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The World Bank

Report No: ICR2597

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IBRD-75310)

ON A

LOAN

IN THE AMOUNT OF US$ 50 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

SHANDONG POWER PLANT FLUE GAS DESULFURIZATION PROJECT

December 21, 2012

China and Mongolia Sustainable Development Unit
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective November 15, 2012)

Currency Unit = RMB/yuan
US$ 1.00 = RMB 6.24

FISCAL YEAR
July 1 – June 30

ABBREVIATIONS AND ACRONYMS

AAOV	Annual Average Output Value	FGD	Flue Gas Desulfurization
ADB	Asian Development Bank	FLI	Furnace Limestone Injection
APL	Adaptable Program Loan	FMR	Financial Management Report
CaO	Calcium Oxide	FMS	Financial Management System
CaCO3	Calcium Carbonate	FRR	Financial Rate of Return
CEM	Continuous Emission Monitor	FY	Fiscal Year
CFB	Circulated Fluidized Bed	GDP	Gross Domestic Product
CNAO	China National Audit Office	GGH	Gas-Gas Heater
CNY	Chinese Yuan	GHG	Greenhouse Gas
CO	Carbon Monoxide	GOC	Government of China
CPS	Country Partnership Strategy	ICR	Implementation Completion and Results Report
CRESP	China Renewable Energy Scale-up Program	IFC	International Finance Corporation
DA	Designated Account	IP	Implementation Progress
DO	Development Objective	KPI	Key Performance Indicator
EA	Environmental Assessment	LIMB	Limestone Injection Modified Burners
EIA	Environmental Impact Assessment	M&E	Monitoring and Evaluation
EMP	Environmental Management Plan	MOF	Ministry of Finance
EPA	Environmental Protection Agency	NDRC	National Development and Reform Commission
ERR	Economic Rate of Return	NOx	Nitrogen Oxide
NPC	National People's Congress	SOE	Statement of Expenditure
NPV	Net Present Value	SPDRC	Shandong Provincial Development and Reform Commission
O3	Ozone		
O&M	Operation & Maintenance		
PDO	Project Development Objective	SPEPB	Shandong Provincial Environmental Protection Bureau
pH	Potential of Hydrogen		
PIE	Project Implementing Entity		
PLG	Project Leading Group	SPFB	Shandong Provincial Finance Bureau
PM	Particulate Matter		
PMO	Project Management Office	SPG	Shandong Provincial Government
RAP	Resettlement Action Plan		
RLG	Resettlement Leading Group	TA	Technical Assistance
SBD	Standard Bidding Documents	TSP	Total Suspended Particulate
SEPA	State Environmental Protection Administration	TTL	Task Team Leader
		UNDB	United Nations Development Business
SIL	Specific Investment Loan		
SO2	Sulfur Dioxide	VAT	Value Added Tax

Vice President:	Pamela Cox
Country Director:	Klaus Rohland
Sector Manager:	Mark R. Lundell
Project Team Leader:	Frederic Asseline
ICR Team Leader:	Frederic Asseline

CHINA
SHANDONG POWER PLANT FLUE GAS DESULFURIZATION PROJECT

CONTENTS

A. Basic Information

Country:	China	Project Name:	Shandong Flue Gas Desulfurization
Project ID:	P093882	L/C/TF Number(s):	IBRD-75310
ICR Date:	11/27/2012	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	PEOPLE'S REPUBLIC OF CHINA
Original Total Commitment:	USD 50.00M	Disbursed Amount:	USD 5.13M
Revised Amount:	USD 35.04M		
Environmental Category: b			
Implementing Agencies: Shandong Provincial Environmental Protection Bureau			
Co-financiers and Other External Partners:			

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	10/27/2005	Effectiveness:	10/15/2008	10/15/2008
Appraisal:	03/30/2007	Restructuring(s):		
Approval:	05/27/2008	Mid-term Review:	06/01/2012	
		Closing:	06/30/2012	06/30/2012

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Unsatisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Unsatisfactory
Borrower Performance:	Unsatisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Moderately Unsatisfactory	Government:	Moderately Unsatisfactory
Quality of Supervision:	Unsatisfactory	Implementing Agency/Agencies:	Unsatisfactory
Overall Bank Performance:	Unsatisfactory	**Overall Borrower Performance:**	Unsatisfactory

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
DO rating before Closing/Inactive status:	Unsatisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Energy efficiency in Heat and Power	98	98
Sub-national government administration	2	2
Theme Code (as % of total Bank financing)		
Environmental policies and institutions	33	33
Pollution management and environmental health	67	67

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	James W. Adams
Country Director:	Klaus Rohland	David R. Dollar
Sector Manager:	Mark R. Lundell	Ede Jorge Ijjasz-Vasquez
Project Team Leader:	Frederic Asseline	Jianping Zhao
ICR Team Leader:	Frederic Asseline	
ICR Primary Author:	Frederic Asseline	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document**)**
The development objective of the proposed project is to reduce SO_2 emission in the heat and power sector and enhance the capacity of regulatory authorities to monitor and enforce compliance with their SO_2 emission reduction program.

Revised Project Development Objectives (as approved by original approving authority)
The objectives were not revised

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Total amount of SO_2 removed in the heat and power sector			
Value quantitative or Qualitative)	10,000 tons	900,000 tons		798,000 tons
Date achieved	12/31/2005	12/31/2010		12/31/2011
Comments (incl. % achievement)	88.6 % of the target was achieved at the end of year 2011, but none of this SO_2 removal was associated with project investments.			
Indicator 2 :	Total amount of SO_2 emissions in Shandong			
Value quantitative or Qualitative)	2.03 million tons	1.6 million tons		1.49 million tons
Date achieved	12/31/2005	12/31/2010		12/31/2011
Comments (incl. % achievement)	In 2010, the value was 1.54 million tons; 116% of the SO_2 reduction target was completed during the 11th Five year plan, but none of this SO_2 emissions reduction was associated with project investments.			

(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 :	Component A: Rules and procedures issued on CEM installation, calibration, data collection and transmission			
Value (quantitative or Qualitative)		Operational		Not operational
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)	The component was not implemented			
Indicator 2 :	Component A: Number of staff, managers and operators trained			
Value (quantitative or Qualitative)	0	500		0
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				
Indicator 3 :	Component A: Percentage of installation and proper operation of CEMs in heat			

	and power plants			
Value (quantitative or Qualitative)	10	100		0
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				
Indicator 4 :	Component A: Online monitoring system			
Value (quantitative or Qualitative)		Operational		Not operational
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				
Indicator 5 :	Component A: SO_2 control policy and regulation prepared			
Value (quantitative or Qualitative)		Operational		Not operational
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				
Indicator 6 :	Component B: Installation fo FGDs and CEMs at the four sites on schedule			
Value (quantitative or Qualitative)		Operational		Not operational at any of the four sites
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				
Indicator 7 :	Component B: Achievement of the target SO2 removal efficiency			
Value (quantitative or Qualitative)	0	90-95%		0
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				
Indicator 8 :	Component B: Total tonnages of SO2 removed annually at the five sites			
Value (quantitative or Qualitative)	0	58,645		0
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				

Indicator 9 :	Component B: Achievement of the target emission rate (400 mg/Nm3)			
Value (quantitative or Qualitative)		All		None
Date achieved	12/31/2005	12/31/2010		06/30/2012
Comments (incl. % achievement)				

G. Ratings of Project Performance in ISRs

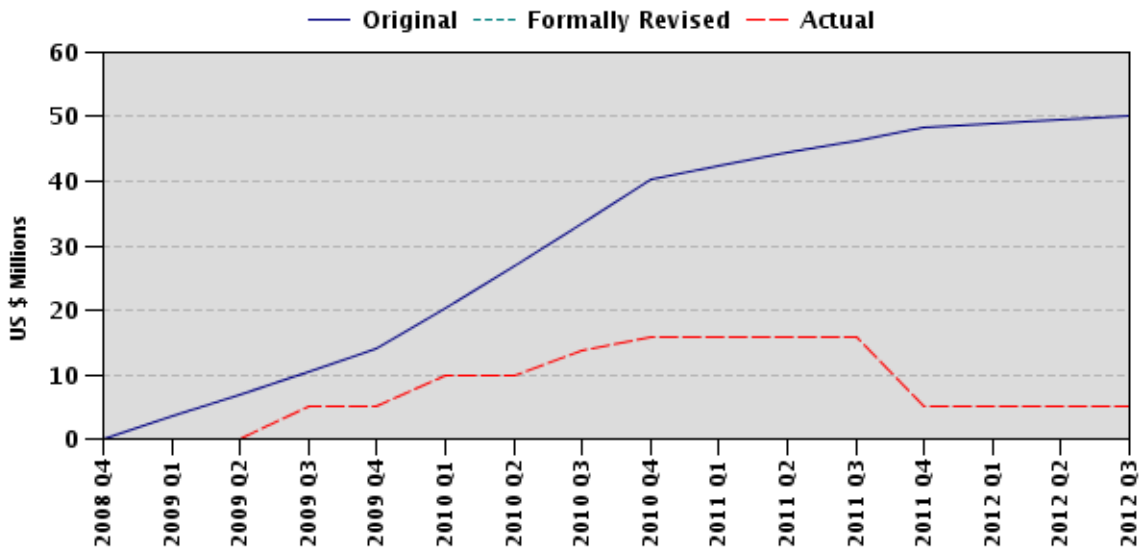
No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	06/26/2009	Moderately Satisfactory	Moderately Unsatisfactory	5.00
2	06/28/2010	Moderately Unsatisfactory	Moderately Unsatisfactory	15.93
3	06/28/2011	Unsatisfactory	Unsatisfactory	15.93
4	04/10/2012	Unsatisfactory	Unsatisfactory	5.00

Note: This disbursement of US$ 5 million is the balance in the DA being returned to the World Bank (unused as no eligible project investments took place) and the front end fee.

H. Restructuring (if any)

Not Applicable.

I. Disbursement Profile



1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

1. At the time of appraisal in year 2007 China's GDP had been growing at a sustained average annual rate of 9 percent since 1980, a growth sustained by a tripling of primary commercial energy consumption, from 600 million tons of coal equivalent (Mtce) in 1980 to 2,200 Mtce in 2005. This rise in energy demand was met by a sharp increase in domestic coal consumption, of which more than 50 percent was used for electricity generation in 2005. Projections at the time of appraisal showed that electricity generation capacity would increase from 508 GW in 2005 to more than 1,100 GW by 2020, of which more than 700 GW would be coal-based.

2. The heavy reliance on coal and the rapid expansion of the power generation system led to severe air pollution, caused primarily by the sulfur dioxide (SO2) released by coal combustion. The State Environmental Protection Administration (SEPA) estimated that in 2005, a total of 25.5 million tons of SO2 was released in China of which 90 percent was contributed by coal combustion. SO2 pollution caused acid rain in more than half of China's 696 cities, and it caused local and regional pollution with PM2.5 particles as the main factor of increased levels of respiratory diseases and related premature deaths.

3. In 2004, Shandong province consumed 159 million tons of coal, ranking second among all the Chinese provinces in coal consumption and producing the highest amount of SO2 emissions in China. Coal accounted for 82 percent of primary energy consumption in the province, compared to a national average of about 67 percent at the time. In 2005, SO2 emissions in Shandong Province amounted to 2.03 million tons, of which 1.17 million tons, or 52.4 percent, were contributed by the power and heat industry.

4. The 11th Five-Year Plan approved by the National People's Congress (NPC) had set a target to reduce the country's SO2 emission by 10 percent from the 2005 level by the year 2010. Accordingly, SEPA signed agreements with the seven largest SO2-emitting provinces (including Shandong) and the six major power-generating companies with specific SO2 emission control targets. The Shandong Provincial Government (SPG) embraced the Central Government's SO2 control policies and targets by developing its own even more stringent SO2 emission control targets and compliance plan. The SPG's plan called for an overall 20 percent SO2 emission reduction by 2010 on the 2005 emission level. To achieve these targets, the SPG needed to develop detailed implementation rules and plans, mobilize adequate financing, upgrade environmental monitoring facilities and information systems, strengthen environmental governance and institutional capacity to ensure compliance, and create emission certificates and emission rights trading schemes.

5. Consistent with the power sector reform program in China, the five large national power generation companies undertook SO2 control projects with their own resources or with commercial financing. However, a large segment of the power and heat sector had

boiler units with a capacity of less than 1,100 t/h range. These units were owned by provincial and local governments, and had neither access to commercial financing nor adequate own resources to finance SO2 control projects. The Bank and other multilateral financial institutions were called to support this niche segment of the power sector.

6. One important theme of the Country Partnership Strategy (CPS) discussed by the Board of Executive Directors on May 23, 2006, was to manage resource scarcity and environmental challenges, especially through the mitigation of air pollution. The project was to directly contribute to achieving these objectives through financing SO2 control facilities and strengthening effectiveness of environmental institutions.

1.2 Original Project Development Objectives (PDO) and Key Indicators

7. The development objective of the proposed project was to reduce SO2 emission in the heat and power sector and enhance the capacity of regulatory authorities to monitor and enforce compliance with their SO2 emission reduction program.

8. Measures of project output during project implementation included physical progress in procurement, construction, and commissioning of the Flue Gas Desulfurization (FGD) facilities, availability and SO2 removal efficiency of the FGD facilities, and progress in the implementation of the Technical Assistance (TA) Component, including Continuous

9. Emission Monitor (CEM) installation rate and the level of SO2 emission fee collection.

10. Measures of project outcome were the reduction of SO2 emissions in Shandong Province and the direct contribution of the project to these reductions.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification

11. The objectives and key indicators were not revised.

1.4 Main Beneficiaries

12. The main beneficiaries identified in the PAD were: 1) the environmental institutions in Shandong Province, notably the Shandong Provincial Environmental Protection Bureau and the municipal level environmental protection bureaus in the province; 2) operators of the FGD systems at the sub-projects included in the project scope; and 3) the Shandong Provincial Government. The attainment of the PDO would benefit the general population of Shandong Province.

1.5 Original Components

13. Technical Assistance Component: To strengthen the technical and institutional capacity related to SO2 emission control and reduction in Shandong. It includes: (i)

capacity building and enhancement in emission monitoring and regulation enforcement, including upgrading of online monitoring equipment and information systems; (ii) technical and managerial training; and (iii) development of related regulations, procedures, and policies.

14. Investment Component: To finance the installation of FGD facilities at four coal-fired heat and power plants. These plants include existing coal-fired cogeneration units and cogeneration units that were under construction or planned for construction. All plants had selected to install limestone-gypsum wet FGD technology.

1.6 Revised Components

15. The original components were not revised.

1.7 Other significant changes

16. Three of four subprojects dropped out of the investment component of the project prior to loan effectiveness generally because alternative sources of financing were available. The fourth was cancelled due to discovery of fraudulent practices. Loan funds were reimbursed and subsequently the corresponding amount of the IBRD loan was cancelled in June 2011. There were no other significant changes in the project design, scope, scale, implementation arrangements, schedule and funding allocations.

17. The relative focus of project implementation changed after the three appraised subprojects dropped out because the Bank team spent most of its time trying to regenerate a pipeline of appraised subprojects. For reasons discussed below, this effort not only proved to be wholly unsuccessful but also diminished the focus on the project's Technical Assistance component and on the tracking of the PDO indicators (for which information was obtained only during the ICR elaboration period). Had the TA component gone ahead, capacity to monitor the SO2 reduction program could have been improved, and the project would have been able to partially achieve the development objective. This did not occur given the excessive focus on the Investment component, which was far less relevant given superior parallel efforts to achieve FGD investments outside of the project.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

18. The PDO and the project design were aligned with the Bank's energy sector strategy in China as articulated in the CPS discussed by the Board of Executive Directors on May 23, 2006. One important theme of this CPS was to manage resources scarcity and environmental challenges, especially through the mitigation of air pollution. At the component level, technical experts were brought in to assist in review of technical options, demonstrating a concerted effort to advance international best practices into project design, and a thorough economic analysis was undertaken.

19. The project correctly identified three criteria for the successful implementation of an SO2 emission reduction program: (a) existence of enforceable environmental regulations and standards, (b) adequate institutional capacity to implement and enforce laws and regulations; and (c) adequate policies and schemes to encourage and facilitate investment in SO2 control facilities and penalize noncompliance.

20. The Technical Assistance (TA) Component was meant to address these three criteria. The component was designed to be financed from the proceeds of the loan and implemented by the Shandong Provincial Environmental Protection Bureau (SPEPB). Shandong Province declared its commitment to support project management under the Project Agreement; however, no formal agreement between the Shandong Provincial Finance Bureau (SPFB) and the SPEPB was requested at entry to ensure funds would be made available to the SPEPB. While the PMO was placed in the SPEPB which was the primary beneficiary of the technical assistance and responsible for meeting the SO2 target, SPEPB paid inadequate attention to the resources and capacity of the SPEPB PMO to implement its responsibilities for the TA component.

21. The project correctly identified adequate and early procurement planning, along with realistic cost estimates as crucial to the rapid and effective implementation of the investment component of the project, two key lessons learned from previous energy projects. Four investment sub-projects were designed and early procurement planning put in place with rational packaging.

22. However, the design of the project quickly proved to be insufficiently robust due mainly to (a) a weak SPEPB project management office which did not manage to establish sufficiently close communications with subproject entities or undertake appropriate supervision of subproject activities; and (b) the apparent lack of awareness by project management and the Bank of the deliberations by the counterparts on the preferred type of SO2 removal technology. Additionally, the availability of alternative sources of financing in the province was not as scarce as envisioned at preparation, and this financing was more attractive than Bank terms because it was much easier to put in place. The target set of enterprises to be served by the project in the province (the segment of the power and heat sector with boiler units with a capacity of less than 1,100 t/h range) was not as large as anticipated at appraisal and shrinking very rapidly due to such enterprises moving quickly to comply with the stringent environmental regulatory requirements owing to a delay in project approval (6 months from decision meeting to appraisal completion, 9 months from appraisal completion to negotiations, and another 6 months to effectiveness).

23. The delays were caused mainly by delays in domestic approvals for four new heat and power plants for which the project was proposed to finance the associated FGD facilities and the SPFB's interest in maintaining the $100 million World Bank loan allocation for the project, while subprojects to be appraised following the decision meeting totaled only about $73 million. Additional subprojects could not be successfully appraised despite an extended appraisal process. In the end, four subprojects remained at negotiations, of which three dropped out before effectiveness (reasons provided below under implementation). In parallel, by the end of 2009, one year after effectiveness, the

province had already exceeded its SO2 emissions target with cumulative reductions achieved at 103%. 1 This trend quickly accelerated with the province achieving a reported 116% of its target by 2010.

24. The risks to project development objective were correctly identified and assessed. Given the lack of implementation in the project, a closer look at the risks to project components is warranted. The risks assessed at entry to component results were: (a) low availability of FGD equipment because of technical defects and lack of technical skills of plant operators (Negligible rating); (b) low utilization rate of FGD facilities because of plant owner's tendency to reduce operation costs (Modest rating); (c) Limited effectiveness of the TA component (High rating); (d) Poor attention to and compliance with safeguards requirements (Negligible rating). All of the above risks were correctly identified and rated. However, the mitigation measures (SPEPB and others have shown adequate capacity and eagerness to further enhance their capabilities. The scope of the TA is designed to fit to the specific needs of receiving agencies.) were clearly inadequate. Moreover, the risk that alternative sources of financing would replace Bank loan funds was not identified and assessed, even though lack of such financing was one of the main assumptions in the project concept.

2.2 Implementation

25. For a number of reasons noted below, neither project component was implemented even partially. Under these circumstances, normally, an Implementation Completion Memorandum would be prepared, but since over 10 percent of the loan funds were disbursed (later to be refunded in full, excluding the front-end fee, as explained below) an ICR has been deemed the necessary report. The project was closed on June 30, 2012, without having disbursed proceeds for any eligible expenditure from the loan. The reasons for failure to make eligible use of loan funds are different for each component (as noted below). The fast evolving SO2 control achievements of Shandong Province made circumstances very difficult for project restructuring.

26. The Technical Assistance component was not implemented. The Project Management Office (PMO) did not submit a work plan to the Bank for the development of the TA component, despite several requests from the Bank team reinforced by management letters. It was reported by PMO staff that the funds needed to implement the TA component were not made available by Shandong Finance Bureau due to internal, inter-agency processing requirements (a recipients agreement to repay used funds), which fundamentally impeded the use of loan funds for TA. The Department which was the beneficiary for this technical assistance did not appear to play an active role in resolving the issues between the two agencies.

[1] Source: the Environmental Bulletin of the Shandong Environment Protection Bureau website, published by the pollution control office of Shandong EPB (http://www.sdein.gov.cn/).

27. The investment component was also not implemented. Three of the four sub-projects identified at appraisal were dropped before project effectiveness (Laiwu thermal power plant, Huangtai thermal power plant, and Yantai thermal power plant) because alternative sources of financing were identified. In the case of Huangtai and Yantai, the project sponsor decided to increase the size of the CHPs (from 2x300 MW to 2x600 MW), requiring a new cycle of local and national re-approvals, stopped taking any action on the FGD subcomponents, and indicating a strong desire to drop from the project. In the third subproject, the subproject sponsor (who owns the Huangtai subproject and holds the largest equity shares in the Yantai sub-project and Laiwu sub-project) did not actively pursue counter-guarantee arrangements with SPFB and also asked to exit the project. The overall explanation given by the three thermal power plants for pulling out was that procedures for accessing Bank financing were complex and took too long to materialize, in a context where local funding could be accessed much faster.

28. Of the four original investment projects identified, only the Lubei Thermal Power Plant Co. Ltd received funding from the Bank loan to install an FGD system. A supply contract was signed on December 2, 2008, and approved for IBRD financing (US$ 14,962,500). However, the Bank team discovered fraudulent practices, as defined under paragraph 1.14(a)(ii) of the Bank's May 2004 Procurement Guidelines, on the contract signed on December 2, 2008, for the Lubei sub-project. As a result, funding for the Lubei sub-project was reimbursed to the Bank in June 2011 and subsequently the corresponding Bank loan amount was cancelled. The Bank did receive a request to reallocate funds to the Lubei Thermal Power Plant subproject, which was not accepted. The Bank did not receive any further request from the Ministry of Finance to restructure the project. Consequently, the project was closed on June 30, 2012, its original closing date. No disbursements from the remaining part of the loan were made.

29. It should be noted that during the course of the project, the Shandong Finance Bureau and SPEPB had presented several new subproject proposals in view of a potential restructuring. After initial screening, only a subset of these proposals was deemed consistent with the PDO. The Bank team worked extensively to complete the appraisal process with the potential beneficiary enterprises but the subprojects eventually were not able to meet Bank appraisal requirements, owing to the fact that (1) the cost estimates and financing requirements kept changing even at late stages of appraisal; (2) the proposed new subprojects changed a number of times with some dropping out to seek local financing and then replaced by SPFB with new proposals; (3) the local approvals needed by appraisal could not be obtained in a timely manner. As noted above, the fast evolving achievements in SO2 control in Shandong Province placed pressure on potential subproject sponsors to undertake control measures, which they could achieve more quickly following industry practices than through use of the World Bank's loan, which has additional due diligence and processing requirements (both domestic procedures on the use of foreign capital and Bank procedures). Proactive guidance by the Bank on when restructuring no longer appears to be a realistic option (in such cases when the Bank team and its clients are unable to deliver over a long period of time) is a key lesson discussed below.

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

M&E Design

30. The M&E framework was designed on a set of indicators corresponding to the objective of the PDO (outcome indicator) and to the project's physical progress and provincial SO2 emissions monitoring as indicated in the Data Sheet.

M&E Implementation

31. Monitoring of the Component A (technical assistance) was not conducted because the component was not implemented. Monitoring of component B was conducted for two years from early 2009 to 2011 for the Lubei sub-project only because the three other sub-projects described in the PAD were dropped in 2008. The Lubei sub-project was cancelled because of fraud and the Bank funding returned. From an operational and environmental monitoring perspective, the monitoring parameters at Lubei, as documented in mission aide memoires and ISRs for these two years, show that the FGD operation was efficient and meeting both operational and environmental targets.

32. The Provincial Government conducted monitoring of progress toward meeting its 11th Five Year Plan SO2 control targets. In year 2007, the total amount of SO2 emissions in Shandong was 1,822, 200 tons, and this represented a reduction of 7.12% from 2006 levels. In year 2008, when the project was approved and became effective, SO2 emissions were further reduced by 7.15% relative to year 2007, with a total emissions amount that year of 1,691,900 tons. By the end of year 2009, one year after effectiveness, the Province had further reduced its SO2 emissions by 6.01% relative to 2008, with cumulative emission reductions accounting for 103% of the SO2 reduction target set for Shandong province at national level for the entire 11th Five Year Plan. In 2010, SO2 emissions were further reduced by 3.3％, contributing to a cumulative reduction rate of 23.22% for the province since year 2007. By the end of 2010, Shandong had reached 116% of the SO2 emission reduction target that had been set for the province in the 11th Five Year Plan.

Indicators (end of year)	2006	2007	2008	2009	2010	2011
PDO Indicator	Actual Value	Actual Value	Actual Value	Actual Value	Actual Value	Actual Value
Total amount of SO2 removed in the heat and power sectors (tons) *Baseline 2005: 10,000 tons*	102.6	95.92	86.26	77.27	75.9	79.8
Total amount of SO2 emissions in Shandong reduced (tons) *Baseline 2005: 2.03million tons*	196.2	182.22	169.19	159.03	153.78	149.08
Source: the Environmental Bulletin of the Shandong Environment Protection Bureau website, published by the pollution control office of Shandong EPB (http://www.sdein.gov.cn/).						
Total installed capacity	17817 MW	31625 MW	57467 MW	60786 MW	62486 MW	68048 MW
Source: Heat and Power annual reports of the Shandong Economic and Information Committee						

M&E Utilization

33. The M&E framework was not utilized since project components were not implemented. The province easily met outcome indicator targets, without contribution from the project.

2.4 Safeguard and Fiduciary Compliance

34. The project was a Category B. A satisfactory Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) were prepared for the Lubei sub-project. This sub-project was subsequently cancelled due to the discovery of fraudulent practices.

35. The FGD system installed at Lubei used a technology different from that described in the PAD. The change was from a Calcium Based Nonregenerable FGD System (as described in the PAD) to a Magnesium Based Regenerable System. The change was made so that Lubei could make better use of the spent sorbent as an input to its fertilizer production process. The lime-limestone process, described in the PAD, produces a spent sorbent that is basically gypsum, to be used as a building material or simply discarded, while the latter process produces magnesium sulfite which can be treated to release concentrated sulfur dioxide used as a feedstock in sulfuric acid manufacturing. The treatment regenerates magnesium oxide which is recycled back to the FGD unit. It was Lubei's intention to utilize the sulfuric acid to make phosphoric acid by digesting calcium phosphate ore and utilizing the phosphoric acid in the production of fertilizers. The technology change request to the Bank was made to and approved by the Bank during project implementation. A revision to the Environmental Management Plan (EMP) to reflect this change should have been made at the time of approval. Still, the update of the EMP was eventually completed. Discussions with both Provincial and local EPB officials indicated that all Chinese environmental assessment procedures were properly followed in allowing the technology change.

2.5 Post-completion Operation/Next Phase

36. As noted in the Monitoring and Evaluation section above, Shandong had achieved, and even surpassed, its 11th Five Year Plan SO2 emission reduction targets already by 2009. Environmental regulations to reduce SO2 emissions were reported to be successfully introduced and uniformly implemented throughout the province. As early as 2008, all large existing power producers had retrofitted their plants with FGD systems and after 2008, all new power plants large or small were required to be commissioned with FGD systems. After 2008 new power plants without FGD systems could not receive authorization from provincial EPB and provincial DRC to operate. This policy continues today.

37. Only a handful of smaller, older plants remained as candidates for retrofits after 2008. Most of these plants did install FGD systems during the 11th Five Year Plan, and they did so using their own financing or local financing sources.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Rating: Moderately Unsatisfactory

38. The project's objectives remain largely consistent with China's focus on sustainable economic growth and reducing environmental impacts of energy use. China's Energy Policy White Paper (2012) clearly notes under the heading "Promoting Clean Development of Fossil Energy" that new built coal fired thermal power generation must install dust removal, desulfurization and nitrous oxide emission control facilities and existing plants are encouraged to accelerate the deployment of emission controls.

39. The new CPS (FY2013-2016) acknowledges the great strides undertaken by China in air pollution, the costs of air pollution, the cost of illnesses from pollution has climbed as the population ages and the urban populations grows. The CPS has as one of its pillars the demonstration of pollution management measures. While not focusing exclusively on SO2 controls, it does include supporting efforts to reduce urban air pollution, working at both the national level (providing TA related to standards, monitoring, and regional strategies) and the municipal level (supporting detailed action plans and investments designed to reduce pollution from the worst sources). Regarding the energy sector, the CPS shows the Bank has also adapted its support plan, focusing on assisting China's efforts to support a sustainable energy path through scale up of renewable and energy efficiency, finding low carbon energy solutions in cities, promoting innovative solutions to development of clean energy policies.

40. The project objectives broadly correspond to the Government's environmental objectives and the project's design and objectives corresponded closely with the Shandong Provincial Government's SO2 control plan. However, it should be noted that the relevance of the project diminished during the extended two year project preparation period and during the project implementation period. At appraisal, it was not projected that SO2 targets set out during the 11th FYP in 2006 were going to be fully achieved by 2009. The SPG reported to have attained 103 % of the target by the end of 2009, only one year after project effectiveness. As described in section 2.3 above, by 2010 the province had reached 116% of its 11th Five Year Plan SO2 emission reduction target. The EPB project management office staff reported 95% percent of the plants in Shandong being equipped with FGD systems by late 2009. Had the project been more quickly approved and deployed it would have been more likely to contribute to SPG's efforts. In the end, the two project components were not implemented as designed and produced no project outcomes.

41. In summary, while the objectives of the project were set out in a satisfactory manner and remain consistent with broad environmental objectives today, the project's design and implementation is less relevant given the policies and procedures in place for SO2 controls. The delayed initial implementation undermined the potential contribution the project may have had to current policies and programs supporting air pollution control. As a result of the above the relevance of project objectives, design and implementation was moderately unsatisfactory.

3.2 Achievement of Project Development Objectives
Rating: Unsatisfactory

42. None of the two project components were implemented, and therefore the project did not finance any investments that could contribute to achieving its development objective.

43. However, as noted above, development outcomes were reached by Shandong province without the intervention of the project.

3.3 Efficiency
Rating: Unsatisfactory

44. Efficiency as defined as the rate of return or cost effectiveness of project investments is not applicable under the project. Three subprojects were dropped prior to effectiveness and one subproject was cancelled due to fraudulent practices. The technical assistance project was not implemented. As there are no project inputs, there is no data on which to make a determination of project efficiency. A rating of unsatisfactory is assigned based on the fact that, in addition to the client's time and resources, the Bank spent $424,000 (preparation and supervision) without any discernible contribution of project activities to the development objective as noted above.

3.4 Justification of Overall Outcome Rating
Rating: Unsatisfactory

45. Based on the above ratings that reflect the fact that neither of the two project components was implemented, the project outcome rating is unsatisfactory.

3.5 Overarching Themes, Other Outcomes and Impacts

46. **Poverty Impacts, Gender Aspects, and Social Development**. Not applicable.

47. **Institutional Change/Strengthening**. The project intended to strengthen SPEB's capacity in SO2 control but could not contribute to this objective because the technical assistance component was not implemented.

48. **Other Unintended Outcomes and Impacts (positive or negative)**. The Bank maintains an ongoing portfolio in Shandong province, including in the energy sector. The project's experience has alerted teams to work with Shandong Finance Bureau more closely on adequate project management financing and to conduct more vigilant financial management supervision.

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

49. Not applicable.

4. Assessment of Risk to Development Outcome

Rating: Moderate

50. Given the previous ratings of the project, a conclusion could be drawn that the risk to development outcomes is high. However, the reported progress of the SPG in SO2 control and supporting regulations suggests that a moderate risk to development outcomes is a more appropriate assessment. There is insufficient evidence on the quality of implementation to justify a lower rating. While the SPG appears to have found alternative financing sources to build capacities the project aimed to do, there was a missed opportunity to use project funds to bring in international experience and best practices in least cost environmental planning and implementation, and developing local institutional capacity required for monitoring and enforcement of environmental regulation.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately Unsatisfactory

51. Given the ratings discussed in Section 3.1 above on Relevance of Objectives, Design and Implementation, the Bank's performance at quality at entry is assessed as moderately unsatisfactory. Technical experts were brought in to assist in review of technical options, demonstrating a concerted effort to advance international best practices into project design, and a thorough economic analysis was undertaken. However, inadequate attention was paid to assessing the implementing arrangements and SO2 control technology choices contemplated by the subproject entities. The wet limestone gypsum FGD process described in the appraisal document is not the FGD technology that was selected by the Lubei sub-project, which opted for a Magnesium oxide FGD system.

52. As noted above, no formal agreement between the Shandong Provincial Finance Bureau (SPFB) and the SPEPB was sought to ensure funds would be made available to the SPEPB both for TA and project management. Provincial regulatory requirements placed significant time pressure on power generators to equip their plants with FGD systems and only one year after project effectiveness, close to 95% of power plants in Shandong province were equipped with FGD systems.

(b) Quality of Supervision

Rating: Unsatisfactory

53. The overall performance of Bank supervision was unsatisfactory. The financial management supervision was highly satisfactory and the team handled the discovery of fraudulent practices effectively. The Bank team also worked to identify a short list of alternative subprojects that were proposed by the Shandong Provincial Finance Bureau throughout the project period. However, the lack of adequate information regarding these potential new subprojects increased the input requirement of supervision and distracted

the team from placing adequate focus on tracking the Province's wider efforts on reducing SO2 emissions. Greater management guidance and support to the team could have helped to establish better balance in this regard, perhaps with an early cancellation or raising issues with Government counterparts to accelerate new subproject preparation. In addition the Bank team should have requested a view of the Project Leading Group, the high level steering committee of the project, when unsatisfactory implementation persisted.

54. In summary the Bank team was so focused on assisting the Province with preparing a restructuring package, which persistently changed, and later on the due diligence that was needed upon the discovery of fraudulent practices that it could not focus on tracking the SO2 emission reduction program undertaken by the Province. This imbalance in focus of project supervision leads this ICR to deem the Quality of Supervision as unsatisfactory.

(c) Justification of Rating for Overall Bank Performance
Rating: Unsatisfactory

55. Bank performance is rated unsatisfactory, based on the ratings for quality at entry and supervision.

5.2 Borrower Performance

(a) Government Performance
Rating: Moderately Unsatisfactory

56. Overall, government performance is rated moderately unsatisfactory. Government was committed to the project during preparation and was proactive in attempting to reprogram the use of loan funds. However, project outcomes may have been achieved with a well-supported PMO, capable of adjusting the TA component, communicating closely with identified subproject sponsors to ensure they understood requirements and timelines, and facilitating timely and adequate preparation of alternative subprojects. The TA component could not be implemented due to the inability of SPFB and SPEPB to complete internal processing requirements. The passivity of the SPEPB in resolving the matter may be an indication of its waning interest in the TA as a result of its good progress in achieving its SO2 targets.

57. Also, failure to identify the fraud that occurred in the Lubei sub-project suggests that inadequate financial management control mechanisms were put in place for the project. The financial management control mechanisms did not (i) maintain proper financial management systems and enhance the controls over transactions including compliance with legal agreements and eligibility criteria, and (ii) enhance the controls over transactions financed by the Bank including proper reconciliation of data, compliance with legal provisions and eligibility, before processing such transactions.

(b) Implementing Agency or Agencies Performance
Rating: Unsatisfactory

58. The implementing agency performance is rated unsatisfactory. The PMO in the Shandong Provincial Environmental Protection Bureau (SPEPB) did not to produce a satisfactory work plan for the TA component. Despite efforts to identify new sub-projects to replace the three original sub-projects that were dropped, the PMO lacked capacity to provide the Bank team with complete appraisal packages for newly proposed subprojects.

59. Moreover, the SPEPB did not maintain sufficiently close contact with the project implementation entities to monitor their deliberations and alert the Bank on the major changes that quickly occurred during project implementation. The project implementing entity of the Lubei investment subcomponent also failed to identify fraudulent practices.

60. Still, the PMO was diligent in assisting the Bank team during the fact finding mission during the due diligence conducted upon discovery of fraudulent practices.

(c) Justification of Rating for Overall Borrower Performance
Rating: Unsatisfactory

61. Overall Borrower performance is rated unsatisfactory based on the ratings of the performance of the government and the implementing agencies.

6. Lessons Learned

62. ***A project supporting mandatory targets should carefully time project support with the targets' timeline.*** The PDO was timely and relevant at the time of identification and preparation, but the ability of the project to make an impact was continuously reduced as developments in the province quickly outpaced the preparation of the project. The expectations and timelines of subproject sponsors outpaced and mismatched with the project's preparation timeline.

63. ***Early communication to the final borrowers of the Bank's project cycle and timing of availability of funding is needed, especially when working with corporations.*** The Bank requirements and procedures, and the internal requirements for the use of foreign capital, appear to have been misunderstood by the subproject sponsors at the time of appraisal. This may have been a key underlying reason for the dropout of the three subprojects that were in the original design. The target set of enterprises to be potentially assisted in making FGD retrofits in the province was a shrinking one, with most of the large power producers equipped. With all of the new operators (large or small) moving to equip themselves with FGC technology as mandated by regulations, the project could target only retrofitting of small plants linked to industrial electricity production. Given the lack of sufficient knowledge of Bank subproject appraisal procedures and requirements, the uncertainty of qualifying quickly for access to project loan funds drove these enterprises to alternative sources of financing.

64. ***Advance procurement of technical assistance, on a retroactively financed basis, and greater attention to final recipients of the technical assistance could mitigate risks of poor loan-financed TA execution.*** Even well-justified and necessary loan-financed

technical assistance carries high borrower performance risk because few borrowers appreciate its value added in advance of implementation. Borrowers prefer grant financed TA, even in middle income countries. Finance bureaus do not wish to carry the loan repayment responsibility on their budgets especially for TA implemented in other agencies. The TA component failed because the SPFB and SPEPB could not agree on these internal arrangements during implementation to overcome aversion to use of non-grant resources for TA activities. A willingness to undertake the TA component early in project implementation is a sign of commitment to the use of loan financed TA, and that internal arrangements are settled. The Bank team could have had a more balanced focus on resolving the lack of progress in the TA component, rather than focusing only on the issues between the PMO and SPFB. An engagement with the leadership of the relevant departments in the SPEPB, which were to be the final beneficiaries of the TA, could have helped to solve the issues.

65. ***Strong project management units are needed to support finance bureaus in supervising multiple subprojects.*** This includes implementation arrangements with clear and transparent financial management systems, complemented with Bank team fiduciary supervision plans tailored to the assessed risk.

66. ***The Bank needs to be more proactive and clearer on initiating project restructuring.*** Client orientation and responsiveness are hallmarks of good project management. Few clients like to cancel IBRD loan funds and Bank teams work very hard to accommodate these requirements. In addition, central governments wish to avoid multiple restructurings, which in turn creates barriers to efficient, partial adjustments that would help achieve the PDO even without full use of loan proceeds within the original implementation period. Clear guidance for task teams on good practices in restructuring would help task teams be forthcoming and able to attain earlier resolution of flaws in project design despite client reluctance towards early restructuring.

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

67. **Borrower/implementing agencies.** Comments have not been received.

68. **Cofinanciers.** Not applicable.

69. **Other partners and stakeholders.** Not applicable.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Investment	74.955	0.00	0.00
Technical Assistance	2.28	0.00	0.00
Total Baseline Cost	77.235	0.00	0.00
Contingencies	4.36	0.00	0.00
Interest during construction	4.42	0.00	0.00
Front-end fee	0.125	0.00	0.00
Total Financing Required	86.14	0.00	0.00

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		17.23	0.00	0.00
International Bank for Reconstruction and Development		50.00	0.00	0.00
Local Sources of Borrowing Country		18.91	0.00	0.00
Sub-borrower(s)		0.00	0.00	0.00
		86.14	0.00	0.00

Annex 2. Outputs by Component

There were no outputs.

Annex 3. Economic and Financial Analysis

Not applicable as none of the project investments were made.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Zhao Jianping	Senior Energy Specialist	EASCS	Task Team Leader
Peter Meier	Economist	EASTE	Economic Analysis
Dawei Yang	Procurement Specialist	EAPCO	Procurement
Efstratios Tacvoulareas	Senior Operations Officer	CEUSB	Operations Support
Yuling Zhou	Senior Procurement Specialist (Co-TTL)	EASTE	Procurement
Jian Xie	Senior Environmental Specialist	EASRE	Environment
Richard Spencer	Senior Energy Specialist	EASVS	Energy
Bernard Baratz	Consultant	EASCS	
Mei Wang	Senior Counsel	LEGAM	legal
Supervision/ICR			
Frederic Asseline	Senior Energy Specialist	EASCS	Task Team Leader
Gailius Draugelis	Lead Energy Specialist	EASCS	Task Team Leader
Bernard Baratz	Consultant	EASCS	
Cristina Hernandez	Program Assistant	EASWE	
Yi Dong	Sr Financial Management Specia	EASFM	
Haixia Li	Sr Financial Management Specia	EASFM	
Jingrong He	Procurement Specialist	EASPM	
Shawna Fei Li	Junior Professional Associate	EASIN	
Guojun Ma	Consultant	EASCS	
Peter Meier	Consultant	EASWE	
Efstratios Tavoulareas	Senior Operations Officer	CEUSB	
Helmut Erich Vierrath	Consultant	EASIN	
Mei Wang	Senior Counsel	LEGAM	
Lynn Wang	Consultant	EASFM	
Dawei Yang	Consultant	EASTS	
Youxuan Zhou	Consultant		
Chunxiang Zhang	Operations Analyst	GFDRR	

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY06		182.04
FY07		107.99
FY08		29.68
Total:		**319.71**
Supervision/ICR		

FY09		36.82
FY10		23.88
FY11		38.71
FY12		6.83
Total:		**106.24**

Annex 5. Beneficiary Survey Results

Not applicable

Annex 6. Stakeholder Workshop Report and Results

Not applicable

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

Borrower’s inputs were not received.

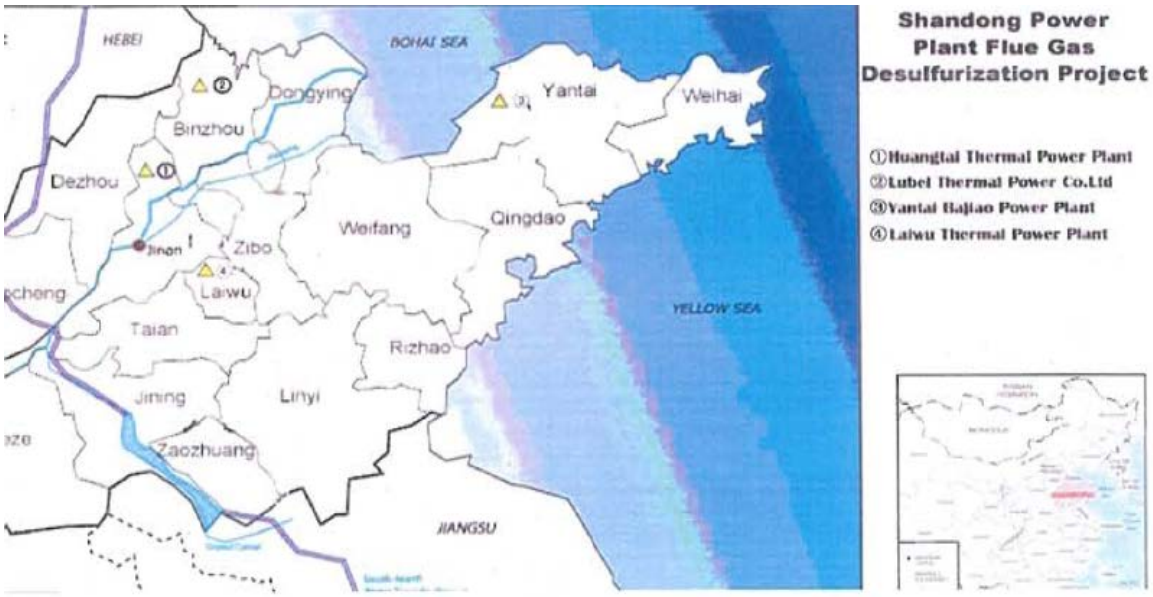
Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

1. Project Appraisal document
2. Project legal documents including project agreement and loan agreement
3. Project file containing records of project preparation and appraisal
4. Supervision aide-memoires, management letters, and Implementation Status and Results reports
5. Project Feasibility Studies
6. Environmental Bulletin of the Shandong Environment Protection Bureau website, published by the pollution control office of Shandong EPB (http://www.sdein.gov.cn)

Annex 10. Map


HEBEI
BOHAI SEA
Dongying
Binzhou
Dezhou
Yantai
Weihai
Weifang
Qingdao
Zibo
Laiwu
Taian
Rizhao
Jining
Linyi
Zaozhuang
JIANGSU
YELLOW SEA
Shandong Power Plant Flue Gas Desulfurization Project
①Huangtai Thermal Power Plant
②Lubei Thermal Power Co.Ltd
③Yantai Bajiao Power Plant
④Laiwu Thermal Power Plant