



## 1. Project Data

<b>Project ID</b> P114069	<b>Project Name</b> CN-Shandong Energy Efficiency	
<b>Country</b> China	<b>Practice Area(Lead)</b> Energy & Extractives	
<b>L/C/TF Number(s)</b> IBRD-80590	<b>Closing Date (Original)</b> 30-Sep-2016	<b>Total Project Cost (USD)</b> 110,081,966.61
<b>Bank Approval Date</b> 09-Jun-2011	<b>Closing Date (Actual)</b> 31-Dec-2018	
	<b>IBRD/IDA (USD)</b>	<b>Grants (USD)</b>
Original Commitment	150,000,000.00	0.00
Revised Commitment	110,081,966.61	0.00
Actual	110,081,966.61	0.00

<b>Prepared by</b> Ihsan Kaler Hurcan	<b>Reviewed by</b> Dileep M. Wagle	<b>ICR Review Coordinator</b> Ramachandra Jammi	<b>Group</b> IEGSD (Unit 4)
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## 2. Project Objectives and Components

### a. Objectives

According to the Loan Agreement (p.5) dated September 2, 2011, and the Project Appraisal Document (PAD, p.2) the project objective was "to improve energy efficiency in selected enterprises in [People's Republic of China] Shandong province, particularly through energy efficiency leasing arrangements, and increase use of biomass for power and heat generation."



The project objective was revised at the second restructuring in September 2016 as follows: "to improve energy efficiency in selected enterprises in [People's Republic of China] Shandong province, particularly through energy efficiency leasing arrangements."

Due to the revision of the project objective, i.e., the deletion of the second sub-objective "to increase use of biomass for power and heat generation," a split evaluation of the project outcome will be undertaken in this review; however, the first objective will not be evaluated in split, since there is no significant material change in this objective, despite a downward adjustment of the corresponding PDO level indicator targets at the second restructuring (For detailed explanations, please see the sections on Project Restructurings, Efficacy and Outcome below).

**b. Were the project objectives/key associated outcome targets revised during implementation?**

Yes

**Did the Board approve the revised objectives/key associated outcome targets?**

Yes

**Date of Board Approval**

30-Sep-2016

**c. Will a split evaluation be undertaken?**

Yes

**d. Components**

The project had three components:

**A. Energy Efficiency Sub-Projects.** (Appraisal cost: US\$266.69 million, International Bank for Reconstruction and Development (IBRD) loan financing US\$133.35 million; actual cost: 215.89 million, actual IBRD financing US\$99.26 million)

Carrying out eligible energy efficiency sub-projects through financial leasing and energy performance contracting arrangements. The IBRD loan was to be on-lent to two leasing companies, i.e., Shandong Rongshihua Leasing Company (Rongshihua – IBRD loan financing US\$64 million at appraisal; actual was US\$46.23 million) and Guotai Leasing Company (Guotai – IBRD loan financing US\$50 million at appraisal; actual was US\$45.54 million), and one energy services company, i.e., Shandong Luxin Energy Investment and Management Company (Luxin Energy – IBRD loan financing US\$20 million at appraisal; actual was US\$7.15 million).

**B. Anqiu Biomass Combined Heat and Power Plant.** (Appraisal cost: US\$36.00 million, IBRD loan financing US\$15.91 million; Actual cost: US\$18.63 million actual IBRD financing US\$10.67 million)

Construction of a biomass combined heat and power plant, with an installed capacity of two units of 15 MWe each, in Anqiu of Shandong Province, including, inter alia, the provision of relevant civil works, goods, and equipment and the construction of relevant steam network and district heating network.



**C. Project Management, Monitoring and Evaluation.** (*Appraisal cost: US\$0.37 million, IBRD loan financing US\$0.4 million; Actual cost: US\$0.15 million, actual IBRD financing US\$0.15 million*)

Strengthening the capacity of the project management office, Rongshihua, Guotai, Luxin Energy, and Anqiu Shengyuan Biomass CHP Company (Anqiu) in project management, monitoring and evaluation through provision of technical assistance, training and study tours.

**Revised Components**

At the second restructuring in September 2016, Component B was deleted due to the continual failure of Anqiu in providing counterpart funding despite repeated assurances that they would do so (ICR, p.11).

**e. Comments on Project Cost, Financing, Borrower Contribution, and Dates**

**Project Cost:** The total project cost was originally estimated at US\$316.14 million including US\$12.00 million for physical and price contingencies, US\$0.70 million for interest during construction and US\$0.375 million for front-end fee. In December 2018, the project closed with a total cost of US\$234.67 million. The actual cost was 77.16 percent of the cost estimated at appraisal excluding physical and price contingencies.

**Financing:** At appraisal, the International Bank for Reconstruction and Development (IBRD) loan was estimated at US\$150.0 million including the front-end fee of US\$0.375 million. At project closing in December 2018, the IBRD financing stood at US\$110.08 million. The realization of disbursement was 73.39 percent.

**Borrower contribution:** At appraisal, the borrower's contribution was estimated at US\$166.2 million. At project closing, the borrower's actual contribution was US\$124.59 million.

**Restructurings and Dates:** There were three project restructurings

- **First Restructuring (August 7, 2013):** Contrary to the expectation at appraisal, demand for energy efficiency financing from large state-owned industrial enterprises, for which national competitive bidding rules would apply, was weak because the cost of commercial loans or using their own funds was lower than financial leasing offers; demand was mostly from small and medium size commercial companies, which had more difficulty raising project financing from commercial banks (Restructuring Paper dated June 27, 2013, p.5). Therefore, at this restructuring, "well-established private sector procurement methods or commercial practices which have been found acceptable to the Bank" was included in the loan agreement as an applicable procedure under the first component, and the prior-review requirements were revised to accommodate these changes (Restructuring Paper dated June 27, 2013, p.5). As a result, commercial practice for procurement was allowed.
- **Second Restructuring (September 30, 2016):** In this Level I restructuring, the Bank and the borrower agreed to drop the second component due to the unavailability of counterpart funds. The project objective was revised accordingly by deleting the part corresponding to the increased usage



of biomass for power and heat generation. The indicators measuring the achievement of this objective were also deleted from the results framework; (i) associated cumulative incremental amount of electricity (GWh) from biomass-based heat and power generation; (ii) associated cumulative incremental amount of electricity and heat (coverage square meter) from biomass-based heat and power generation; and (iii) generation capacity of renewable energy (other than hydropower) constructed. Furthermore, the end targets for annual energy savings both for overall project and for each project implementing company—two leasing companies and one energy services company—were lowered 20 percent; the reasons are given as (i) smaller pool of projects at creditworthy small and medium size enterprises due to economic downturn; and (ii) substantial increase in the cost of energy efficiency investments (Restructuring Paper dated September 13, 2016, p.7). In this restructuring, the scope of the subprojects was extended to cover renewable energy projects. Lastly, project implementing companies could not raise sufficient domestic funds to finance energy efficiency sub-projects due to economic slowdown, which significantly slowed the pace of project implementation; therefore, the disbursement ratio of the World Bank loan proceeds was raised from 50 percent to 80 percent and the project closing date was extended by 18 months from September 30, 2016 to March 31, 2018 because of slow progress in project implementation caused by economic slowdown.

- Third Restructuring (March 29, 2018):** The difficulty in identifying industrial energy efficiency subprojects at creditworthy small enterprises, which were interested in financial leasing model, continued through project implementation. The project implementing companies had to refocus on state-owned economic enterprises, where identifying and executing subprojects took longer time. This resulted in a second extension of the project closing date by nine months from March 31, 2018 to December 31, 2018. Furthermore, remaining project funds were allocated to the best performing project implementing company to support two new sub-projects. This restructuring was expected to "enable reaching of the targets for energy saving capacity and funds leveraged for energy efficiency project" (Restructuring Paper dated March 28, 2019, p. 2).
- Dates:** The project closing date was extended twice: by 18 months in the second restructuring and by 9 months in third restructuring. As a result, the project closing date was extended by 27 months from September 30, 2016 to December 31, 2018. The reasons for these extensions have been outlined above (see: references to the second and third restructuring).

### Disbursement Percentages

The following disbursement percentages will be used in deriving the weights to be applied to revised objectives in Outcome rating.

Project Objective	Disbursed Amount (\$ million)	Disbursement Percentage (%)
Original	55.00	49.96
First Revision	55.08	50.04



<b>Total</b>	<b>110.08</b>	<b>100.00</b>
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### 3. Relevance of Objectives

#### Rationale

The relevance of the project objectives to country context in China is high. China is one of the largest greenhouse gas emitting countries in the world. At appraisal, coal comprised about 69 percent of China’s total primary energy consumption. According to the International Energy Agency, coal’s share among primary energy sources dropped slightly to around 64 percent in 2017. Therefore, for sustainable economic growth, China still needs to achieve significant gains in energy efficiency and lower the carbon dioxide intensity of its economy—carbon dioxide emission per unit of GDP. In this regard, the project objectives are relevant to the Chinese government’s goal set in its 13th Five Year Plan from 2016 to 2022 to decrease the carbon dioxide intensity in its economy by 18 percent from 2015 levels by 2020 and to reduce energy intensity—energy consumption per unit of GDP—by 15 percent in the same time period. It is also relevant to the goal of Shandong Province to lower coal consumption by 10 percent from 2015 levels by 2020.

At the time of project closing, there was no country partnership strategy in implementation. However, according to the latest Country Partnership Strategy 2013-16 (p.18-19) before project closing, the project objective was substantially relevant to the Bank strategy under Strategic Theme One, Supporting Greener Growth, Outcome 1.1 Shifting to a Sustainable Energy Path. Accelerating energy conservation and investment in energy efficiency through investment and advisory services at national and local levels that would enhance the quality of administrative measures and encourage greater reliance on the market to deliver energy efficiency was listed as one of the areas the Bank would focus to support China’s efforts to build a secure, sustainable, and cost-efficient energy sector. Furthermore, at the time of project closing, the project objective was substantially relevant to the Bank priorities defined in the China Strategic Country Diagnostic (SCD) 2017 Under the pillar of Green Growth for Sustainability, two of the key priorities are defined as (i) fuller use of market mechanisms to reduce pollution and promote green growth and more efficient and sustainable use of natural resources; and (ii) the reduction of the use of fossil fuels, through continued promotion of energy efficiency, renewable energy, efficiency in heavy industries, and green transportation (SCD, p.73). However, the discussion in the SCD (pp. 60-61) appears to refer to mechanisms, such as pricing policies that better reflect environmental externalities, taxes and carbon-trading systems, and not to the use of financial leasing in any form.

At the time of appraisal, the World Bank had already been closely involved in the design and implementation of energy efficiency programs in China for more than ten years (PAD, p.3). In addition to its support at the national level, the Bank had been increasingly asked to provide support at the provincial level. This project was "part of an emerging provincial level support platform which combines [Global Environment Facility] supported policy and capacity building support with [International Bank for Reconstruction and Development] supported mechanisms to accelerate adoption of new approaches" (PAD, p.4). The project, being the first Bank financed financial leasing project in the country to support new equipment leasing through direct financial lease, had a demonstration aspect, as well. Therefore, given the Bank’s prior experience in the national and provincial level in China, the project objective was adequately challenging.

#### Rating



Substantial

#### 4. Achievement of Objectives (Efficacy)

### OBJECTIVE 1

#### Objective

To improve energy efficiency in selected enterprises in Shandong province, particularly through energy efficiency leasing arrangements.

#### Rationale

The first objective was clearly defined. In addition to the short-term objective to improve energy efficiency in selected enterprises in Shandong province, the project aimed at demonstrating the use of financial leasing as a feasible solution to finance energy efficiency projects. The project design was simple; the project was to provide funding to (i) two local leasing companies to finance energy efficiency projects of state-owned economic enterprises and small-and-medium size enterprises; and (ii) to one energy services company (ESCO) to demonstrate the efficient and effective adoption of the energy performance contracting (EPC) mechanism. However, the causal link between leasing and energy efficiency does not emerge clearly. Leasing is simply an instrument to facilitate the use of energy efficiency technologies by smaller units which would otherwise not be able to afford the investments required (though another alternative could have been for the government to have provided direct financial incentives to promote the use of these technologies). Towards this end, the project was simply pre-selecting two or three leasing companies to provide financial leases to smaller manufacturing or other units, in the expectation that the demonstration effect of the success of these projects would help popularize the use of leasing for energy efficiency purposes—the theory of change diagram in the ICR (p.8) supports this. There is otherwise no intrinsic connection between leasing and energy efficiency. As such, the absence of any indicators to measure these demonstration effects is a serious deficiency of the results framework. From this perspective, the theory of change for this objective was not robust.

The project financed a total of 34 energy efficiency sub-projects; 26 through financial leasing and 8 through EPC. Of these 34 sub-projects, 21 belonged to private companies and 29 companies were SMEs (for the list of companies and projects, please see Annex 6 of the ICR). The PAD did not specify the number of energy efficiency sub-projects to be supported by project funds since the selection of sub-projects was to be done after project's effectiveness. The intermediate indicators were designed to measure the investment flows for energy efficiency projects by each project implementing leasing company and ESCO. Cumulatively, the realization of investment flows was US\$215.98 million against the original target of US\$268.00 million. The breakdown of the cumulative amount per project implementing company is given below (The targets were not revised at the second project restructuring):

- Rongshihua: US\$98.39 million against the original target of US\$128.00 million
- Guotai: US\$103.43 million against the original target of US\$100.00 million.
- Luxin Energy: US\$14.16 million against the original target of US\$40.00 million



As a result of these energy efficiency investments, 331,000 tce of energy or fuel was saved at project closing. The original and revised targets were 397,000 tce and 318,000 tce, respectively. The achievement was substantial, but it differed significantly per company:

- Rongshihua: 70,470 tce against the original target of 188,000 tce and revised target of 150,000 tce
- Guotai: 239,290 tce against the original target of 147,000 tce and revised target of 118,000 tce
- Luxin Energy: 21,340 tce against the original target of 62,000 tce and revised target of 50,000 tce

The performance of Guotai stands out compared to other two project implementing companies; this was mostly because of a single energy efficiency project of the Rizhao Co., Ltd. of the Shandong Iron and Steel Group, which was financed by Guotai. If this project is excluded, the project's cumulative energy saving drops from 331,000 tce to 141,400 tce, well below the original target of 397,000 tce and the revised target of 318,000 tce. Rizhao Co., Ltd.'s project accounted for 20 percent of the cumulative investment flows, but 57 percent of the energy saved (ICR, p.17).

Regarding the demonstration effect of the project on the feasibility of financial leasing to finance energy efficiency projects, the second PDO level indicator of associated cumulative amount of funds leveraged by the Bank loan, which was US\$116.63 million against the original target of US\$134.00 million, partially captures the performance of the project. The ICR (p.16) provides additional evidence for the demonstration impact of the project; at the start of project implementation, there were five leasing companies and only Guotai and Rongshihua were active in the energy efficiency sector. At project closing, there were 19 leasing companies registered in Shandong. A causal link can be established between the demonstration effect of the project and the increase in the number of the financial leasing companies in Shandong, because the project was the only one implemented in the province when financial leasing for energy efficiency was at its infancy (ICR, p.16). It should also be noted that the provincial government's circular issued in March 2012 provided incentives to promote the development of financial leasing in the province (ICR, p.16) The project team commented that while the project had benefited from the energy conservation related provincial policies, it had also contributed to the formulation and issuance of a series of policies, including the promotion of ESCO business model.

Despite the large impact of a single project on achieving the performance indicator, the project was overall substantially successful, before and after the project restructuring, in achieving the project objective to increase energy efficiency in selected enterprises in Shandong province, particularly through energy efficiency leasing arrangements and demonstrating that financial leasing is a feasible financing mechanism for energy efficiency projects. Therefore, the efficacy of the achievement of this objective is rated substantial.

**Rating**  
Substantial

## **OBJECTIVE 2**

### **Objective**

"To increase use of biomass for power and heat generation."

### **Rationale**



The second objective was also clearly defined. The project was to finance the construction of two units of 15 MW equivalent of power generation units fueled by corn stalks and wheat stalks and a steam network for heating. The expected outcome was to increase the share of the biomass, hence avoiding coal, in power and heat generation. The project inputs were sufficient to achieve this goal. A direct causal chain can easily be established between the project activities and project outputs and outcome. The PDO level indicators of (i) associated cumulative incremental amount of electricity (GWh); and (ii) associated cumulative incremental amount of electricity and heat (coverage in m2) from biomass-based heat and power generation fully captured the achievement of this objective. Overall, the theory of change for the second objective was robust.

However, as of September 2016, the project was not compliant with the action plan requirement of documenting the availability of counterpart funds sufficient to ensure that the project objective targets could be met. Anqui did not allocate funds for this component. It was also found that such funds would not be available during the life of the project (Restructuring Paper dated September 13, 2016, p.6). As a result, although most of the civil works were completed, second component of the project, i.e., the construction on the biomass-fired generation units and the steam network, was cancelled at the second restructuring. As of project closure, no additional work was commissioned for the construction of the power generation units (ICR, p.11).

The efficacy of the achievement of the second objective is rated negligible.

**Rating**  
Negligible

## **OVERALL EFFICACY**

### **Rationale**

The theory of change was weak for the first objective, but robust for the second. The project objectives were clearly defined, and the project outcomes were broadly measurable. The causal link between the project activities, outputs and the achievement of the outcomes related to the first objective was not clear. However, the achievement of the first project objective to improve energy efficiency in selected enterprises in the Shandong Province particularly through financial leasing arrangements was substantial. The achievement of the second objective to increase use of biomass or power and heat generation was negligible, as the corresponding component was cancelled at the second project restructuring due to unavailability of counterpart funds and ineligible expenditure. This also resulted in the revision of the project objective with the second objective being deleted. At the time of the revision, less than half of the project funds were disbursed. Therefore, overall efficacy of the project is rated substantial (A detailed split rating for outcome is given in the Outcome section below).

### **Overall Efficacy Rating**



Substantial

## 5. Efficiency

### Economic and Financial Analysis

Three other project design alternatives were considered at appraisal: (i) financing a series of smaller sub-projects up to the full amount, which was rejected because of complexity, reduction in economies of scale and increase in transaction costs; (ii) lending through financial banks, which was rejected because the provincial government preferred to address persistent market failures in the energy efficiency sector through the demonstration of financial leasing mechanisms; and (iii) blending the project with the Provincial Energy Efficiency Scale Up Project, which was rejected because the loan would support only one of the three provinces covered by that project (PAD, p.7).

At appraisal, an economic analysis was conducted for the two components at the project implementing company level. Although carbon dioxide emission reduction benefits were excluded, other cost-benefit assumptions used in the analysis were adequate to conduct a robust economic analysis. Costs were assumed as (i) investment in capital equipment, working capital and long-term leases; (ii) incremental operating costs including wages, plant maintenance and overheads, and input costs, such as fuel, electricity and water; and (iii) amortization of capital costs, investment in long-term leases, engineering-procurement-and-construction contracts and connection fees over the life of the asset. Costs excluded taxes, duties, financial costs and other transfers. Major benefits were assumed to come from improved energy efficiency and savings over the life of the sub-projects and the incremental supply of heat and power (PAD, p. 58). Since sub-projects were not identified, an economic analysis was conducted for three representative energy efficiency subprojects to be used in the overall economic analysis of the project: (i) boiler renovation; (ii) waste heat recovery; and (iii) motor adjusting speed drives (PAD, p.69). The main assumptions were energy prices based on market prices, electricity tariff, energy savings from avoided coal consumption for the boiler renovation and waste heat recovery and avoided electricity consumption for motor adjusting speed drives, 15 years of equipment life, emission factors and the value per ton of avoided emission (PAD, p.69). The economic analysis at appraisal resulted in an overall economic rate of return (ERR) of 23.1 percent and a net present value (NPV) of US\$373.00 million at a discount rate of 8 percent (PAD, p.58).

At project closure, an economic analysis, based on the same approach used at appraisal, was conducted for the first component only, because the second component was cancelled at the second restructuring. The investment cost and working capital cost estimates were replaced by the actual costs. Furthermore, US\$840 per tce of the annual energy saving unit cost of subprojects estimated at appraisal was replaced by US1,210 per tce of the actual energy saving unit cost of subprojects. These resulted in much lower ERRs and NPVs per project implementing company under the first component as given in Table 1 (The ICR did not calculate a cumulative ERR for this component.)

**Table 1: Comparison of Appraisal and Project Closing ERRs and NPVs**

Component		ERR (%)	NPV (RMB million)
A.1. Rongshihua	Appraisal	20.0	949.1
	Project Closing	6.7	-77.71
A.2. Goutai	Appraisal	21.2	709.3
	Project Closing	8.6	17.45



A.3. Luxin Energy	Appraisal	35.4	489.2
	Project Closing	9.9	11.3

The main reasons for the decrease in economic returns are given as (i) increase in investment cost for energy savings; (ii) higher default rate than estimated at appraisal; (iii) project implementation delay; and (iv) higher financing cost for counterpart funding (ICR, p.19).

In financial analysis, net sales and decrease in long-term receivables were taken as benefits, while taxes were included in the costs. Given the changes made in the other assumptions, as explained above, there was a decrease in the financial rate of return (FRR) and a large one in corresponding NPVs. Comparison of appraisal and project closure figures are given in Table 2. (The project FRR and NPV calculated at appraisal were 12.2 percent and US\$164.72 million, including the biomass-based heat and power generation component. A project-based calculation was not made at project closure.)

**Table 2: Comparison of Appraisal and Project Closing FRRs and NPVs**

Component		FRR (%)	NPV (RMB million)
A.1. Rongshihua	Appraisal	9.5	117
	Project Closing	8.5	10.6
A.2. Goutai	Appraisal	8.9	165
	Project Closing	8.2	3.07
A.3. Luxin Energy	Appraisal	9.6	55.3
	Project Closing	8.3	1.4

### Operational and Administrative Efficiency

There were major shortcomings in the operational and administrative efficiency of the project. First, project implementation and the achievement of project objectives were adversely affected by the failure of the counterpart to provide funds for the biomass-based heat and power generation component. Although Bank funds were used to finance the completion of the civil works of the biomass-fired power generation units, there has not been any construction activity after the cancellation of this component. Second, there were differences in the implementation capacity and internal project processing procedures of the companies conducting energy efficiency projects, which resulted in delays in project implementation and disbursements (ICR, p.24). Third, the project implementation was adversely affected by economic slowdown. This risk was identified at appraisal, but mitigation measures were weak. This resulted in less demand for energy efficiency project financing from SMEs; therefore, the project implementing companies had to refocus on state-owned-enterprises "where identifying and executing subprojects took considerably longer" (ICR, p.20). Lastly, the high turnover of staff with experience in energy efficiency technologies and financing within the project implementing companies resulted in slower sub-project processing

Overall, due to considerably lower than estimated economic returns and major shortcomings in project implementation, the efficiency of the project is rated Modest.



## Efficiency Rating

Modest

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	23.10	95.75 <input type="checkbox"/> Not Applicable
ICR Estimate		0	0 <input type="checkbox"/> Not Applicable

\* Refers to percent of total project cost for which ERR/FRR was calculated.

## 6. Outcome

In order to sustain economic growth, China needs to decrease the energy intensity and carbon dioxide intensity of its economy. Therefore, energy efficiency applications and increased use of renewable energy sources, such as biomass, for heat and power generation, are highly relevant to the country context. However, these were substantially in line with the Bank's priorities for China as defined in the Strategic Country Diagnostic, the only Bank document available at the time of project closing. Hence, the relevance of objectives is rated Substantial. The achievement of the first project objective to improve energy efficiency is rated Substantial before and after the project restructuring in September 2016. The second objective, to increase use of biomass, was deleted in the second restructuring due to the unavailability of counterpart funds. The achievement of this objective is rated negligible. Efficiency is rated Modest due to lower than estimated economic returns and shortcomings in operational and administrative efficiency. Since the project objective was revised, a split rating is applied (please see the table below). The overall outcome rating is barely Moderately Satisfactory.

	Original objectives	Objectives after revision
<b>Relevance of Objectives</b>	Substantial	
<b>Efficacy</b>		
Objective 1:	Substantial	Substantial
Objective 2:	Negligible	N/A
<b>Efficacy</b>	Modest	Substantial
<b>Efficiency</b>	Substantial	
<b>Outcome Rating</b>	Moderately Unsatisfactory	Moderately Satisfactory
<b>Outcome Rating Value</b>	3	4
<b>Amount Disbursed (US\$ million)</b>	55.00	55.08



<b>Disbursement (%)</b>	49.96%	50.04%
<b>Weight Value</b>	1.4988	2.0016
<b>Total weights</b>	3.5004 (rounds up to 4)	
<b>Overall Outcome Rating</b>	<b>Moderately Satisfactory (4)</b>	

- a. **Outcome Rating**  
Moderately Satisfactory

## 7. Risk to Development Outcome

**One potential risk to the sustainability and the replicability of the project outcomes would be the worsening of the local or the national economy.** The project was successful in demonstrating that financial leasing is a feasible mechanism to finance energy efficiency projects with relatively small amount of capital. However, if the economy slows down and energy consumption decreases, companies would be less willing to invest in costly energy efficiency projects in the absence of direct financial incentives from the authorities.

**A change in national or local policies favoring cheaper energy from fossil fuels might also pose a risk to the sustainability of gains from energy efficiency projects, but the likelihood of this policy change is very low.** If electricity tariffs are lowered or the cost of primary energy from fossil fuels becomes cheaper, companies, especially SMEs, would have no incentive to implement energy efficiency project. However, given China’s efforts to lower the energy intensity of the economy and lower greenhouse gas emissions, it is not very likely that the Chinese government or the Shandong provincial government will reverse their energy efficiency and renewable energy policies.

## 8. Assessment of Bank Performance

### a. Quality-at-Entry

The objectives were clearly defined and strategically relevant to the country context and the priorities of the Bank. The theory of change was weak for the first objective, but robust for the second. The PDO level indicators were broadly sufficient to capture the achievement of the project outcomes. The project design benefited from lessons learned of other similar Bank and Global Environment Facility (GEF) projects, such as China Energy Conservation Projects I and II, and China Energy Efficiency Financing Projects I and II (PAD, p.6) in local risk mitigation and project valuation methods, and selection criteria for energy conservation sub-projects. The project design also incorporated the findings of an ESMAF-financed Review and Assessment of Biomass-fired Power Development in China (PAD, p.7) in fuel supply arrangements, technical requirements for boilers, and developmental plans to guide local biomass power proposals.

The economic analysis conducted at appraisal was sound, even though it was not known which sub-projects would be financed. The operations manual included a detailed technical evaluation framework according to which sub-projects would be evaluated for selection (PAD, p.32-33). Project implementation arrangements were in place; the World Bank and Asian Development Bank Energy Conservation Project



Management Office (PMO) established in 2009 was responsible for the overall management of the project. Rongshihua, Guotai, Luxin Energy, and Anqiu were the project implementation units and fully responsible for implementing their respective sub-components, including procurement, financial management, monitoring and evaluation, and project reporting (PAD, p.9). Fiduciary aspects were sound; the procurement capacity of the project management office and the financial management systems of the project implementing companies were assessed to be adequate (PAD, p.15). Although the overall impact of the project on environment was expected to be positive, due to the potential temporary adverse environmental impact of the project activities, such as dust, noise, disposal of solid waste, and interruption of traffic, the project was classified Category B and the Involuntary Resettlement safeguard policy was triggered.

However, despite a detailed fiduciary assessment of the project implementation units, the project implementation capacity, including administrative and financial management capacity of Anqiu, the company responsible for the construction of the biomass-fired power and heat generation units, was not adequately assessed, which eventually resulted in the cancellation of the second component and the revision of the project objectives. Furthermore, the risk stemming from economic slowdown was underestimated and it was expected that economy would recover back to its pre-financial crisis, which did not materialize (PAD, p.11 and ICR, p.23). Lastly, the exchange rate risk was not addressed at appraisal; the project funds were denominated in US dollars and the actual contracts were signed in the Chinese currency of renminbi. The fluctuations in exchange rate adversely affected financial costs and returns on capital (ICR, p.23-24 and 42).

Overall, the quality of entry is rated moderately satisfactory.

### **Quality-at-Entry Rating** Moderately Satisfactory

#### **b. Quality of supervision**

The project team closely monitored project implementation through formal missions and regular interactions with the project management office (PMO) and the Shandong provincial government. Upon the project team's request, the PMO and project implementing companies submitted detailed project implementation reports and reports on the performance of sub-projects. This resulted in speeding up project implementation, especially towards the later stages of the project (ICR, p.26). When it was clear that counterpart funds were not available for the biomass-fired power generation units, the project team cancelled that component and revised the project development objective. In order to allow private companies to benefit from the project funds, project was restructured to allow commercial practice for procurement. According to the borrower feedback, the project team's flexible management of the project was crucial for the success of the project, and the project team provided strong support and advice to the PMO and project implementing companies in procurement and financial management (ICR, p.42). The project team's supervision of the fiduciary aspects of the project was adequate; there were two ineligible expenditures by Anqiu and Shengyuan, which were refunded to the Bank (ICR, p.28). The project team's supervision of safeguard policies was adequate (ICR, p.27).

Overall, quality of supervision was moderately satisfactory.



### **Quality of Supervision Rating**

Moderately Satisfactory

### **Overall Bank Performance Rating**

Moderately Satisfactory

## **9. M&E Design, Implementation, & Utilization**

### **a. M&E Design**

The objectives were clearly defined, but a clear causal link could not be established between project activities, outputs and expected outcomes for the first objective. The PDO level indicators were adequately designed to capture the achievement of both objectives, except the indicator of cumulative amount of funds leveraged by the Bank loan, which was not linked to the theory of change, but partially related to the demonstration effect of the project. The indicators were measurable and achievable. The three companies implementing the energy efficiency component of the project were fully responsible for project M&E. A variety of methods for measurement and verification (M&V) of energy savings from the implementation of energy efficiency projects were defined in the operation manual. The quality of M&V was to be ensured by a senior engineer or a professional with equivalent qualifications (ICR, p.26). In terms of design, the M&E framework was sufficient to assess the achievement of the project objectives.

### **b. M&E Implementation**

The indicators included in the results framework were measured by the project implementing companies. Rongshihua and Guotai staff calculated the amount of energy saved based on data provided by the sub-project implementing companies; Luxin Energy hired a third party for data collection. Because of high staff turnover or companies going out of business, on-site visits could not be conducted for 7 sub-projects out of 34 (ICR, p.25). The project management office prepared annual progress reports with inputs from the three project implementing companies. However, the project team commented that there were shortcomings in M&E implementation and aggregation of data, and there was a need for third party M&E for additional layer of data reliability and certainty. The PMO completed the procurement of a consulting firm in September 2015; however, the contract had to be terminated since the consulting firm was on the debar list of the Bank. In November 2017, Shandong Coal Energy Saving Technology Service Center was hired as the verification agency.

Due to the cancellation of the biomass-based power and heat generation component, related indicators were also deleted in the second restructuring in September 2016. At the same restructuring, the targets of the PDO-level indicators capturing the achievement of the first objective were decreased by 20 percent because of the continued impact of the economic slowdown on the implementation of energy efficiency projects by SMEs. However, the project implementing companies did not monitor the performance of sub-projects as frequently as requested (ICR, p.26). Upon the follow-up of the project team, the PMO and the project implementing companies started reporting M&E findings on a monthly basis. It was only in the



later stages of project implementation that the PMO collected comprehensive data and information from the three project implementing companies and prepared detailed project progress reports.

### c. M&E Utilization

PMO communicated the M&E findings to the provincial government agencies and the three project implementing agencies for project decision-making. M&E findings were used to revise the project objectives and reallocation of funds among project implementing companies. M&E data was also used to provide evidence of the achievement of the project objective to increase energy efficiency in selected enterprises.

Despite some modest shortcomings in implementation, the M&E system as designed, implemented and utilized was generally sufficient to assess the achievement of the project objective and test the causality in the results chain. Therefore, the M&E quality is rated substantial.

### M&E Quality Rating

Substantial

## 10. Other Issues

### a. Safeguards

The project was classified as Category B under Environmental Assessment (OP/BP 4.01) and triggered Involuntary Resettlement (OP/BP 4.12).

**Environmental Assessment (OP/BP 4.01):** The project outcome was to have a positive impact on the environment; however, a potential temporary adverse environmental impact of project activities in the first component, such as dust, noise, disposal of solid waste, and interruption of traffic, was expected. An environmental screening and management framework (ESMF) was developed by the project implementing companies to screen sub-projects to be financed by the project and to ensure compliance with the Bank and national environmental safeguard requirements (PAD, p.16). For the second component, public consultations were conducted during environmental assessment (EA). The EA showed that greenhouse gas emissions from the biomass-fired heat and power generation unit would meet relevant national and provincial standards and would be complying with the Bank's environmental, health and safety standards. Both the EA and ESMF were disclosed at the PMO's office and the Bank's Infoshop (PAD, p.16). The ICR (p.28) states that "no construction activities that would cause adverse environmental and social impacts were conducted" during project implementation. The project team confirmed that the project was in compliance with the environmental safeguard policy.

**Involuntary Resettlement (OP/BP 4.12):** It was expected that some energy efficiency sub-projects might require limited land acquisition for the construction of heat pipelines outside the plants. A resettlement policy framework was prepared should there be any land acquisitions. None of the 34 energy efficiency sub-projects required new land acquisition. However, some sub-projects related to Rizhao Co, Ltd., of Shandong Iron and Steel Group were implemented on recently acquired land. For such projects, due diligence reviews were conducted, and the land acquisition procedures were found to be in compliance with



the national and provincial regulations and the Bank's policy on involuntary resettlement (ICR, p.27). Similarly, a separate due diligence review was conducted for the land acquisition that had already been completed for the construction of the biomass-fired heat and power generation units before the start of project implementation. This review, too, found that land acquisition procedure was compliant with the national laws and regulations and the Bank's policy on involuntary resettlement (PAD, p.17).

## **b. Fiduciary Compliance**

### **Financial Management**

The financial arrangements were sound; the Ministry of Finance (MoF) of the Chinese government was the borrower of the loan, which was on-lent to the Shandong provincial government. The loan proceeds were further on-lent to two leasing companies and one energy services company to finance energy efficiency sub-projects, and to Anqiu to finance the biomass-fired power and heat generation units. Project accounting and financial reporting followed the regulations issued by the MoF and complied with the requirements set in the loan agreement. At project closing there was no overdue auditing report.

However, there were major shortcomings in the provision of counterpart funding for the second component, which adversely affected the project's progress. The counterpart funding was never made available for this component, as a result of which the second component of the project, i.e., the construction of the biomass-fired power and heat generation units, was cancelled. Furthermore, two instances of misuse of funds were discovered during audits. Anqiu forged documents to claim US\$924,056. The amount was refunded to the Bank and the balance US\$5.28 million was cancelled at the second restructuring. The second incident related to Rongshihua. An amount of US\$17.46 million was disbursed to ineligible activities, which was not compliant with the procurement requirements specified in the Operation Manual and the Bank's guidelines. The project team confirmed that the amount was refunded to the Bank after project closing. The ICR (p.28) states that "[i]n both cases, the non-compliance cannot be interpreted as genuine misunderstanding of the agreed requirements and procedures as specified in the legal agreement and Operation Manual."

### **Procurement**

During project preparation and implementation, members of staff from the project management office (PMO) attended workshops on financial management and procurement. Additional programs were organized in the project area to train the staff of project implementing companies on procurement (ICR, p. 21). At the first restructuring, procurement rules were revised to include commercial practice of procurement. This allowed private companies to benefit from financial leasing for their energy efficiency projects. Overall, the procurement followed the procurement requirements specified in the Bank's guidelines and Operation Manual, except for the two ineligible expenditures explained in the above paragraph.

## **c. Unintended impacts (Positive or Negative)**

None.



**d. Other**

None.

**11. Ratings**

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Moderately Satisfactory	Moderately Satisfactory	
Bank Performance	Moderately Satisfactory	Moderately Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

**12. Lessons**

The first lesson is taken from the ICR with some adaptation of language. The second one is derived from the ICR.

**Inadequate risk analysis at appraisal, which results in underrating important risks, can adversely affect project implementation and the achievement of the project objectives.** The two major risks identified at appraisal, i.e., the macroeconomic downturn and obstacles in subproject development pipeline, were rated as moderate. However, the difficulty in identifying industrial energy efficiency subprojects at creditworthy small enterprises, which were interested in financial leasing model, continued through project implementation. The situation worsened as a result of economic downturn. This necessitated two project restructurings in which renewable energy projects were added to the project scope as eligible subprojects, the disbursement ratio of the World Bank loan proceeds was raised from 50 percent to 80 percent—because project implementing companies could not raise sufficient domestic funds—and project closing dates had to be extended due to slow project implementation. Furthermore, project’s focus had to shift from large state-owned economic enterprises (SOEs) to small enterprises, and in the latter part of project implementation back to large SOEs, again, to achieve project objectives. However, this resulted in longer project implementation since identifying and executing subprojects at SOEs took longer time. If the large subproject implemented by Shandong Iron and Steel Group Rizhao Co., Ltd, which is a SOE, had not been implemented, the project would have most likely fallen short of achieving the project objective.

**If the implementation capacity of leasing companies is not adequately addressed, projects promoting financial leasing might face problems during implementation and not fully achieve their objectives.** One of the barriers which adversely affected project implementation was the capacity of the project implementing units (PIUs). Guotai had sufficient capacity to implement financial leasing operations through leveraging its large balance sheet and originating projects as a result of its extensive network; it also increased the number of staff working in its energy saving industry department. On the other hand, despite having a considerable technical strength and



reputation, Rongshihua was faced with implementation delays and procurement issues. Some subprojects identified by Rongshihua had to be dropped because of failure to obtain requisite guarantees needed for counterpart funding or non-compliance with the procurement requirements under the legal agreement and the operation manual. Despite disbursing 100 percent of its loan amount, Rongshihua could not reach the energy saving target, because it had to finance several solar photovoltaic subprojects, which had low energy saving capacity, to compensate for not being able to finance energy efficiency projects. Furthermore, the high staff turnover rate within PIUs with expertise in energy efficiency technology and financing, especially towards the end of the project implementation, weakened the project implementing capacity of the PIUs and resulted in significant project implementation challenges.

### 13. Assessment Recommended?

No

### 14. Comments on Quality of ICR

The ICR is candid about the shortcomings of project design and implementation and provides a comprehensive overview of the project. The narrative is internally consistent and follows the Bank guidance. It supports the ratings. The discussion of efficacy is aligned to the achievement of the project outcomes, which were adequately captured by the PDO level indicators. The discussion is not restricted to the achievement of the targets; it includes information outside of the project documents to show the demonstration impact of the project. The discussion on efficiency clearly shows what the project's shortcomings were in achieving project outcomes in an efficient way. The discussion on fiduciary aspect was adequate.

However, the discussion on quality at entry is weak; it does not support the rating. Discussion on safeguards was confusing, which required further clarification from the project team. Lessons and recommendations are generic; as an operation meant to promote the use of leasing to support energy efficiency projects, there is no lesson reported in the ICR related to the actual financial leasing business.

#### a. Quality of ICR Rating

Substantial

