by the Government to promulgate and manage the evolution of effective EE policies; and

(c) The general public that would benefit from reduced pollutant emissions resulting from the investments financed by the project.

1.5 Original Components (as approved)

11. **The project comprised three provincial components**: (a) Shandong Energy Efficiency Scaling-up Program (GEF financing, US$4.46 million); (b) Shanxi Energy Efficiency Scaling-up Program (GEF financing, US$4.46 million); and (c) Jiangxi Energy Efficiency Scaling-up Program (GEF financing, US$4.46 million). A summary of project costs and financing is listed in annex 1.

12. **Each component provided technical assistance (TA) and capacity building for four to six thematic programs tailored to the priorities of each province.** Most thematic program were comprised of several subcomponents or activities. The thematic programs at approval are described in the following paragraphs, and summarized in table 1.

(a) **Develop the EE service industry.** The EE service industry includes enterprises and other organizations that undertake a wide variety of EE services from energy auditing and consulting to EE financing and implementation. This thematic program supported TA (for instance, market assessment and policy analysis) and capacity building (for instance, training activities) to help develop this industry.

(b) **Establish EE monitoring, supervision, and information management platforms.** The platforms established under the project included various technologies and functions, such as network-based data collection and reporting, advanced energy metering systems, data analysis, and network-based information dissemination and communication. Special focus was given to key energy-consuming enterprises

because of the effort to both strengthen the effectiveness of energy targeting systems and assist enterprises in identifying key energy saving opportunities. This thematic program supported both software and hardware to develop platforms tailored to each province's own needs.

(c) **Promote enterprise Energy Management Systems (EMS).** EMSs provide a comprehensive management systems approach for enterprises to assess their energy consumption, identify opportunities to use energy more efficiently, establish EE goals, and monitor and measure progress toward these goals on a continuous basis. This thematic program promoted adaptation of EMS in industrial enterprises through training activities, hands-on guidance, EMS assessment, and demonstration of good practices to improve results in enterprise energy savings.

(d) **Build capacity for EE program management and supervision in local enterprises and agencies.** The quality of implementation of local EE programs depends critically on the capacities and abilities of these agencies and their staffs. This thematic program supported capacity building through training activities, upgrading of technical equipment, and TA in developing detailed implementation plans for EE regulations, standards, and policies.

(e) **Develop energy pricing and fiscal policies to further incentivize EE activities and investments.** Energy pricing and related fiscal policies directly influence EE activities and investments. This thematic program was directed at areas where provincial governments had the authority to adjust energy prices, to add specific energy surcharges, or to implement other fiscal policies that could further improve market incentives without unduly compromising vulnerable groups.

(f) **Support building energy efficiency (BEE) programs.** At the time of project preparation, energy consumption in buildings was identified by the NDRC as one of the three 'energy-intensive sectors' along with industry and transportation. It was especially important in the northern provinces, which have large winter space heating needs. This thematic program helped to develop both provincial BEE assessment and labeling programs and BEE systems for provincial government buildings through detailed implementation guidance and training activities for relevant professionals.

(g) **Strengthen the system of collecting statistics on energy consumption**. A good statistics system is critical for providing reliable energy consumption data that covers all energy producers and consumers. Combined with statistics on outputs, energy consumption statistics establish energy indicators that can be used for monitoring and decision making. This thematic program helped strengthen the EE statistics system in the provincial units of the National Statistical Bureau system by providing training to technical staff, offering TA on building an energy consumption database, and developing relevant regulations and guidance.

(h) **Establish the EE appraisal system for large, new fixed-asset investments.** Because energy demand from new fixed-assets investments (like factories, power plants, office buildings and apartment blocks) generally persists over many years, it is important to

ensure that these new investments meet EE requirements when they are built and that energy-inefficient technologies are avoided. This is especially important for provinces that are rapidly industrializing and urbanizing, when many new industrial projects and large real estate projects are expected. This thematic program provided TA on developing such a system with associated implementation regulations and guidance.

Table 1. Thematic Program by Province

Thematic Programs	Shandong	Shanxi	Jiangxi
(1) Develop the EE service industry	✓	✓	✓
(2) Establish an EE monitoring, supervision, and information management platform	✓	✓	✓
(3) Promote Enterprise Energy Management Systems (EMS)	✓	—	—
(4) Build capacity for EE program management and supervision in local enterprises and agencies	✓	✓	✓
(5) Develop energy pricing and fiscal policies to further incentivize EE activities and investments	—	✓	✓
(6) Support BEE programs	—	✓	—
(7) Strengthen the energy-use statistics system	—	✓	—
(8) Establish EE appraisal system for large, new fixed-asset investment	—	—	✓
Number of programs	*4*	*6*	*5*

13. **To address the respective sets of priorities in each province and over the project implementation period, the provinces each chose a different, though overlapping, set of activities within the themes.** For instance, all three provinces had subcomponents to develop, install, to train staff on, and to pilot online energy consumption monitoring systems. On the other hand, four thematic areas had only one province with subcomponents in those areas. Shandong, Jiangxi and Shanxi had, respectively, four, five and six thematic programs.

14. **The project also employed a rolling approach to programming implementation.** The work program included a detailed work programming exercise each year, with reviews during semiannual missions, followed by final definition and agreement on the following year's activities.

1.6 Revised Components

15. There were no revisions to the original project components.

1.7 Other Significant Changes

16. **Extension of the project closing date.** The original closing date was June 30, 2016. In May 2016, the closing date was extended by six months, until December 31, 2016, to allow for full disbursement, achievement of project end targets, and enhancement of project impacts, such as summarizing and disseminating lessons from the project to other provinces.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Soundness of Background Analysis

17. **The project built upon the long collaboration between the Government of China and the World Bank to improve EE of the Chinese economy, and was founded on extensive, current analysis of how to improve EE at the provincial level**. This project responded to the recognition that improving the ability to implement central-level EE policies at provincial levels is necessary to successfully reach the Government's FYP EE targets. This was reflected in the NDRC's *Survey Report on the Energy Conservation Measures and Actions of Chinese Provincial Governments* (2008)[2] and *Best Practice Case Studies of Chinese Provincial Energy Conservation Actions* (2009)[3], the World Bank's sector study *Accelerating Energy Conservation in China's Provinces* (2010)[4], and the CPS of 2006-2010. These resources effectively enabled the selection and design of suitable approaches to the different thematic programs described above in section 1.5.

Assessment of Project Design

18. **The design of the Provincial Energy Efficiency Scale-up Project was fundamentally sound.** The PDO and GEO were defined in ways that were relevant, adequate, and in line with the priorities of the Government of China and the beneficiary provinces. The provincial implementing agencies were chosen based on the recognition that local institutions and innovation help generate urgently needed local implementing capacity and opportunities for peer learning while at the same time helping align the provincially tailored project components with the broader objectives of the Government. The selection and design of the provincial subcomponents were geared toward adapting central-level regulations on EE. The Jiangxi PMO, for instance, reported that in the selection of components, prioritization was done in accordance with the 12th FYP.

19. **The project implementation arrangements were well designed, and were customized to the varying capacities and structures of the agencies that govern and enforce EE in the provinces.** Each of the provinces established a PMO which was responsible for project coordination and implementation. Specific arrangements differed among provinces based on their respective circumstances. In Shandong Province, the PMO was established under the Provincial Government Energy Conservation Office. In Shanxi Province, the PMO was established under the Shanxi Provincial Finance Bureau. In Jiangxi Province, a PMO was formed jointly by the Jiangxi Provincial Industrial and Information Commission (JIIC) and the Provincial Finance Bureau. A more detailed description of the implementation arrangements is presented in Annex 7.

20. **In recognition of the differing capacities and development stages of the beneficiary provinces, as well as the benefits of inter-provincial knowledge exchange, the project included activities for peer learning.** The project also supported an international EE adviser to facilitate inter-provincial information sharing. Peer learning between Shandong, Jiangxi, and Shanxi, as well as with other provinces, was accomplished through several channels,

[2] NDRC, 2008, Survey Report on the Energy Conservation Measures and Actions of Chinese Provincial Governments. Energy Conservation Information Dissemination Center.
[3] NDRC, 2009, Best Practice Case Studies of Chinese Provincial Energy Conservation Actions. Energy Conservation Information Dissemination Center.
[4] World Bank. 2010. *Accelerating Energy Conservation in China's Provinces*. World Bank. https://openknowledge.worldbank.org/handle/10986/2894 License: CC BY 3.0 IGO.

including (a) biannual missions that brought all PMOs together; (b) activities and events organized by the Energy Foundation, an EE nongovernmental organization and advocacy group; (c) joint studies with other provinces; and (d) training and study tours. For example, the Shandong PMO provided training material and trainers for the provinces of Yunnan and Guangxi.

Adequacy of Government Commitment

21. **The overall level of commitment of the Government of China remained strong throughout the project.** This commitment was encapsulated in the Fiscal Year Plans (FYPs), which set targets and priority policies that spurred efforts to reduce energy intensity at all levels of government. Building on the achievements in reducing energy intensity under the 11th FYP, the 12th FYP set a new and ambitious energy intensity reduction target of 16 percent per unit of GDP, which was adopted shortly after the commencement of the project. The 13th FYP became the focus of attention toward the end of the project and provided a strong incentive to maintain that commitment.

22. **All three provincial governments demonstrated good attention and engagement throughout the project.** Provinces also demonstrated commitment toward reducing energy intensity by taking initiatives to develop an environment supportive of furthering energy savings that went beyond those mandated by the national government. For instance, Shandong developed a 'Performance Evaluation Method' to assess EMSs that complemented the existing national 'Certification Method'.

Assessment of Risk at Time of Appraisal

23. **At appraisal, the overall project risk rating was assessed as 'Modest' and the risk mitigation measures adopted were appropriate** (table 2). The two risks rated 'Modest' were the ones that turned out to be relevant. One of these, weak implementation capacity of provincial governments, was a factor in implementation, and was addressed through the implementation support missions and training given by the World Bank. The other risk rated 'Modest' was difficulty in project supervision due to the large number of project activities in the three provinces. Mitigation measures undertaken for both risks were appropriate and effective.

Table 2. Critical Risks and Possible Controversial Aspects

Project Risks Identified at Appraisal	Mitigation Measures	Risk Rating After Mitigation	Actual risk	Adequacy of Mitigation Measures
Weakened provincial government commitment to promote EE if the energy intensity target is not continued in the 12th FYP.	China's leadership had called for a reduction in carbon dioxide intensity in its economy by 40%–45% from 2005 to 2020. Achievement of this objective would require continued efforts to reduce energy intensity. The energy saving responsibility system played a key role in the 11th FYP and was considered highly likely to continue in the 12th FYP.	Low	The Government of China continued to pursue ambitions of energy intensity targets in the 12th and 13th FYP	As the risk did not materialize, mitigation was not necessary.
Weak implementation capacity of provincial governments	The proposed GEF project was expected to strengthen the Government's implementation capacity in the three provinces.	Modest	Shanxi and Jiangxi Provinces started from a position of more limited experience implementing EE projects.	Adequate. Through TA and capacity building supported by the project, all provinces rapidly developed stronger implementation capacities. The World Bank team provided training in procurement and financial management necessary to execute project activities.
Difficulty in project supervision due to the large number of project activities in the three provinces	The GEF project included provision for periodic joint meetings for coordination and work planning. The provinces hired an international EE project adviser who was tasked with helping develop well-formulated terms of references for the various subcomponents.	Modest	Project supervision was challenging, especially for Shanxi, where the PMO was established under the Provincial Finance Bureau rather than an agency concerned with EE. Shanxi also had the largest number of thematic areas (six) to coordinate.	Adequate. Through periodic meetings and substantial efforts on the part of the EE project advisor, project activities were developed, adapted and monitored appropriately.
Overall risk rating		Modest		Adequate

2.2 Implementation

24. **The three provincial PMOs not only carried out project activities, but became catalysts for pursuing the wider EE agenda of the provinces, in the service of national EE goals.** The project established of PMOs that were either entirely new implementing units (as for Shanxi) or the significant strengthening of existing EE units (in the cases of Shandong and Jiangxi). These PMOs not only had access to the projects grant funds, but also the provincial governments' financing. The availability of provincial outlays was important, because, as is common in many World Bank-financed projects, it takes time for PMOs to become familiar with the rules and practices for handling funds from an international financial institution. The achievement (and in some cases exceedance) of some targets well before the end of the project is attributable in part to the access of the PMOs to significant counterpart financing, and supported by the strong push by national and provincial levels of government to pursue EE goals.

25. Nevertheless, progress in implementation varied over time, among provinces, and among subcomponents. The Implementation Status Report (ISR) ratings for Implementation Progress started at 'Satisfactory' when the project began in October 2011, to 'Moderately Satisfactory' in mid-2012. These ratings reflected in large part implementation progress of the monitoring and supervision information platform. Delays in the procurement of the goods for the platform, meant that Shanxi and Jiangxi Provinces were not meeting targets for connecting enterprises to the platform nor training staff on how to use it. By the end of 2015, implementation progress was rated "Moderately Unsatisfactory' with significant risk assigned to the possibility that without the extension of the closing date, targets for these indicators would not be met.

26. **That Jiangxi and Shanxi lagged with implementation compared to Shandong can be understood from their different organizational capacities at the start of the project.** Shandong Province had significant experience implementing EE projects. Jiangxi Province on the other hand, started with very little experience but learned quickly. Over the period of project implementation, the capacity of supervision troupes in Jiangxi province increased significantly, as the number of troupes at various administrative levels more than doubled, the scope of work broadened and deepened and enforcement capacity strengthened. In Shandong, the PMO was established under a dedicated Provincial Government Energy Conservation Office, while the Shanxi PMO was established under Provincial Finance Bureau where it had relatively little access to 'in-house' EE technical expertise and experience. In addition, the Shanxi PMO had to contend with the largest number of sub-components, adding to the complexity of supervision. This was exacerbated by leadership and staff turnover, which the Shanxi PMO experienced more than the other two provinces.

27. **As the original closing date of June 2016 approached, it was apparent that some of the project targets could not be achieved without a relatively short extension.** Most notably, the provinces were delayed in implementing the rollout of hardware systems for the online energy consumption monitoring platforms, in part due to the rapid evolution of hardware and software systems, requiring redesign of the approach. (The drop in the cost of these systems allowed for savings that allowed expansion of activities in the same or other project areas.)

The design and installation of systems was a prerequisite to the related training tasks as well. An extension would also provide additional time to consolidate and disseminate lessons learned from the project, strengthening the peer learning benefits of the project.

28. **The project was thus restructured in May 2016 to extend the closing date from June 2016 to December 2016.** Afterwards, implementation progress improved markedly and returned to a 'Moderately Satisfactorily' rating that, in 2016, was further increased to 'Satisfactory'. In Shanxi Province, the assignment of a new manager to head the PMO during the last year of the project significantly accelerated project implementation. At the time the project ended, all the PDO results indicators had achieve. Of the intermediate outcome indicators, all but one was not achieved and two were partially achieved.

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

M&E Design

29. T**he M&E design complied with the requirements for GEF-funded projects by including key outcome indicators for EE investments, energy savings, and GHG emissions avoided.** Given the capacity-building nature of the project, this necessitated making strong assumptions about the links between project activities and these indicators. Targets for these indicators in the Results Framework were based on the remaining key outcome indicator—coverage of EE monitoring and supervision platforms—and one intermediate outcome—the number of EPC projects conducted.[5] The remaining intermediate outcome indicators tracked outputs that were more directly related to project activities. The relationship between the indicators and the project objectives is discussed below.

PDO Indicators

30. **Indicators that capture the ultimate outcomes of capacity-building projects like this one are challenging to formulate, and the set developed for this project struck a good balance of measurability and attributability.** The PDO was to improve the quality and sustainability of provincial EE programs in Shandong, Shanxi, and Jiangxi Provinces through TA and institutional capacity building. The channels through which capacity building and TA could improve quality and sustainability were numerous because the project supported several themes across the provinces, each with a varied list of activities suited to its needs and circumstances. It was challenging to define a set of indicators that capture the 'quality' and 'sustainability' of outcomes in ways that are comparable across locations and over time, and that are reasonably economical to track. Moreover, there were tradeoffs between indicators that were broad enough to substantively capture numerous channels through which the project contributed to the PDO and ones that were narrow enough that they were largely attributable to project activities.

31. **The approach taken in the PAD was to use two broad indicators—investment flows from ESCOs** and **number of enterprises connected to the online energy monitoring and**

[5] The investments in EE achieved by Shandong Province were calculated somewhat differently, being based on investment estimates from the Shandong Energy Efficiency Scaling-up Program (P114069). These links are described in more detail in annex 3.

supervision information platforms. The relationship between the latter indictor was direct, since the project supported creation of and connection to the platforms. In the case of the former indicator, ESCO investments, the relationship was more indirect, but still an important means of which capturing the activity of the sector that most directly benefitted from the project's capacity-building activities. Both indicators are correlated with the maturity and vitality of the EE market and, in this regard, capture quality and sustainability of project outcomes. These were complemented by the more-specific intermediate outcome indicators, described below.

32. **Since this was not an investment project, there was no defined set of investments from which to calculate energy savings that were directly and wholly attributable to the project.** At the same time, the overall impact of this project was to improve the environment for investments in EE. As such, at least a portion of the overall activity in EE investment was felt to be attributable to project activities. One possibility would have been to track overall trends in EE investment, but these can fluctuate based on many factors. At the design stage, it was decided to track a given fraction of total investments in ESCO-financed projects in each province, representing an approximation of incremental investments arising from the improved investment environment resulting from the project. EE investments are difficult to measure under ordinary circumstances, but at the time of project design provinces were tracking ESCO investments very closely because of the policy of offering government financial support to them, based on *ex post* validation. This provided a high level of confidence that such indicators, collected and reported annually by provincial governments, would provide an accurate account of trends in EE investment, even if it did not capture the entire market.

33. **The energy monitoring platforms implemented in project provided the three provinces the ability to measure energy consumption of enterprises**, in many cases at the level of major equipment, like boilers. The platforms are key to the ability of the provinces and the country to carry out their ambitious policies not only with respect to EE, but also CO_2 emissions reductions. It can be claimed that the project in fact accelerated this process — possibly by years — and helped to improve the quality of how it was done.

34. **Considering the discussed trade-off in indicator design, the PDO outcome indicators are rated adequate for monitoring progress toward the PDO**. However, the PAD would have benefitted from a discussion of these design considerations, as well as an explanation of how exactly the information on energy investments would be collected to better describe what it represented in relation to the project activities.[6]

[6] Alternative or additional PDO outcome indicator that could have been considered at the design stage would not have overcome the inherent difficulties of measuring this project's outcomes. The current intermediate outcome indicator 'staff trained to operate and monitor the energy data platform' captures an activity that increases skills and raise productivity, resonating with the PDO elements of 'quality' and 'sustainability'. Such an indicator would have further desirable properties of being project attributable and highlights the project's efforts to remove one of the key barriers to EE scale-up as identified in the PAD—that of insufficient human capital. However, the indicator would track another output rather than an outcome.

GEO Indicators

35. **The GEO indicators were of a similar quality as the PDO indicator on ESCO investment flows; they were necessarily related to CO_2 emissions and the energy savings underpinning them, but equally necessarily indicative of the improved investment environment resulting from the project rather than being wholly attributable to the project.** The GEO was to achieve energy savings and associated GHG emission reductions through incremental EE investments and improved EE management enabled by provincial energy conservation programs that have been strengthened by the project. It well accepted that simply making financing available is insufficient to catalyze EE investment. Capable implementation of well-designed policies and regulations—the purpose of this project—is at least equally necessary. Therefore, although the GEO indicators track outcomes indirectly attributable to the project, they represent an adequate approximation of impacts that are not possible to quantify directly.

Intermediate Outcome Indicators

36. **The intermediate outcome indicators tracked some of the many outputs resulting from the capacity-building efforts, and, being more narrowly defined and more directly attributable to project activities, complemented the broader PDO and GEO indicators.** Some of the intermediate indicators were simply each province's contributions to the PDO and GEO indicators, while others covered reports, regulation, training sessions, that were attributable to the project. The intermediate outcome indicators reflect increased capacity at the provincial level to collect, evaluate, and report on EE information as well as shape an environment that fosters greater EE efforts. To capture the wide variety of outcomes supported by this project, an unusually large number of indicators was created. This helps to communicate the richness of the project content.

37. **There are two areas where the M&E design of the intermediate outcome indicators could have been improved.** First, the description of indicators and targets relating to policy development in the Results Framework could better reflect what was being tracked, namely outputs that support research and development of policies, plans, standards, and regulations. The targets 'Policies Implemented' are not accurate. Second, as mentioned earlier, the intermediate outcome indicator number of EPC projects conducted holds a special role in the Results Framework.[7] It is the only variable underlying the calculation of leveraged private EE investments for the Results Framework and the primary determinant of energy savings and GHG emissions reductions. The issue of attribution of outcomes to project activities rests heavily on this indicator. Both the PAD and project manuals are missing a precise elaboration on how this indicator measures an acceleration of the EPC market related to project activities rather than a continuation of an existing trend.

[7] An Energy Performance Contract (or Energy Savings Performance Contract) is an arrangement between an ESCO and an energy-consuming enterprise. The ESCO identifies energy saving opportunities, makes the investments necessary to pursue them, and recoups the investment costs from payments in return for guaranteed savings as specified under the terms of the contract.

M&E Implementation

38. **The M&E implementation was challenging because of the large number of indicators.** Data collection was mainly done by PMOs and indicator status was reported biannually to the World Bank supervision team for ISRs. While the unusually large number of intermediate indicators aided in monitoring for implementation, it was also resource-intensive to track so many of them.

39. **The PDO indicator on the number of enterprises connected to the data platform was relatively easy to monitor in real time.** The other PDO indicator, energy savings for ESCOs, along with other GEF indicators, were collected through official channels that monitor and report this information. For example, in Shandong, the data were obtained from the Annual Notification of Energy-saving Service Industry Development, reported by 200 key energy-saving service companies, recorded in local energy-saving offices, and summarized by the Shandong PMO.

40. **Most intermediate outcome indicators were very straightforward to track**, consisting of staff trained; enterprises connecting to the monitoring platform; enterprise adopting EMS; development of policy, plans, and guidelines; building labels awarded; and appraisals conducted. One of the intermediate indicators, 'number of EPC projects conducted', however, was implemented inconsistently. The indicator, as presented in the Results Framework, is an annual target. However, this annual target increased over time and both the ISRs and the provinces interpreted the numbers as being cumulative, which resulted in the end target appearing significantly lower than the intended target. Moreover, some provinces reported only on outputs from subsidized EPC projects while others reported on outputs from both subsidized and unsubsidized EPC projects. The combination of these two factors appears to have contributed to Shanxi Province not attaining its real target.

M&E Utilization

41. **The M&E results were used by the PMOs to measure their progress, and provided the basis for adjustments to their respective implementation plans to achieve the project's objectives.** Each of the three PMOs had the responsibility for collection of the data on the indicators, which were reported semiannually to the Government of China and the World Bank. The measured progress was a focal point of discussion during the World Bank's implementation support missions, and indicators were used as diagnostic tools for identifying areas where emerging issues might require attention. For instance, the indicators were important in identifying the delay in procurement and implementation of the online energy monitoring systems, and enabled the World Bank team to focus its support on resolution of issues that were hindering progress.

42. **The setting of separate intermediate indicators for each province enabled the implementation support to be tailored to each province's needs.** Tracking of the indicators were also important in deliberations concerning the extension of the closing date of the project, showing at the time that attainment of end targets could realistically be achieved within the additional six months granted for project implementation.

2.4 Safeguard and Fiduciary Compliance

Safeguards Compliance

43. **Environmental safeguards.** The project financed TA and institutional capacity building, with limited equipment installation and with no works performed with GEF financing. The World Bank's OP 4.01 (Environmental Assessment) was not triggered.

44. **Social safeguards.** The project financed TA and institutional capacity building but with limited equipment and installation of goods. No works were implemented with GEF financing. Neither OP 4.12 (Involuntary Resettlement) nor OP 4.10 (Indigenous Peoples) was triggered.

Financial Management and Procurement

45. **Financial management. The project had an adequate financial management (FM) system that provided, with reasonable assurance, accurate and timely information that the loan was being used for the intended purposes.** The project accounting and financial reporting were in line with the regulations issued by the Ministry of Finance (MOF) and the requirements specified in the Grant Agreement. No significant FM issues were noted throughout the project implementation, and the FM-related inadequacies raised during FM supervision were resolved on time. The project audit reports received unqualified audit opinions. In addition, the withdrawal procedure and the arrangement for the flow of funds were appropriate.

46. **Procurement. Overall, the procurement implementation in the project was rated satisfactory**. Procurement in the project included selection of consultants and procurement of goods. All procurement was conducted in accordance with the procedures specified in the project legal document, the World Bank's Procurement Guidelines, and Consultant Guidelines. The World Bank team provided support to the PMOs, as needed.

2.5 Post-completion Operation/Next Phase

47. **Transition arrangements.** By placing the emphasis on strong PMOs that are an integral part of the departments responsible for provincial EE, the project design ensured continuance beyond the duration of the project. Throughout the project, the World Bank team supported the PMO staff in the respective provinces to help them build capacity and develop working mechanisms to maintain and extend the mandate for provincial EE regulation and enforcement. At the time of the ICR mission, all PMOs reported that they would continue to provide training to both administrative staff and operations personnel of EE enterprises to help them make additional improvements in areas, such as energy data collection, EE regulation, management, and identification of EE potentials (see Annex 6 for a summary of the borrower's ICR and comments on the draft ICR.) For instance, in Shanxi Province, the Energy Conservation Supervision Agency plans to continue populating the energy database and increase the number of covered enterprises to facilitate KPI benchmarking across enterprises and establish a feedback loop to these enterprises to further improve EE.

48. **Sustaining regulatory efforts and institutional capacity.** Several of the outcomes achieved under the provincial subcomponents will have a strong positive impact on sustaining regulatory

efforts and institutional capacities beyond the duration of the project. The Shandong PMO plans to disseminate its project results and lessons learned. In Shanxi, the establishment of the Provincial Energy Conservation Service Industry Association in 2016, which attracted more than 60 member organizations within one year, helps connect industrial stakeholders, carries out research, organizes training, and provides advice and auditing services to participating enterprises. It further plans to establish a research and energy audit department to sustain and extend project impact.

49. **The capacity of the Jiangxi PMO was strengthened to the point that it could develop to maturity a major green investment project.** In Jiangxi, the PMO developed the capacity to prepare a loan proposal for multilateral development bank support for a green industrial development investment project. The project is expected to be funded by the Brazil, Russia, India, China, and South Africa (BRICS) Development Bank. The PMO of Jiangxi reported that based on the training and knowledge for FM and procurement that they received, they were able to develop a loan proposal to be financed by the BRICS Development Bank. The loan is targeted toward a low-carbon and green transformation of the local industry. The total loan volume is US$200 million, of which 50 percent is to be financed by the Chinese Government. The loan was initially designed with the expectation that it would be financed by the World Bank, but the Chinese Government decided to request the loan from the BRICS Development Bank instead. The loan is a five-year revolving fund for 20 years, providing the flexibility to adapt the national FYPs. If the loan is approved this year, it will be directly connected to the green development components of the 13th national FYP. The components of the loan are as follows:

    (a) Promote the transformation of the green manufacturing industry

        - Infrastructure**.** Industrial parks, including centralized heat, cooling, steam, and recycling resource use

        - Processes**.** EE renovation for industrial processes and equipment, plus efficient recycling of waste heat

    (b) Improve clean production

        - Support coal substitution and reduction coal consumption (gas electricity)

        - Clean production renovation for steel cement, chemicals, and nonferrous metals, emissions reduction, pollution reduction, and productivity increase

    (c) Improve the comprehensive use of industrial resources

        - Recycled use of solid waste disposal from industrial production

        - Municipal waste as fuel

    (d) Promote and develop the ESCO industry

- The project contributes directly here—creating demand-pull. The ESCO industry is identified by the Central Government as one of the seven major emerging industries. Jiangxi's industrial development is also aimed at being closely aligned with the production of energy-efficient products.

- Through the ESCO industry, develop advanced technologies and products

(e) Promote the development of green industries

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design, and Implementation

Rating: **High**

50. **Relevance of objectives.** The PDO was to improve quality and sustainability of provincial EE programs in Shandong, Shanxi, and Jiangxi Provinces through TA and institutional capacity building. The GEO was to achieve energy savings and associated GHG emission reductions through incremental EE investments and improved EE management enabled by provincial energy conservation programs that have been strengthened by the project. The PDO and GEO were highly relevant at the time of the project design, and they remain highly relevant upon completion of the project. The GEO and PDO are consistent with: the Government's EE and green growth priorities set out in the 12th and 13th FYP; the World Bank's CPS for FY2013–FY2016, which under Outcome 1.1 "Shifting to a Sustainable Energy Path" includes "Accelerating energy conservation and investment in EE"; GEF-5 strategy in the climate change focal area objective 2 (promote market transformation for EE in industry and the building sector); China's Intended Nationally Determined Contributions as submitted to the Conference of the Parties on June 30, 2015 which, include goals (a) to lower carbon intensity of GDP by 60 to 65 percent below the 2005 level by 2030, and (b) to reduce CO_2 emissions per unit of GDP by 40 to 45 percent below the 2005 level by 2020.

51. **Relevance of design.** The project design targeted identified barriers to scaling up EE of inadequate information, limited human capital and the absence of an EE market. The indicators show progress towards elimination of these barriers, both at an outcome and output level. The approach to improving provincial EE implementation and enforcement capacities—by enhancing awareness and understanding of the relevant issues, as well as by the project's focus on industrial EE—was highly relevant at the time of project appraisal and remained highly relevant at project completion. The project's scheme to work in three provinces, each with different capacity levels, and to afford an opportunity for peer learning for other provinces, proved to be highly effective to achieve the project's objectives of increased energy savings and mitigated GHGs in the industrial sector. The selection and design of the provincial subcomponents were geared toward adapting central-level regulations on EE.

52. **Relevance of implementation.** The project's implementation arrangements—especially the use of provincial PMOs to improve provincial capacities for EE—proved effective for contributing to the Government's targets to reduce the energy intensity of the Chinese economy. While the project may have benefitted from a formal structure to better share lessons learned in the provinces with the Central Government (for instance through a lead PMO or

other designated unit tasked with that responsibility), other channels of dissemination were successfully employed, for example, inter-provincial exchanges on specific subcomponents, semiannual meetings between the provinces during mission visits, and a two-day workshop at the closing of the project to disseminate findings.

3.2 Achievement of Project Development Objectives and Global Environmental Objectives
Rating: **Substantial**

53. The targets for many of the PDO indicators, as well as most of the intermediate outcome indicators, were met or exceeded prior to the original closing date of the project. The quality and sustainability of provincial EE programs in the Provinces has undoubtedly improved as a result of the project. PDO outcome indicator targets were substantially exceeded: ESCO companies of the Provinces invested US$ 737 million over the course of the project, exceeding the targeted US$ 429 million, and 2,006 enterprises were connected to the EE monitoring and supervision information platform, exceeding the target of 500 (Data Sheet Section F). The intermediate outcome indicator targets that were not fully achieved are the following ones for Shanxi Province: The number of EPC projects (Indicator B1.2), which was partially achieved for reasons described para 42 in section 2.3; The energy pricing adjustment policies to promote energy conservation (Indicator B4.1), which had been developed but for which the implementation was still under discussion and; Taxation and other fiscal policies to promote energy conservation (Indicator B4.2), which led to plans for an energy fund for energy saving, but the fund was never materialized due to an unexpected abolishment of a coal resource fee that financed the fund.

54. **The targets for the GEO indicators were also achieved.** Investments in EE resulted in cumulative lifetime energy savings of 65.92 Mtce, exceeding the target of 18.20 Mtce, and brought about GHG emissions reductions of 173.93 $MtCO_2$, exceeding the target of 44.40 $MtCO_2$ (Data Sheet Section F).

55. **Through the implementation of the project, the institutional capacity for both the management and technical aspects of rational energy use in key industrial sectors in the provinces was strengthened.** Industry is now better equipped to contribute to improvements in EE and the reduction of GHG emissions, which is important for the achievement of EE and green development goals of the 13th Five-Year Plan. Project highlights are presented in the following paragraphs. More detailed information on the project achievements by Province can be obtained from annex 2.

56. **10,000 Enterprise Program Monitoring and Supervision Platforms**. At least 2006 enterprises were connected, substantially exceeding the target of 500. Original objectives were fully met, with digitized reporting and communication systems constructed, and analysis and summation software being used. These platforms are important not only for monitoring energy consumption but also for evaluating progress toward targets for energy savings and better understanding the dynamics of energy consumption across sectors. Provinces were already moving past simple reporting systems to develop two-way communication. In addition, all PMOs mentioned that they were extending the platform to enterprises beyond the 10,000-enterprise program. Shandong is at the forefront of developing the platform and has become

an important reference for national authorities as they build a national monitoring, management, and information dissemination platform

57. **10,000 Enterprise Program Supervision Agency Capacity Building.** Supervision Agency institutions, staff capacity, and depth of understanding and experience in supervising enterprise compliance with EE agreements and regulations were strengthened in all three provinces. Together, the three Provinces trained more than double the targeted number of staff to use the monitoring and supervision platform. Stocktaking surveys and research on Agency capacities and needs were completed in Jiangxi and Shandong, informing 12th and 13th FYP EE work plans. A range of technical and management training materials were prepared and courses delivered to staff, often in events also involving enterprises. Especially important, the project research led to EE supervision regulation issuance by Nanchang Prefecture's People's Congress, with a legal standing that sets a model for other localities

58. **Development of the Energy Service Industry.** Over the course of the project, 872 EPC projects were conducted yielding investment flows from ESCOs totaling US$737 million. These figures represent an approximate doubling of original targets. In Shandong, key outputs are those that resulted from the research and pilots on energy-saving calculation methods, including establishment of a database with 672 standards (international, national, local, and industrial) to achieve energy saving, which provide guidelines for measuring and calculating energy savings that are recognized standards in Shandong Province since January 14, 2016. Other outputs include a training materials developed from a review of EPC projects which were used to train 450 staff at ESCOs. In Shanxi and Jiangxi Provinces, the ESCO industry at the start of the project was very weak but has since developed significantly. Shanxi established a Provincial ESCO association with 60 members by the end of 2016, while Jiangxi developed three plans that were officially adopted as part of the 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry.

59. **Provincial-level Policy Development.** The project supported energy policy analysis at the Provincial level, allowing Provinces to pursue EE research topics of their own interest, which allowed them to complement the existing, and more broad, national policy framework. The policy analytical work of the project focused especially on practical implementation and institutional strengthening issues. It increased the capacity, visibility and confidence of in-Province research groups, which will undoubtedly be needed going forward. Among policy research outputs supported by the project, the following are highlighted:

    (a) All three provinces pursued research on current institutional systems and future government EE programming. The research enabled the Provinces to seek improvements of the current framework supporting EE and plan for the 13th FYP.

    (b) Shanxi completed a major study of coal-bed methane gas pricing. The study recommended a series of departures from the current system of benchmarking CBMG prices against natural gas prices, enabling currently wasted and dangerous coal bed methane to be use more broadly as an efficient energy source. Implementation of recommendations was under discussion at project closure.

(c) Jiangxi's research on pricing led directly to the approval of new time-of-day prices in several counties, implementation of a full scheme of electricity price penalties for enterprise failing to meet mandatory EE standards, as well as some other changes in electricity price structure. Research on fiscal policies helped progress subsidy implementation for EE equipment, achieving meaningful results in public-sector procurement of more energy efficient equipment, and implementation of EPC subsidies.

(d) Jiangxi and Shandong conducted strategic development studies. With its aims for greener growth, Jiangxi used project support to develop definitions of energy-efficient, low-emission industrial zones, which was followed by the preparation of a BRIC lending project proposal for the development of such zones. Shandong completed a study on the influence of urbanization in the province on long-term energy supply, consumption and efficiency.

60. **Development and Enforcement of Industrial Energy Efficiency Standards.** Shanxi and Jiangxi Province developed innovative solutions to enforce national and sub-national EE standards for industrial equipment and processes. Shanxi procured body cameras that are worn by inspectors, allowing immediate and visual reporting from onsite inspections to headquarters, thereby radically reducing the time and cost of processing non-compliance cases. Jiangxi developed and deployed software tools, allowing inspectors to input basic data onsite with similar benefits in improving speed and accuracy of enforcement.

61. **Enterprise Energy Management Systems in Shandong.** With the support for the project, Shandong Province developed a system for accrediting enterprises for the adoption of EMS that complements the existing national certification method, and certified 1188 enterprises, exceeding the target of 200. The accreditation system, known as the performance evaluation method, focuses on energy saving results being achieved and strengths and areas for further improvement in on-site EMS implementation. Over the course of the project, other Provinces (Guangxi and Yunnan) adopted Shandong's approach. Experiences with EMS adoption have also been shared abroad, with staff from Shandong joining a World Bank team in Uzbekistan for this purpose.

62. **Ensuring Quality Energy Use Statistics in Shanxi.** The Shanxi Province Statistical Bureau organized the completion and publication of a new, detailed manual on energy use statistical reporting for enterprises and used it to train 949 staff, compared to the targeted 150 staff. This system complements energy consumption data collected through two other systems -detailed data reporting from key energy consuming enterprises and data from China's periodic Economic Census. While most participants were enterprise staff, 130 administrative staff from counties (119) and municipalities (11) also benefitted from the training. The manual and program has attracted support from the Central Government NSB office, and other provinces are interested in undertaking similar training.

63. **Promoting Energy Efficiency in Buildings in Shanxi.** The Provincial Construction Commission of Shanxi developed training manuals and inspection procedures to further improve capacity for implementation of China's EE building codes. This helps Shanxi, a newcomer in the EE building space, build capacity in implementing policies and programs that

are overseen by the Ministry of Housing and Urban and Rural Development (MOHURD), but implemented sub-nationally. As part of a drive by MOHURD to audit public and residential buildings, Shanxi completed 400 new building audits and associated renovation plans. Shanxi also completed a plan for furthering its building EE work during the 13th FYP.

64. **Fixed Asset Investment EE Appraisals in Jiangxi.** The project supported the development of the Jiangxi Provincial Government appraisal method and guidance for fixed-asset investments. These help Jiangxi comply with requirements of the 12th FYP and will be important during the 13th FYP to control allocations of rights to consume increased amounts of energy from expanded assets. 500 staff received training on the new fixed-asset EE appraisal system, of which 200 were from key enterprises, and over 2700 appraisals had been conducted by the end of 2016 compared to a target of 20.

3.3 Efficiency

Rating: **High**

65. An incremental cost-benefit analysis in the PAD attempted to quantify some of the impacts of the project on social welfare. Costs that were included in this analysis were the GEF and its counterpart project financing costs, as well as the costs of the targeted number of EPC projects. Benefits that were included were the energy savings and associated GHG emission reductions that resulted from the EPC projects, as well as other EE investments made by enterprises connected to the monitoring, supervision, and information management platform. Table 3 summarizes the results of the analysis at the time of appraisal versus at project closing. It shows that investments from ESCOs in the three provinces exceeded anticipated targets by 60 percent but that the cumulative lifetime energy saving and associated GHG emissions reductions exceeded the targets multiple times over.

66. **With 174 $MtCO_2$ avoided, the GEF grant of US$13.28 million contributed to emissions reductions with a cost-effectiveness of just under US$0.08 per tCO_2 (tons of carbon dioxide equivalent).** Considering the estimated costs of the Government of China co-financing, as well as the investment flows from energy services companies, the cost of avoided carbon emission rises to US$4.51 per tCO_2. This value would rise somewhat more if the energy-saving investment costs of the enterprises connected to the platform could be measured and included in the calculation. However, given that this estimate does not consider other pathways to energy saving and emission reduction that are supported by the project, the true number is likely to be lower in value. Details of the analysis can be found in annex 3.

Table 3. Incremental Costs and Benefits

	Flow	Appraisal Estimate (US$, million)	Achieved/Latest (US$, million)	Percentage of Appraisal
Costs	GEF Financing (US$, million)	13.39	13.23	98.8
	Investment from ESCOs (US$, million)	429.00	737.00	171.8
Benefits	Cumulative lifetime energy saving (Mtce)	18.20	65.92	362.2
	Associated GHG emission reductions ($MtCO_2e$)	44.40	173.93	391.7

67. **Preparation of the project took 22 months** (concept review to effectiveness), which was in line with the usual GEF project preparation time.

3.4 Justification of Overall Outcome Rating

Rating: **Satisfactory**

68. **The overall outcome rating is based on High relevance of GEO and PDO throughout and beyond project implementation, Substantial achievement of objectives, and High efficiency.** Although implementation of various components in different provinces exhibited some delays, this was primarily with the establishment of the EE monitoring and supervision information platform in Shanxi and Jiangxi Provinces, resulting in part due to the inexperience of these Provinces with the procurement of large goods contracts. Many indicator targets were achieved prior to the original closing date and most exceeded the targets by the end of the revised closing date, thanks to strong support from Provincial governments as well as outlays in counterpart financing that exceeded originally expected contributions. Two outcome indicators were partially achieved whereas one was not achieved as discussed in section 3.2 para 55 above.

3.5 Overarching Themes, Other Outcomes, and Impacts

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

69. The project did not focus specifically on the aspects of gender, poverty, and ethnic minorities and hence these are not mentioned in the PAD.

(b) Institutional Change/Strengthening

70. Because institutional capacity building was central to the project objective, the discussion on institutional change and strengthening is above in section 3.2

3.6 Summary of Findings of Stakeholder Workshops

71. **The PMOs held a national dissemination workshop in Beijing on November 1, 2017.** Speakers included officials of the NDRC and the MOF, as well as officials of the three provinces, the PMOs, selected experts, the World Bank (Country Management Unit and project team), and the GEF. It was attended by over 100 participants from central and provincial government offices, energy companies, and expert organizations to share knowledge and experience accumulated during project implementation. The final agenda is attached as annex 5.

4. Assessment of Risk to Development Outcome

Rating: Negligible to Low

72. **At the time of the ICR mission, there was a high likelihood that the project development outcomes would be maintained** and even improved further due to a high awareness of and willingness for substantial progress on EE, as shown, for instance, in the 13th FYP that identified green development as one of five major development principles. A number of factors can be expected to contribute to the sustainability of outcomes after the ending of the project:

(a) strengthened institutional capacity for improved EE monitoring and enforcement in the industrial sector at the national level and especially at the provincial level; (b) strengthened technical and managerial skills to identify and tap into EE potentials in industrial, and in particular, in key industrial enterprises, as reflected by the improved energy intensity of their outputs; (c) improved access to EE services and data by means of data collection platforms and energy services included in the framework of the project; (d) continued high commitment by the Central Government to further reduce energy intensity and move away from energy-consuming heavy industry sectors, as defined in the 13th FYP for 2016–2020; and (e) increased collaboration among provincial, national, and private sector actors that were initiated through the project.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry
Rating: **Satisfactory**

73. The justification and the rationale for World Bank support were well founded at the time of project preparation. The project directly addressed the Government's EE priorities and was well aligned with the World Bank CPS. Preparation of the project was facilitated by the task team's ability to draw on long implementation experience in EE operations. The team that prepared the Provincial Energy Efficiency Scale-up Project had carefully assessed the experience of prior industrial EE projects, recognized key lessons learned, and incorporated them into the design of this project.

74. The Bank team worked with the Borrower to develop an M&E framework that addressed the inherent challenges of measuring the impact on CO_2 emissions—as required for a GEF-financed project—of the capacity-strengthening and knowledge-building activities that are essential to enabling energy savings investments and their consequent emissions reductions.

(b) Quality of Supervision
Rating: **Moderately Satisfactory**

75. **The World Bank task team was consistent and diligent in supporting project implementation.** It carried out two supervision missions per year. The teams, comprising mainly World Bank staff complemented with external consultants, consistently included technical, FM, and procurement specialists. The Aide Memoires and ISRs show that the task teams assessed progress and challenges and regularly made helpful and proactive recommendations to address problems. However, due to the abundance of intermediate outcome indicators and three different PMOs, the team faced challenges regarding data collection consistency and ensuring data quality.

76. **A close relationship was developed between the World Bank task team and the PMOs.** This was maintained even as the World Bank's team leader was changed on three occasions, since at each instance, the new task team leader was brought into the project at least a year before taking over responsibility.

77. **There are two areas in which The World Bank's supervision could have been improved.** The task team could have improved support for clear and consistent data collection by the PMOs, in particular to ensure consistent treatment of one of the intermediate outcome indicators, 'number of EPC projects' across provinces. In addition, as it became apparent during project implementation that some of the targets were being exceeded by large margins, an opportunity should have been taken to revise the end targets to a higher level of ambition.

(c) Justification of Rating for Overall Bank Performance
Rating: **Moderately Satisfactory**

78. Together with the Government of China, the World Bank identified a project that directly addressed the Government's EE priorities and was well aligned with the World Bank CPS and produced a design that was appropriate for the objectives. During implementation, the task teams provided continuous support, were responsive to ongoing needs, and were proactive in addressing emerging challenges. Some improvements in M&E could have been made, however, leading to an overall rating of Moderately Satisfactory.

5.2 Borrower
(a) Government Performance
Rating: **Satisfactory**

79. **Support from the Government of China was Satisfactory throughout the project.** The concerned government agencies in all three provinces kept in close communication with the PMOs, and provided them with sufficient human and financial resources for project implementations. They provided consistently supportive direction and guidance as well as necessary staffing and financial resources. Each of the three provincial governments incorporated outputs of the project into policies and regulations issued during the project.

(b) Implementing Agencies Performance
Rating: **Satisfactory**

80. The three PMOs of Shanxi, Shandong, and Jiangxi were responsible for implementing the Provincial Energy Efficiency Scale-Up Project in each of their respective provinces. The performance of the PMOs differed at the beginning of the project due to varying capacity levels and differing degrees of industrialization. However, all PMOs and staff were highly motivated throughout the project and delivered with great dedication on the project's objectives and beyond. It is important to note that lagging procurement and disbursements in Shanxi in the early phase of the project were due to a wave of personnel changes that occurred between 2014 and 2015, which significantly slowed down implementation. The new PMO head appointed in Q3 2015 had to catch up on this backlog.

81. All three PMO management teams oversaw the successful implementation of a large and diverse work program, made certain that activities and outcomes were well documented, ensured that fiduciary functions were carried out in compliance with World Bank and Government policies and procedures, and maintained proactive communications with partners and stakeholders at national and departmental levels. The PMOs were especially effective in instilling a learning culture among the staff, making effective use of the systems to identify

lessons learned that could be used to adjust and improve operating procedures, and sharing information with other provinces. In this respect, the Shandong PMO took a lead role and shared training material and trainers with the provinces of Yunnan and Guangxi.

(c) Justification of Rating for Overall Borrower Performance
Rating: **Satisfactory**

82. While the concept of relying as much as possible on provincial PMO is attractive in principle, in practice it meant that the project approach missed an important opportunity to scale-up nationally in a more systematic way. One important point that could potentially have been addressed at the design stage was the designation of a national-level PMO to coordinate between provinces. While it is not possible to know if the Bank team would have been successful, working towards a more effective organizational structure could have improved the chances of better coordination and project results dissemination.

83. Based on the Government performance rating of 'Satisfactory' and the implementing agency performance rating of 'Satisfactory', and considering the 'Satisfactory' outcome rating, the overall borrower performance is rated 'Satisfactory'.

6. Lessons Learned

(a) **Achieving national EE goals requires tailoring approaches at the subnational level.** A This project illustrated the diversity of barriers, and corresponding solutions, to scaling up EE faced at a key, intermediate level of government. Part of the success of this project lay in working closely with each province to design an appropriate and unique set of component in parallel with others, so that the goal of national aggregation of information can also be served.

(b) **The project reinforced the adage that "what you cannot measure you cannot control".** The monitoring and supervision platform, energy use statistics system, equipment inventory assessments, industry stocktaking surveys and other research outputs supported by the project had measurement as their primary goals. Without measurement, only a partial understanding can be gained of how to approach EE, such as what energy savings can be achieved, whether enforcement activities are working, and how to design incentives and standards for EE. In addition, the project reinforced the lesson that people matter. Many of the project activities included elements of staff training, and development of guidance documents and methodologies to be used on the front lines of implementation and enforcement.

(c) **A flexible approach to project design, with a rolling process for defining the work program, allows scope for innovation.** One key development, not foreseen at the design stage, was equipping inspectors in Jiangxi and Shanxi provinces with software and hardware, including body cameras, to monitor industrial energy efficiency standards. This immediately multiplied the enforcement capability of inspectors. This was made possible by developments and cost reductions in mobile technologies that

could not have been predicted, but which provided an opportunity that the provinces were able to exploit quickly.

(d) **While having multiple PMOs introduces complexities in management, the opportunity for peer learning yields significant benefits.** The project's horizontal design, with multiple PMOs, provided with each implementation support mission important opportunities for sharing and learning. The Jiangxi and Shanxi PMOs, for instance, benefitted greatly from Shandong's early experience and greater implementation capacity of EE measures. One possible improvement to the arrangement would have been to have an active coordinator among them, either one PMO designated as a 'lead' or a separate coordinating body. This coordinator could have taken up the responsibilities of communicating with the national government agencies, as well as outreach and communication with other provinces.

(e) **Complex results frameworks capture important detail, but at a cost.** The many subcomponents under each provincial component and associated intermediate outcome indicators provided the flexibility needed to tailor the project to the priorities of the provinces. This design was suited to the diverse set of activities undertaken at three very different provinces. However, it also made the M&E design and implementation complex and resource-intensive. Future project designs could benefit from smaller sets of intermediate indicators.

(f) **Attribution of high-level outcomes to capacity-building projects is challenging.** While there are good reasons to track the outcomes from capacity-building activities, the typically long chain of causality makes it challenging to design an indicatory that is reflective exclusively of the project activities. The logic, assumptions and data sources underlying the design of such indicators should be transparent and well documented.

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

(a) Borrower/implementing agencies

84. The Shandong PMO commented that the grant being issued in U.S. dollars rather than Chinese Yuan had a negative impact during project implementation due to exchange rate fluctuations and the resulting uncertainty about the availability of funds. This was associated with real costs such as time spent confirming the remaining grants. At project approval, the exchange rate stood at around CNY 6.55 per U.S. dollar; it depreciated to CNY 6.05 per U.S. dollar in early 2014 and appreciated to CNY 6.95 per U.S. dollar at project close. Although it was not mentioned, this could have implications for planning and subsequently implementation progress is an important issue to be raised.

85. The Shandong PMO also commented that maintaining staff throughout the project implementation period was challenging and that it was an arduous task to train staff for projects requiring international cooperation such as this one. The point is well taken, and it should be noted that despite this challenge, the province PMOs maintained full and competent staffing.

86. Both the Shandong and Shanxi PMOs commented that between project design and implementation, priorities had shifted and, thus, some of the project components had to be redesigned. The time taken to prepare the project (22 months) is not unusual for the World Bank and both the World Bank and borrower teams should be commended for adapting the design to meet the dynamic needs of the three provinces rapidly making progress toward greater EE.

Annex 1: Project Costs and Financing

(a) Project Cost by Component (in US$, millions equivalent)

Components	Appraisal Estimate (US$, millions)	Actual/Latest Estimate (US$, millions)	Percentage of Appraisal
A: Shandong EE Program	4.46	4.39	98.43
B: Shanxi EE Program	4.46	4.51	101.10
C: Jiangxi EE Program	4.46	4.33	97.09
Total baseline cost	13.39	13.23	98.81
Physical contingencies	0.00	0.00	—
Price contingencies	0.00	0.00	—
Total project costs	13.39	13.23	98.81
Project Preparation Facility	0.00	0.00	—
Front-end fee IBRD	0.00	0.00	—
Total financing required	13.39	13.23	98.81

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (US$, millions)	Actual/Latest Estimate (US$, millions)	Percentage of Appraisal
Borrower	—	287.36	287.26	98.80
GEF	—	13.39	13.23	99.20

Annex 2: Outputs by Component

1. The Provincial Energy Efficiency Scale-Up Project was arranged in a matrix structure, grouping and selecting a total of eight different components by the three provinces. This appendix summarizes the outputs achieved in each component. For the ease of better comprehension of the complex structure of subcomponents and contractual outputs, this annex will present intermediate outcome indicator tables as well as contract outputs for each of the provincial subcomponents.

Component A: Shandong Energy Efficiency Scaling-up Program (GEF financing US$4.46 million)

Subcomponent A1: Develop EE Service Industry

Table 2.1. Intermediate Outcome Indicators

Component	Target	Achieved
A1.1. Development of supporting policies for energy service industry	Policies implemented	Policies implemented
A1.2. Number of EPC projects conducted	225	736

Table 2.2. Contract Outputs

Cont.2b	Research and pilot on energy-saving amount calculation methods
Cont.3	Compiling typical cases of EPC, developing training materials, and conducting training
A1-2013-01	Research on energy management software for textiles, cement, and alcoholic beverage enterprises
A1-2013-02	Research on development of an EMS information platform for the energy conservation service
A1-2015-01	Study on energy conservation management measures in the coal industry
A1-2015-02	Research on stimulating finance for energy conservation financing

2. Outputs in this component include research, pilots, guidelines, and training aimed at accelerating the development of the EE service industry. Key outputs are those that have resulted from the research and pilots on energy-saving calculation methods, including establishing a database with 672 standards (international, national, local, and industrial) to achieve energy saving; providing guidelines for measuring and calculating energy savings that are recognized standards in Shandong Province since January 14, 2016; providing training for 180 people in the use of the guidelines; conducting a study of policies to promote EPC projects; conducting a study on the relationship between energy-saving and carbon emissions reductions; and conducting pilot studies of EPC with five different technologies (lighting, heat pumps, waste heat recovery, renovation of air conditioning systems, and rehabilitation of boilers).

3. A review of the state of the EPC industry in Shandong Province resulted in a database of EPC projects. A literature review and interviews onsite at 10 EPC projects resulted in better understanding of EPC projects and particularly the implementation challenges, from which training materials were published, and 450 people were trained at ESCOs.

4. Two studies contracted under this component led to the development of EMS software for specific industries. One study focused on software for textiles, cement, and alcoholic beverage enterprises and is used to analyze energy consumption and to benchmark and identify

opportunities for EMS implementation. Another study focused on the coal industry and led to the training on using the software for staff at six coal mines.

5. An online Energy Conservation Platform was developed under this component. Its purpose is to function as a type of 'supermarket' or matching-market in which the Government, ESCOs, equipment manufacturers, and other key users can meet to provide services, discuss ideas, and so on. The site would also function as a platform to disseminate guidance on EPC and to announce training opportunities.

Subcomponent A2: Establish an EE Monitoring, Supervision, and Information Management Platform

Table 2.3. Intermediate Outcome Indicators

Component	Target	Achieved
A2.1. Number of enterprises connected to the information platform	200	1,518
A2.2. Number of staff/officials trained to use the information platform	400	1,040

Table 2.4. Contract Outputs

Cont.X	Construction of an energy-saving information system
Cont.5/A2-2013-01	Purchase of goods (computer, removable storage device network equipment, support equipment, equipment for system integration, and so on)
A2-2015-01	Research on a public mobile platform on energy-saving

6. The project helped further expand software and hardware in the EE Monitoring, Supervision, and Information Management Platform of Shandong Province. New software components included an energy-saving information dispatch management system and a system for analyzing and reporting on energy consumption. The web page of the platform is hosted on the website of the Shandong Energy Conservation Supervision Corporation (www.sdeic.gov.cn).

7. The project also supported a study on how to create a mobile platform that would increase public knowledge and awareness of the benefits of energy saving. Following the study, an application was developed that could be run on devices such as mobile phones. The application provides access to a social network allowing users to interact and discuss on topics relating to EE. It is publicly available, and there have been reports that it was very actively used. For instance, it was mentioned that the platform was used to organize talks on the subject once a week and that they were well attended.

Subcomponent A3: Promote Enterprise Energy Management Systems (EMS)

Table 2.5. Intermediate Outcome Indicators

Component	Target	Achieved
A3.1. Number of enterprises adopting EMS	200	1,188

Table 2.6. Contract Outputs

Cont.8	Development of EMS teaching and training material
Cont.9	Assistance to demonstration enterprises to build EMS
A3-2013-01	Creation of an archive of EMS projects
A3-2013-03	Preparation of guidelines for performance evaluation of the EMS and measures for implementation

A3-2015-01	Research on the comprehensive EE improvements of industrial enterprises
A3-2015-02	Research on Shandong EE leaders
A3-2015-03	Research on the system of energy management positions and an energy management officer

8. With the help of these subcomponents, Shandong Province developed a system for accrediting enterprises for the adoption of EMS. Previously, firms in Shandong Province could become certified for EMS only through the national certification method administered by 26 entities that have been accredited by the National Government to perform certification. Shandong Province developed its own accreditation system known as the performance evaluation method, which is administered by the Energy Conservation Office and seeks to improve the rigor and depth of the national certification method.

9. In the process of developing this system, many different outputs were realized: (a) development of EMS teaching and training materials, (b) set up of 25 EMS demonstration projects, (c) establishment of an archive of EMS projects, (d) development of eight case studies on EMS to inform a report about implementing EMS in practice, and (e) EMS training of 60 people. To date, 746 enterprises have been certified through the Shandong Province performance evaluation method.

Subcomponent A4: Build Capacity for EE Program Management and Supervision in Local Enterprises and Enterprises

Table 2.7. Intermediate Outcome Indicators

Component	Target	Achieved
A4.1. Number of energy conservation staff/officials trained	450	7,307

Table 2.8. Contract Outputs

Cont.12	Study on energy conservation working measures of the 12th FYP
Cont.15	Hiring of a national consulting company to provide technical advice on energy conservation program management
Cont.16	Utilization of a Provincial Energy Efficiency Scale-up Project technical adviser
A4-2013-01	Research on the adaptability of energy-saving management agencies
A4-2013-02	Capacity building of energy monitoring system
A4-2015-01	Evaluation of the implementation of Shandong 12th FYP energy conservation policies and research on the 13th FYP
A4-2015-02	GEF Provincial Energy Efficiency Scale-up Project evaluation and final report
A4-2015-03	Research on industrial boiler EE promotion
A4-2015-04	Energy-saving promotional video formulation and advertisement
A4-2015-05	Sustainable development research on using low heat value fuel (such as coal gangue) to generate electricity
A4-2015-06	Research on the influence of urbanization on long-term energy supply, consumption, and saving in Shandong Province
A4-2015-07	Energy-saving work research under the Internet big data background
Cont.16-1	Hiring of a project management consultant to finish the downstream work
A4-2016-01	Research on the certified energy manager and EMS in Shandong Province

10. The various research activities financed under this component resulted in information and recommendations aimed at improving the capacity within Shandong Province for EE management and supervision. They include a report aimed at better understanding of national and international energy conservation measures, written by the consultant after discussions with the Shandong PMO as well as the National Energy Conservation Center in Shanghai; a study on the 12th FYP and its implications for Shandong EE planning; a study to assess efficiency of coal-fired industrial boilers; the production of EE promotional material to publicly advocate energy conservation; a study of the impact of urbanization in Shandong on energy supply, consumption, and saving; and a study to understand how the large amount of data that is emerging with increasing energy data monitoring and collecting can be used.

Component B: Shanxi Energy Efficiency Scaling-up Program (GEF financing US$4.46 million)

11. The Shanxi component is divided into six subcomponents.

Subcomponent B1: Develop EE Service Industry

Table 2.9. Intermediate Outcome Indicators

Component	Target	Achieved
B1.1 Development of supporting policies for energy service industry	Policies implemented	Policies implemented
B1.2 Number of EPC projects conducted	105	50

Table 2.10. Contract Outputs

TA_B12	Shanxi ESCO industry survey
TA_B13	Shanxi ESCO industry management and capacity building
TA_B14	Shanxi ESCO industry planning preparation and policy study
TA_B16	EPC mechanisms
TA_B17	Research and consulting services for EE and energy management in key energy-consuming enterprises
TA_B18	Energy management training textbook compilation and training services

12. This subcomponent focused on assessing the current state of the Shanxi ESCO industry, facilitating its development, and establishing a local Energy Service Companies Association. The ESCO industry survey investigated the potential and need for EE and energy management in key energy-consuming enterprises and explored different models of ESCO operation and financing. Results from the survey and other research activities of this component helped create a five-year development plan for the ESCO industry.

13. The Shanxi Provincial Energy Conservation Service Industry Association was established in 2016. It was initiated by seven ESCOs and has since attracted 60 member organizations. Approximately, 20 people work for the association, half of whom are part-time staff. The association helps connect different industries, conducts research, organizes training, and provides advice to enterprises. It also plans to establish a research and energy audit department. In 2016, the association organized 15 days of training for six sectors and 2,000 people. Training was provided not only to the ESCO staff but also to other interested parties, such as the National Asset Management Commission, that is overseeing large energy consumers. The

reception of the training was overwhelmingly positive and the association plans to continue providing training.

Subcomponent B2: Support Building of an EE Program

Table 2.11. Intermediate Outcome Indicators

Component	Target	Achieved
B2.1 Number of buildings obtaining EE building labels	20	20

Table 2.12. Contract Outputs

TA_B21	Buildings EE training textbook and auditor certification procedures
TA_B22	Buildings energy audits and consultation services on piloting EE
TA_B23	Public buildings EE statistics
TA_B27	Development and designation of green urban and buildings zones at Shanxi municipal levels
TA_B28	Development and designation of green urban and buildings zones at Shanxi county levels
TA_B64	Roadmap for advancing BEE in Shanxi

14. Activities of this subcomponent were aimed at complementing Shanxi Province's efforts to scale up the national building labeling program (for which implementation has in part been left to the provinces) and to strengthen overall monitoring and supervision of energy consumption in buildings.

15. A training textbook was written on EE measurements in buildings that covers current energy-savings standards for design and construction of buildings as well as inspection rules. This was complemented with certification procedures and technical requirements for third-party energy auditors. There were 11 organizations identified that would meet the requirements. However, the procedures were not formally issued because energy auditors would have been required to buy inspection equipment they deemed too expensive.

16. Auditing of 400 public and residential buildings was supported by this subcomponent. The audited building stock was supposed to be rehabilitated in accordance with new standards issued in 2014 by the Central Government. However, the financial viability of the rehabilitation work relied on national subsidies (of CNY 135 per m^2) which were cancelled during the 13th FYP. Shanxi, having started relatively late with energy-efficient rehabilitation of buildings, compared to other provinces, was therefore not able to take advantage of the subsidy, and hence, continuation of this work is questionable.

17. Another output of interest was an experiment to assess the deviation between energy consumption in buildings calculated from design specifications compared to actual consumption. To this end, software from the Ministry of Housing was used to calculate the theoretical value of energy consumption of an existing building. This value was compared to energy consumption measured at the building. It was found that the theoretical values underestimated measured values significantly, with the discrepancy attributed to deviations in behavior and materials that the theoretical model did not or could not control for. It was mentioned that the results of the experiment have been used to improve the software's predictive capabilities. Between 2011 and 2016, 20 buildings were awarded EE labels.

Subcomponent B3: Establish an EE Monitoring, Supervision, and Information Management Platform

Table 2.13. Intermediate Outcome Indicators

Component	Target	Achieved
B3.1 Number of enterprises connected to the information platform	100	400
B3.2 Number of staff/officials trained to use the information platform	300	480

Table 2.14. Contract Outputs

TA_B31	Setup of the physical platform for energy conservation monitoring
TA_B32	EE supervision training materials

18. This subcomponent had two major aspects—supporting capacity building for energy data collection and monitoring and installing a smart energy information platform.

19. The component was targeted at the Shanxi Brigade for Inspection of Energy Conservation, in charge of ensuring compliance with national energy regulations. The department works with enterprises by providing information and capacity building while monitoring energy consumption and energy consumption processes. While the department's training usually focused on helping enterprises comply with new EE regulations, training delivered through the project allowed the department to increase general awareness of EE principles on the part of an extended target group of energy managers, general managers, supervision staff at municipalities and counties, and senior administration officials.

20. Through the creation of the Shanxi smart energy data center, the Brigade can now collect data online from the enterprises, which is then stored on their servers. Currently, the system covers 400 enterprises across six sectors, such as power generation, steel, chemicals, and coal processing, and has a potential capacity for covering 2,000 enterprises.

21. Between 2011 and 2016, 480 professionals were trained and 400 enterprises were connected to the information platform.

Subcomponent B4: Develop Energy Pricing and Fiscal Policies to Further Increase Incentives for EE Activities and Investments

Table 2.15. Intermediate Outcome Indicators

Component	Target	Achieved
B4.1 Development of energy pricing adjustment policies to promote energy conservation	Policies implemented	Policies partially implemented
B4.2 Development of taxation policies and other fiscal policies to promote energy conservation	Policies implemented	Policies not implemented

Table 2.16. Contract Outputs

TA_B41	Coal pricing policy study
TA_B42	Fiscal policy study
TA_B43	Coal bed methane study

22. Three studies were conducted under this subcomponent.

(a) **Cost of coal study.** The objective of this research can be defined as better understanding the cost of coal to promote efficient use of coal resources. In addition to studying how the private costs of coal production vary (due to variation in scale of production, type of mine, quality of coal, and so forth), this research aimed to shed light on the external cost of coal production (for instance, environmental costs and depletion allowances). It was thought that with a better understanding of such costs, policies could be created to ensure that coal is used in a more efficient manner. The results of the research were used to inform a plan by the state council on reforming the way in which natural resources were managed. However, the health of the Shanxi coal mining industry was deteriorating since inception of the research, and by the end of the project, there was little desire to implement a plan that was expected to increase coal prices for an ailing coal industry. Aside from the cost study, another output of this research was a price warning system that makes coal price projections for planning purposes. In addition, it was mentioned that the research sparked a discussion about whether the complex structure of charges and fees applied to coal production can be substituted for a simpler tax system.

(b) **Fiscal support for an energy-saving fund study.** This work looked at the funding of the Energy Conservation Special Fund managed by the Bureau of Finance of Shanxi Province. The purpose is to understand how the fund is used and identify issues. Previously, 80 percent of financing for this fund came from a coal resource fee. In 2016, the fee was abolished in favor of a tax, the proceeds of which are not received by the provincial government.

(c) **Coal bed methane study.** The overarching objective of this research was to work toward a more efficient use of coal bed methane resources in Shanxi Province. Relative to coal, the coal bed methane industry is underdeveloped and coal bed methane resources are often simply wasted in the production of coal. The research studied coal bed methane markets, prices, regulations, and policies. One of the outputs that resulted from the research was guidance on coal bed methane prices. Between 2011 and 2016, research on coal and coal bed methane costs and prices was developed to inform policies aimed at energy conservation through price and tax adjustments. At the time of project close, implementation of the recommendations was under discussion.

Subcomponent B5: Strengthen the Energy Consumption Statistics System

Table 2.17. Intermediate Outcome Indicators

Component	Target	Achieved
B5.1. Development of EE indices system	System implemented	System implemented
B5.2. Number of staff trained	150	949

Table 2.18. Contract Outputs

TA_B51	Training textbook for EE statistics
TA_B53	EE statistics training

23. This subcomponent focused on improving the capacity of both collection and processing of energy statistics in the enterprises and administrations.

24. To assess the situation at the provincial level, a survey was completed for the sectors industry, construction, wholesale, retail, accommodations, and catering. Based on the findings, a training textbook was developed to guide enterprises and statistical offices in compiling improved statistics. In general, enterprises need to complete nearly 20 pages of energy-related surveys on an annual, biannual, and monthly basis, which are then used as input for the energy balance. The process of data collection of annual statistics involves large enterprises sending their data to the county by February 5, to allow for review of data accuracy by the statisticians before they are made accessible at the national level two days later. If discrepancies are found, local-level authorities can ask enterprises to make changes to their data, which can then be tracked through the system. An annual statistics book for Shanxi is made available for public access to the data.

25. Training sessions were offered every year focusing on three different sectors: coal and coal-related industry, heavy energy consumers, and SMEs. While most participants were enterprise staff, 130 administrative staff from counties (119) and municipalities (11) also benefitted from the training. Between 2011 and 2016, 949 professionals were trained, and a system of EE indices was developed.

26. The Shanxi Statistics Office collaborated with the Energy Conservation Brigade to do an interesting data cross-check—they compared SME energy consumption collected by the two different systems and found that for larger SMEs, the systems reported consumption figures that more or less matched, but that this was not the case for 60 percent of smaller SMEs. The discrepancy highlights that further work would need to be done to move toward harmonized data on energy consumption.

Table 2.19. Contract Outputs

TA B61(A)	Overall project management
TA B61 1	Hiring of a project management consultant
TA B61 2	Hiring of a financial consultant
TA B62	Hiring of an international technical adviser
TA B63	Dissemination of results
TA B64	Road map for promoting BEE technology

27. Under this subcomponent, the PMO received capacity-building support from three consultants on EE and management.

Component C: Jiangxi Energy Efficiency Scaling-up Program (GEF financing US$4.46 million)

28. The project component for Jiangxi is divided into five subcomponents, reflecting the province's priorities to achieve the 12th FYP targets.

Subcomponent C1: Develop EE Service Industry

Table 2.20. Intermediate Outcome Indicators

Component	Target	Achieved
C1.1. Development of supporting policies for energy service industry	Policies implemented	Policies implemented
C1.2. Number of EPC projects conducted	75	96

Table 2.21. Contract Outputs

TA_C11	Research on the market management system of Jiangxi EE technology services and the development of the ESCO industry
TA_C12	Research on promoting development of the EE equipment manufacturing industry in Jiangxi Province

29. This subcomponent focused on the development of the market for energy-savings services, which was relatively new in Jiangxi Province compared to other provinces. The two major outputs under this subcomponent were research reports on energy-savings technology for the development of the energy service industry (TA_C11) and a report on the promotion of local energy-savings equipment manufacturing (TA_C12). These reports contributed toward Jiangxi's efforts to develop expertise in energy efficient equipment. The PMO also developed guidance to define and explain EE among industry stakeholders. The studies drew lessons from the experiences of developed countries and other regions to inform policy recommendations on how to promote Jiangxi's EE service market and energy-saving manufacturing industry. Specifically, it led to three plans[8] that were officially adopted as part of the 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry.'

30. Training materials were produced under this component, such as 'Contractual Energy Management Cases and Practices' as well as 'Auditing for Cleaner Production: Theory and Practice', both published by the Jiangxi Publishing Houses of Science and Technology. These materials were frequently used during the training sessions organized by the Provincial Commission of Economy and Information together with the Jiangxi University. The training was provided to help energy auditors, as well as enterprises, to do their own auditing. In total, approximately 300 people were trained.

Subcomponent C2: Establish an EE Monitoring, Supervision, and Information Management Platform

Table 2.22. Intermediate Outcome Indicators

Component	Target	Achieved
C2.1. Number of enterprises connected to the information platform	200	518
C2.2. Number of staff and officials trained to use the information platform	400	2,400

[8] Plan for the Development of Energy Efficiency and Environmental Protection Industry in Jiangxi Province (2013–2017), Plan for Actions of Energy Efficiency and Environmental Protection Industry in Jiangxi Province (2016–2018), and Plan for Green Development of Industry in the 13th FYP of Jiangxi Province.

Table 2.23. Contract Outputs

TA_C21	Construction of Energy Monitoring and Monitoring Information Platform in Jiangxi Province
G_C21	Network platform system and hardware procurement

31. Under this subcomponent, hardware was installed and software developed to establish a platform for the collection and dissemination of energy data for energy monitoring, supervision, and information management (TA_C21 and G_C21). The platform brought data from key energy-consuming enterprises to a network that connects 11 municipal energy consumption supervision and monitoring offices and six countries with the provincial monitoring center. Because it enables better auditing of data by the responsible departments and an increase in data collection frequency from quarterly to weekly, the platform improves data accuracy and enables the offices to provide better information on energy flows and EE opportunities.

32. The system allows enterprises to benchmark their EE performance against other enterprises, as well as to check for compliance with their energy intensity targets and installed equipment. The system also forecasts certain data such as provincial energy consumption for the enterprises connected to the platform. A technical manual and training materials for using the platform were developed and 380 people were trained. As a next step, the PMO plans to continue training of staff at enterprises on how to use the platform as well as on how to use collected data to provide valuable services to their respective enterprises.

Subcomponent C3: Develop Energy Pricing and Fiscal Policies to Create Incentives for EE Activities and Investments

Table 2.24. Intermediate Outcome Indicators

Component	Target	Achieved
C3.1. Development of fiscal subsidies and rewarding policies to promote energy conservation	Policies implemented	Policies implemented
C3.2. Development of taxation policies to promote energy conservation	Policies implemented	Policies implemented
C3.3. Development of energy pricing adjustment policies to promote energy conservation	Policies implemented	Policies implemented

Table 2.25. Contract Outputs

TA_C31	Study on fiscal and taxation policies of energy prices in Jiangxi Province

33. This subcomponent supported research on fiscal and price incentives for improved EE in Jiangxi Province (TA_C31). The research helped develop the 'Twenty Policies and Measures of Jiangxi Provincial People's Government on Supporting the EE and Environmental Protection Industry' implemented by the Taxation and Fiscal Bureau, Pricing Bureau, Development and Reform Commission, and Provincial Commission of Economy and Information.

Subcomponent C4: Build Capacity for EE Program Management and Supervision in Local Public Sector Implementing Agencies

Table 2.26. Intermediate Outcome Indicators

Component	Target	Achieved
C4.1. Development of energy conservation monitoring implementation plan for key energy-consuming industries	Plan developed	Plan developed
C4.2. Number of staff/officials trained in the EE monitoring and supervision system	300	981

Table 2.27. Contract Outputs

TA_C41.1	Jiangxi Province energy-saving monitoring application guide and work manual
TA_C41.2	Guidelines for the application and digitization of local standards for energy consumption limits in Jiangxi Province
TA_C41.3	Application guidance and digitization of energy-savings monitoring standards for major energy-using equipment
G_C41. 1	Mobile energy-savings monitoring platform
G_C41.2	Vehicle equipment procurement
G_C41.3	Energy savings monitoring equipment
TA_C42	Study on EE benchmarking and EMS for key energy-consuming enterprises in Jiangxi Province
TA_C43	The key energy-using enterprise energy management training materials
TA_C44	Jiangxi '13th Five' supervision system planning for industrial EE
TA_C45	Modeling of Jiangxi Province's industrial energy consumption and early-warning and control system for energy conservation
TA_C46	Study on the feasibility, risk analysis, and performance evaluation of demonstration projects for industrial low-carbon transformation
TA_C47	Study on the evaluation of the Index System of Building Energy-saving and Emission-reduction in a demonstration area of industrial Jiangxi Province
TA_C48	Project dissemination

34. Under this subcomponent, a total of 10 advisory service contracts and three goods contracts were executed. While this component had separate intermediate outcome indicators, it is important to note that works under this component were related to the other Jiangxi components.

35. The '*A*pplication of Jiangxi provincial energy-saving monitoring' (TA_C41.1) directly contributed to the introduction of 'Nanchang regulations on monitoring industrial energy saving', approved by the People's Congress of Nanchang and Jiangxi Province and put into effect on December 1, 2014. This regulation is considered the most important output of this component. It was the first local supervision law on industrial EE implemented in China and provided a legal basis for the supervision agency to conduct their activities of monitoring and law enforcement surrounding industrial energy saving.

36. Implementation of the 'Guidelines for the application and digitization of local standards for energy consumption limits in Jiangxi Province' (TA_C41.2) and the 'Application guidance and digitization of energy-savings monitoring standards for major energy-using equipment' (TA_C41.3) resulted in the automation of calculations that were previously done manually. This allows, for example, an industry to obtain, based on readily available input it provides on its processes, an estimate of its energy intensity that is calculated consistently, following guidelines, and enables benchmarking. The automation of the calculation now covers 22

national energy-consuming limits, 6 Jiangxi energy-consuming limits, and 14 national major energy-consuming equipment monitoring standards.

37. The 'Study on EE Benchmarking and Energy Management System for Key Energy-consuming Enterprises in Jiangxi Province' (TA_C42) proposed plans for key energy-consuming enterprises to set up energy management and EE standardization systems and implemented pilot projects in some enterprises (including the development of KPIs) to measure EE per unit output. The consulting contract 'Modeling of Jiangxi Province's industrial energy consumption and early-warning and control system for energy conservation' (TA_C45) developed models to calculate the total energy consumed by Jiangxi's industries.

38. Finally, the project also implemented three contracts for procurement of goods: a mobile energy-savings platform or app to check for compliance with industry limits and KPIs (G41.1), vehicle-mounted energy-consumption supervision equipment (G41.2), and energy-savings monitoring equipment (G_C41.3). This equipped the Jiangxi provincial monitoring team and 11 other teams at the municipal and district levels with a real-time monitoring platform and special equipment to strengthen the law enforcement capacity of Jiangxi's monitoring personnel.

Subcomponent C5: Establish an EE Appraisal System for Fixed-Assets Investments

Table 2.28. Intermediate Outcome Indicators

Component	Target	Achieved
C5.1. Development of EE appraisal method and associated guidance for fixed-assets investment	Implemented	Implemented
C5.2. Number of EE fixed-asset appraisals conducted	20	2,171

Table 2.29. Contract Outputs

TA_C51	Research on the construction of EE evaluation and examination systems for new industrial projects

39. Against the background of tightened control over energy consumption through the 12th FYP, this component introduced an innovative approach for delivering improved energy intensity and consumption control in the industrial sector through an EE appraisal system. While energy intensity control has been ongoing since the 11th FYP through intensity targets imposed by the Central Government, the fixed assets system aims at improving energy volume control by using permits for new enterprises and forced retrofits or decommissioning for existing enterprises. It therefore provides necessary guidance for implementation of the national framework of volume control at both the provincial and sectoral levels. Currently, the system is focusing on six major energy-consuming sectors: steel, cement, ceramic, chlorine-alkali, non-ferrous metals, and thermal power. The methodology was developed by Nanchang University and is tailored to the specific demands of each sector. One of the main benefits of the methodology is its ability to calculate EE at the plant level. The methodology was officially adopted by Jiangxi Province and is being reviewed and adapted annually.

40. A total of 500 staff received training on the fixed-asset EE appraisal system, of which 200 were from enterprises. Through the new requirements and standardization of energy audits, over

2,000 fixed-asset appraisals were carried out, a group of demonstration enterprises for cleaner production were identified, 31 cleaner production audits and consultancy organizations were designated, and the Jiangxi Association of Cleaner Production was founded. Finally, clean production audits and investments were carried out in 300 enterprises under the fixed-asset EE assessment and triggered investments of CNY 4.94 million.

Annex 3: Economic and Financial Analysis

1. The PAD economic analysis consists of essentially an incremental cost-benefit analysis that forms the foundation of the GEO and PDO indicator targets. Incremental economic costs and benefits of a project are those that arise relative to a situation in the absence of the project. The project's incremental economic cost includes primarily financing provided by the World Bank and GEF and by provincial governments for realization of project objectives, costs of additional EE investments facilitated through the strengthened EE service industry, and costs of additional EE investments by key energy-consuming enterprises under strengthened monitoring and supervision.

2. Incremental economic benefits arising from the project are multiple. Primary benefits are those that arise from increased energy savings, such as reduced expenditures on energy; a reduction of environmental pollutants (GHG and others); and possibly, improved quality of health. Secondary benefits arise from increased investment in human and physical capital, such as improvements in labor productivity arising from TA and capacity building, and increased output of energy-saving equipment manufacturers.

3. Many of these benefits are difficult to quantify because it is difficult to measure benefits arising from TA and capacity building when these benefits are diffuse and often indirect, and it is also difficult to attribute causal linkage between observed benefits and project intervention. Determination of project economic and financial viability by calculating rates of return is not feasible in any accurate sense. However, the PAD does provide estimates of energy savings and GHG emission reductions following investments from EPC project sand from key energy-consuming industries connected to the monitoring platforms. These estimates aim to provide at least an indicative value of project benefits while also satisfying a requirement to report on energy savings and emissions reductions for the GEF-financed projects.

Incremental Costs

4. The incremental costs of the project include those incurred by GEF and counterpart financing sources as well as the capital costs of additional EE investments facilitated through the strengthened EE service industry. The capital costs of additional EE investments by key energy-consuming enterprises is more difficult to estimate and was therefore excluded from the analysis in the PAD.

5. Investment flows from ESCOs totaled US$737 million, 172 percent above the target value of US$429 million. The PAD economic analysis estimates investment flows from ESCOs, which is itself a PDO outcome indicator, based on the intermediate outcome indicators A1.2, B1.2, and C1.2. The calculation of investment flows was made with the assumption that the average investment of an EPC project was approximately US$1.06 million[9], using as reference records of the China Energy Management Company Association.

[9] For Shandong Province, the investment flows from ESCOs target was originally based on a target in the Shandong Energy Efficiency Scaling-up Program rather than the expected number of EPCs in this project. If it was based on the number of targeted EPCs, the PDO outcome indicator targets would not be substantially different—investment flow from ESCOs would be US$429.55 million (rather than US$459 million), cumulative lifetime energy saving would be

Table 3.1. EPC Investment Costs

Flow	Province	Target at Appraisal (US$, million)	Actual/Latest Estimate (US$, million) [a]	Percentage of Appraisal
Number of EPC projects conducted (from provinces)	Shandong	225	736	327
	Shanxi	105	50	48
	Jiangxi	75	96	128
	Total	**405**	**882**	**218**
Investment flows from energy services companies (US$, millions)	Shandong	239	543	227
	Shanxi	111	53	48
	Jiangxi	80	96	120
	Total	**429**	**737**	**172**

6. The outcome indicator for investment flows were based on the joint efforts of the three provinces. Using the methodology for setting the PDO outcome indicator targets in the PAD, as well as the information reported independently by the three provinces, the targeted and achieved values can be broken down by province. This shows that investment flows from ESCOs in Shanxi Province were below expectations, but the investments in other provinces, particularly Shandong, exceeded the expectations, making up for the investment shortfall in Shanxi. It must be noted, however, that Shanxi Province reported only on the EPC projects that received federal subsidies, whereas the number for Shandong Province also included the EPC projects that did not benefit from subsidies.

Incremental Benefits

7. The outcome indicators (a) cumulative lifetime energy savings (Mtce) and (b) associated GHG emissions reductions are quantified project incremental benefits. Energy savings resulting from the energy services industry were estimated based on the assumptions that the average cost of industrial energy conservation investment projects is US$303 per tce-annual capacity (based on studies of experts from the Energy Research Institute of the NDRC) and that the average lifespan of the energy-saving capacity is 10 years. Additional energy savings flowing from investments made by enterprises connected to the EE monitoring, supervision, and information dissemination platform were calculated based on historical savings. Specifically, it was assumed that these enterprises accounted for approximately 70 percent of total industrial energy consumption in the three provinces, that the savings they would produce over the lifetime of the project would be slightly lower than those achieved in the past (due to reduced technical improvement potential), and that the project would contribute to 10 percent of these savings.[10] Using a similar procedure, the Provincial level indicators can be derived and are shown in Table 3.2

Table 3.2. Energy Saving and GHG Reduction Benefits

Flow	Province	Appraisal	Achieved	Percentage of Appraisal
Cumulative lifetime energy saving (Mtce)	Shandong	10.5	50.6	482
	Shanxi	4.8	5.3	110

17.2 Mtce (rather than 18.2 Mtce), and associated GHG emission reductions would be 42.0 $mtCO_2e$ (rather than 44.4 $mtCO_2e$).

[10] It is argued that China's experience shows that strengthened energy management and supervision can contribute up to 10 percent energy savings in industrial enterprises.

	Jiangxi	2.9	10.4	359
	Total	18.2	65.9	362
Associated GHG emission reductions ($mtCO_2e$)	Shandong	25.7	132.7	516
	Shanxi	11.7	14.0	120
	Shanxi	7.0	27.2	389
	Total	44.4	173.9	392

8. Table 3.2 shows how the expected savings compared to those that were achieved as reported by the PMOs. For each province, the savings were much higher than expected, with the multiplicative factor by which the target was exceeded roughly corresponding to the volume of investments from ESCOs since this is where the bulk of the savings (83 percent at appraisal) were expected to be achieved.

9. The GHG emissions reductions associated with the energy savings are calculated assuming a conversion factor of around 2.44 $mtCO_2e$ per Mtce.[11] At appraisal, the project was expected to reduce emissions by 44.4 $mtCO_2e$, which was exceeded substantially. With 173 $mtCO_2e$ avoided, the GEF grant of US$13.39 million achieved a cost-effectiveness of just under US$0.08 per tCO_2. Considering the estimated costs of the Government of China cofinancing, as well as the investment flows from energy services companies, the cost of avoided carbon emissions rose to US$4.34 per tCO_2. This value would rise somewhat if the energy-saving investment costs of the enterprises connected to the platform could be measured and included in the calculation. However, given that this estimate does not consider other pathways to energy saving and emission reduction that are supported by the project, the true value number is likely to be lower.

[11] The emissions factor was slightly higher only for the achieved values reported by Shanxi at 2.62 $mtCO_2$ per Mtce.

Annex 4: Bank Lending and Implementation Support/Supervision Processes

Task Team Members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Gailius J. Draugelis	Senior Energy Specialist	EASCS	Task Team Leader
Bob Taylor	Senior Consultant	EASCS	Energy Efficiency
Yabei Zhang	Energy Economist	EASIN	Technical
Alberto U. Ang Co	Senior Energy Specialist	EASIN	Technical
Xin Ren	Environmental Specialist	EASCS	Environment Safeguards
Youxuan Zhu	Consultant	EASCS	Social Safeguards
Xiaowei Guo	Senior Procurement Specialist	EAPPR	Procurement
Fang Zhang	Financial Management Specialist	EAPFM	Financial Management
Kun Cao	Program Assistant	EACCF	Assistant
Supervision/ICR			
Jonathan Sinton	Senior Energy Specialist	GEE05	Task Team Leader
Yun Wu	Energy Specialist	GEE09	Task Team Leader
Yabei Zhang	Senior Energy Economist	GEE03	Task Team Leader
Joeri de Wit	Energy Economist	GEESO	ICR Author
Christian Mahler	Energy Specialist	GEEES	ICR Author
Bob Taylor	Senior Consultant	GEE03	Energy Efficiency
Xin Ren	Senior Environmental Specialist	GEN2A	Environment Safeguards
Youxuan Zhu	Safeguards Specialist	GSU02	Social Safeguards
Jianjun Guo	Senior Procurement Specialist	GGO08	Procurement
Fang Zhang	Financial Management Specialist	EAPFM	Financial Management
Shanshan Ye	Program Assistant	EACCF	Assistant
Na Han	Team Assistant	EACCF	Assistant
Cristina Hernandez	Program Assistant	GEE09	Assistant
Tianxiu Kang	Program Assistant	EACCF	Assistant
Yuanyuan Tan	Consultant	EACCF	Interpretation

Staff Time and Cost

Stage of Project Cycle	*Staff Time and Cost (Bank Budget Only)*	
	No. of Staff Weeks	*US$, Thousands (including travel and consultant costs)*
Lending	41.39	
	—	55.35 (travel)
	—	47.91 (consultants)
Total:	**41.39**	**103.25**
Supervision and ICR	1.89 + 23.67	
	—	52.07 (travel)
	—	1.86 + 33.84 (consultants)
Total:	**66.95**	**191.03**

Annex 5: Agenda of the National Dissemination Workshop

National Dissemination Workshop held in November 2016 in Beijing

研讨会议程

Workshop Agenda

时间 Time	会议内容 Content	发言人 Speakers
上午 **Morning**		
9：00	会议开始 Starting the Meeting	世行项目组组长 乔纳森·辛顿 World Bank Task Team Leader, Jonathan Sinton
领导致辞 Introductory remarks		
9:05-9:10	世行领导致辞 World Bank	Zoubida Kherous Allaoua
9:10-9:15	财政部领导致辞 Ministry of Finance	田敏 国家财政部国际财经合作司 官员 Min Tian, Officer, International Finance and Cooperation Department, Ministry of Finance
9:15-9:20	国家发展改革委领导致辞 National Development & Reform Commission	蒋靖浩 国家发改委资源节约和环境保护司副处长 Jinghao Jiang, Deputy Director , Resource Conservation and Environmental Protection Department,National Development and Reform Commission
9:20-9:25	全球环境基金秘书处致辞 GEF Secretariat	杨明 资深项目管理专家
项目成果介绍 Results from provinces		
9:25-9:55	江西省情况介绍 Jiangxi Province	江西省节能监察总队总队长 聂云霞 Shanxi Energy Conservation & Supervision Corps, Chief Captain, Yunxia Nie
9:55-10:25	山西省情况介绍 Shanxi Province	山西省财政厅国际处 处长 琚良太 Liangtai Ju, International Department, Shanxi Finance Bureau
茶歇 Tea Break		
10:40-11:10	山东省情况介绍 Shandong Province	山东项目办执行主任 代兵 Shandong PMO Executive Director, Bing Dai
11:10-11:30	世行总结 Summary by the World Bank	Todd Johnson
下午 **Afternoon**		
论坛 Discussion of Key Project Results		
13:30-14:40	（一）在线能效监测，汇报和传播系统（三省）和创新的企业能效监察工具（由监察机构使用）Online Government-Enterprise EE Monitoring, Reporting and Dissemination Systems & Innovative Industrial EE	江西节能监察总队副总队长 喻丹峰 Shanxi Energy Conservation & Supervision Corps, Deputy Chief Captain, Danfeng Yu

	Supervision Tool	
	1. 江西： a. 介绍信息平台建设情况 b. 能耗限额电算化应用程序 c. 主要用能设备电算化应用程序 1. Jiangxi: a. Construction of the energy-saving information platform b. Application program for the computerization of energy consumption quota c. Application program for the computerization of main energy-consuming equipment	1.a&b 任兴来 青岛高校信息产业股份有限公司 Qingdao Gaoxiao Information Industry Corp., Ltd. c. 喻金平 江西理工大学工程学院
	2. 山西：平台建设情况 Shanxi: Construction of energy-saving information platform	山西省节能监察总队刘明 队长
	3. 山东：节能监察机构能力条件研究 Shandong: Assessment of capabilities of energy saving supervision organizations	山东环境咨询有限公司 袁学良 Shandong Environment Consulting co., LTD, Xueliang Yuan
14:40-15:10	（二）展示企业能源管理系统（能源管理体系）Roll-out of Enterprise Energy Management Systems (EMS)	主持人 Host 刘建华 山西省财政厅 副调研员
	1. 山东：能源管理体系，项目成果和当前建设情况 Shandong: Energy management system, project achievements and current status	山东省节能协会 王世岩 Shandong Energy Conservation Association ,Shiyan Wang
	2. 江西：能效对标和建立能源管理体系研究 Energy efficiency benchmarking and establishment of energy management systems	杨杰 通标标准技术服务有限公司（SGS）厦门分公司
茶歇 Tea Break		
15:20-16:05	（三）支持本地节能服务产业发展 Expansion of the Local Energy Service Industry	主持人 Host 山东项目办执行主任 代兵 Shandong PMO Executive Director, Bing Dai
	1. 山西：节能服务产业发展情况介绍 Overview of the ESCO	山西省经信委节能处 乔铁军 副处长

	industry	
	2. 山东： a. 节能信息平台，节能辅助系统和智慧能源云平台 b. 合同能源管理项目节能量测量和验证方法 2. Shandong: a. Energy--‐saving information platform, energy--‐saving auxiliary system and smart energy cloud platform b. Measuring and verifying energy savings in EPC projects	积成电子有限公司 赵金洋 Integrated Electronic Systems Lab Co., Ltd., Jinyang Zhao 通标标准技术有限公司 朱斌斌 Standards Technical Services Co., Ltd, Binbin Zhu
16:05-17:25	（四）政策研究成果。介绍项目节能政策的研究工作，重点在政策和/或能力建设的应用效果 overview of the listed key policy research efforts, focusing on policy and/or capacity building implementation results	主持人 Host 世行首席能源专家 罗伯特•泰勒 Chief Energy Expert of the World Bank, Robert Taylor
	1. 江西：省节能监察应用指南及工作手册 Jiangxi: Provincial energy--‐saving monitoring application guideline and workbook	赵武 南昌市节能监察中心
	2. 山西： a. 能源统计指导和培训 b. 煤炭和煤层气政策研究 c. 推进山西省建筑节能技术路线图研究 2. Shanxi a. Energy statistical officer guidance and trainingb b. Coal and coal--‐bed methane policy research c. Pathway to building energy efficiency technologies	2-a 山西省统计局能源处 焦有梅 处长 2-b 山西省价格协会 刘玎玲 博士 2-c 国瑞沃德（北京）低碳经济技术中心 王健夫 主任
	3. 山东：新形势下节能融资研究 Shandong: Research on energy conservation financing under the new circumstances	国瑞沃德低碳经济技术中心 蒋习梅 Green World Low-carbon Economy & Technology Center, Ximei Jiang
17:25--17:40	会议讨论 Discussion	
17:45	闭幕 Close of workshop	

Annex 6: Summary of Borrower's ICR and/or Comments on Draft ICR

Shandong ICR Summary

1. The Provincial Energy Efficiency Scale-Up Project had three parts, including the Shandong, Shanxi, and Jiangxi Province projects, with total GEF grant support of US$13.39 million. The project objective was to improve quality and sustainability of provincial EE programs in three provinces through technical assistance and institutional capacity building. Shandong was allocated a GEF grant budget of US$4.46 million to carry out the Provincial Energy Efficiency Scaling-up Project through promoting the development of the energy-saving service industry, establishing an energy-saving management information platform, strengthening the enterprise EMS, and improving the supervision capacity of the EE project of local enterprises and government departments.

2. In accordance with the requirements of the project documents and combined with the actual situation, Shandong Province carefully designed the project content, earnestly implemented the project, and successfully completed the project target. As for the project design, we carried out specific projects covering macro policies, market mechanisms, EE standards, enterprise EE improvement, and key energy equipment management. The overall design and implementation of the project were in full compliance with the actual needs of Shandong energy conservation work. It also firmly grasped the key point of current economic and social development in Shandong and brought realistic guiding significance and foresightedness. In the current and future period, the project outputs will guide the province's energy-saving work in depth.

3. Shandong achieved excellent results from implementing the Shandong/World Bank/GEF Provincial Energy Efficiency Scale-Up Project. We completed 56 reports of investigation, research, and management, with a total of more than 210 million words; formally published 4 books, with a total of 1.4 million words; directly organized 13 trainings, with the cumulative trained personnel of 2,200; issued 4 local standards in the field of energy conservation; promoted the development of 3 provincial energy-saving platforms; completed 5 software-like energy management assistance systems; produced 8 energy-saving promotion videos; and made more than 460 policy recommendations, which have been paid great attention by the provincial Energy Conservation Office, and some of them have been implemented in Shandong and have achieved remarkable results. And the project completed the project design requirements of the various indicators. In the specific project, results are mainly reflected in the following aspects. The Shandong project has achieved all the project designed indicators and the specific project outputs are mainly reflected in the following aspects.

4. First, the project strongly accelerates the development of the province's energy-saving services industry. Through the implementation of the project, we developed the standard for the Energy-saving Amount Measurement and Verification Methods of EPC, which is the first in China and which standardized the implementation of the EPC project; published the 'Energy-saving Amount Measurement and Verification Method' and '60 Q&As of Energy Performance Contracting', which are the first systematic teaching materials of introducing energy-saving amount verification and the actual operation of the EPC project; used the grant funds for directly training more than 590 people of third-party certification units and the energy-saving service company staff, which effectively promotes the development of energy-saving services industry;

and promoted the 'Research on energy conservation financing under the new circumstance', which proposes a new energy-saving financing model at the provincial level and is highly regarded by industry experts. A series of fruitful activities have played a positive role in promoting healthy and long-term development of the energy-saving service industry.

5. Second, the project comprehensively promotes the improvement of the province's energy-saving information platform. Through the implementation of the project, Shandong completed and improved the province's energy-saving information platform, which is in the leading position, domestically. As of the end of December 2015, it has connected 1,518 enterprises and trained the 1,040 related personnel, which is far more than the project's designed target of 200 enterprises and 400 trained people. The establishment of the platform is very important for Shandong Province to master the province's energy consumption data, assess the progress of energy-saving targets, and grasp the energy consumption changes of key energy-saving units. We also developed the first public welfare energy-saving mobile Internet platform, which fills a domestic gap. It is an Internet-based, energy-saving information dissemination and communication platform, which will focus on the new energy-saving technologies, new product promotion, and innovation mechanism.

6. Third, the project effectively supports the development of the provincial EMS. The outputs of the project research directly affect the development of the EMS in Shandong, which promoted this work move on the fast lane. We made three local standards of EMS implementation guidelines in the cement, thermal power, and paper industries, which filled the gap domestically and took a leading position internationally. To promote the EMS's in-depth implementation, we published the 'Energy Management System,' 'Energy Management System: From Theory to Practice,' which became the most systematic set of teaching materials for EMS theory and actual operation, formulated three standard framework of EE leaders in the fields of thermal power, electrolytic aluminum, and chlor-alkali, which is the first nationwide framework to put forward specific measures for implementation of an EE leader system at the technical level; directly supported and guided 25 key energy units to develop the EMS; and promoted the formulation of the 'Shandong Province Energy Management System Construction Plan', 'Energy Management System Audit and Evaluation Guideline' and other policies, which helped improve the scheduling system of the EMS construction work; and based on the improvement of the comprehensive measures, ensured that the construction work of Shandong Province's EMS is always at a leading level, domestically. As of the end of 2015, in Shandong Province, there were 976 key energy-consuming enterprises to start the construction work of the EMS on time. Among them, the number of certified enterprises was 197 and the number of enterprises that passed the evaluation was 746, accounting for 13.1 percent nationwide. The implementation of various measures provides a good reference for the Central Government to develop and promote the EMS. At the same time, it effectively helps enterprises improve the energy management capacity and promotes the energy-saving work and EE increase, which has played an important role in enhancing the quality of economic development.

7. Fourth, the project effectively promoted the increase of the province's energy-saving management capacity significantly. Through the implementation of the project, we carried out the 'Research on the adaptability of the energy-saving management organization of Shandong' and 'Research on the construction condition of the ability of the energy-saving supervision organization', which put forward specific measures for provincial energy-saving management mechanism construction and energy-saving monitoring capacity improvement aiming at changes of economic and social development and energy-saving work. We also took the lead in conducting

the research on the influence of urbanization development to long-term supply of energy consumption and energy-saving work in Shandong Province, which put forward specific policy measures and technical lines aiming at the energy consumption rigid growth demand brought by urbanization. Focusing on Internet development, the team carried out the research of energy-saving work under the Internet big data background, which puts forward the specific measures of energy-saving work with Internet big data and fills the gaps in the domestic level. The team vigorously promoted the increase of energy-saving consciousness of the whole society; produced eight energy-saving public welfare videos to advertise the concept of energy conservation and practical energy conservation knowledge, which is a systematic video collection for presenting energy-saving information; and played a positive role in the overall promotion of the whole society's awareness on energy conservation.

8. As one of the first provinces to take the initiative to explore the energy-saving work, the outputs of the Shandong World Bank project provided valuable experience and important technical support for the promotion of advanced technology and universal service model at the national level. Through the implementation of the project, Shandong has broken through the industrial development bottlenecks of energy-saving projects, supported industrial development through information technology, explored the financing problem of energy-saving projects and carried out related practice, built a local energy-saving information platform, explored the integration of the Internet and energy-saving work, and made a systematic exploration in the application of energy-saving data. And the experience and follow-up work of Shandong Province EMS is not only important for Shandong Province but also for promoting the development of EMS nationwide. The project has made a breakthrough on the evaluation of the performance-based EMS and consolidated the technical basis for the next step on policy specialization of promoting energy conservation work relying on EMS mechanism. The project also combines the reality to perfect the construction of the standard system and provides the authoritative guidance for the implementation of the standard of the EMS.

9. The achievement shows that the predesign of the project is in line with the actual situation of EE industry in Shandong Province. Under the guidance of the authorities at all levels and the World Bank, the PMO successfully completed the project implementation work, realized all the expected project objectives, and achieved and greatly exceeded the designed indicators. The practical experience of the institution, organization, and financial mechanisms through the GEF project implementation in Shandong provides a good demonstration for other provinces to develop EE project implementation plans.

Shanxi ICR Summary

10. The Shanxi GEF donation-based Provincial Energy Efficiency Promotion Project was formally implemented since May 2011 and all the task requirements were met by December 31, 2016. After it was reviewed and assessed by the relevant industry experts, it was concluded that no visible defects are found in goal fulfillment, efficiency, or relevance, and the assessment was that the implementation was Highly Satisfactory.

11. This project is designed to attract the total investment of US$13.55 million, of which GEF's donation is US$4.47 million and local funding is US$9.08 million. The actual total investment was US$12.08 million, of which GEF's donation was US$4.34 million and local funding was US$7.57

million. A total of six subprojects have been designed and implemented in total, including energy-saving service, building energy conservation, energy conservation supervision, energy price and fiscal policy study, energy conservation statistics, and institutional capacity building. In addition, 23 consulting contracts and eight good procurement contracts were signed and implemented, and 24 training and investigating activities were organized. A total of 5,373 people have attended the activities, more than 75 study reports of different types have been prepared, an information platform was built to cover more than 2,000 key energy-consuming enterprises in the province, and 400 sets of mobile law enforcement recorders were purchased.

12. With the implementation of this project, as of the end of December 31, 2016, the number of enterprises connected to the energy detection information platform is 400. Total investment through ESCOs are US$53 million. Total cycle energy conservation of the project is 5.25 million tons of standard coal. Related GHG reduction is 13.75 mtCO_2. The abovementioned supervision indicators have been exceeded.

13. One Project Office in charge of organization and coordination has been set up by the Shanxi provincial government; four sub-subject offices have also been set up to guide the implementation of the project and establish the organizational structure for undertakers in charge of specific project. During the implementation process, the 'Triple Three' working mechanism was implemented to ensure the quality of project. The 'Triple Three' working mechanism is as follows: the contract is reviewed by tender company, subproject office, and provincial PMO; the kick-off meeting, MTR meeting, and final meeting are regularly held during the process of implementation; and the implementation results of each subject are reviewed by experts from the project group, subproject office, and provincial PMO. Through the implementation of the project, the following achievements have been achieved.

(a) The Project Has Promoted the Introduction of Series of Policies in the Field of Shanxi Energy-Saving Areas.

- **Shanxi Province energy conservation industry development planning preparation and policy study [TA_B14].** Prepare Outline for Shanxi Energy-Saving Industry Development Plan and provide theoretical support for preparing Shanxi '13th five' energy-saving industry plan—many such proposals are contained in the Shanxi '13th five' Energy-saving and Environmental Protection Industry Development Plan.

- **Study of coal seam gas price policy [TA_B43].** Directly promote the introduction of Guiding Opinions for Promoting the Study and Reform of Shanxi's Coal Seam Gas Pricing Mechanism, which has planned the Shanxi coal bed gas price formation mechanism from the macro level. In addition, some departments continue to deepen the study of coal bed methane price formation mechanism based on this guidance and the research results, thus promoting the development of coal bed methane.

- **Study of coal price policy [TA_B41].** The concept of "internalizing the external costs of coal production, such as mining rights acquisition, resource exploitation, environmental management, ecological restoration, safety investment, infrastructure construction, enterprise exit and conversion, and improvement of people's livelihood" is highly appraised by the Shanxi Comprehensive Reform Office and is included in

the Pilot Implementation Plan for Shanxi National Resource-Based Economic Restructuring Comprehensive Reform (2014–2015). The concept of "establishing a sound coal price warning and forecasting system," is contained in the Notice on Exploration and Establishment of Work Program for Coal Price Discovery Mechanism and Transmission Mechanism (Jin Jia Yan Zi [2015] No.157) issued by Shanxi Price Bureau.

- **Study of fiscal policy [TA_B42].** Policy recommendations on the coal resource tax have been approved by the relevant state departments, which has encouraged the country to issue a notice on the implementation of coal resource tax reform issued by the MOF and State Administration of Taxation on October 2014 (CS [2014] No.72).

- **Shanxi Province BEE technology road map research [TA_B64]**. the proposed conclusions and recommendations have a very strong guiding role, which is being studied by the relevant departments to develop relevant building energy conservation policies.

(b) The Project Has Enhanced the Energy-Saving Management Capabilities and Energy-Saving Supervision Capabilities of Shanxi Province.

14. With the establishment of energy-saving monitoring subproject information platform [TA_B31], Shanxi Province Energy Conservation Supervision Corps has established the Shanxi energy-saving supervision information platform, enhanced energy management and control capacity of energy-saving management departments at all levels and energy-saving supervision agencies, accurately and timely analyzed the trend of energy-saving, and enabled energy-consumption enterprises to carry out EE benchmarking. The information construction has promoted the standardization of energy-saving supervision system and improved the level of energy-saving supervision in Shanxi Province, which is at the forefront of energy-saving supervision work in the country.

(c) The Project Has Filled the Gaps of Shanxi Building Energy-Efficiency Assessment and Energy-Saving Statistics.

15. The topic of 'Shanxi BEE evaluation' (TA_B22) fills the gap of Shanxi Province's BEE evaluation work. The 'energy-saving statistical training material preparation' (TA_B51) topic compiled 'Basic Knowledge and Application of Energy-Saving Statistics', which is the first textbook that comprehensively and systematically introduces energy-saving statistics; fills a gap in the field of energy-saving statistics in Shanxi Province and the country; and has played an important role in promoting the energy-saving statistical business capacity in the country, especially for enterprises.

(d) The Project Has Promoted the Development of Shanxi Coal Bed Methane Characteristics Industry.

16. The study of coal bed methane price formation mechanism [TA_B43] has promoted the development of coal bed methane industry in Shanxi Province and the strategic development of 'gasification Shanxi'. If the research results of this project can be further studied and applied, it

can change the energy consumption structure of Shanxi Province to achieve the purpose of structural energy conservation, reduce the traditional energy consumption, and improve the EE of related industries in Shanxi Province.

(e) The Project Has Cultivated Many Energy Management Personnel for Government and Enterprise.

17. During the implementation of the project, each subproject used GEF to hold training for management personnel in the government departments and key energy-consumption companies. A total of 5,373 people have attended the training, which cultivated many knowledgeable and skilled energy management personnel, strengthened their capabilities in relevant areas, and had a profound impact on energy-saving work in Shanxi Province.

18. The main experience of the project is summarized as follows: the pre-planning design of project, good communication in the implementation process, efficient organization of project office, and guidance of the World Bank experts are the guarantee for the quality of the project; the approval time for project was relatively long, leading to the redesign of some subjects, so it is recommended to shorten the approval time of the World Bank/GEF.

19. This project has promoted the development of energy-saving work in Shanxi Province and improved the Government's energy conservation management capacity and enterprise's energy conservation at the management level. The project made achievements in energy conservation service, building energy conservation, energy conservation supervision, and energy conservation statistics, which will continuously power and promote the energy conservation in Shanxi and will have a far-reaching influence on energy-saving management work of the Shanxi Provincial Government and relevant departments.

Jiangxi ICR Summary

Description of Project

20. The World Bank/GEF Provincial Energy Efficiency Scale-up Project, Jiangxi Component (Grant No.: P114182) was initiated in August 2011 and scheduled to close on December 31, 2016. Since the implementation of the project till the present, 30 different research reports were completed, one information reporting platform covering 500 energy-consuming enterprises in Jiangxi was established, two pieces of computation program were developed, 132 sets of mobile monitoring platforms and equipment were procured, and 2,400 persons were trained.

Major Outputs Achieved

21. **Subcomponent C1: Develop EE service industry.** Implementation of two consultant tasks—Energy conservation service market management system and developing the provincial EE service industry (TA_C11) and study on policies of developing EE production industry in Jiangxi Province (TA_C12). The proposed policy was adopted by the 12 pieces of 'Polices and Measures of Jiangxi Provincial People's Government on Supporting EE and Environmental Protection Industry' and Plan for Actions of EE and Environmental Protection Industry in Jiangxi Province (2016–2020). The training materials on 'Cases and Practice of Energy Performance Contracting'

and ‘Theory and Practice of Reviewing Clean Production’ were published by Jiangxi Scientific and Technical Publishers and used in the training classes.

22. **Subcomponent C2: Establishing an EE monitoring, supervision, and information dissemination platform.**

- Implementation of consultant contract of EE monitoring and supervision information dissemination platform construction of Jiangxi (TA_C21) and corresponding goods procurement contract procurement of hardware equipment needed for the platform (G_C21).

- Completion of the procurement, installment, and commissioning of the software and hardware for the platform.

- Finishing the direct online report, analysis, and pre-warning for energy data of 500 key enterprises.

23. Based on this output, Jiangxi will make more investment in establishing energy online monitoring platform (system) covering all key enterprises in whole province and improving the timeliness, accuracy, and applicability of energy data.

24. **Subcomponent C3: Developing energy pricing and fiscal policies to incentivize EE activities and investments.** Based on the thorough research, a series of policies and suggestions relating price and finance were proposed in favor of energy conservation and emission reduction. The output promoted the related work of authorities on finance, taxation, reform and development, industry and information technology, and so on and led to the development of a series of policies regarding pricing, fiscal, and taxation for promoting energy conservation and emission reduction.

25. **Subcomponent C4: Building capacity for EE program management and supervision in local public sector.** Implementation of 10 consultant contracts and 3 goods procurement contracts includes the task of ‘Guideline and Working Manual for Jiangxi EE Program Management’ (TA_C41.1) that led to preparation of ‘Guideline and Working Manual for Jiangxi EE Program Management and Work Flow Chart for EE Supervision Law Enforcement’. The output from the task directly promoted the promulgation of Jiangxi Supervision Measures for Industrial EE and Nanchang Supervision Regulation for Industrial EE. The tasks of ‘Standard Application Guideline and Computerization for Jiangxi Energy-consuming Quota’ (TA_C41.2) and ‘Standard Application Guideline and Computerization for Key Energy-Consuming Equipment in Jiangxi Province’ (TA_C41.3) developed computerization programs for 15 pieces of national energy-consuming quota for the main unit product, 15 pieces of Jiangxi energy-consuming quota for the main unit product, and 20 pieces of national monitoring standards for key energy-consuming equipment. The outputs were recognized by the Ministry of Industry and Information Technology and applied nationwide. The mobile platform and related devices and equipment tremendously strengthened the EE Supervision Law Enforcement capacity in Jiangxi.

26. **Subcomponent C5: Establish EE appraisal system for fixed-assets investment.** Implementation of consultant contract developing the EE appraisal system for new industrial projects (TA_C51). It proposed the EE appraisal guideline for six key energy-consumption

industries and Measures of Computerization for Energy Savings in Key Energy-consuming Enterprises. It further promoted the energy conservation evaluation and audit for fixed-asset investment in Jiangxi Province.

Next Steps of Project

27. Through the implementation of the project, the PMO not only improved the strength but also built the capacity of foreign-aid projects' management capacity. Based on the outputs, the Jiangxi Industrial Green Development and Low-carbon Provincial Pilot Project (Loan Amount: US$200 million) is more likely to be supported by BRICS Development Bank.

Annex 7: Implementation arrangements

1. In Shandong Province, the PMO was established under the Provincial Government Energy Conservation Office. Without similarly dedicated energy conservation office, implementation arrangements within the other Provinces were more complex.

In Shanxi Province, the PMO was established under the Shanxi Provincial Finance Bureau and had responsibility for overall project coordination for this component. It worked with four Subproject Implementation Offices (SIOs) that were each responsible for different subcomponents of the project: (a) an SIO under the Shanxi Provincial Economic and Information Commission for development of EE service industry and development of EE monitoring, supervision, and an information dissemination platform; (b) an SIO under the Provincial Construction Commission for BEE; (c) an SIO under the Provincial Statistics Bureau for the EE statistics system; and (d) an SIO under the Provincial Pricing Bureau for energy pricing.

In Jiangxi Province, overall project coordination, monitoring, and management was led by a PMO founded jointly by the Jiangxi Provincial Industrial and Information Commission (JIIC) and the Provincial Finance Bureau. Subprojects were implemented in close collaboration with the following institutions: JIIC for development of the EE service industry and establishment of a fixed assets EE appraisal system; the Jiangxi Provincial Energy Conservation Supervision Agency for development of an energy conservation monitoring, supervision, and information dissemination platform, as well as the subproject on capacity building for EE management and supervision in local public sector implementing agencies; and the Jiangxi Financial Bureau for a study on energy pricing and fiscal policies

MAP: China Provincial Energy Efficiency Scale-Up Program