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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Energy Conservation and Greenhouse Gas Emissions Reduction in Chinese Township and Village Enterprises-Phase II

Final Report

For

Pilot and Replication Project Energy Saving and GHG Emission Reduction Monitoring and Evaluation

Request for Proposal No. P. 16001067 - EG/CPR/99/G31

Submitted by:

Center for Energy and Environmental Protection Technology Development, Chinese Academy of Agricultural Engineering

May 8, 2007

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Thanks

We greatly appreciate help from the following personnel. Without their support and guide, we can't complete this project smoothly.

Mrs. Wang Guiling, Deputy Director of PMO

Mr. Wangxiwu, Senior project managers

Dr. Xu litong, Technical Adviser of project

Mr. Song Dongfeng, Contract Officer of PMO

Mrs. Mounira Latrech, Contract Officer of UNIDO

Dr. Enver Khan and other working personnel

Contents

1. Preface

The draft is the final report on the subcontracts of energy conservation and GHG emissions reduction measurement and evaluation of the pilot and replication projects-"Energy Conservation and GHG Emissions Reduction in Chinese TVEs" project Phase II, which is submitted to the UNIDO and PMO of MOA by CEEP.

2. Background

The aim of the TVE project entitled "Energy Conservation and GHG Emissions Reduction in Chinese TVEs" is to reduce GHG emissions in China from the TVE sector by increasing the utilization of energy efficient (EE) technologies and products in the brick, metal casting, cement, and coking sectors. This project is to remove key market, policy, technological, and financial barriers to the production, marketing and utilization of EE technologies and products in these sectors.

During these four years, the project has achieves some tangible results in both technical areas and the institutional mechanisms. The objective of the subcontract is to evaluate at both project level and macro level the pilot and replication (both project supported and independent replications) projects in terms of the changes in energy efficiency ad GHG emission reduction, as well as VA mechanism and its effectiveness, identify and analyze the best practices and lessons learned, as well as suggest areas for future adjustment and improvement, through comprehensive review and summarization of project activities, outputs, outcomes and impacts. The implementation of the subcontract will provide systematic feedbacks and recommendations for international organizations, such as GEF, UNDP and UNIDO, Chinese government and other key stakeholders to organize or participate relevant activities more effectively in the future.

3. Objectives:

The objective of the *subcontract* is to evaluate at both project level and macro level the pilot

and replication (both project supported and independent replications projects in terms of the changes in energy efficiency and GHG emissions reduction, as well as VA mechanism and its effectiveness, identify and analyze the best practices and lessons learned, as well as suggest areas for future adjustment and improvement, through comprehensive review and summarization of project activities, outputs, outcomes, and impacts. The implementation of the subcontract will provide systematic feedbacks and recommendations for international organizations, such as GEF, UNDP, and UNIDO, Chinese government and other key stakeholders to organize or participating relevant activities more effectively in the future.

Scope of work:

- ✓ Evaluation and assessment of VA system and its effectiveness;
- ✓ Tracking information of pilot and replication projects and self-replication projects;
- ✓ 2 cases for the best practice.

4. Project Implementation

Under the organization of PMO, subcontractors had a report meeting for thesis proposal and submitted it (Annex 1). Then the subcontractors carried out many activities to investigate the implementation conditions of energy conservation technology and gained the necessary information for evaluation.

- Refer to several of literatures relevant to the industries such as statistics materials, publications by the government and reports of the industries and associations to make choice, abstraction, arrangement and analysis of the policies on energy conservation technologies made by the government.

- Carefully study the project documents, midterm evaluation reports, TORs and bidding documents of pilot as well as the replicated enterprises, check and confirm the feasibility reports, phase reports, midterm reports and final reports of the replications,

propose the opinions after checking and confirmation, make communication with the replication subcontractors, try to get consensus on opinion and guide the subcontractor to make revision. The documents being checked are in Annex 2.

- Visit the pilot enterprises and replications on the very sites, exchange opinions with local governors, subcontractors of replications on specific problems, and make investigation and research of the project implementation in pilot enterprises and replications. In addition, subcontractors had talk with National Policy Guiding Commission, PMO and Hong Yuan and collect large amount of useful information. The onsite investigation is in Annex 3.

- To evaluate the energy conservation conditions of pilot enterprises according to the relevant national laws and standards of energy conservation, including the energy management, energy consumption of each unit of product, calculation of the energy conservation, the financial and economic analysis of the energy conservation and technological improvement in enterprises. Furthermore, the authoritative institute was consigned to make energy conservation testing and measurement to two brick plants. To evaluate the activities, outputs, goals and effects of the project implementation of energy conservation technologies through several of ways such as overall analysis and panel discussion according to the logic frame. The responsible persons of the project analysis summarize the evaluation opinions and compile the progress report. And then hand it to the PMO and UNDIO.

After accomplishing the report, we have communicated with the officials of PMO, UNDIO and the international professors on estimating. They make some related suggestions, based on which Subcontractor revise the estimating report and finally accomplish it. The main suggestions proposed by the international professors are about further compartmentalizing the voluntarily generalizing activities of the

project. Besides, as required by the project office, the number of case study is changed from 2 to 5 and the specific can be seen the case study.

5. Activities

5.1. Task A. Project inception

Activity A.1 Kick-off meeting

Time: 1st week

Participants: All team members

Contents:

- ✓ Subcontractor composes a topic report introducing relevant issues and submit to PMO;
- ✓ Discuss and share ideas;
- ✓ Subcontractor adjust the LFA, Indicator system outline, information collecting mechanism and plan, best practice outline and work plan according to the result of the conference;

Output: Topic report amended LFA, indicator system outline, information collecting mechanism and plan, best practice outline and work plan.

Activity A.2 Project Coordinating Conference

Time: 1st week

Participants: All team members

Contents:

- ✓ At the project inception, a project coordinating conference will be held. Representatives from PMO, PIC, Hong Yuan Company, LPIC, pilot enterprises and

other subcontractors will be asked to attend the conference;

- ✓ The project manager will introduce the major methodology, plan and organization to the attendees, and answer the questions arisen.
- ✓ Exchange ideas with all parties, set the goal and understand each other better;
- ✓ Consult with the representatives from LPIC, pilot enterprises and other subcontractors about the field research and EE evaluation. Change the schedule in accordance with different situations.

Output: conference summary, and amended implementing schedule.

Note: 3 subcontract coordinating conferences had better to be held together in this way to save time and money.

5.2. Task B. Set indicator system

Activity B.1 set indicator system

Time: 2nd week

Participants: TIAN Yishui, ZHAO Lixin, WANG Fei

Contents: Set indicator system based on the SMART and the existing indicator system referring to relevant indicators in the Logical Framework Table and GEF Climate-Change Project and considering the requirement of this subcontract. (See 3.3)

Output: Set of indicators

5.3. Task C. Research and survey

Activity C.1 Obtain project information

Time: 3rd week to 4th week

Participants: ZHAO Lixin, WANG Fei

Contents:

- ✓ Set the project information that need to be obtained according to the indicator system and evaluation items.
- ✓ Obtain necessary project information from PIC, OMO and Hong Yuan Company throng interviews and sessions.
- ✓ File the information obtained and edit and categorize it to support the evaluation.

Output: Project documents, interview logs and session logs.

Activity C.2 Obtain National/ Macro Information

Time: 3rd week to 4th week

Participants; TIAN Yishui, WANG Fei

Contents:

- ✓ Design a research and survey outline according to the indicator system and evaluation items.
- ✓ Collect information from various governmental departments (including MOA, national development and reform commission, and state environmental protection administration) and the national associations of brick, cement, metal casting and coking industries through interview and literature review;
- ✓ Our major target is the information concerning EE technology and policy in China;
- ✓ File the information obtained and edit and categorize it to support the evaluation.

Output: Government documents, reports, statistics, plan and interview log.

5.4. Task D. Field research and EE evaluation (obtain local and enterprise information)

Activity D.1 Field research in cement sector and EE evaluation

Time: 5th week to 7th week

Participants; TIAN Yishui, WANG Fei

Contents:

- ✓ Design a research and survey outline for the cement sector (questionnaire included) and the EE evaluation outline;
- ✓ Do the field research in the three pilot cement enterprises and hold sessions with the local government officers;
- ✓ Evaluate the EE situation in the 3 pilot enterprises;
- ✓ Hand out the questionnaire, check and organize the replication information in cement sector provided by other subcontractors, and do the sample survey and complete the EE evaluation database for replication enterprises in cement sector.
- ✓ Check the rate of the fulfillment and effectiveness of VA. The subject including the local government and enterprises.

Output: research report on VA fulfillment and effectiveness, EE evaluation reports of the 3 pilot enterprises and the EE evaluation database for replication enterprises in cement sector.

Activity D.2 Field research in metal casting sector and EE evaluation

Time: 8th week to 10th week

Participants: TIAN Yishui, WANG Fei

Contents:

- ✓ Design a research and survey outline for the metal casting sector (questionnaire included) and the EE evaluation outline;
- ✓ Do the field research in the three pilot metal casting enterprises and hold sessions with the local government officers;
- ✓ Evaluate the EE situation in the 2 pilot enterprises;
- ✓ Hand out the questionnaire, check and organize the replication information in metal casting sector provided by other subcontractors, and do the sample survey and complete the EE evaluation database for replication enterprises in metal casting sector.
- ✓ Check the rate of the fulfillment and effectiveness of VA. The subject including the local government and enterprises.

Output: research report on VA fulfillment and effectiveness, EE evaluation reports of the 2 pilot enterprises and the EE evaluation database for replication enterprises in metal casting sector.

Activity D.3 Field research in brick sector and EE evaluation

Time: 5th week to 7th week

Participants: MENG Zhaoli, JIANG Yun

Contents:

- ✓ Design a research and survey outline for the brick sector (questionnaire included) and the EE evaluation outline;
- ✓ Do the field research in the three pilot brick enterprises and hold sessions with the local government officers;
- ✓ Evaluate the EE situation in the 2 pilot enterprises;
- ✓ Hand out the questionnaire, check and organize the replication information in brick sector provided by other subcontractors, and do the sample survey and complete the EE evaluation database for replication enterprises in brick sector.
- ✓ Check the rate of the fulfillment and effectiveness of VA. The subject including the local government and enterprises.

Output: research report on VA fulfillment and effectiveness, EE evaluation reports of the 2 pilot enterprises and the EE evaluation database for replication enterprises in brick sector.

Activity D.4 Field research in coking sector and EE evaluation

Time: 8th week to 10th week

Participants: MENG Zhaoli, JIANG Yun

Contents:

- ✓ Design a research and survey outline for the coking sector (questionnaire included) and the EE evaluation outline;
- ✓ Do the field research in the three pilot coking enterprises and hold sessions with the local government officers;

- ✓ Evaluate the EE situation in the 2 pilot enterprises;
- ✓ Hand out the questionnaire, check and organize the replication information in coking sector provided by other subcontractors, and do the sample survey and complete the EE evaluation database for replication enterprises in coking sector.
- ✓ Check the rate of the fulfillment and effectiveness of VA. The subject including the local government and enterprises.

Output: research report on VA fulfillment and effectiveness, EE evaluation reports of the 2 pilot enterprises and the EE evaluation database for replication enterprises in coking sector.

EE evaluation reports of the pilot enterprises should includes the following:

1) company background: introduction of the company including its major business line and its techniques;
2) the energy management system of the enterprise: energy management organization, energy measuring system, energy management criteria and regulation;
3) enterprise energy statistics: energy network chart, energy balance sheet, energy consumption structure and financial statement, general statement of the energy management system;
4) evaluation of the EE technical reform: technical features, EE effectiveness, evaluation on technique economy and ecological benefits;
5) conclusion: EE evaluation, existing problem, suggestions

5.5. Task E. Set up the baseline

Activity E.1 set up the baseline

Time: 11th week

Participants: TIAN Yishui, WANG Fei

Contents:

- ✓ Arrange the information concerning baseline including VA signed by pilot enterprises and local government, and information provided by other subcontractors;
- ✓ Set up baseline for each indicator (see 3.4.3).

Output: baseline.

5.6. Task F. Compose the evaluation report

Activity F.1 Compose the VA mechanism and effectiveness report

Time: 12th week to 13th week

Participants: TIAN Yishui, JIANG Yun, Heinz-Peter Mang

Contents:

- ✓ Evaluate the mechanism and effectiveness of the VA using LFA and all the information obtained (including the fulfillment of VA and effectiveness report and EE policy in China) (see 3.3).
- ✓ The focus of the evaluation is on the rationality of VA mechanism (whether it is fit for Chinese enterprises), its successful experience, effect on Chinese EE policy, environment policy and fiscal policy, and the barriers and problems in promotion.

Output: VA mechanism and effectiveness report (draft for comments)

Activity F.2 Evaluation report on EE technology in pilot, replication and self replication information tracking

Time: 12th week to 13th week

Participants: MENG Zhaoli, ZHAO Lixin, WANG Fei

Contents:

- ✓ Evaluate EE technology pilot, replication and self replication information tracking using TFA and all the information obtained (including EE evaluation report and EE technology in China) following evaluation criteria.
- ✓ EE kiln, reactive power compensation, and air brick are three major evaluation aspects in brick sector; shaft kiln EE technology, shaft kiln to rotary kiln, Low Temperature Residual Heat Power Generation Technology are three major evaluation aspects in cement sector; cold box and sand recycle are the 2 major evaluation aspects in metal casting sector; while in coking sector, Residual Heat Power Generation is the major evaluation aspect.
- ✓ Elaborate to analyze the change and achievement brought by piloting and replicating above mentioned EE technology, find out the factors restricting the replication and come up with improvement measures.

Output: evaluation report on EE technology pilot, replication and self replication information tracking (draft for comments)

Activity F.3 Summarize 5 best practices

Time: 14th week

Participants: TIAN Yishui, Heinz-Peter Mang

Contents:

- ✓ Analyze the above two reports and evaluation reports on 9 pilot projects.
- ✓ Narrow it down to 5 after consulting PIC and PMO.
- ✓ Compose the report of the 5 best practices.

Output: the report of the 5 best practices.

The report need to include:

- ✓ Brief introduction to the enterprise, technique and baseline.
- ✓ Annual energy consumption.
- ✓ Fulfillment of the EE technical reform: including energy management and it affects as well as the implementation of the EE measures.
- ✓ Other item and measures to improve the EE: the situation of operation, management and R&D, and its difference from the last year.
- ✓ Achievements and barriers.
- ✓ Experience acquired and suggestions to how to improve the VA.

Activity F.4 Complete the final draft of the evaluation report

Time: 15th week to 16th week

Participants: Tian Yishui, Heinz-Peter Mang, WANG Fei

Contents:

- ✓ Hold an EE evaluation seminar inviting PMO, PIC, Hong Yuan Company and LPIC.
- ✓ Brief the evaluation procedure and the conclusion and ask for comments
- ✓ According to the comments from all parties, amend the two sub-reports and two best practices and complete the final draft.

Output:

- ✓ VA mechanism and effectiveness report (final draft).
- ✓ Evaluation report on EE technology pilot, replication and self replication information tracking (final draft).
- ✓ 5 best practices (final draft).

6. Output

Project subcontractors have accomplished the work required by the contact. The output of the contact includes report on technology implementation of energy conservation , voluntary energy conservation system and validity evaluation report. In addition, five cases were summarized and analyzed according to the requirement of PMO (Annex 6).

Annex 1: Inception Meeting

Time: March 15-16

Venue: Henan Mansion, Beijing

Participants: Staff of MOA project implementation agencies, PIC members and the secretariat staff, UNDP and UNIDO representatives of the Beijing Office, LPIC representatives, subcontractor representatives. For detailed list of participants, see Annex.

Agenda:

9:00－9:15 Introduction and Opening Remarks

Moderator: Wang Guiling, Deputy Director of PMO

9:15－9: 35 Remarks

Program officer of UNDP resident mission in China, representative of GEF office in China

9:35－10:05 Design Ideas of Project Outcome Evaluation Subcontracting

Xu Litong, Senior Project Management Expert, PMO;

10:05－10:35 Implementation Strategies, scheme and plan of evaluation subcontracts on the effectiveness of Policy Instruction Committee (PIC、LPIC) mechanism, and impacts of the project on policies, market, women and social development;

Zou Ji, Vice President, College of Environment, Renmin University;

10:35－10:50 Tea Break

10:50－11:20 Implementation Strategies, scheme and plan of evaluation and perfecting subcontracts of the Recycling Capital Fund (RCF) mechanism structure;

Hu Bo, Vice President, Yuhuayun Investment Consulting Company Ltd.;

11:20－11:50 Implementation Strategies, scheme and plan of monitoring and evaluation subcontracts on pilot and replication projects;

Tian Yishui, Senior Engineer, Center for Energy and Environmental Protection Technology Development, MOA;

11:50－12:10 Question and Answer

12:10－12:30 Summing up

Wang Xiwu，Senior Director, PIC secretariat

14:00－18:00 Group Discussion

1、Introduction to the places and organizations

2、Discussion on the implementation strategy, scheme and plan of 3 subcontracts

Annex 2: Examination of Documents

Cement Sector:

Cement Replication(1): July 5, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 10 cement enterprises from Tianjin Academy of Industrial Development; July, 6, checked and assessed the energy efficiency data in the report and sheet, and fed back the results to PMO on the same day; October, 19, received the revised data from enterprises, conforming to the requirements after check.

Cement Replication(2): April 28, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 10 cement enterprises in Nanjing; April 30, checked and assessed the energy efficiency data in the report and sheet, and fed back the results to PMO on the same day; June 30, received the revised data from enterprises, conforming to the requirements after check.

Brick Sector

Chendu Brick Sector: May 18, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 15 brick enterprises in Chengdu City; May 22, checked and assessed the energy efficiency data in the report and sheet, and fed back the results to PMO on the same day; June 10, received the revised data from enterprises, conforming to the requirements after check. December 22, 2005, Chengdu Brick Sector submitted the final report draft; January 18, 2006, submitted the revised final draft; May 18, 2006, submitted the final report.

Shenyang Brick Sector: May 18, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 16 brick enterprises in Shenyang City; April 30, 2006, checked and assessed the energy efficiency data in the report and sheet, and fed back the results to PMO on the same day; June 8, received the revised data from enterprises, conforming to the requirements after check. January 22, 2006, submitted the final report draft; April 21, 2006, submitted the final report.

Xi'an Brick Sector: May 19, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 15 brick enterprises in Xi'an City; April 30, checked and assessed the energy efficiency data in the report and sheet, and fed back the results to PMO on the same day; June 15, received the revised data from enterprises, conforming to the requirements after check. April 14,

2006, submitted the final report draft; July 27, 2006, again submitted the revised final draft; August 7, submitted the final report.

Xianyang Brick Sector: May 19, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 14 brick enterprises in Xianyang City; May 30, checked and assessed the energy efficiency data in the report and sheet, and fed back the results to PMO on the same day; June 12, received the revised data from enterprises, conforming to the requirements after check. March 22, 2006, received the final report on technological renovation submitted by replication enterprises in Xianyang City; May 9, 2006, received the final report draft; June 27, 2006, received the final report.

Metal Casting Sector

Dalian Metal Casting: July 13, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 8 metal casting enterprises in Dalian City; July 14, checked and assessed the energy efficiency data in the report and the sheet and fed back the results to PMO on the same day; August 7, received the revised data from enterprises, conforming to the requirements after check. Tianjin Metal Casting: July 25, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 7 metal casting enterprises in Tianjin City; July 26, checked and assessed the energy efficiency data in the report and the sheet and fed back the results to PMO on the same day; August 26, received the revised data from enterprises, conforming to the requirements after check, made suggestions to the final report on April 19, 2007.

Nanjing Metal Casting: August 28, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 6 metal casting enterprises in Nanjing City; August 30, checked and assessed the energy efficiency data in the report and the sheet and fed back the results to PMO on the same day; September 20, received the revised data from enterprises, conforming to the requirements after check, made suggestions to the final report on April 19, 2007.

Shanxi Metal Casting: August 28, 2006, received the Feasibility Study Report and Energy Efficiency Sheet on 10 metal casting enterprises in Shanxi Province; August 29, checked and assessed the energy efficiency data in the report and the sheet and fed back the results to PMO on the same day; October 18, received the revised data from enterprises, conforming to the

requirements after check.

Coking Sector:

December 19, 2006, received final report on replication in coking sector; December 20, put forward feedback ideas.

Annex 3: Field Visits

Time	Place	Organization Visited	Interviewee	Major Contents of Work
April 4-5, 2006	Nanjing	Nanjing Moling Foundry General Plant	Mr. Liang (Factory Director), Mr. Hu (General Engineer), Mr. Meng Qinggui (General Secretary), etc.	Visited Nanjing Moling Foundry General Plant, replication enterprises and comparison enterprises, to study the implementation situation of EE technological renovation of pilot and replication enterprises.

		Nanjing LPIC, Bureau of TVE Administration of Nanjing City, Nanjing Foundry Association	General Director Li, Bureau of TVE of Jiangning District, Nanjing City; Wang Jie, Director General, Jiangning District Bureau of Finance; Guo Xing, Director General, Bureau of Science and Technology; Mr. Lang, deputy director of the Environment Protection Administration; General Director Wang, Nanjing Bureau of TVE Administration; Director Wu, Division of Instruction, Nanjing Bureau of TVE Administration; President Xu Yilong, Foundry Association of Nanjing City; General Secretary Meng Qinggui, Foundry Association of Nanjing City; Factory Director Liang, Nanjing Moling Foundry General Plant	Studied the implementation of subcontract of Nanjing metal casting sector.

		Nanning Kaisheng Cement Technical Engineering Company, Ltd.	General Manager Luo Libo, Nanning Kaisheng Cement Technical Engineering Company, Ltd., and subcontractors	Studied the implementation of cement subcontract.
April 6-7,2006	Tongxiang City, Zhejiang Province	Zhejiang Shenhe Cement Plant, Department of Economy and Trade, Tongxiang City, Zhejiang Province	Director Shen Xinglong, LPIC representative of Zhejiang Province; Director Shen Weizhong, Cement Quality Inspection Station of Zhejiang Province; General Manager Shen Fuqiang, Shenhe Cement Plant	Studied the implementation of EE technological renovation project in Shenhe Cement Plant and the replication facts of cement low temperature waste heat power generation project in Zhejiang Province.
April 17-18,2006	Xi'an	Xi'an Liucun Village Hollow Brick Plant, Shijiadao Brick Plant, Shenwei Wall Material Plant	General Director Wang Yu, Section Chief Bai, Bureau of Economy and Trade of Baqiao District, Xi'an City; Factory Director Ling Fu and management staff, Liucun Village Hollow Brick Plant; President Xiao Hui and subcontractors team, Xi'an Academy of Wall Materials	Studied the implementation of EE technological renovation in pilot and replication enterprises, and the promotion of EE technologies.

		Bureau of Economy and Trade of Baqiao District, Xi'an City; Wall Materials Association of Xi'an City, Wall Materials Reform Office of Xi'an City	General Director Wang Yu, Section Chief Bai, Bureau of Economy and Trade of Baqiao District, Xi'an City; Executive Director Zhou Xuan, General Secretary Wang, Wall Materials Association of Xi'an City;	Introduced related background and the selection criteria of brick replication enterprises.
April 19, 2006	Xianyang	Zhouling Hollow Brick Plant of Weicheng District, Xianyang City	Mr. Wang Hao, general manager of Xi'an Kaisheng Construction Materials Engineering Company, Limited; subcontractors team; principals of replication enterprises; Principals from Leading Group of Brick and Tile Industry Rectification of Xianyang City; Bureau of Economy and Trade; Wall Material Reform Office; Bureau of TVE Administration; Bureau of Technical Supervision; Bureau of	

			Natural Resources; Environment Protection Administration	
May 10-11, 2006	Xinjin County, Chengdu City	Department of SME of Xinjin County, Chengdu Yongxing Wall Materials Technology Consulting Service Company, Yongxing Shale Brick Company, Ltd., Xingsheng Shale Brick Company Limited of Xinjin County, Chengdu City; Honglin	General Director Wang Lizhi, deputy director , Department of SME of Xinjin County; General Manager Gong Muquan, Mr. Li Zhigen, Chengdu Yongxing Wall Materials Technology Consulting Service Company; Mr. Wang Fugeng, Engineer, Leshan City Jiqiao Machinery Company; Factory Director Liu Binqing, Xinjin Tangzhong Shale Materials Company Limited; Factory Director Guo Jianquan,	Studied the implementation of EE technological renovation in pilot and replication enterprises in Xinjin.

		Brick Plant, Qionglai City, Sichuan Province	Xinjin County Huayuan Shale Hollow Brick Plant; Factory Director Wang Min, Xinjin County Huangdu Shunyuan Brick Plant; Factory Director Li Dongjiu, Gaofeng Mechanical Brick Plant of Jinhua Town, Xinjing County; Factory Director Wen Peiyi, Tongxing Construction Materials Plant Xinjin County; Factory Director Han Huicheng, Xingsheng Shale Brick Company Limited, Xinjin County, Chengdu City; Director Liu Guoquan, Honglin Brick Plant, Qionglai City, Sichuan Province	
May 12, 2006	Shuangliu County, Chendu City	Department of SME, Shuangliu County	Mr. Chen Xiaoping, Director General, Mr. Lei Yueshu, Deputy Director General, Bureau of SME, Shuangliu County; Deputy Director General Yang Jingui, Pan Shiwang,	Studied the implementation of EE technological renovation of replication enterprises in Shuangliu county.

			Bureau of SME, Xinjin County; General Manager Gong Muquan, Li Zhigen, Chengdu Yongxing Wall Materials Technology Consulting Service Company; General Manager Wang Fugeng, Leshan Jiqiao Machinery Company; Director Qin Hongkun, Shuangliu Changhong Shale Hollow Brick Plant; Director Qin Jinhua, Huayang Honghuo Shale Hollow Brick Plant, Shuangliu County; Director Zhou Shuihe, Chengdu Sanli Shale Hollow Brick Company Limited; Director Zhou Qiang, Shuangliu Gaofeng Shale Hollow Brick Plant; Director Yan Huineng, Liugong Huineng Shale Brick Plant, Shuangliu County; Office Director Xie Zhongxiu,	

			Shuangliu Jiancha Shale Brick Plant	
July 5-7, 2006	Gaoping City, Shanxi Province	Gaoping Municipal Government, Gaoping Xinggao Coking Group Company Limited	General Manager Hou, Gaoping Xinggao Coking Group Company Limited; staff from related agencies, leaders of the departments of the Gaoping Municipal Government	Studied the implementation of EE technological renovation of pilot enterprises, and the replication of clean oven technology.

UNIDO

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Energy Efficient Technologies Implementation Monitoring and Evaluation

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Pilot and Replication Project Energy Saving and GHG Emission Reduction Monitoring and Evaluation
Request for Proposal No. P. 16001067 - EG/CPR/99/G31

Submitted by:
Center for Energy and Environmental Protection Technology Development, Chinese Academy of Agricultural Engineering

May 8, 2007

Table of Contents

1. Executive Summary

This report describes the results of Energy Efficient Technologies Implementation Monitoring and Evaluation under the project of "Energy Conservation and Greenhouse Gas Emissions Reduction in Chinese Township and Village Enterprises-Phase II" (hereinafter referred to as the Project). In the process of the completion of this report, the PMO has given strong guidance and assistance, and LPIC, pilot enterprises, replication enterprises and subcontractors have also provided with a lot of information. However, the evaluation conclusions are drawn by experts independently, and subcontractors are to solely take the responsibilities of any possible error or neglect in the report.

The objective of this evaluation is to evaluate at both project level and macro level the pilot, replication and independent replication enterprises in terms of energy efficient technology implementation, changes and results in energy efficiency and GHG emissions reduction, identify and analyze successful practices, mechanism and influencing factors, and find the direction of improvement. According to the provisions of "GEF supervision and evaluation of policies and procedures", the Logical Framework Approach (LFA) is adopted by the experts as the basic evaluation method.

The project has demonstrated a number of energy efficient technologies in cement, coking, metal casting and brick sectors, built 8 pilot enterprises, and carried out a series of technical training and promotion activities which benefited 670 enterprises with a total attendance of over 900. The 118 energy efficient enterprises selected have all completed the preparation of feasibility study on energy efficient technology renovation, among which 60 brick making and 31 metal casting enterprises have completed the energy efficient technological renovation, 3 coking enterprise and 7 cement plants have completed energy efficient technological renovation project or under construction.

Evaluation Conclusions: 8 pilot enterprises' energy conservation is 81,000 tce per year and carbon dioxide emission reduction of 203,000 tons (project targeted at carbon dioxide emission reduction of 85,000 tons per year). The 118 replication enterprises are expected to conserve energy

by 809,000 tons per year and reduce carbon dioxide emission by 2.018 million tons (project target is carbon dioxide emission reduction of 1 million tons per year); the project has accomplished annual energy conservation of 370,000 tons and carbon dioxide emission reduction of 923,000 tons). The construction of pilot projects and training and exchange activities led to the rise of replication activities in all the four sectors. Thanks to the success of demonstration technologies and pilot projects, the project promoted the development of energy conservation technology policy at both national and local level.

The implementation result of energy conservation technologies is far better than expected, which, evaluation experts believe, is due to the rapid development of Chinese economy and the implementation strategies adopted by PMO, including timely adjustment of demonstration technologies according to national industrial policy, giving full play to initiatives and enthusiasms of enterprises and LPIC, adoption of VA mechanism, improvement of management and attaching importance to process monitoring and strengthening the capacity building of Hong Yuan Company etc.

2. Project Background

Township and Village Enterprises (TVEs) are the rural collective economic organizations, or various types of enterprises invested mainly by farmers, located in townships (or villages) and bear the obligation of supporting agriculture. Since the reform and opening up, TVEs have made indelible historic contributions to the agricultural and rural economic development. TVEs came to the world in the vast land of China, and the development and strengthening of TVEs played a significant role in boosting rural economy, increasing farmers' income, improving the living standards of farmers and solving the problem of rural surplus labor force. In 2005, the total number of TVEs in China reached 22.4959 million, with 142.7236 million employees, the value added of 5.053425 trillion RMB, total production of 21.78186 trillion RMB, total profits of 1.25186 trillion RMB, taxes 518.092 billion RMB, employees' payment of 1.111743 trillion RMB, and per capita income of 7,790 RMB.

Since the reform and opening up, China has developed, demonstrated (introduced) and

replicated a large amount of energy efficient new technologies, new techniques and new equipment which greatly enhanced the energy efficient technologies. However, due to the lack of stimulative policies and mechanisms, it was difficult to promote energy efficient technologies especially in TVEs. The overall low level of technology, equipment and management led to serious high energy consumption and environment pollution which have become the main constraints to the sustainable and healthy development of TVEs. Among them, the township cement, brick, coking and metal casting industries are the big energy consumers. According to data, the energy consumption of Chinese TVEs accounted for 50% of Chinese total industrial energy consumption, and the energy consumption of the above four sectors accounted for 56% of total TVEs' energy consumption.

(1) TVEs are usually small-scale, volatile, insufficient in funding, and poor in technical conditions. Most of their production techniques are only at the level of the 1950's, and most of the production equipment is eliminated from the original state owned plants which is tattered, broken, or patched and causes serious waste, emission, dripping and leakage. Many of the manufacturing styles of TVEs are extensive full of phenomena of dripping water and uncared long on lights. Compared with large and medium-sized state owned enterprises, TVEs have serious problems in energy consumption and raw material consumption per unit of product.

(2) The management and technical staff of the TVEs have low consciousness in energy conservation and environment protection, old fashioned ideas and little knowledge of energy efficient technologies, or even blank. They don't have strong sense of a people-centered, comprehensive, coordinated and sustainable scientific development concept, don't have profound recognition of the importance of energy conservation, neither do they have deep understanding of the close relationship between energy conservation, cost reduction, environmental protection and achievement of sustainable development. In development conception, they think much of exploitation, little of conservation; much of extension, little of intension; much of growth, little of development; much of short term, little of long term.

(3) In TVEs, the ratio of senior managers and technical staff is low, while the majority of ordinary workers are farmers with low literacy and poor overall quality. Take metal sector for

instance, due to the low pay and, poor working environment, there is a serious shortage of technical personnel, most of the farmer-workers have rarely received professional trainings. Mainly manifested in: the under number and uneven distribution of technical and management staff, the least ratio of technical and management staff to total employees is 12%, while the highest is 23%. Senior talent is even less. Basically, the technical and management staff in metal casting enterprises is mainly graduates from technical secondary schools, junior colleges and universities with large numbers of technical secondary school and junior college graduates, but very small number of master school graduates.

(4) In TVEs, there are common problems of poor management, no establishment or improvement of quality and energy management systems, and serious waste of resources and environment pollution. Most TVEs have imperfect management systems, chaotic manufacturing sites, no logic procedures for production process; Although some enterprises have drawn up a management system, it is simply copy of other practices, not corresponding to specific enterprise implementation; Some enterprises have unclear quality responsibilities, no fulfillment of the responsibilities and on the surface quality management, resulting in inferior product quality and lack of competitiveness.

(5) Due to the information asymmetry, TVEs are lack of effective access to information, hard to know the latest technological advances in the industry, let alone application. Many TVEs are actively looking for energy efficient technologies and products suitable to their needs. But as there is serious information asymmetry, they can't get the information on energy efficient technologies, or there is still a big gap between what they get and what they need, which results in more money inputs, more equipment installation, increased technical complexity but bad effects in energy conservation.

In order to help TVEs in cement, metal casting, brick, and coking sectors to overcome the barriers in technology, market, policies, financing and internal mechanism in the use of high efficiency energy-saving technologies, to strengthen the competitiveness in absorbing energy efficient technologies through the market, and ultimately reduce their emissions of carbon dioxide, Global Environment Facility (GEF) funded this "Energy Conservation and Greenhouse Gas

Emissions Reduction in Chinese Township and Village Enterprises" project. The purpose of the project is to help Chinese TVEs in the four sectors of brick making, cement, metal casting and coking to adopt energy efficient technologies, so as to accomplish the reduction of greenhouse gas emissions. This project adopts the comprehensive, innovative, ambitious transition to market approaches to promote the energy conservation of TVEs. It will try to eliminate the major barriers of market, policies, technology and financing existed in the process of production, distribution and application of energy efficient technologies and products.

3. Objectives and Scope of work

3.1. Objectives

The objective of the *subcontract* is to evaluate at both project level and macro level the pilot and replication (both project supported and independent replications projects in terms of the changes in energy efficiency and GHG emissions reduction, as well as VA mechanism and its effectiveness, identify and analyze the best practices and lessons learned, as well as suggest areas for future adjustment and improvement, through comprehensive review and summarization of project activities, outputs, outcomes, and impacts. The implementation of the subcontract will provide systematic feedbacks and recommendations for international organizations, such as GEF, UNDP, and UNIDO, Chinese government and other key stakeholders to organize or participating relevant activities more effectively in the future.

3.2. Scope of work

In accordance to the TOR, in regard to a time consequence, it can be divided to phrases of project design, adjustment, implementation and completion. In terms of the vertical logic of LFA, it includes activities, outcomes, effects, impacts and sustainability, concerning 9 pilot projects, 118 replication projects and self replication, as well as VA in brick-making, cement, metal casting, and coking sectors. A chart（Chart 1） with time and logic items can illustrate the work scope of this subcontract.

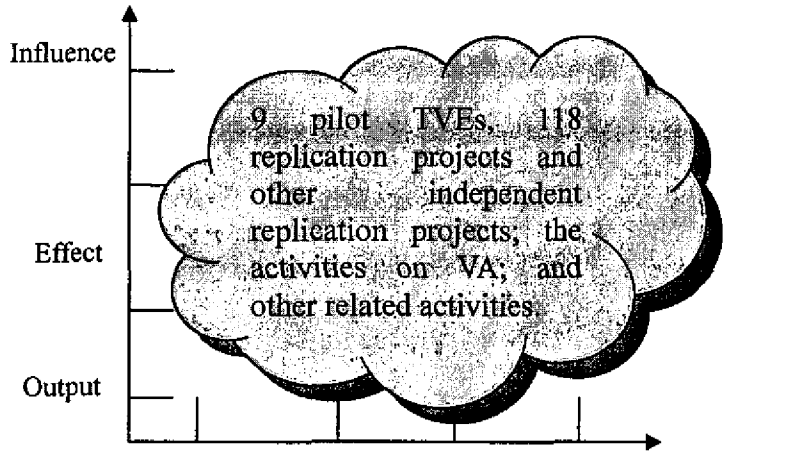

Chart 1 Subcontract Management

4. Evaluation Criteria and Methodology

4.1. Evaluation criteria

During the project implementation, we will follow the five criteria of GEF project evaluation:

- ✓ Impacts: Impacts of the pilot and replication activities, and other independent replication projects as well as all activities relating to Energy Conservation VAs to technologies and policies concerning China's energy conservation and GHG emissions reduction. Positive and negative, anticipated and unanticipated as well as changes and results has to be taken into account.
- ✓ Effectiveness: Identify the actual and possible extent for achievement on project objectives[1].
- ✓ Efficiency: Assessment on inputs-and-outputs correlations, costs, implementing progress and economic/financial outcomes. How is the barriers removed in the technical, policy, financial aspects and is the benefit bigger than cost.
- ✓ Linkage: Discussions on linkage between pilot technologies in the four sections and the

[1] Project objectives can be found in Annex 2 of the project document.

governmental preferential energy efficient (hereafter as EE) technologies (national and local ones); linkage between VA system and national and local development and environmental policy priority and strategies; linkage between similar projects.

- ✓ Sustainability: extent of sustainability in terms of outcomes and profit achieved by the project, in regard to local development, monitoring and evaluation of VA system, and energy industry in China.

4.2. Methodology

In accordance with *Global Environmental Facility Policies and Procedure for Monitoring and Evaluation*, the subcontractor is asked, during the implementation of the subcontract, to adopt the Logical Framework of Approaches (LFA) as the fundamental framework. LFA is an effective tool for facilitating project design and evaluation when being used properly, which will contribute significantly in setting up linkage between objectives, activities, and outputs. The core part in LFA is the If-Then causality between all elements in a project.

The product of this analytical approach-LFA-is the **Logframe Matrix**, which summarizes what the project what the project intends to do and how, what the key assumptions are, and how outputs and outcomes will be monitored and evaluated.

4.3. Set of indicators

The indicator system in this subcontract is established according to the SMART rule in *UNDP HANDBOOK ON MONITORING AND EVALUATING FOR RESULTS*. "SMART" stands for SPECIFIC, MEASURABLE, ATTAINABLE, REALISTIC, and TIME BOUND. *Performance Indicators for GEF-Measuring Results from Climate Change Programs* and requirements for this subcontracted are also refereed to set a system of indicators in the categories of EE indicators, financial indicators, technical indicators, policy indicators, management indicators, and information indicators (Table 1). The evaluation of project impacts in a macro level in regard to the relevant indicators will be a focus.

Table 1 Criteria system

	Indicators	Units	Notes
1. EE indicators	1.1 Annual (added) energy conservation per project/TVE	tce	Quantitative indicators
	1.2 Annual CO_2 emissions reduction per project/TVE	T	Quantitative
2.Financial indicators	2.1 Total investment for EE technical renovation	10,000 RMB	Quantitative
	2.2 Total project investment for EE technical renovation	10,000 RMB	Quantitative
	2.3 Investment recovery period of EE projects	Year	Quantitative indicators
	2.4 Internal rate of return of EE projects	%	Quantitative indicators
	2.5 Net present-value of EE projects	10,000 RMB	Quantitative indicators
3.Technical indicators	3.1 Number of replication EE technologies	Project	Quantitative indicators
	3.2 Number of feasibility studies and of whose with official confirmation	Number of feasibility study	Quantitative indicators
4.Policy indicators	4.1 Impacts of the project replication EE technologies to the long/medium-term EE planning in China		Qualitative indicators

	4.2 Impacts of the project replication EE technologies to Chinese industrial policies		Qualitative indicators
5.Management and 6.Information indicators	5.1 EE trainings	Person-time	Quantitative indicators
	5.2 Impacts of VA to improvement of EE awareness among TVE managers and employees		Qualitative indicators
	5.3 Knowledge about business opportunities concerning EE in TVEs		Qualitative indicators

4.4. Evaluation Process

In the process of evaluation, through a variety of ways, evaluation experts have undertaken surveys on the implementation of energy conservation from various aspects, and acquired necessary data for the evaluation.

- Refer to such literature as statistical data, government publications, trade associations reports, and undertake selection, extract, trimming and analysis on energy conservation technology policies of government departments.

- Carefully study the project documentation, mid-term evaluation report, TOR of pilot enterprises and replication enterprises and tender paper, look through the feasibility study reports, phase report, mid-term report and final report of replication enterprises, put forward review comments, communicate with sub-contractors, reach consensus and guide the sub-contractors to revise. See Annex 3 for examined documents.

- Pay site visits to pilot enterprises and replication enterprises, exchange ideas in details with pilot enterprises, local officials and replication sub-contractors, and investigate and study the implementation of pilot and replication enterprises. Furthermore, the sub-contractors have undertaken nonscheduled interviews with the national policy instruction committee, PMO and Hong Yuan Company and acquired a lot of useful information. For information on site visits.

- In accordance with state energy conservation regulations and standards, the Evaluation sub-contractors executed evaluation on the energy conservation status of pilot enterprises including the energy management profiles, energy consumption of unit product, calculation of energy conservation, and financial and economic analysis on energy conservation technological renovation projects. In addition, an assessment of the energy management profiles; Profile of the energy and energy flow; Energy Consumption indicators analysis; Festival energy calculation; Energy saving projects in the financial and economic analysis. In addition, an authoritative agency was entrusted to carry out test on energy conservation of two brick making enterprises.

Through the ways of summarized analysis and panel discussion, based on logical framework approach, evaluation was carried out on the project activities, outputs, objectives and impacts of the energy conservation technologies implementation. (For project progress analysis, see annex 1) Project leader composes the evaluation report after analyzing and summarizing the above evaluation results.

5. Evaluation on Energy Efficient Technologies Implementation Results

5.1. Selection and Demonstration of Energy Efficient Technologies

5.1.1. Selection of Energy Efficient Technologies

Through a comprehensive study on the current status of the equipment of TVEs in the four sectors, based on national and industrial policies and taking into account of the geographical distribution and the level of regional economic development, the PMO selected energy conservation technologies for demonstration. For the characteristics of each demonstration technology, see table 2.

Table 2 Characteristics of Demonstration Technologies

Sectors	Demonstration Technology	Characteristics
Cement	New Type Dry Cement Pure Low Temperature Waste Heat Power Generation	By Utilization of low-grade steam produced by the medium & low temperature exhaust steam to drive the low parameter turbines to generate electricity. The basic principle is that the demineralized water is pumped into kiln head waste heat boiler and heated into saturated steam of around 190℃, then into kiln head and kiln end waste heat boiler drums respectively, and further conflows into the turbine power generator, exhaust steam into the steam condenser. The key equipment includes kiln head and kiln end waste heat boilers and steam turbine generator.
	New Type Dry Process Rotary Kiln	New type dry cement production technology represented by precalciner kiln is the internationally recognized cement technology that can represent the contemporary technological development. The main burning equipment applies outside kiln decomposing technology, multilevel heater, environmentally friendly dedust technique which has a series of merits of large production capacity, high automation degree, superior quality, low energy consumption, low emissions and utilization of industrial waste, and becomes the main cement production technology of today's world.

	Mechanical Shaft Kiln Energy Conservation Technology	Prehomogenizing technology of material and fuel, Homogenizing technology of raw materials and cement, Improvement in raw material proportioning and selection, Ratios of raw material and heat proportion of black raw meal, Pregrinding Technology, Application of Grinding Aids, Drying Energy Conservation Technology, Application of New Type Mills, Application of High Efficiency Separator, Prewatering granulation and Pellets Quick Burning Technology, Shaft Kiln Energy Saving Lining Technology, Selection and Application of the Discharge Grate of Shaft Kilns, Hidden Fire Close Door Operating Techniques, Administration of Dust Emission of Shaft Kiln Enterprise, Production Process Quality Control and Management Technology, Automatic Control of Production Process of Shaft Kiln Enterprise, Chemical Equipment Analysis and Physical Testing technology, Comprehensive Utilization of Resources, Variable Frequency Speed Control Technology, Group Kilns Big mills Technology
Coking	Clean Heat Recovery Coke-oven and Waste Heat Power Generation	Clean coke oven doesn't recover coke oven gas, instead, it burns the gas directly in the upper carbonization room space and oven bottom fire path, the heat produced will be used by coking, it lets in air through a common flue at oven top, burning all the combustible component of oven gas, containing no

		phenols, benzene or other harmful gases in the exhaust gas. Exhaust gas enters waste heat boiler to produce steam for power generation. As for the negative pressure in the carbonization room in the process of coking and no leakage, and desulfurization of exhaust gas before emission, it has good environment protection effect.
Metal Casting	Because of the product multiplicity and technique complexity, it is difficult to identify a specific demonstration technology.	
Brick Making	Hollow Brick Energy Conservation Technology	Architecture energy conservation technology
	Energy efficient annular kiln	The upper flue can reserve surplus heat for reuse; The side walls and top of the kiln are built with heat preserving hollow block, which not only reduces the construction cost, but also greatly improves thermal insulation properties of the kiln; The kiln adopts energy efficient fan for ventilation, which is small in power but big in wind, and causes the burning more sufficient.

5.1.2. Selection of pilot enterprises

Due to the changes in the state's industrial policy, the environmental policy implementation has been intensified, and changes in the market, some recommended enterprises encountered financial downturn and technically backward, 5 of the 8 enterprises selected during Project Phase I

(1998 -1999) no longer meet standards for pilot, only 3 of them are reserved; The PMO again selected another 6 enterprises to replace the originally recommended 5 enterprises. The project funded the construction of pilot enterprises, and selected the appropriate technical support organization to provide service in energy conservation technological renovation, and to help the pilot enterprises to set up and perfect quality and energy management system. Furthermore, the project set up 8 LPIC at the localities of pilot enterprises, and facilitated the signing of VA between the LPIC and pilot enterprises. For pilot enterprises, see table 3.

Table 3 Fact Sheet of Pilot Enterprises

Sector	Pilot enterprises	EE Technologies	Remark
Cement	Zhejiang Shenhe Cement Plant	New Type Dry Cement Pure Low Temperature Waste Heat Power Generation	
	Guangdong Baojiang Cement Plant	New Type Dry Process Rotary Kiln	
	Hubei Lufeng Cement Plant	Mechanical Shaft Kiln EE Technology	Adopted 16 technologies of them based on the enterprise actual situation
Coking	Shanxi Gaoping Xinggao Coking Plant	Clean Heat Recovery Coke-oven and Waste Heat Power Generation	
	Shanxi Gangyuan Coking Plant		
Metal Casting	Jiangsu Moling Foundry Plant	EE techniques and improvement of product quality	
	Dalian Jinmei Pipe Casting Plant		

Brick	Sichuan Yongxing Hollow Brick Plant	Hollow brick EE technology, etc.	
	Shaanxi Liucun Village Brick Plant	EE Annular Kiln, etc.	

5.1.3. Results of Energy Efficient Technologies Implementation

Evaluation experts tracked and evaluated the energy conservation technologies implementation profiles of pilot enterprises. Currently, 8 enterprises have completed the EE technological renovation projects involving a total investment of 320 million RMB, of which GEF funded 750,000 USD. After the completion of EE technological renovation, the annual energy conservation is about 81,000 tce, and CO^2 reduction is 203,000 tons, far exceeding the project set target (the project documents set 850,000 tons of annual CO^2 emissions reduction by the 8 pilot enterprises. Meanwhile, the pilot enterprises have strengthened consciousness in safe production, product quality, energy conservation management and environment protection, established sound energy management system, and continually improved the comprehensive management. The results of energy conservation technologies implementation of pilot enterprises are as follows:

Zhejiang Shenhe Cement Company Ltd.

It has one 2500t/d and one 1000t/d New Type Dry Process Rotary Kiln clinker production line with an annual production of 2 million tons of P.O42.5 and P.O32.5 ordinary Portland cement. This enterprise set up the first five level preheated pure low temperature waste heat power generation project among new type dry process cement clinker production lines in China, the system mainframe includes two waste heat boilers and a set of condenser steam turbine power generator with a total capacity of 3MW, and investment of 17.76 million RMB, of which GEF funded 100,000 USD. This project was accepted into the power grid on March 26, 2005 with annual electricity generation of 20.94GWh and CO_2 emission reduction of 20,000 tons. The project doesn't need any fuel distribution facilities without affecting the normal operation of cement production process. On the one hand, it realized comprehensive utilization of waste heat from cement production line, recovery of high temperature flue gas heat, reduction of production

costs and improvement of the economic returns of enterprises, and partly eased the tense situation of industrial electricity; On the other hand, it can reduce flue gas temperature and dust concentration, and mitigate heat pollution and environment pollution. This EE technology has been widely accepted in China.

Yingde City Baojiang Cement Material Company Ltd.

It has 2 Φ3×10m mechanical shaft kiln production lines, with an annual output of 200,000 tons of Portland cement clinker. Considering the development needs, it will build a 2500t/d new type dry process rotary kiln cement clinker production line in replacement for the existing two shaft kiln production lines. After the completion of the new line, the original shaft kiln production lines will be closed. The new production line will use Φ4×60m rotary kiln and outside kiln decomposing system consisting of single series 5 grade low-voltage loss cyclone preheated with an offline decomposer. The total investment is 188 million RMB, of which GEF funded 100,000 USD. After the commissioning of the new production line, it can realize an annual energy conservation of 120,000 tce, and carbon dioxide emission reduction of 300,000 tons. It not only greatly reduces energy consumption and greenhouse gas emissions, but also significantly reduces the main pollutant emissions.

Lufeng Cement Company Ltd, Lufeng Group, Huangshi City, Hubei Province

It has four Φ3×11M mechanical shaft kiln cement production lines with annual output of P.O32.5, P.O42.5, P.S32.5 cements more than 500,000 tons. In order to improve product quality and energy efficiency, by their own efforts and project facilitation, they have successively completed 16 mechanical shaft kiln EE technological renovation projects, to improve production process and raise the overall level of production lines. The total investment is 8 million RMB, of which GEF funded 70,000 USD. By EE technological renovation, they annually conserved energy 9000 tons, reduced carbon dioxide emissions of 225,000 tons. Meanwhile, it reduced the production costs, improved the environment and increased the market competitiveness of their products.

Gaoping City Xinggao Coking Group

Clean heat recovery coke oven was adopted to replace the modified coke oven, with an

annual output of 400,000 tons of coke. In 2003 and 2004, 2 groups of clean heat recovery coke ovens were successively put into production, with about 40% of anthracite used for coking, which saved China's important coking coal and manifested an important breakthrough in coking sector. The waste heat power generation was successfully merged into power grid in August 2005. The total investment of clean heat recovery coke oven project is 210 million RMB. 70 million RMB was invested in the waste heat power generation plant, of which GEF funded 100,000 USD. It uses 4 20t/h waste heat boilers, matched with a 15MW condenser or steam turbine power generator providing electricity 1,200 million kW/h annually, with energy conservation of 46,000 tons and carbon dioxide emission reduction of 115,000 tons. Clean heat recovery coke oven doesn't recover coal chemical products with whole system under negative pressure, and burns all coking by-products for power generation, which minimizes the emission of harmful substances; The tamping packing and discharging of coal and coke avoids environmental pollution when loading coal and discharging coke, thus the factory is clean, free of coking smell, and the whole plant area is like a clean garden, drawing the attention of counterparts of many other countries.

Problems: Due to the high oil prices in the world market, particular attention has been paid to saving oil, for this reason, Some people think it better to recover benzene, tar and other chemical products than to burn flue gas directly, and comprehensive appraisal is needed in its economic efficiency. Therefore, more discussion is necessary before spreading this experience across the country.

Taiyuan Gangyuan Coking Company Ltd.

The company planned to build 4×25t/h mesothermal middle pressure waste heat boiler, matched with 3×6MW condenser steam turbine. Expected energy conservation results: annual electricity generation of 9.27×107kW•h after operation, newly added energy 41,364 tce, CO^2 emissions reduction 103,120.45 ton. The plan was intended to be accomplished before March 1, 2005, but due the company's internal reason, it has not started.

Reasons: On the one hand, it's because of the domestic industrial environment at that time. The national economy kept growing rapidly then, driving the electricity demand entirely up, and many factories were even forced to purchase power generators by themselves, which led to the

price hike of generators. Even the purchase of generators at high prices took a long time of waiting. On the other hand, the enterprise management possibly didn't totally understand the significance of energy conservation and emissions reduction, but only calculated the extra income brought in by waste heat power generation. When power generation didn't produce more economic profits, the capital was first put into other more profitable fields (coal mine, real estate, etc.), and gave up EE technological renovation project.

Dalian Jinmei Pipe Casting Plant

It has a foundry, a mechanical processing workshop and a precision casting workshop. The company will carry out comprehensive renovation on existing modeling, melting and sand treatment process. Main activities include: improvement of modeling process reducing the rate of overweight of ductile iron pipe fittings; application of joint smelting of intermediate frequency inductive electric furnace and furnace cupola; re-use of sand; building of Coke bank, etc. Total investment is 5.3 million RMB, of which GEF funded 60,000 USD. The renovation will cause annual energy conservation of 152.94 tce and carbon dioxide emission reduction of 381.27 tons.

Nanjing Moling General Factory of Casting

The major products include the main body of diesel engine, castiron parts in cars and buildings, and aluminum alloy components as car engine intake pipe, intake curve pipe and juncture pipe. Since selected as a pilot enterprise, the plant has begun entire renovation on the original technologies and equipment and modernization of management. They have made alteration successively to melting, sand, modeling, core making, cleaning, thermal treatment, while expanding its casting and machining capacity, to meet the market demand for high quality castings, with a total investment of 29.4 million RMB, of which GEF funded 100,000 U.S. dollars. Through EE technological renovation, they have improved quality, improved the work environment and increased the rate of qualified products, with annual energy conservation of 3068.2 tce and carbon dioxide emissions reduction of 7594.3 tons.

Xi'an Liucun Village Hollow Brick Plant

By updating equipment, repairing and refurbishing kilns, improving and perfecting production process, and other energy-saving measures, the plant will improve the overall quality

of the production line. The total investment is 2.434 million RMB, with GEF funding of 60,000 USD, mainly for the preparation and compiling of a feasibility study, procurement of energy efficient equipment, installation and debugging, and staff training. After renovation, the plant will produce multiple rectangular hole bricks with product strength of MU15 grade, no pan frost, no burst, no frozen damage, the holes are rectangular holes in an orderly arrangement, the porosity is 31%, and the product quality is consistent with the first grade of national standard GB13544-2003 "Sintered Porous Brick"; The annual energy conservation is 1298.11 tce, and carbon dioxide emissions reduction 3236.18 tons.

Xinjin Yongxin Shale Brick Company Ltd., Sichuan Provicnce

The company transformed production lines from semi-rigid-plastic forming into hard plastic forming, and products porosity from 45% up to 60%; altered the kiln heat insulation, reducing heat loss of 15%; and expanded the raw materials staling bank. Total investment is 2.6 million RMB, of which GEF funded 59,950 USD. After renovation, the power consumption of per 10,000 bricks is less than 350kWh, coal consumption is 0.9 ton standard coal, and rate of qualified products is 98% for multi-porous bricks and 96% for hollow bricks respectively. Annual energy conservation is 1,943.06 tce, and carbon dioxide emissions reduction of 4,844.06 tons.

For the fact about implementation of the energy efficient technologies of pilot enterprises, see Table 1.

5.2. Replication of Energy Efficient Technologies

Based on summing up the successful experience of pilot enterprises, the project carried out a series of technical training and technical promotion activities, and trained LPIC representatives, managers and technical backbones altogether 900 persons time, benefiting 670 enterprises. Meanwhile, the project selected 118 enterprises in 11 promotion areas, through the measures of technological renovation and improvement of energy management system, to apply the technologies and experiences of technological renovation and modification, energy conservation and returns increasing, and product quality improvement that are successful in pilot enterprises to

the replication enterprises, so as to improve the energy efficiency of replication enterprises, increase the awareness, imitation and application of successful technologies and experiences of TVEs, improve the overall energy efficiency and product quality of TVEs, and ultimately reduce the energy consumption and Greenhouse gas emissions. For the facts about replication enterprises, see Table 4.

Table 4 Fact Sheet of Replication Enterprises

Sector	Industry/Region	Number of Enterprises	Content of EE Technological Renovation	Progress
Cement	Cement Sector (1)	10	To promote cement pure low temperature waste heat power generation technology	Feasibility study completed, EE technological renovation partly completed
	Cement Sector (2)	10	To promote cement pure low temperature waste heat power generation and mechanical shaft kiln converted to rotary kiln technologies	Feasibility study completed, EE technological renovation partly completed
Coking	Shanxi Province	7	To promote clean oven waste heat power generation technology	Feasibility study completed
Metal Casting	Tianjin City	7	To promote EE casting technology	EE technological renovation completed
	Dalian City	8		
	Nanjing City	6		
	Shanxi Province	10		

Brick Making	Xi'an City	15	To promote hollow brick and other EE technologies	EE technological renovation completed
	Xianyang City	14		
	Shenyang City	16		
	Chengdu City	15		
	Total	118		

By evaluation, the 118 replication enterprises have all completed the composing work of feasibility studies on EE technological renovation at present, with the anticipation of annual energy conservation of 809,000 tce and carbon dioxide emissions reduction of 2.018 million tons, much higher that project expectation. (Project document: carbon dioxide emissions reduction of 1 million tons per year) Among them, 60 brick and 31metal casting enterprises have completed EE technological renovation work, one coking enterprise and 8 cement enterprises have completed or are constructing EE technological renovation projects. The annual energy conservation is 292,000 tce, carbon dioxide emissions reduction of 728,000 tons. See Table 5.

Table 5 Facts on Energy Conservation of Replication Enterprises

Sectors	Replication areas	Number of Enterprises	Expected Results		Present Completion	
			Energy Conservation (tce)	Emissions Reduction(t)	Energy Conservation (tce)	Emissions Reduction (t)
Cement	Cement Replication (1)	10	276,869.39	690,235.39	144,617.71	360,531.95
	Cement Replication (2)	10	136,535.21	340,382.29	53,667.19	133,792.30
Coking	Coking Replication	7	306,783.00	764,810.02	4,596.00	11,457.83
Metal Casting	Tianjin Replication	7	902.67	2,250.35	902.67	2,250.35
	Dalian Replication	8	1,790.51	4,463.73	1,790.51	4,463.73
	Nanjing Replication	6	1,587.30	3,957.14	1,587.30	3,957.14
	Shanxi Replication	10	7,545.92	18,811.99	7,545.92	18,811.99
Brick Making	Xi'an Replication	15	10,575.59	26,364.94	10,575.59	26,364.94
	Xianyang Replication	14	14,396.36	35,890.12	14,396.36	35,890.12
	Shenyang Replication	16	15,182.06	37,848.87	15,182.06	37,848.87
	Chengdu Replication	15	37,314.27	93,024.48	37,314.27	93,024.48
Total		**118**	**809,482.28**	**2,018,039.32**	**292,175.57**	**728,393.70**

The evaluation on the results of EE technologies implementation in replication enterprises is as follows:

5.2.1. Cement Sector

20 cement enterprises were selected nationwide as replication enterprises to provide advisory services for cement enterprises including assessment on the new type dry cement low temperature

waste heat power generation technology, feasibility study on waste heat power plant, etc. The 20 replication enterprises are expected to conserve energy of 413,000 tce and reduce carbon dioxide emissions of 1.03 million tons annually. In addition, 7 cement enterprises have completed EE technological renovation projects with annual energy conservation of 152,000 tce and carbon dioxide emissions reduction of 380,000 tons.

5.2.2. Coking Sector

7 coking enterprises were selected in Shanxi Province as replication enterprises to provide advisory services including evaluation on the coking enterprises adopting the waste heat power generation system in clean coke oven undertake feasibility study on waste power plant, help to establish management system and carry out technical training. It is expected the 7 enterprises' annual energy conservation amounts to 307,000 tce, and annual carbon dioxide emissions reduction 765,000 tons while enhancing energy conservation and emissions reduction awareness, urging the enterprises to spend more efforts in production, energy conservation and emissions reduction, and to strive for greater efficiency. In addition, 3 coking enterprises has completed EE technological renovation projects with annual energy conservation of 130,000 tce and carbon dioxide emissions reduction of 324,000.tons.

5.2.3. Metal Casting Sector

Tianjin Replication Area

7 metal casting enterprises in Tianjin were selected as replication ones to carry out technological renovation with a total investment of 4.983 million RMB, of which GEF funded 105,000 USD. The main replication technology is conversion of cold wind oven to high efficiency hot wind oven. Through technological renovation, the 7 enterprises can accomplish energy conservation of 902.67 tce, and carbon dioxide emissions reduction of 2,250.35 tons.

Dalian Replication Area

8 metal casting enterprises in Dalian were selected as replication ones to carry out technological renovation with a total investment of 12.5667 million RMB, of which GEF funded 120,000 USD. The main replication technologies are the replacement of dried clay sand by furan resin hard sand; and double furnace smelting process with core inductive electric furnace. Through

technological renovation, the 8 enterprises can accomplish energy conservation of 1,790.51 tce and carbon dioxide emissions reduction of 4,463.73 tons.

Nanjing Replication Area

6 metal casting enterprises in Nanjing City were selected as replication ones to carry out technological renovation with a total investment of 10.526 million RMB, of which GEF funded 90,000 USD. The main replication technologies include the replacement of clay sand by resin sand for sand frame; application of foundry sand frame technique, manual forming and core making; adoption of hot wind cupola; building of intermediate frequency electric oven production line; mechanical forming instead of manual forming; changing wet sand core to ventro-mould dry core, newly building dissolving mould casting assembly line, etc. Through technological renovation, the 6 enterprises can accomplish annual energy conservation of 1,587.3 tce and carbon dioxide emissions reduction of 3,957.1 tons.

Shanxi Replication Area

10 metal casting enterprises in Shanxi Province were selected as replication ones to carry out technological renovation with a total investment of 6.94 million RMB, of which GEF funded 150,000 USD. The main replication technologies include addition of aluminum silicate fiber insulation to front oven lining; improvement of dissolving mould process; manual coal burning changed to side firing chain coal burning machine; modification of galvanized furnace; introduction of resin sand molding technique, etc. Through technological renovation, the 10 enterprises can accomplish annual energy conservation of 7,545.92 tce and carbon dioxide emissions reduction of 18,811.99 tons.

5.2.4. Brick Sector

Chengdu Replication Area

15 brick enterprises in Chengdu City, Sichuan Province were selected as replication enterprises to carry out technological renovation with a total investment of 11.026275 million RMB, of which the project supported 180,000 USD. The EE technologies include the installation of non-power compensation on electric inductive load equipment; changing old bricks and felt of oven lining with new technical felt scheme, strengthening seal; replacement of hammer machine,

etc. Through technological renovation, the 15 enterprises can accomplish annual energy conservation of 37,314.27 tce and carbon dioxide emissions reduction of 93,024.48 tons.

Shenyang Replication Area

The project selected 16 brick enterprises in Shenyang City, Liaoning Province as replication enterprises to carry out technological renovation with a total investment of 11.3 million RMB, of which the project supported 192,000 USD. The EE technologies include addition of rotary kiln; application of variable frequency fan speed control technology; building of artificial drying room; installation of transformer non-power capacitance compensation equipment, etc. Through technological renovation, the 16 enterprises can accomplish annual energy conservation of 15,182.06 tce and carbon dioxide emissions reduction of 37,848.87 tons.

Xi'an Replication Area

The project selected 15 brick enterprises in Xi'an City, Shaanxi Province as replication enterprises to carry out technological renovation with a total investment of 8.5245 million RMB, of which the project supported 180,000 USD. The EE technologies include rotary kiln modification, process equipment alteration, improvement of flan yard drainage system, etc. Through technological renovation, the 15 enterprises can accomplish annual energy conservation of 9,910.09 tce and carbon dioxide emissions reduction of 24,705.85 tons.

Xianyang replicatin Area

The project selected 14 brick enterprises in Xianyang City, Shaanxi Province as replication enterprises to carry out technological renovation with a total investment of 7.525 million RMB, of which the project supported 117,600 USD. The EE technologies include building or modification of rotary kiln; process equipment alteration; electric transformation, etc. Through technological renovation, the 14 enterprises can accomplish annual energy conservation of 14,396.3 tce and carbon dioxide emissions reduction of 35,890.12 tons.

5.3. Self Replication Activities

By the identification of EE renovation technologies in 4 sectors, the project promoted the energy efficient technological renovation in the four sectors, and sparked the self replication.

Evaluation specialists have discovered that the construction of pilot enterprises brought along self replication in the following two categories:

（1）The pilot enterprises actively carried out self replication activities through the development demonstration visits, training and exchange, advisory services and other methods, benefiting more than 400 enterprises. For example, under the project's drive, Zhejiang Province has established 8 low temperature waste heat power generation systems, and 30 are under construction this year.

Xi'an Liucun Village Brick plant has been successfully completed, and over 160 brick plants nationwide have made study tour to the plant. After the tour, the leaders of brick plants from Chongqing, Zhejiang, Hunan and other places plan to carry out EE technological renovation, and vigorously promote the power saving technologies as energy efficient rotary kiln, variable frequency controller, and rectangular hole porous brick production technology. Foreign counterparts from Bangladesh, Guinea and other countries have repeatedly visited the factory and planned to build plants following this example.

Yongxin Hollow Brick Plant has spread its successful renovation technologies and experience to other brick enterprise in the province and across the country through publications and meetings of Sichuan Wall Material Network. Nearly 100 enterprises from all over the country have visited the factory and received training. In addition, the plant holds technical training courses every year in baking technology, mechanical repair technology and production process and management.

（2）The project carried out training activities. 13 energy conservation technical training activities have been carried out, benefiting 670 enterprises with over 900 people participation. As the managers and technical staff of TVEs are backward in energy conservation and environment protection awareness, lack the knowledge of energy efficient technologies and lack the training opportunities, the participation in the project training activities is certainly useful, and it may promote the development of enterprise self replication work in energy conservation and emissions reduction. However, due to the lack of relevant information, it is temporarily not able to accurately judge how many enterprises have benefited.

Taking the best implementation of spontaneous replication in cement and brick making fields into account, the evaluation experts will only estimate the spontaneous replication status in those two fields.

（1）Cement Industry

According to the replication subcontractors-Tianjin Cement Design and Research Insititute and Nanjing Triumph Cement Technology Engineering Co, there are about 40 cement replications in line with the above two forms. Please refer to Annex 3 for the company list, technological improvement plan for energy conservation and the implementation status. All the cement companies mentioned above adopted waste heat power generation technology. Total capacity of which amounted to 309.1MW. If the annual utilization arrives at 7000 hours, the annual power generation will reach 2.16 billion KWh, equal to 829 thousand tons tce and the CO_2 reduction will be 2.066 million tons.

（2）Brick Making Industry

Take Xi'an for example, which is the implementation site of Xi'an Liucun Hollow Brick, there are about 360 small sized enterprises with the output of 1500-3000 bricks. Most of the plants used clay as their materials and produced round-hole and hollow brick fired with combustible additives. They mainly introduced one crushing roller, one mixer, vacuum extruder, dry by nature, firing by obsolete kiln and get the products out by manpower. But owning to the old production technique, obsolete equipments, especially the simple structure of firing kiln without air system or with unreasonable air system, high energy consumption and incomplete combustion happened. The potential energy conservation of each plants amounts to 1000 tons tce. About72 plants, standing for 20% of all brick plants, take energy conservation measures under the lead of Liucun Hollow Brick Plant. Those plants included 15 replications and 57 plants with total energy conservation of 57 thousand tons tce and CO2 reduction of 142 thousand tons tce annually. There are four replication areas all over China, so the annual energy conservation and CO_2 reduction of spontaneous replication will be 228 thousand tons tce and 568 thousand tons tce respectively.

There is something we need to emphasize that the enterprises mentioned above are only one part of the project effect. Actually, there are still some plants not noticed which also have been

influenced positively by the project.

6. Main Findings

From the above evaluation, we can find that the implementation results of the project, in both carbon dioxide emissions reduction and the number of enterprises, are much higher than expected. This, evaluation experts believe, has benefited from China's rapid economic development and is also related to the implementation strategies adopted by PMO. As follows:

6.1. Timely Adjustment of Demonstration Technologies According to National Industrial Policy

During the implementation of the project, the state's industrial policies have undergone some changes, particularly in the coking and cement sectors. In 1999, the former State Economic and Trade Commission issued the "List of backward production capabilities, processes and products elimination" (The first batch, the second batch, the third batch) to stop low-level redundant construction, speed up the pace of structural adjustment, and promote the upgrading of production process, equipment and products. It stipulated the immediate elimination of mechanized shaft kiln cement production line with kiln diameter less than 2 meters (with an annual output of 30,000 tons), elimination before 2000 the ones with kiln diameter less than 2.2 meters (with an annual output of 44,000 tons), and elimination before 2000 the soil coking process(including modified ones). Therefore, mechanical shaft kiln with diameter less than 2.2 meters and "89 model" coking oven have been listed as elimination technologies.

In 2000, the former State Planning Commission and the Economic and Trade Commission jointly issued an "Catalog of state strongly encouraging industries, products and technologies (2000 Revision)", and abolished at the same time the original" Catalog of state strongly encouraging industries, products and technologies (Trial). It encourages the clinker new type dry process cement production line with output of 4,000 tons/day and above. As the selection of energy conservation demonstration technologies has much to do with next step replication, the project should choose advanced, mature and reliable, applicable and replicable technologies, so as to promote the development of the whole industry. Taking the complexity of the sectors of cement, coking, metal casting and brick into account, the right selection of demonstration technologies will

get twice the result with half the effort.

As the project was designed to be completed in 1998, the originally selected EE technologies were unable to meet the requirements of the new situation. Although the clean coke oven and dry cement pure low temperature waste heat power generation technologies are not listed in the state encouragement catalog, the above two technologies are in line with the direction of national industrial development, have a good perspective, coincide with the future direction of development of the state's industrial policies, and have a greater potential and greater replication value. The PMO timely adjusted the demonstration technologies. Therefore, the evaluation experts consider it a certainly right choice, far sighted and innovative to adjust demonstration technologies according to state industrial policies, and select the technologies of clean coke oven and dry cement pure low temperature waste heat power generation in place of previously selected technologies.

6.2. Giving Full Play to Initiative and Enthusiasm of Enterprises and LPIC

Evaluation experts discovered that the PMO respected the right of independent choice of enterprises, guided the enterprises to take measures according to their own conditions, and maximumly mobilized the initiative and enthusiasm of the enterprises to carry out EE technological renovation. For example, Nanjing Moling Casting General Plant made adjustment of its EE technological renovation scheme for several times in light of its own needs, the PMO provided great support, and adjusted the tender documents. Meanwhile, pilot enterprises carried out emissions reduction activities based on their own conditions. For another example, Sichuan Yongxin Hollow Brick Company Limited was selected as a pilot enterprise of first batch for GHG emissions reduction in 1991. For the past over ten years, the company has made decision on technological renovation plans products development direction consciously according to the requirement of the Energy Conservation and Emission Reduction Project, and invested more than 2.5 million RMB in technological renovation, and achieved good results.

PMO has brought LPIC into play in both policies and financing fields. For policies, the LPIC in various areas have helped enterprises to implement national policies, and administered

preferential policies to enterprises who have signed VA. For example, in strict accordance with " Jinnan District Implementation Measures on Interest Discount Loans to Technological Renovation Projects of Industrial Enterprises" (The technological transformation of industrial enterprises in discount interest loans for projects implemented" (Jinnan ZhengFa [2004]67) and the "Jinnan District Implementation Rules on Technological Renovation Projects of Industrial Enterprises Subject to Duty-free Import of Foreign Equipment and Domestic Equipment Income Tax Reduction Policies" uipment Credit policy implementation details of the income tax " (Jinnan ZhengFa [2004]68), the LPIC of Jinnan District of Tianjin City has administered preferential policies to replication enterprises meeting the requirements, including interest discount loans, exemption of import VA taxes and custom duties for the introduction of foreign equipment, reduction of the same amount to 40% of the investment purchasing domestic equipment from the increased corporate income taxes the year of the acquisition of technological renovation over the previous year. In the field of financing, the LPICs in various areas have helped enterprises in various ways to get capital for EE technological renovation. For example, the LPIC of Xinjin County in Chengdu City recommended a pilot enterprise to the Chengdu Bureau of Finance – Yongxin Shale Brick Plant, Xinjin County, Sichuan Province, as a SME financing pilot enterprise, and obtained 500,000 SME loans for the EE technological renovation of the pilot enterprise.

6.3. Linking Project Implementation to Local Work

Combining the work of energy conservation and emissions reduction with local government's work, and linking the work of LPIC to the current, mid and long term development goals and implementation strategies make the work of LPIC and the work of local government complement each other and form a virtuous interaction, this is a bright spot of the project. For example, the LPIC of Baqiao District, Xi'an City comprehensively implemented the "Implementation Paper on the ban clay solid bricks in time limit" and thoroughly undertook the ban work. According to "Action Plan", they actively renovated original clay solid brick enterprises, and avoided new permission of clay solid brick enterprises; they made an application on the establishment of new wall materials base in Baqiao District, composed and submitted the application materials, and

obtained the approval of city government. The new wall materials base has been identified as a priority of Baqiao District in 2006.

LPIC also played an important role in the implementation of policies. Shuangliu County LPIC, Chengdu City took active measures in coordination with Chengdu Municipal Government and shut down, stopped or transformed all the clay brick enterprises in the county. LPICs are usually composed of local departments in charge of a certain industry and trade associations which are conducive to the interaction among various departments in taking measures to combat the vicious competition.

In the project, PIC is responsible for all the regional LPICs and carries out training activities. In this way, LPICs have consistent understanding of the project, communicate with each other and achieve the common development. They have improved the work efficiency and lowered the costs. For example, at a LPIC training course, Tieshan District LPIC of HuangShi City, Hubei Province introduced the instance in which they helped a pilot enterprise (Lufeng Cement Company Ltd.) to gain VA tax relief according to relevant stipulations of Ministry of Finance and the State Administration of Taxation. Enlightened by this instance, Tongxiang LPIC submitted a report to the government on this issue, and got the answer from the government to strictly enforcing this stipulation henceforth.

LPICs provided a platform for the exchange of information, and facilitated the common improvement of policy and technical levels in different regions. Jiangning District LPIC, Nanjing City, taking advantage of the inter-linkages with local governments, organized a study tour to Dalian for local metal casting enterprises in 2004, and helped the pilot enterprises in restructuring and introduction of new technologies. Some LPICs also took the initiative to expand market for enterprises through the coordination between sources of raw materials and potential markets.

6.4. *Introduction of New Energy Conservation Mechanism*

Voluntary Agreement (VA) is an agreement signed between the industrial organizations or enterprises and the government on the voluntary basis, for the purpose of energy conservation and GHG emissions reduction. The project takes the lead to introduce the VA mechanism to TVEs, so

that the passive administrative energy conservation changes to active socially responsible energy conservation. Through the introduction of VA, the project not only tries to explore a new energy management mechanism adaptive to market economy, and leads the TVEs to voluntarily undertake energy conservation and emissions reduction activities, but also promotes the enterprises to consciously undertake energy conservation and emissions reduction activities.

With reference to domestic and foreign experience, and according to the characteristics of Chine SMEs, the project assisted enterprises in establishing VA. Under the coordination of LPICs, the project facilitated the successful signing of VA between 9 pilot enterprises and local governments. According to the evaluation of annual implementation, VA is applicable, and all the pilot enterprises have been able to strictly implement the VA. The project has taken the lead in introducing VA mechanism into Chinese SMEs, and accumulated experiences for the promotion of this mechanism.

Currently, the project has further selected 11 areas (Guangdong Province, Zhejiang Province, Liaoning Province, Nanjing City, Xi'an City, Xianyang City, Jinzhong City, Linfen City, Jinnan District in Tianjin, Shuangliu County in Chengdu, Jinzhou District in Dalian) to establish LPICs, and to promote the implementation of VA in the local replication enterprises. Some enterprises have already signed VA with local governments. This is a beneficial successful attempt in the realization of energy conservation, emissions reduction, environment protection and sustainable development of TVEs.

The Project has made innovation from concept to form, from the participants to the selection procedure of pilot enterprises, and further to the stimulus policies. It has successfully expanded the connotation and extension of the VA in China. Although the state has paid more and more attention to the development of TVEs in recent years, and the newly enacted energy conservation and environmental protection regulations are applicable to TVEs, the TVEs still fail to get enough attention of the government, to this problem. However, through the implementation of this project, the local and national government have paid greater attention to TVEs and have got more accurate and clear understanding of the TVEs' policy needs and their contribution to the achievement of local and national goal of energy conservation. It is believed that the government will give more

consideration to the development of TVEs in the formulation of relevant policies.

The "National Mid and Long Term Energy Conservation Program" proposed "Promotion of A New Energy Conservation Mechanism Based on Market System" including "Promotion of VA, that is energy consumers or trade associations signing VA with governments". In April 2006, five national ministries jointly issued the "One Thousand Enterprises Energy Conservation Action" program. Although the 1,000 enterprises are mandatory and can not be esteemed as VA, yet many of items are closely linked with voluntary agreements, such as energy audits, energy conservation planning and designing, etc. "One Thousand Enterprises Energy Conservation Action" is a state level policy, and the introduction and experiment of VA in China (including pilot SMEs) directly contributed to the issuance of this policy, and also influenced the contents of the policy to a large extent.

6.5. Improving the Energy Efficient Technological Renovation and Management

The project implementation process paid attention to the replication of EE technologies, and paid even more attention to improvement of corporate governance. The work includes training of managers and technical staff in key positions, establishing and improving energy management system, post operation rules and quality inspection system, and perfecting ration responsibility management system, rewards and punishment system, consumption indicators monitoring and control system, etc. For example, Sichuan Yongxing Hollow Shale Brick Company has greatly improved its management, obtained the certification of ISO9001-2000, and elected as the vice president enterprise of China Brick and Tile Association.

6.6. Attaching Importance to Process Monitoring and Evaluation

The project attached great importance to the monitoring during the implementation process particularly the establishment of baseline. In the implementation process, the project designed the "Energy Efficiency Sheet" containing detailed information on the status, products portfolio, process technology and energy consumption of the pilot and replication enterprises before renovation, and set up the baseline; commissioned subcontractors to track and record the changes of the pilot and replication enterprises after technological renovation including the technological

renovation program, investment, energy consumption, economic and technical indicators, etc., and made verification.

The project formulated the "Energy Conservation Voluntary Agreement Monitoring and Evaluation System Scheme" to monitor and evaluate the results of enterprises' implementation of VA. The work includes evaluation of annual monitoring report of pilot enterprises, auditing the authenticity of the data provided by pilot enterprises, assessing the fulfillment of energy conservative targets and recommendations on agreement amendments, and notifying the enterprises on measures that should be taken, including problems finding, seeking new energy conservation measures, improving work of the next year, revising energy conservation plans, etc. The evaluation is divided into two steps. Through supervision and evaluation, the project provides a mechanism for the successful realization of energy conservation goals. The government and a third party may inspect the policy results so as to make effective amendments during the project implementation period.

7. Impacts on Macro Policies

The project design didn't expect to promote the development of relevant policies. However, it can be seen that, on account of the success of demonstration technologies and pilot projects, the project has promoted the development of energy conservation policies at both national and local level. In this connection, it has successfully promoted the development of energy conservation policies in China.

7.1. Cement Sector

Since Zhejiang Shenhe Cement Company Ltd successfully implemented the pilot project of New Dry Cement Low Temperature Waste Heat Power Generation, the replication of this technology in Zhejiang Province and nation wide has been intensified. The cement industry of Zhejiang Province has collectively implemented Pure Low Temperature Waste Heat Power Generation renovation project. The electricity cost is just about 0.12 RMB per kWh, reducing the clinker cost by 15 RMB per ton and increasing returns of 20 million RMB per year. Currently, 8 new dry cement production lines have undergone renovation of pure low temperature waste heat

power generation in 6 cement enterprises, namely Zhejiang Sanshi Cement Corporation, Changxing County Meishan Zhongsheng Cement Plant, Zhejiang Honghuo Group (Jiangshan), Zhejiang Shenhe Cement Company Limited (Tongxiang), and Zhejiang Qinglongshan Building Materials Company Ltd. (Longyou), and the total generating capacity has reached 30,000 kilowatts. Take Changxing County Meishan Zhongsheng Cement Plant for example, it has implemented the renovation of pure low temperature waste heat power generation by using domestic equipment, no coal and using the waste heat of exhaust gas produced by the new dry process cement rotary kiln, the electricity generated amounts to one-third of its total electricity consumption. This year, renovation of 30 industrial kilns using waste heat power generation technology is under construction.

According to the introduction of officials of Electricity Division, Zhejiang Provincial Economic and Trade Commission, a number of cement enterprises already started the feasibility study on waste heat power generation in 2004, some even reserved relevant equipment. But, as complementary coal process was selected at that time, even though waste heat could be recovered, it's harmful to environmental protection. Knowing the successful power generation of Shenhe plant, Zhejiang Provincial Economic and Trade Commission learned in the successful bid for power generation exercised strict control over approval, and positively recommended enterprises to adopt advanced pure low temperature waste heat power generation technology, and provided policy support.

Zhejiang Provincial Government and the National Government have successively issue d relevant technical policies, namely:

(1) (Zhejiang Government[2006]35) "Notice on Strengthening the energy conservation work" clearly put forward "encouraging the application of waste heat utilization technologies as mesothermal and low temperature waste heat power generation by cement enterprises. To the end of '11th Five year Program', achievement should be made in generating capacity of 250,000 kW by mesothermal and low temperature waste heat power generation, annually generating electricity 1.8 billion kWh".

(2) The National Development and Reform Commission (NDRC) document "Special

Program for Mid-and Long-Term Energy Conservation" (NDRC Environment Resources [2004]2505) points out that "to develop new dry process outside kiln decomposition technology in cement industry, raise the proportion of new dry cement clinker, actively promote EE grinding equipment and cement kiln waste heat power generation technology, modify the existing large and medium-sized rotary kiln, mill and dryers, and to phase-out mechanical shaft kiln, wet kiln, dry hollow kiln and other backward cement production process."

（3）The NDRC and MOST (Ministry of Science and Technology) joint document "China Energy Conservation Technology Policy Outline(2005)" (Exposure Draft). " listed the "large new type dry cement mesothermal and low temperature waste heat power generation" as key support item.

（4）The NDRC document "The Guidance Catalog of Industrial Structural Adjustment (2005)" (No. 40) listed "new dry cement waste heat power generation with production capacity of 2,000 tons per day of clinker or above" as encouragement item.

（5）The NDRC document "Ideas on speeding up the restructuring of the cement industry" (NDRC Operation [2006]609), states that " the per ton clinker heat consumption dropping from 130kg to 110kg of standard coal in new dry process cement, waste heat power generation occupying 40%, energy consumption of unit cement product decreasing by 25%."

（6）The NDRC, MOST, Ministry of Finance, Ministry of Construction, General Administration of Quality Supervision, Inspection and Quarantine, the State Environmental Protection Administration, the State Council Departments Administration Bureau, and CPC Central Departments Administration Bureau joint document "Ideas on the 10 Key Energy Conservation Projects Implementation During '11th Five-Year Program'" (NDRC Environment and Resources[2006]1457) put forward, for the cement industry, "to promote Pure Low Temperature Waste Heat Power Generation technology, to build cement cogeneration installations. In "11th Five-Year Program" period, to build 30 sets of mesothermal and low temperature waste heat power generation installations annually in 2000t/d or above cement production lines, achieving energy conservation of 3 million tce annually."

7.2. Brick Sector

The success of hollow brick pilot project and the kick-off of replication projects have effectively supported the implementation of national "Solid Brick Ban" policy. For example, under the recommendation of LPIC and the Association of Brick and Tile Industry Self-regulation, Chengdu Municipal Government in Sichuan Province issued No.97 government decree, from the June 1, 2003 on, the government will not approve any new, rebuilding or expanding solid clay projects within Chengdu administrative domain; existing solid brick enterprises getting clay from arable land should be shut down, those getting clay from non-arable land must stop production before December 31, 2005.

8. Sustainability Analysis

The "11th Five-Year Program for National Economic and Social Development" puts forward: "On the basis of optimizing the structure, improving efficiency and lowering consumption, to realize that in 2010 doubling the GDP per capita over 2000; significantly improving the efficiency of resource utilization, and lowering energy consumption of unit GDP by about 20% than the end of the "Tenth Five Year Plan". It reflects not only the profound strategic significance of the realization of 20% lowering target, but also the determination of Chinese government to transform the growth mode and development model. During the "Eleventh Five Year Program" period, Chinese TVEs will play an important role in achieving the set goal. Evaluation experts believe, there is vast development potential in the future long period for the EE technologies and mechanism demonstrated by the project, that is, sustainable.

The Sustainability Analysis on EE technologies is shown in Table 6.

Table 6 Sustainability of EE Technologies

Sectors	Demonstration Technology	Sustainability

Cement	New Type Dry Cement Pure Low Temperature Waste Heat Power Generation	Nationwide new dry process cement production capacity in 2005 will reach 450 million tons, If pure low temperature preheating power generation technology is applied in all of them, the total installed generating capacity will reach 1500MW. , providing about 9 billion kWh electricity annually, which is equivalent to saving 3.45 million tce and reducing 8.625 million tons carbon dioxide emissions per year, thus greatly reducing air pollution and greenhouse effect.
	New Type Dry Process Rotary Kiln	In current China's cement industry, there are still too many enterprises with shaft kilns and other backward production processes, causing high energy consumption, a serious waste of resources and environmental pollution. In a rather long period of time of future, the new dry process cement production technology and equipment, together with the characteristics of a modern cement industry to the cement industry, intensively manifest the new road to industrialization of cement sector. To the end of 2005, the new dry cement production capacity China only accounts for 40% in China, nearly 60% of the backward production capacity must be eliminated or modified, and be replaced by the new dry process.

	Mechanical Shaft Kiln Energy Efficient Technology	China's cement industrial policy is not to shut down all the shaft enterprises in the short term. Especially for the large number of small-capacity towns and scattered rural cement market nationwide, it's not yet ready for the development of large-scale new dry process production line, but only suitable for small and medium-sized cement operation. The cement industrial structure combining large, medium and small sized enterprises will not change in a fairly long period of time. Small and medium sized cement enterprises are still important components of national cement industry. Therefore, to guide the shaft kiln technological renovation, getting the energy consumption and various technologies coincide with national standards, is in line with conservation conscious society, and an important task.
Coking	Clean Heat Recovery Coke Oven and Waste Heat Power Generation	China's coking production technology is at low level with backward production technologies occupying a large proportion of coking industry. In Coking TVEs in Shanxi Province, the modified TJ-75 type coke oven, Hongqi type oven, small 58 and WJ663 and other small coke ovens are still in use in a fairly large sphere, with only half of the ovens conforming to the national industrial policy and development direction. Currently, China is implementing increasingly stringent environmental standards, compelling many heavily polluting coke enterprises to seek a new path

		of clean production. With the closing of primitive coke ovens (including modified ones) and mechanical oven with the height of carbonization room below 4.3 meters, 30 million tons of coke production capacity will be reduced merely in Shanxi Province. Therefore, this technology, with its advanced process, good environmental effect, lower investment, high rate of return on investment, high rate of comprehensive resource utilization, and high quality of coke, start an alternative technical path for improvement of coking industry pollution, promotion of coking economy and environmentally friendly development.
Metal Casting	Metal Casting Sector Energy Efficient Technology	China's metal casting sector is huge with more than 2.6 million enterprises, an annual total output of over 22 million tons and large amount of coal consumption. Generally speaking, high energy consumption, high resource consumption, poor working conditions, serious environmental pollution are common features of Chinese metal casting sector. Take cast iron production as an example, China produces cast iron 15 million tons annually, needing about 22 million tons of molten iron. In which, electric furnace and cupola with large diameter, long life and hot wind accounts for less than 15%, the majority are cupolas with small diameter, short life and cold wind which have low utilization rate of energy. The average level of energy consumption of China is about twice or more of the

		one in developed countries, and there is a great potential for conservation in China.
Brick	Energy Efficient Rotary Kiln, Hollow Brick Energy Efficient Technology	China's brick sector is huge with over 100,000 enterprises, an annual output of 600 billion pieces of ordinary brick, annual coal consumption of 60 million tce, and earth resources consumption of about 1 billion m3. Most enterprises are TVEs which are small scale, backward in process, technology and equipment, especially the roasting kiln emissions of carbon dioxide, other harmful gases as sulfur, fluoride and greenhouse gases causing serious damage to the environment. As all localities have started to strictly enforce the ban on the use of solid bricks, enterprises are faced with the grim situation of rising coal prices, high production costs and the adjustment of product structure. Despite the awareness of the need for EE technological renovation, the enterprises are still doubtful about technology and equipment. This project will eliminate technical obstacles for enterprises implementing EE technological renovation.

9. Conclusions and Recommendations

9.1. Conclusions

8 pilot enterprises annually conserve energy of 810,000 tce, and reduce carbon dioxide emissions of 203,000 tons (project targeted at carbon dioxide emission annual reduction of 85,000 tons). 118 replication enterprises are expected to conserve energy of 809,000 tce and reduce carbon dioxide emissions of 2.018 million tons annually (project targeted at annual carbon dioxide emission reduction of 1 million tons). They have achieved the annual energy conservation of

370,000 tce and carbon dioxide emissions reduction of 923,000 tons. The construction of pilot projects, training and exchange activities have comprehensively driven up the self replication activities.

Therefore, the evaluation experts believe, the project is very successful in the implementation of EE technologies, and the results are much higher than expected. This has benefited from the rapid development of Chinese economy and the implementation strategies adopted by PMO, including timely adjustment of demonstration technologies according to national industrial policy, giving full play to initiative and enthusiasm of enterprises and LPIC, adoption of VA mechanism, improvement of management and attaching importance to process monitoring.

In the project design, it was not expected to directly promote the development of relevant policies. However, it can be seen that, on account of the success of demonstration technologies and pilot projects, the project has promoted the development of EE technology policies at both national and local levels. In the process of investigation, evaluation experts found that the implementation of this project had successfully influenced the trend of China's energy conservation technology policies. This is a consequence of the success of the technology demonstration.

In the "11th Five-Year Program" period, Chinese TVEs will play an important and decisive role in achieving the set goals, and the project will persistently play its role.

9.2. Recommendations

（1）Strengthening the capacity building and enhancing the mechanism development of energy conservation, consumption reduction and environment protection are the important contents of sustainable development of the project. We recommend continuing to provide technical guidance and services to enterprises in the process of EE technology application and new products development, so as to make the project sustainable in promotion of energy conservation and GHG emissions reduction. The project set up Hong Yuan Company, an information transmission institution, provided a great amount of effective information, set up a communication platform for enterprises and experts, and provided technical advisory services. From the current situation, the project itself has been relying more on domestic research and design institutions and

manufacturers. Hong Yuan Company needs to strengthen capacity building, so as to provide better advisory services to enterprises in EE technologies and equipment.

(2) There is a great demand for infrastructure construction in rural areas in the process of the construction of a new socialist countryside. It's estimated that, in the "11th Five-Year Plan" period, there will be 2.1 billion cubic meters of new building annually, and the demand for housing in urban and rural areas will be 1.3 billion cubic meters. However, there has not been fundament change in the situation of solid clay bricks and tiles as major building material in China, and most enterprises are small scale. The production process, technology and equipment are relatively backward. Some are still digging and burning to make bricks. Although energy waste and environmental pollution has eased to some extent, there is still a big gap to the national EE building standards and environment protection requirements. Evaluation experts recommend the appropriate extension of the project implementation period or to apply for projects on the basis of the results of this project, to develop new wall materials including sintered porous brick and hollow brick, to enhance the product's function of energy efficient buildings, to eliminate the high energy consumption and backward technology as small shaft, small enclosure kiln, drain ditch kiln, horseshoe kiln, etc., and to ensure the continued promotion of the project's results.

Annex 1: Project Progress indicators Analysis

Objectives	Milestones	Activities	Output/Outcome
Macro Goal: Elimination of technical obstacles in the process of adoption of EE technologies, production, sales and application of EE products by TVEs in brick, cement, Coking and metal casting sectors.			1. The project has achieved notable energy conservation and emission reduction results, promoted the self replication activities in TVEs; 2. Demonstration and promotion of EE technologies effectively eliminated technical barriers in the process of EE technologies application; 3. Implementation of the project enhanced the enforcement of the existing policies and regulations of EE technologies, promoting the formulation and issuance of relevant EE technology policies at both state and local levels.
Direct Objectives:			

Objectives	Milestones	Activities	Output/Outcome
Enhancing the technological capability of pilot enterprises in terms of energy conservation and product quality improvement, eliminating technical barriers.	Compared with before renovation, the rate of energy conservation of pilot enterprises amounts to 20%, total annual GHG emissions reduction of pilot enterprises amounts to 8, 5000 tons.	1. Selection of pilot enterprises and EE technologies	Carried out reevaluation, screening and adjustment on the demonstration technologies selected in project (Phase I), and selected new demonstration technologies as follows: *Cement Sector*: New dry process rotary kiln, pure low temperature waste heat power generation, mechanical shaft kiln energy efficient technology; Coking Sector : Clean heat recovery coke oven waste heat power generation; Metal Casting Sector: Process energy conservation and product quality improvement; Brick Sector: Hollow brick energy efficient technology, EE rotary kiln, etc.
			Complement of selection and identification of 9 pilot enterprises.

Objectives	Milestones	Activities	Output/Outcome
		2. Construction of pilot enterprises	8 pilot enterprises have completed EE technological renovation with a total investment of 380 million RMB, annual energy conservation of 81,000 tce and carbon dioxide emissions reduction of 203,000 tons.
		3. Activities of pilot enterprises	Altogether over 100 enterprises visited the pilot enterprise-Yongxing Brick Plant; Training courses were held every year, over 400 enterprises received technical training of pilot enterprises; Through the publications and meetings of Sichuan Wall Material Network, to promote and spread the successful experience and technologies of renovation to brick and tile enterprises nationwide.

Objectives	Milestones	Activities	Output/Outcome
			Over 70 domestic brick enterprises and seven foreign enterprises (including Bangladesh) visited the pilot enterprise- Liucun Village Brick Plant, to learn the successful experience in optimizing the production lines, energy reservation, cost reduction and management. The project has brought along the brick and tile enterprises in Baqiao and Xi'an districts to take an active part in technological renovation. The demonstration technology-EE rotary kiln has been promoted to Bangladesh.
			The project has successfully built the first domestic cement pure low temperature waste heat power generation cogeneration project, and eliminated the technical risks of the promotion of this technology in the market. Over 50 enterprises have visited the pilot enterprise- Shenhe Cement Plant.

Objectives	Milestones	Activities	Output/Outcome
			The project has successfully completed the first domestic clean heat recovery coke oven cogeneration project. More than 40 domestic coking enterprises have visited the pilot enterprise- Xinggao Coking Company, among which, 13 coking enterprises from 8 provinces sent 14 batches of participants to the training courses; 10 Indian enterprises have visited Xinggao Coking Company, and begun to imitate the mode of production, 3 enterprises of them have sent staff to participate in the company's training course.
To realize the commercial operation of TVEs energy conservation project financing, and extend the useful	Plan to achieve GHG emissions reduction of 1 million tons.	Selected 118 replication enterprises. Composed feasibility study reports on EE technological	118 replication enterprises have completed the feasibility study on EE technological renovation, with the expectation of annual energy conservation of 809,000 tce and annual carbon dioxide emission reduction of 2.018 million tons.

Objectives	Milestones	Activities	Output/Outcome
experience and measures nationwide.		renovation of 118 replication enterprises. Carried out EE technological renovation in metal casting and brick replication enterprises.	So far, 91 brick and metal casting enterprises have EE technological renovation and established sound energy management institution. In addition, 1 coking enterprise and 8 cement enterprises have completed EE technological renovation projects or are under construction. The annual energy conservation is 292,000 tce and annual carbon dioxide emissions reductions 728,000 tons.
	Promote TVEs in four sectors to spontaneously carry out EE technological renovation activities.		Pilot enterprises actively carried out self replication activities through development visits, training and exchange, and advisory services, benefiting more than 400 enterprises. Zhejiang Province has completed 8 low temperature cogeneration systems, another 30 are under construction this year.

Objectives	Milestones	Activities	Output/Outcome
	Promote the improvement of energy conservation technology policies at both local and nation levels.		The project promoted local governments to administer the "solid brick ban" policy. Promoted the implementation of "solid brick ban" policy in Chengdu City, Sichuan Province, facilitated the establishment of trade self regulation associations in Xinjin and Shuangliu, improved the market competitive capacity of hollow brick enterprises, increased the motivation of hollow brick enterprises to carry out EE technological *renovation*. Promoted Xi'an City comprehensively to implement the "Paper on the Implementation of Ban on the Use of Clay Solid Bricks in Set Time", thoroughly carry out the ban work, actively transform original solid brick enterprises, and ensure no new permission of clay solid brick enterprises. New wall materials base has been listed as a priority in 2006 in Baqiao District. In addition, the shooting and play of scientific short movie-"solid clay brick and hollow brick" raised the public awareness of building bricks and the harm of using solid clay bricks, and establish scientific brick using

Objectives	Milestones	Activities	Output/Outcome
			The project promoted the replication of cement low temperature waste heat power generation technology and the launch of industrial policies. Knowing the successful electricity generation of Shenhe Cement Plant, Zhejiang Economic and Trade Commission exercised strict control over approval process, proactively recommended enterprises to adopt low temperature waste heat power generation technology, provided policy support, and stopped approval of complementary burning power project. The "Cement Industry Design Criteria" revised version brought the cement low temperature waste heat power generation into the design criteria. The cement low temperature waste heat power generation technology has been included successively in the documents of "Notice on Strengthening Energy Conservation and Consumption Reduction Work" (Zhejiang Government [2006]35), NDRC "Mid and Long Term Special Program on Energy Conservation", "China Energy Conservation Technology Policy Outline (2005) "(Exposure Draft), "Guidance Catalog on Industrial Restructuring

Objectives	*Milestones*	*Activities*	*Output/Outcome*
			The clean heat recovery coke oven and waste heat power generation technology identified by the demonstration technology has been listed as a "two high and one new" project preferably supported by the state; listed as a key promotion technology in coking sector in Shanxi Province.

Annex 2: The list of enterprises completed the technical transformation[2]

Company Name	Scale production line	Capacity	Project Status
Changxing Zhongsheng Building Material Cement Co., Ltd	5000t/d	6000kW	completed
Xinging Jingdingzi Building Material Cement Co., Ltd	2500t/d	3000kW	completed
Wutong Building Material Cement Co., Ltd	5000t/d	6000kW	completed
Deqing Zhongxinyuan Cement Co., Ltd	2500t/d	3000kW	completed
Qinglongshan Cement Co.Ltd.	1200t/d+2500t/d	2×3000kW	completed
Henan Tongli Cement Co., Ltd	2500t/d+5000t/d	15000kW	completed
Longyan Chunchi Group	2500t/d	3000kW	Building
Xingning Ningjiang Builing Material Co.Ltd.	2500t/d		Building
Shanxi Lvliang Yaolong Coking Co. Ltd.	40t/a	1500kW	completed
Shanxi jiexiuluxin 煤炭气化有限公司	100t/a	24MW	Building
Shanxi linfenwenfeng Coking Co. Ltd.	50t/a	18MW	Building

[2] the list of enterprises come from the sub-contractors to undertake the project.

Annex 3: Spontaneous promotional activities [3]

Part of the promotional activities being carried out by their own cement enterprises include :

Company Name	The scale of the production line designed	Capacity	Operation time
Zhonglian Julong huaihai Cement Co.Ltd.	5000t/d	9MW power generation by waste heat	installing
Chongqing jjnjiang Cement Co.Ltd.	2500 t/	4MW power generation by waste heat	Designing
Jiangsu Jinshu Cement Co.Ltd.	2500t/	4MW power generation by waste heat	Building
Guangdong Zhujiang Cement Co.Ltd.	5000t/d	7.5MW power generation by waste heat	Building
Tieling Tiexin Cement Co.Ltd.	2*2500t/d	1*8MW power generation by waste heat	Designing
Zhonglian Nanyang Cement Co.Ltd.	3000t/d+6000t/d	6MW+9MW power generation by waste heat	Designing
Zhejiang Changshan Tianma Cement	2500 t/d	4MW power	Designing

[3]the list of enterprises come from the sub-contractors to undertake the project.

Co.Ltd.		generation by waste heat	
Zhejiang Shuangshi Cement Co.Ltd.	2500 t/d	4MW power generation by waste heat	Designing
Jiamusi Hongji Cement Co.Ltd.	1300t/d+2500t/d	7.5MW power generation by waste heat	Designing
Guangdong Guangda Cement Co.Ltd.	2×5000t/d	2×8MW power generation by waste heat	Designing
Neimenggu Wulan Cement Co.Ltd.	2×2500t/d	8MW power generation by waste heat	Designing
Zhangjiang Haolong Building Material Co., Ltd	1200t/d	1.5MW	2006.1
Hainan Sanya Huasheng Tianya Cement Co.Ltd.	5000t/d	6MW	2006.5
Yibin in Sichuan Shuangma Power Energy Limited Power Energy Limited	2500t/d	3MW	Building
Gansu Qilian Mountain Cement Co.Ltd.	2×2200t/d	6MW	Building
Beijing Cement Co.Ltd.	2000t/d+3000t/d	7.5MW	Building
Shandong Zibo Donghua Cement Co.Ltd.	5000t/d	6MW	Building
Guangxi Huarun Cement(pingnan)	5000t/d	7.5MW	Building

Co.Ltd.（Phase Ⅰ）			
Jiangxi Taihe Yuhua Cement Co.Ltd.	1200t/d	2.5MW	Building
Anhui Huaibei Mining Cement Co.Ltd.	2500t/d	4.5MW	Building
Zhejiang Zhengda Cement Co.Ltd.	1200t/d	2.5MW	Building
Anhui Hede Sanshi Cement Co.Ltd.	5000t/d	9MW	Building
Anhul jiande Sanshi Cement Co.Ltd.	5000t/d	9MW	Building
Zhejiang Hongshi Cement Co.Ltd.	2×2500t/d + 5000t/d	2×7.5MW	Building
Jiangxi Gaoan Hongshi Cement Co.Ltd.	5000t/d	9MW	Building
Anhui Huainan Mining Cement Co.Ltd.	2×2500t/d	9MW	Building
Shandong Longkou Conglin Cement Co.Ltd.	2500t/d	3MW	Building
Guotou Hainan Cement Co.Ltd.	2×2500t/d	8.8MW	Building
Hunan Pingyong Cement Co.Ltd.	2500t/d	3MW	Building
Jiangsu Helai Cement Co.Ltd.	2500t/d+5000t/d	4.5MW+7.5MW	Building
Zhejiang Linan jinyuan Cement Co.Ltd.	5000t/d	8.8MW	Designing
Henan Zhumadian Cement Co.Ltd.	2×5000t/d	2×7.5MW	Designing
Guangxi Huarun Cement (pingnan)Co.Ltd.（(Phase Ⅱ)）	2×5000t/d	7.5MW	Designing
Guangxi Huarun Cement (guigang)Co.Ltd.	2×5000t/d	18MW	Designing
Guangxi Huarun Cement	2500t/d+3200t/d	9MW	Designing

(hongshuihe)Co.Ltd.			
Guangxi Huarun Cement (nanning)Co.Ltd.	5000t/d	7.5MW	Designing
Henna Mengdian Cement Co.Ltd.	3×3000t/d	2×7.5MW	Designing
Henna Weihui Tianrui Cement Co.Ltd.	5000t/d	7.5MW	Designing
Hubei Yongxin Cement Co.Ltd.	2000t/d	4.5MW	Designing
Ningbo, Zhejiang Xiaoshunjiang Cement Co.Ltd.	2500t/d	4.5MW	Designing

UNIDO

Energy Conservation and Greenhouse Gas Emissions Reduction in Chinese Township and Village Enterprises-Phase II

Evaluation Report on mechanism and Feasibility of Energy Efficiency Voluntary Agreement

Final report

For

Pilot and Replication Project Energy Saving and GHG Emission Reduction Monitoring and Evaluation
Request for Proposal No. P. 16001067 - EG/CPR/99/G31

Submitted by:
Center for Energy and Environmental Protection Technology Development, Chinese Academy of Agricultural Engineering

May 8,, 2007

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1. Implementation Abstract

This report states the evaluating result of mechanism and feasibility on mechanism and Feasibility of Energy Efficiency Voluntary agreement of "Energy Conservation and Greenhouse gas emissions in Chinese Township and Village Enterprises – Phase II" (hereinafter refers as TVES project). During writing of this report, PMO has provided supervision, Local Policy Implementation Committees (LPIC). Demonstration Enterprises and Replication Enterprises have offered great assistance, however, the evaluation result is summarized independently by experts, and subcontractor is sorely responsible for any possible error and omission in this report.

VA is an agreement signed between government and organizations or enterprises on the basis of voluntary, which aims at energy conservation and reducing greenhouses gas emissions. VA helps enterprises change the energy-conservation model from administrative management to a social responsibility. Because of introduction of VA, we not only find out an energy conservation system which fits market economy, thus motivate Chinese Township and villages enterprises start energy conservation activities, but also enlighten enterpriser's enthusiasm on energy conservation activities.

TVES project uses experiences from China and abroad for reference, assisting local government and enterprises formulate VA plan according to practical conditions of Chinese small and medium enterprises and each individual enterprises. Strongly supported by LPICs, local governments have successfully signed VA with 8 enterprises. And the project entrusted Hong Yuan Company to monitor and evaluate the implementation of VA. On the basis, 11 areas (Guangdong Province, Zhejiang Province, Liaoning Province, Nanjing City, Xi'an City, Xianyang City, Jinzhong City, Linfen City, Southern Tianjin District, Chengdu Shuangliu County, and Dalian Jinzhou District) are selected to establish LPICs, to further promote VA to the selected demonstration enterprises in those regions. Up to now, 21 enterprises have signed VA with local governments. Evaluating exports believe, the first introduction

and successfully demonstration of TVES project in Chinese small and medium enterprises have been an innovation from theory to practice, from demonstrator to motivation policy, it has successfully expand the intension and extension of VA. The introduction and demonstration of VA in China(including the demonstration in small medium enterprises) directly calls for the establishment of National "The Special Medium-long Item Program of Energy-saving" and "Top-1000 Enterprises Energy Efficiency Program" , and largely enrich the content of policies.

When confirming the implementing effect of TVES project, evaluating exports also find a few places which require improvements. The evaluating process is simple; the evaluating result is comparatively ambiguous. Even if comparing to other similar projects, TVES project is strongly supported by the government policy, currently the policy is still not efficient in terms of truly motivate enterprises' enthusiasm in energy conservation, and the relationship between Recurrent Fund (RCF) and VA should be clarified. At last, evaluating experts suggested widely promote the demonstration enterprises and project result, to improve influence of the TVES project.

2. Background

In year 1998, China issued "Energy conservation act" and put into practice, however, because of immaturity and poor feasibility, little observation of law and slack law enforcement have become outstanding problems. As the government role has changed, the original energy conservation management system is not effective any more, and the energy conservation system in the planed economy can no longer fulfill the requirement of the current situation, the financing policy support in energy conservation technological transformation is insufficient, effective motivation system has not been established. Environment protection brings forward increasing demands on energy consumptions, etc. Enterprises face a lot of problems on energy conservation.

Experiences from China and abroad show, energy conservation belong to field of market malfunction, where macroeconomic control and monitoring from government is highly necessary. Under socialist market economy, In order to push and motivate the development of energy conservation, Central and local government have to find new models of energy management and the mechanisms of operation, so that energy conservation could be changed from Compulsory Administrative command to non-compulsory policy such as guidance policy or motivation policy. Reviewing the development path of energy management from foreign governments, most VA was divided into 3 stages: compulsory policy, non-compulsory policy, and VA (compulsory policy + non-compulsory policy). VA in different countries vary in term of names and organizations, however, VA is a voluntary agreement enterprises signed with government, undertake to improve energy efficiency, reduce greenhouse emissions, and benefit environment. The implementation of VA is evaluated and audited by a third party; the evaluating result is open to public. Which not only meet the target of energy conservation and environment protection, but also build up a fine image of enterprises among public? Now, VA has been widely adopted in developed

countries such as UK, France, Germany, Holland, Norway, Denmark, U.S., Canada and Japan, etc. and it obvious result, 20%, total over 1000 enterprises, the coverage is 90% of the energy consumption. The main motivating method is information broadcast, training, energy, financial support, simplify environmental certification, etc, if, government warmed more strict environmental standard will apply. The efficiency increased 22.3% by 2000, CO_2 emissions reduced 50Mt. Compare to other enterprises, emissions reduced by 23%.

Former State economy and trade committee and U.S. Energy Foundation Launched" China VA trial project" together, China Energy Conservation Association (CECA) helped Shandong provincial government signed VA with Jinan Iron & Steel Group Corporation and Laiwu Iron & Steel Group Corporation on April 22, 2003, both enterprises promised to save energy consumption of 1 Mtce in 3 years, 0.145 Mtce more than the initial target, which marks the first pilot of VA project. One year later, both enterprises matched the energy conservation target set in VA, total saved-up energy equals to 224,000 tons of standard coal, meanwhile reduced 4,022 tons of SO_2, 124,000 tons of CO_2 emission. The energy conservation amount equals to 122 million RMB to achieve energy efficiency. The initial success of the trial, on the one hard, proved the feasibility of VA in China, on the other hand, reflected the problems existed from the trial to the real promotion which needs to be solved, such as index system, government policy, etc. What's more, the project will aim at large enterprises in application.

Chinese Township and Village Enterprises have already become the leading power in the development of Chinese countryside economy, but the common out-of-date technology and equipment, low management level caused great waste of energy, which restricts Chinese Township and Village Enterprises from sustainable development. Compared to State-Owned large and medium enterprises, Township and Village enterprises feature the Characteristics of small scale, large variations, insufficient capital, and low technical content. Generally speaking, the energy and

material consumption of Chinese Township and Village Enterprises per product unit is larger than State-owned enterprises. Their average production techniques are on the level of the 1950's, most production equipments are discarded ones from State-owned medium and large enterprises, which are not in good condition. The awareness of energy conservation and environmental protection among management level and technical personals are backward, insufficient, or almost blank, further promotion and training are required. Therefore, Chinese Township and Village Enterprises have larger potential of increasing efficiency of energy consumption.

Chinese Township and Village Enterprises features the Characteristics of large quantity, scattered, small scale, etc. The quantity of Chinese Township and Village Enterprises is large, while the power of energy conservation management is weak, it's difficult to accurate statistics, scientific management, monitoring and evaluating. So the promotion of VA in Chinese Township and Village Enterprises has more common and realistic meanings. VA, as a non-compulsory policy tool, places both parties at equal position, and increases enterprises' Enthusiasm and motivation of energy conservation and environment protection, Enterprises can get the profit brought by energy saving and favorable policies from government, while government and public can enjoy the benefit of environment. Meanwhile the government realized a functional change and tries to explore a suitable energy conservation management system in market economy environment, guiding Chinese Township and Village Enterprises to start energy conservation and environment protection activities voluntarily. Therefore, TVES project decided to begin with introduction of VA in Chinese Township and Village Enterprises, to trial and do further promotion.

3. Overview of VA promotion in TVES projects

3.1. VA trial in demonstration enterprises

In order to realize energy efficiency technological transformation and reform of monitoring system in Chinese Township and Village Enterprises to fulfill requirement from market economy. TVES project decided to introduce VA, the first launching 4 demonstration enterprises are as follows

—Lu Feng Cement Co. Ltd in Tieshan district, Huangshi city, Hubei Province.

— Yong Xing Shale Brick Co. Ltd, in Xinjin County of Sichuan Province.

—Mo Ling Foundry Co. In Jiangning county of Jiangsu Province

—Canal Casting Co. Ltd in Dalian city of Liaoning Province

After studying the process of signing VA from China and abroad, according to the characteristics of Chinese Township and Village Enterprises, TVES project set up energy conservation target according to the evaluation of energy conservation potential of the demonstration enterprises, assisting LPIC of the demonstration enterprises formulated favorable policy, motivation and penalty, designed VA suitable for Chinese Township and Village Enterprises, helped the above 4 enterprises signed VA with local government, at the same time formulated "Supervision and Evaluation system plan" Though analysis and summary of the initiate, contents, models, working process, results, conclusions and function characteristics of VA, another 4 demonstration enterprises signed VA with local governments, including:

- Air Brick Factory in Liu Village, Baqiao District of Xi'an City;
- Shen River Cement Co. Ltd in Tong Village of Zhejiang Province;
- Yingde Cement Co. Ltd in Guangdong Province;
- Xingao coking company in Shanxi Province

3.2. Monitoring and Evaluation of VA implementation

Hong Yuan Company is entrusted by TVES project to monitor and evaluate the implementation status of VA, they organized demonstration enterprises to fill in "the Annual Monitoring Report of energy efficiency", and Hong Yuan Company's experts evaluated the detailed implementation status of VA, finalized a result and informed PIC, LPIC and demonstration enterprises by written report. Through evaluation process, technical experts learned the situation of VA implementation, monitored and evaluated the result of VA implementation in enterprises. According to the suggestions of evaluation, the demonstration enterprises made effective modification during project implementation to fulfill the energy conservation target.

3.3. Implementation of VA in promotion enterprises

Based on the above pilots, TVES projects decided to furthermore promote VA in Chinese Township and Village Enterprises. Through material collection, Referring to the investigation result of the related industries, carefully study the energy conservation characteristic in cement, casting, brick and coking industries, also on the basis of monitoring and evaluation, TVES project drafted "VA Template" for the 4 industries, state the right and obligations, responsibility and aim of Government and Enterprises in improving energy efficiency and reducing CO2 emission. What's more, TVES project selected 11 areas to establish LPIC, (Guangdong Province, Zhejiang Province, Liaoning Province, Nanjing City, Xi'an City, Xianyang City, Jinzhong City, Linfen City, Southern Tianjin Area, Chengdu Shuangliu County, and Dalian Jinzhou area), to further promote VA to the selected demonstration enterprises in these regions. Up to now, 21 enterprises have signed VA with local government.

4. Evaluation of TVES project implementation effect VA

TVES project uses experiences from China and abroad for reference, assisting local government and enterprises to formulate VA plan according to practical situation of Chinese small and medium enterprises and each unique enterprises. TVE project has successfully finished the trial, and signed VA with a total of 8 demonstration enterprises and 21 promotion enterprises. By now, the technological transformation has been done. According to the tracking and evaluation of VA implementation status, evaluating experts believe the VA is feasible and down to earth, the project has saved up 81,000 tce, and reduced 203,000 tons of CO2 (refer to "Final evaluating report of energy efficiency technology implementation". TVES project introduced VA to China small and medium enterprises for the first time largely enhance the energy efficiency in Chinese Village and Township Enterprises, and accumulated rich experiences for VA promotion.

4.1. Improve energy efficiency of Chinese Township and Village Enterprises

4.1.1. Improvement on the energy conservation consciousness

At the beginning of this project, some local government officials, management level and technical personals from enterprises not only learned VA for the first time, but also operated in international project for the first time. Because of the practical reasons such as insufficient economic development, short of information, etc, their consciousness of energy conservation is weak. Besides, lack of management level technical personals that's familiar with energy conservation also becomes an important factor which affects Chinese Village and Township Enterprises from carrying out energy conservation activities. Many technical personals are used to

work with the traditional techniques, and do not want to learn new techniques and methods, which blocks Chinese Village and Township Enterprises from technological transformation of energy conservation.

As the project progressed, UNIDO、PMO、PIC、CTA and distributors entrusted government officials and experts to provide training to the local government officials, management level and technical personals from enterprises frequently, made a great effort to communicate with demonstration enterprises and promotion enterprises to make them realize the importance of energy conservation and environmental protection.

4.1.2. Improvement of technology

In fact, technical improvement is the most direct and effective method to improve energy efficiency ratio of Chinese Village and Township Enterprises. VA also includes energy conservation plan, only by improvement of technology, the energy conservation target can be met.

4.1.3. More support from Central and local government

In recent years, although State Government places more and more emphasis on the development of Chinese Village and Township Enterprises, and issued laws and regulation for them, but the support to Chinese Village and Township Enterprises is not sufficient. By implementation of TVES project, local and state government placed more concern on Chinese Village and Township Enterprises, accurately and clearly understand the policy requirement and the contribution made by Chinese Village and Township Enterprises in order to realize the target of energy conservation. In future formulating of related policies, government will concern more about the development of Chinese Village and Township Enterprises.

4.2. Demonstration effect of VA introduction

VA study was started in 1999; the first VA was signed in April, 2003. VA was promoted in some provinces and industries, but not much progress has been made.

TVES project is the only complete and successfully implemented project; undoubtedly it will play a very good demonstrating role in introduction of VA in China

4.2.1. The innovation of government management system

"LPIC" is a specialized organization participated by functional organizations of the government, form up by local government department and financial institutions. Mainly help the Chinese Township and Village Enterprises overcome the policy obstacles of energy conservation. By formulating "action plan" and signing VA with enterprises, effectively promote enterprises to start working on energy conservation and reducing emissions.

Evaluating experts believe, The establishment of LPIC is a beneficial effort, it restructured and optimized government functions, utilized the functioning advantages in different organization, strengthened government law enforcement, improved policy environment to fulfill requirement from market economy, adjusted energy efficiency policy and measures in local government to adapt market economy, applied motivation methods to improve the self-discipline of local Township and Village Enterprises so that laws and technical standards of the energy efficiency and environmental protection could be implemented voluntarily. Despite the existing problems of orientation and continuous development, LPIC expands and strengthens the government functions of organizing and coordinating, introduced a new direction for VA, thus undutiful create a new system of government management.

4.2.2. Innovation of financing channel

TVES project prepared recurrent fund (RCF) as a system to remove the obstacles of financing for Township and Village Enterprises. In order to buildup the RCF, GEF funded USD1, 000,000, China Ministry of Agriculture funded USD1, 000,000, and Agriculture Bank of China funded USD2, 000,000. Hong Yuan Company is selected to take care of the fund from GEF, and two demonstration enterprises have already obtained loans. Evaluating export believe, The concurrent fund makes up the

financial difficulties when introducing VA, so that small and medium enterprises who join VA can acquire solid financial support, and realized financial income. Through innovation on financing channel, the room of decision-making has been expanded, so that local government can play more important role in VA promotion.

Establishment of RCF provided new solution for motivation policy of VA. Backed up by the fund, talking about is motivation policy of VA is no longer like an armchair strategist. The ultimate intention of enterprises asking for government policy is financial benefit, however, China's taxing and financial system at present can not support VA with new policy. The existing policy has little force and limited, and can not fully motivated enterprises to join VA. The use of RCF is flexible, the application procedure is comparatively simple, enterprises can received true benefit from it.

4.2.3. Improve relationship between Small and Medium Enterprises and local government

Through on the spot visits and investigations, evaluation experts find out the small and medium enterprises in demonstration region have changed from little knowledge of energy conservation to actively conserving energy, trying every possible method to start energy conservation projects, making contribution to reach local energy conservation target. Local governments attach more attention to energy conservation, and help enterprises solve technical and financial difficulties, the relationship of medium and small enterprises and local governments are strengthened. It's one of the outstanding achievements of VA to improve relation between government and enterprises; TVES project has already proved it.

4.2.4. Motivation policy and local government function

With advantageous system of LPIC, motivation policies of VA in TVES project are mainly provided by local government, main motivation policies include income tax reduction, local financing aid, favorable loan policy, honor, certificate and information notice, etc. Which shows, local government has more policy flexibility

and stronger policy enforcement power, but local government also has the disadvantages of closely following central government policies and having little room of decision making. Besides, TVES project promote local government to carry out state policies, and increase the conductivity of local government to carry out state policy of energy conservation.

4.2.5. Promote VA system through technology promotion

Compare with the system, promotion of technology is much easier. The designer of TVES project finds out, and skillfully promotes the VA system by way of promoting technologies. TVES project promoted VA system when promoting technological transformation of energy conservation in the promotion enterprises. Enterprises in the active application of energy efficiency technologies, recognize the significance of energy conservation and reducing emissions, and voluntarily joined VA.

4.2.6. VA with third party participation

As PTPMC-- Hong Yuan Company played the third party role from the start of TVES project, TVES project is a VA project with participation of third party. Though all VA ploit projects in China wished to learn from international experience, to introduce the third party in the beginning. But until now, the third party hasn't been included. The trial project in Shandong was only joined by government and enterprises. In TVES project, although Hong Yuan Company didn't sign on the VA agreement, it played the third party role by participating in the monitoring and evaluation of VA implementation, adjusting energy-saving target, formulating energy conservation plan, etc. It's a beneficial experiment of introducing and promoting third party in VA.

4.3. Indirect influence to state policy establishment

4.3.1. Indirect influence to VA related State Policies

"The Special Medium-long Item Program of Energy-saving" mentioned

"promote new energy conservation system based on marketing system" , and for the first time clearly stated "Promote VA, is to encourage enterprises and industry associations signing VA with government". In April 2006, five ministries and commissions announced implementation plan of "Top-1000 Enterprises Energy Efficiency Program". Although the Top-1000 program is a compulsory program which can not be called VA, but a lot of contents in the program are closely related to VA, for example, energy audit, energy efficiency plan, etc. Considering the relativity and the participation of some VA experts, the introduction and trial of VA directly called for the establishment of the above two policies. And to a large extent, TVES project influenced content of the policies.

4.3.2. Indirect influence to development policies of Chinese Township and Village Enterprises

TVES project selected coking, cement, casting and brick industries to initiate trial, China Township and Village enterprises in the above 4 industries feature large quantity, scattered and fast development, their influence grows fast in the respective industries. However, state policies are established mostly based on requirements from large and medium enterprises, requirements from China Township and Village enterprises are seldom considered, which restrict the industries from development. The successful implementation of TVES project proved the influence of China Township and Village enterprises can not be ignored in the industry development. In future, China Township and Village enterprises will be attended in the state policy formulation

4.3.3. Indirect influence to state technical policy of energy conservation

China government concerns about development of energy efficiency technology very much, and promotes development of energy efficiency technology by way of policies, such as establishment of regulation and standards to encourage new technologies development, issuing "Energy efficiency technologies and product catalogue", "catalogue of discarded products". TVES project has successfully

demonstrate some advanced technologies and acquired state approval, Such as successfully implementation of "China new model dry cement product line first 5 degree demonstration project" .etc.

5. The promotion of VA by TVES project

TVES project is the one of the earliest implemented VA projects in China. According to the project target and working content, a series of activities were designed to promote energy efficiency and emission reduction of China Township and Village enterprises. From theory to practice, from participating parties to motivation policy, TVES project innovation, and successfully expand the intension and extension of VA in China. The successful implementation will promote the introduction and promotion of VA.

5.1. Explore VA implementation plan in medium and small enterprises

5.1.1. Necessity

From international experience, in terms of implementation effect of VA, large enterprises are better than medium and small enterprises. However, according to the practical situation in China , implementation of VA in small & medium enterprises are highly necessary, evaluating export believe it can be explained in the following two aspects:

(1) Most of the foreign enterprises are private. The main differences between large and small enterprises are operation scale and management level. Therefore, refer to international experiences; we could be believed the implementation effect of VA in private enterprises of large energy consumption is better than private enterprises of small energy consumption. But most large enterprises in China are state-owned enterprises, while medium and small enterprises are private, and substantial differences exist between the two. Considering VA is a policy model based on market system. It's highly necessary and valuable to promote VA in China Small and Medium Enterprises.

(2) China economy is on the stage of taking off, development of Village and Township Enterprises become the main drive to China social economy changing from planed economy to market driven economy. Currently, China Village and Township Enterprises have already played an important role in local area economy in China. Besides, even if the scale of small and medium enterprises is not large, it have an advantage in quantity, therefore, the total energy consumption is quite specula. According to the statistics, the total energy consumption of China Village and Township Industry takes up 50% of the national industries in total. However, generally speaking, the technology and management level of these enterprises are low, therefore, the energy efficiency has good potential of growth.

By exploring and implementing VA in Medium and Small Enterprises, helping Village and Township Enterprises overcome the difficulties of technology, market, policy, finance, and the inside aspects during the process of applying high efficiency energy conservation technologies. Improve the market compatibility, and finally reduce emission of CO2, is an important path of healthy and continuous development of Township and Village Enterprises, and Chinese industry.

Besides, the study of VA in China is still in the beginning stage, it's highly necessary to try different implementation methods and approaches in a short time to accumulate experiences. Therefore, it's a necessary and useful experiment to implementer VA in medium and small enterprises.

5.1.2. Implementation plan of Medium and Small Enterprises

A number of VA projects have been started in China, for example, "China VA trial -Shandong Iron and Steel industry" sponsored by US energy foundation and implemented by CECA, "clean electric power enterprises voluntary campaign of reducing emissions" by WWF, "Feasibility study project of VA implementation in China iron and steel industry." by China iron and steel association, "Energy conservation and emissions reduction agreement research project" by environment college of Beijing University, etc. In order to implement VA system in the

demonstration enterprises successfully, TVES projects paid attention to VA development in China and abroad during the complete implementation process, kept close contacts with other VA research projects , well considered the characteristics of Small and Medium Enterprises, worked out an implementation plan with good feasibility and unique characteristics. The implementation plan can be divided into 6 steps:

(1) Evaluation of energy conservation potential of demonstration enterprises. The evaluation first compares the energy efficiency of the actual production techniques in demonstration enterprises and advanced domestic enterprises, and calculates the energy efficiency potential. The potential evaluation report also includes related information such as energy efficiency technology planed to apply, etc. to make preparation to setup target in the next steps.

(2) Formulate favorable policy. Taking advantages from PIC and LPIC, formulate favorable policies and motivation methods, help demonstration enterprises to realize energy conservation target. Favorable policies includes local financing aid, technological transformation loan, to encourage development of equipments in cleaning product catalogues, enterprises start energy audit and listed training and related costs to the total operation cost, listed technological research and development cost to enterprises management cost, honor and public promotion, etc.

(3) Enterprises set up target for energy efficiency improvement. After self-evaluation and confirmation of favorable policies, demonstration enterprises set up energy efficiency target and time limit. According to demonstration enterprises' own characteristics , through analysis of energy efficiency potential in different working procedures, status of equipments, technology and financing capacity, etc, set up a challenging yet feasible energy efficiency target. Because of simple production techniques and unified product line of Township and Village enterprises, the technological transformation plans are limited, therefore, energy efficiency target is divided into technological transformation target and project target, the design of the

two targets are helpful to effective monitor and evaluate the project. Besides, set the project time limit to as long as 5 years, because a long time target can help enterprises implement the energy efficiency plan better, and avoid short term action.

(4) VA agreement drafted for Township and Village Enterprises. According to the characteristics of VA itself, the development status of Chinese Township and Village Enterprises, status of local government and the practical situation of demonstration enterprises, VA agreement were drafted for Township and Village Enterprises. The agreement clearly states the right and obligations, execution period, time limit and energy conservation targets, demonstration enterprises adopt energy efficiency measures, local government provides favorable policy, monitoring and evaluation methods and measures, modification of agreement target and termination of the agreement, etc.

(5) Signing VA. LPIC on behalf of government, after evaluating the feasibility of enterprises energy efficiency target, and if policy and regulation, sign VA with demonstration enterprises

(6) Formulate VA monitoring and evaluation plan. Considering the demonstration enterprises belong to different industries and locate in different areas of different development levels. The implementation plan includes monitoring and evaluation plan for the VA experts hired by the project, self monitoring by demonstration enterprises, previous year monitoring report submission(including, enterprises annual energy efficiency survey, energy efficiency index, energy efficiency ratio, etc.) mid -term and final evaluation would be done by PIC and PTPMC as VA monitoring and evaluation organizations. The evaluation results can be divided into 3 grades: good, average and poor.

5.2. Function of LPIC

On the aspect of promoting VA in China, establishment of LPIC in TVES project is enlightening effort. LPIC made great contributions to monitoring, financing, policy

enforcement of the demonstration projects, the selection and recommendation of promotion enterprises, and greatly promote the implementation of the project.

5.2.1. Innovation of organization structure

Evaluation export believes LPIC is an innovation of organization structure, created a new idea for the research of China VA system. According to international experiences, normally VA implementation is done by one government department or a third party, not a newly established combined organization. VA is a system which required coordination and cooperation from different government departments for implementation. According to the management system in China, it's difficult to coordinate between different departments. Therefore, in this project, in order to solve the difficulties of policy, technology, market and financing, LPIC is established by different departments of local government of the demonstration enterprises and promotion enterprises, to play important roles in the project.

(1) Help demonstration enterprises and promotion enterprises with technological transformation of energy conservation and emissions reduction, promote VA system, formulated and execute the motivation policy of energy efficiency.

(2) Explore new financing channel

(3) Assist selecting demonstration enterprises and promotion enterprises

(4) Promote the establishment of industry self-discipline association.

(5) Formulate promotion plan, instruct Village and Township Enterprises in related industries to implement energy efficiency and technological transformation plan.

Establish specialized coordinating organization by related functional organizations, by way of utilizing the functions and advantages of different organizations, overcome policy obstacles, to promote VA system, is feasible and necessary. The background of LPIC decided its work content have natural connections

with government functions, and developed to a combined organization by government, industry and financing department. LPIC provides communication and problem solving platform for all parties of VA, which becomes the best media for VA. Of course, the above not only aim at VA, but also aim at financing, technology promotion and policy enforcement, etc. the more power LPIC has, The more it will do in implementation of VA.

5.2.2. The complete course of VA with LPIC participation

(1) Participate in setting up of enterprises energy efficiency target. Setting up target according to enterprises energy efficiency potential and through negotiation is an important step in the process of reaching VA by government and enterprises. Because conditions of each Village and Township Enterprises are different, a lot of differences exist in development status, production techniques, product types, energy con and influence to environment. The government knowledge of Village and Township enterprises may differ; as a result the targets set up for enterprises might be too high or too low. LPIC can help enterprises deliver information to government, and deliver government feedback to enterprises. So that when Village and Township Enterprises discuss energy conservation target with local government, LPIC plays a role of coordination, and promote the two parties to reach an agreement.

(2) Participate in the draft of VA. LPIC participate in the complete process from draft of VA to the final signing of VA. The agreement is drafted for medium and small enterprises, energy conservation target and favorable policy reward if the target is met are clearly written in the agreement. LPIC in different regions also promote "Draft of VA" for different industries.

(3) Participate in establishment of energy efficiency plan. After signing of agreement, enterprises should establish energy saving plan ASAP, list down the energy conservation methods to be adopt in order to reach the target. LPIC is familiar with the production status, technology level, energy conservation potential and financing capacity of the local demonstration enterprises. At the same time, LPIC has

thorough understanding about the project and VA system. Therefore, LPIC can help enterprises establish energy efficiency plan according to practical condition and meanwhile fulfill the VA requirement.

(4) Participate in evaluation of VA. LPIC evaluates VA implementation together with the third party. The evaluation result from the third party should be reported to LPIC in written form; therefore, LPIC can be fully in control of the enterprises implementation status.

5.2.3. LPIC plays an important role in policy establishment and enforcement

Because LPIC is made up of medium and small enterprises management, energy conservation, environmental protection and financing departments, it has special functions of policy coordination and enforcement.

(1) be the" legs" of government. First, local LPIC keeps close contacts with demonstration enterprises and promotion enterprises, and fully understand development conditions, characteristics and problems of local industries, so LPIC can provides reasonable suggestions for policy establishment. For example, LPIC in Shan Xi province well knows the effects of "clean model"-hot recycle coking technology adopted by demonstrated enterprises on reducing emissions, and suggested provincial government to establish policy to promote clean model hot recycle coking technology which was approved by government. Secondly, LPIC plays an important role in policy enforcement. For example, LPIC of Chendu Shuangliu county actively cooperate with Chendu government and adopt measures to make clay and brick enterprises realized simultaneous running of pause and shut down, LPIC of Shandong Yingde worked closely with government cement development plan, organize purchasing meeting of coal, and invited large and medium coal enterprises to meet face to face with customers in Yingde area, Thirdly, LPIC normally make up of multiple departments in charge and industry associations in one region, which is easy to make for combined action to against vicious competition. Which undoubtedly build a good foundation for VA promotion?

(2) Be the "mouth" of enterprises. After completion of the project, LPIC energetically promote the result and benefit of enterprises made in the technological transformation, help enterprises put the favorable policies into effect, remove the various concerns of enterprises, and ensure enterprises can receive support from local government in technological transformation.

5.2.4. Promote interlocal communication

In the project, all LPICs are reported to PIC, LPICs often conduct training together, so that they can have common understanding of TVES project. On the basis, LPICs communicate with each other frequently to seek mutual development, which not only improve work efficiency, but also save up cost. For example, at LPIC training class, Huangshi Tieshang area of Hubei province introduced the example of Lufeng cement cooperation Ltd who enjoyed value-added tax reduction according to regulation from Ministry of Finance and State Administration of Taxation. LPIC of Tong County was enlightened by the example, and submitted a report to local government, and local government promised to strictly follow the regulation in future.

Through the information communication platform built up by local LPICs, the policy and technology in different areas develop together. LPIC in Jiangning area Nanjing City use the advantages of interconnection among governments in different regions, organized trip to casting industry in Dalian and other places, and help demonstration enterprises modify system, introduce new technologies. Some LPICs even actively build up platform to help enterprises expand market, through coordinate material production area and potential market.

5.2.5. Help enterprises obtain information

When adopt energy efficiency technologies, enterprises often face difficulties in acquiring technical information and forecasting the effect of technologies, etc. LPICs have advantage in helping enterprises solve technical difficulties, realizing energy efficiency and reducing emissions. When LPIC acknowledges the difficulties of enterprises, it will help enterprises acquire the technical information by way of

organizing activities such as visit and inspection, technical training, and technical conference, etc, and build a solid foundation for the application of energy efficiency technologies.

LPIC of Chendu Shuangliu County and Xi'an city organized local enterprises to visit demonstration enterprises, LPIC of Tianjin Southern District, Dalian Jinzhou District, Shanxi Linfen City organized technical trainings, also provide technical development trends in China and abroad, so that enterprises can benefit from it.

5.2.6. Help enterprises solve financial difficulties

Because technological transformation of energy efficiency requires comparatively large initial investment, and the possible risks, it's difficult to apply loan from banks, so enterprises are cautious to invest. In the process of technological transformation, LPIC help enterprises enforce various favorable policies, seek financing support, and ensure the successful implementation of technological transformation.

LPIC of Chengdu Xinjin Country signed a cooperation agreement with China Develop Bank Xichuan branch, offering a loan of 50;000;000 RMB to small and medium enterprises, by recommendation from Chengdu financing bureau, Demonstration enterprise Yongxin shale brick and clay factory in Sichuan Xinjin County is selected as a trial of financing in Small and Medium Enterprises, offering a loan of RMB500, 000 to support the demonstration enterprises with technological transformation. After demonstration enterprises finish technological transformation, LPIC in Dalian Jinzhou District help enterprises apply financing support from government of Jinzhou District. In order to fulfill requirements from demonstration enterprises, Tianjin Southern District offers multiple favorable policies such as favorable loan interest, reduction of import value-added tax and duty tax, etc.

5.3. Design motivation policy of VA

VA is a promise enterprises made to government, while government rewarded

enterprises with motivation policies. The effect of VA larges depends on motivation policy of government. Motivation policy (such as information broadcast, government honor and public recognition, audit and evaluation, tax reduction and regulation, and financing motivation, etc.) is crucial for motivating enterprises to participate and implement VA.

Foreign government normally uses combination of motivation and penalty policies to encourage industry enterprises to sign VA. It's helpful for enterprises to match target through motivation policies such as audit, evaluation, monitoring, information broadcast and financing motivation, however, successfully VA projects normally include tax reduction and reduce obligation from environmental regulation, etc.

As carbon tax and energy tax haven't been applied in China, and no regulations with strong sanction on environment and energy resources can be applied in VA. It's impossible to apply penalty measures, so we could only use available policies to motivate enterprises who signed VA.

Motivation policies in TVES project have good maneuverability. Motivation policies include:

- ✓ Government apply quicken up depreciation of the equipments in cleaning product catalogues, honor and public promotion.
- ✓ Demonstration enterprises list down the cost of energy audit and training into enterprises operation cost.
- ✓ Demonstration enterprises increase the proportion of technological research and development cost of energy efficiency, and list down into enterprises management cost.
- ✓ Through guaranty system of small and medium enterprises, government helps demonstration enterprises solve financing difficulties, apply loan from concurrent fund by recommendation of State policy supervision committee and invest into energy efficiency technological transformation project.

6. Conclusions and Suggestions

6.1. Conclusions

After evaluating 350 voluntary activities and projects, IEA[1] find out from experiences, as long as accurately design and voluntarily implement the plan, the target can be met without much difficulty, sometimes the final result even go beyond the initial target. Besides, via voluntary activity, economy and environmental targets fall together.

TVES project is an accurately designed and successfully implemented VA project. It not only realized the energy conservation and emissions reduction target set forth in the agreement, but also is a profound influence to development and research of VA in China. The project made effective innovation and achieved remarkable results.

Overall plan was formulated at the beginning of the project, First of all, list down related organizations, including establishment of LPIC, unity of production and technology, RCF, etc. After that, on technical aspect, provide technical consultation and services for Township and Village enterprises, make them benefit from VA. Finally put favorable policies into effect, so that demonstration enterprises of VA can enjoy favorable policy from local government.

In 2004, when VA trial project in Shandong province achieved periodical success, Problems policy makers facing was how to enlarge the trial area, and discuss how to "localize" the VA system. Undoubtedly, in the aspects above, TVES project has provided a lot of valuable experience for the decision makers.

Of course, the effect of system innovation could only be told by time. Evaluation expert believe, for TVES project, the next research topic is how to clarify relationship between different innovative features, combine the innovative features together, to avoid counteract.

[1] IEA,1997. Voluntary action of reducing CO_2 emissions. Paris: OECD/IEA.

6.2. Suggestions

When approving the implementation result of TVES project, evaluating expert also find out a few places that require improvement.

6.2.1. Monitoring and Evaluation

TVES project sets up monitoring and evaluating plan for VA, but the evaluation is not systematic and thorough enough, the evaluation process is comparatively simple, and the result is comparatively ambiguous. Evaluation of VA should be given more attention, chasing down the good deeds and wrong deeds according to enterprises' self-evaluation report, so that more reasonable and feasible suggestions can be drawn as working guidance for the next year. The examination of energy efficiency plan should consider the problems of continuity and intercross, etc, and make sure demonstration enterprises can realize the energy efficiency target according to the plan. Another very important evaluating content is to adjust the next year target according the enterprises implementation status.

The evaluation report should be open to enterprises who signed VA, and available to related government departments, social organizations and associations who are concerned about energy conservation and environmental protection. This is a very good method to monitor the implementation status of the project.

6.2.2. About LPIC

When establishing LPICs in 11 promotion areas, it's preferred to establish LPIC sat provincial and city level (3 provincial LPICs, and 5 city level LPIC). The attempt help improve the influence of LPIC and the project, and beneficial to development of the project

The model of building up LPIC can not be unified; we should try to include all the organizations that would be influential to implementation of the project.

The background of LPIC establishment is closely related to the political system and organization setup in China. LPIC is born because of the drawback in government

system, and in coordination of policy enforcement. In future, along with reformation of government system, the transformation of LPIC function or dismiss of LPIC should be discussed later

6.2.3. Policy Strength

Under current economic condition in China, the primary motive of enterprises is economic profit. Currently, the strength of both economic motivation and penalty is not strong enough, which causes little enthusiasm from enterprises who wish to save-up energy, and little action from enterprises who do not wish to save-up energy. Under the circumstances, though the policy strength is remarkable compared to other projects of the same kind, however in order to truly motivate the enthusiasm of enterprises to save up energy, the currently policies are not sufficient. Besides, we should combine the evaluation result with motivation policy, to motivate enterprises join VA.

6.2.4. Use of Recurrent Fund (RCF)

Introduction of RCF in the project has primarily solved the difficulties in financing, the next step is to clarify the relationship of RCF and VA, and for example, enterprises who signed VA can use the fund to pay for a part of audit cost. A fixed amount would be taken out from the fund to encourage enterprises who over fulfill energy efficiency target. Projects listed in VA energy efficiency plan can enjoy priority applying loan, make the RCF can play more important role in the implementation of VA in future.

6.2.5. Promotion

Only by promotion, TVES project can be known as a remarkable and effective VA projects by enterprises, government, trade associations, etc... Promotion helps spread experiences of the project, and call for more people to support VA development. So we should promote the demonstration enterprises and project result, make sure the project can have maximum influence.

UNIDO

Energy Conservation and Greenhouse Gas Emissions Reduction in Chinese Township and Village Enterprises-Phase II

Case Study

Final Report

For

Pilot and Replication Project Energy Saving and GHG Emission Reduction Monitoring and Evaluation
Request for Proposal No. P. 16001067 - EG/CPR/99/G31

Submitted by:
Center for Energy and Environmental Protection Technology Development, Chinese Academy of Agricultural Engineering

May 8, 2007

Case(1) —Hollow Brick Plant in Liu Village of Xi'an

In order to assist TVEs in the fields of cement, foundry, brick and coke to clear the obstacles of technologies, marketing, policies, financing and internal systems of enterprises when the high efficient and energy conservation technology were adopted, to enhance the competitiveness of TVEs in digesting energy conservation and pollution reduction technologies through market and therefore realize the reduction of CO2 emissions, GEF raised money to support "Energy Conservation and GHG Emission Reduction in Chinese TVEs" project (hereafter as TVEs project). The aim of which is to reduce GHG emissions through introducing and adopting EE technologies in the fields of brick, cement, foundry and coke. The project will clear the main blocks of marketing, policies and financing in production, sale and adopting EE technologies as well as applying products within the four industries. This project adopted comprehensive, innovative and market transformation ways with great goals to promote TVEs energy conservation implementation. This case is to analysis hollow brick plant in Liu village of Xi'an, which is one of the nine pilot enterprises chosen by TVEs project.

1. Brief Introduction of Plant

The hollow brick plant lies in the south of Liu village, the suburb of Xi'an, Shaanxi province. This plant was established of collective ownership in1962 and was restructured to private enterprise in 1994. The plant which covers over 190 mu area has the fixed assets of over 5 million RMB and 256 employees. The plant uses local clay and coal ash as main materials to produce 50 million pieces of standard bricks and has become the largest brick plant in Xi'an. Most of the customers come from Xi'an.

The plant carried out technological improvement for energy conservation in March, 2005 after it was chosen as pilot enterprise of "Energy Conservation and GHG Emission Reduction in Chinese TVEs" project, and finished the construction in the

middle of June, 2005. The investment of this project was 2.434 million US dollars (301584.00 RMB), including US dollars by GEF to compile the feasibility report, buy, install and adjust equipments of energy conservation, and training employees.

2. Technological Improvement Measures and Energy Efficient Management

In order to improve the quality and energy efficient of products, the plant carried out several energy conservation measures, such as updating the equipment, remedying and renewing circular kiln, improving production techniques, and thus promoting the overall level of product line.

—Raw materials treatment: raw materials should be stored for over half a year to be air slaked completely, and then be put into production; through this way, the plasticity of raw materials is enhanced and the performance of the materials is improved; furthermore, two more load banks were used to exploit and transport the raw materials so that to decrease the intensity of labor while increase the production efficient.

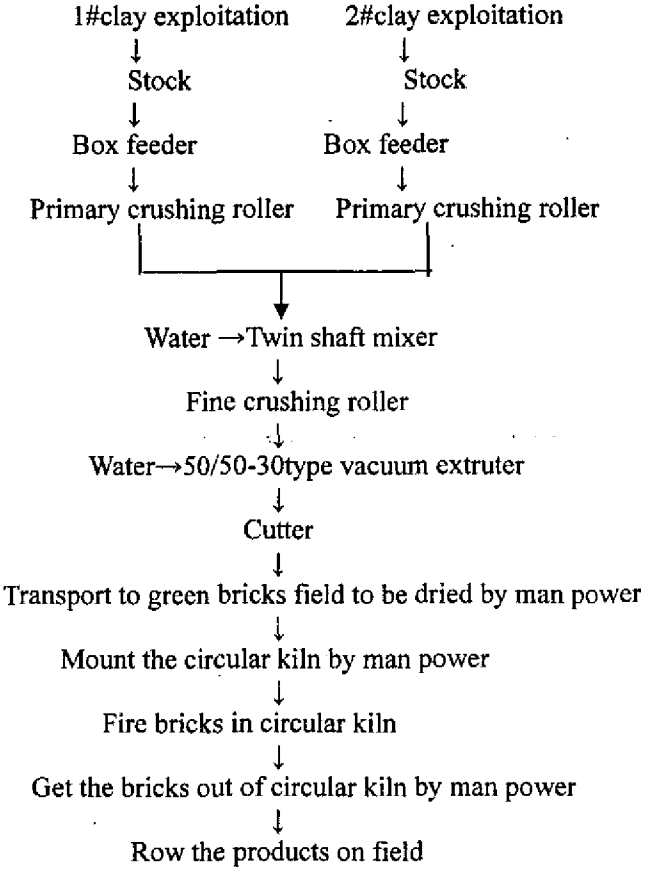
—Raw materials crushing: two staged crushing measure was adopted and one more smashing roller machine was used to make raw materials more fine so as to improve the quality of product; a double shaft milling machine was renewed to enhance the uniformity and stability of the mixture of raw materials and water.

—Molding: the former 40/50 extruder auger was washed out and a JZK50/50-30 screw auger of vacuum extruder was introduced in order to get better extrusion result with the extrusion pressure increased and rate of qualified products was improved from the former 80% to 90% now. The abrasive tool for brick machine was updated, wear resistant ceramic materials were put into use, holes arrangement has changed to make them more suitable for the modules in building and increase the hole rate of fired perforated bricks (rectangular hole) from 26% to 33%. Former clay column cutter machine was replaced by vertical cutter so that clay column rate can be improved from 88% ~90% to over 98% and the power consumption can be decreased

over 8%; the immediate incremental capacity and power saving compensation condenser was added to improve and sustain the power factor at over 0.95 so as to conserve electricity with reduction of power consumption.

——Firing: improve the drainage system of green bricks field, reduce the loss of green bricks resulting from the rainy season or immediate severe rainfall; an old circular kiln was washed out completely; instead, a new circular kiln of energy conservation was built at the former site; and the tops of other two circular kilns were overhauled.

The technical process of production line after technological improvement:



In addition, both the managers and technical staff of important posts in the plant were trained, the energy consumption control system, operational regulations and process of all posts as well as test system of products quality were established and improved, the quota duty management system, prize and penalty system, the monitoring and control system of consumption index were enhanced so as to make the

management of each production process have its source and record.

3. Project Achievements

The plant produces rectangular bricks through EE technological improvement. The products grade is MU15 without efflorescence and structure damage, without crack, without frost damage, but has rectangular holes arranging interleaving in order. The holes rate reaches 31%, the quality of product meets the requirement of the national standard GB13544-2003-the first grade of <Firing Perforated Bricks>; the annual energy conservation achieved 1,298.11 tce, CO_2 emission is reduced by 3,236.18 tons.

The technological index comparison before and after technological improvement is listed in Table 1.

Table 1 Technological Index Comparison Table

Index		Unit	Before improvement	After improvement
Output		(Common brick) 10,000 pieces/year	3,400	5,000
Qualified products rate		%	80	90
Hole rate	Firing perforated bricks	%	26	33
Coal consumption		kg(tce) /10,000 pieces	1,250	1,000
Power consumption		kW·h/10,000 pieces	165	145

After technological improvement, the annual production capability enhanced from 30 million pieces (amounts to common bricks) to 50 million pieces and the employees increase from 156 to 260. The IRR of the project is 16.14%, the payback period of investment, including building period is 6.87 years and the FNPVR amounts to 140,750 US dollars.

After EE technological improvement, the plant was awarded the member of Xi'an Bricks Association, "The excellent building material enterprise in Shaanxi" by Shaanxi Building Material Association in 2005 and the national famous and excellent products.

Through EE technological improvement, the plant reduced energy consumption and cost greatly, it plays a perfect example role in the brick industry of TVEs in China. Currently, there are over 160 brick plants dispatched staff to visit the plant and learn from them. Especially the managers from brick plants of Chongqing, Zhejiang and Hunan were ready to have EE technological improvement after visit and replicated the power saving technologies, such as EE circular kiln and variable-frequency controller, and rectangular perforated bricks production technologies. The persons of brick industry both at home and abroad including Bengal and Guinea also came to visit the plant and will make it as their example to build such plants in China.

At the moment, the annual clay brick output in China is about 500 billion pieces (amounts to common bricks) with coal consumption of about 62.5 million tce. In some brick plants, the coal consumption of each ten thousand pieces bricks even reaches 2.5tce. If those plants can introduce and adopt EE technology, we assume that the coal consumption will be reduced from 1.25 tce to 1tce, they will conserve energy 1.25 million tce annually.

4. Analysis of Experience and Lessons

(1) Technological Screening

There are about 360 brick plants in the project implementation area-Xi'an. The average output of each plant amounts to 15-30 million standard bricks with small scaled production. Most of them use clay as the raw materials to produce brick fried with combustible additives with round perforated bricks and hollow bricks. They adopt only one crushing roller to crush, one mixer, molded by vacuum extruder and dried by natural conditions. The green bricks are fired by the old circular kiln and got out by man power. The obsolete technical process, old equipments, especially the simple structure of kiln for firing and without ventilation system or with unreasonable ventilation system all result in high energy consumption and incomplete combustion. The brick plant in Liu village before its technological improvement is the typical one among the enterprises. The other enterprises have the same problems with it, therefore

the EE technology chosen by the pilot enterprise is the only solution of technological problems.

And also the replication in Xi'an and Xianyang fully proved this. The main EE technology in Xi'an replicated area includes: circular kiln improvement, technical and equipment alteration, power change, and drainage system promotion in green bricks field; the main EE technologies in Xianyang replicated area includes: newly establishing or rebuilding of circular kiln, improvement of technical process and equipments and power enhancement. These technologies have been practiced in the plant in Liu village as the example to avoid many risks, and therefore were carried out successfully in replication enterprises.

(2) Policies Driven-Incentive System

With the issuance of solid clay bricks production forbidden policy and the intensity of implementation in Shaanxi province, Xi'an has been listed of one of the 170 cities, published by Chinese government in the first group, in which solid clay bricks are forbidden. The current equipments in brick plants cannot meet with the requirements of EE and new standard, which drive enterprises to make technological improvement. In addition, the plant promises to conserve energy and reduce GHG emissions through signing EE voluntary agreement with local government of Baoqiao District, Xi'an. The local government implemented favorable policies which stimulated the enterprise to make EE technological improvement.

The main policies issued in recent years in Shaanxi province and Xi'an city include:

The 8th article of No. 59 document, <The renovation of wall materials and control method for EE building in Shaanxi>, prescribe "New construction and extension of solid clay bricks production lines are forbidden. The existed plants which produce solid clay bricks must be confined in the same address and output. To produce solid clay bricks in another address is not allowed."

No. 26 document of <The notice about make efforts to build the energy conservation society of Shaaxi government>, issued by Shaaxi government (2005)

proposed "intensify the control and protection of farm fields, resist the behavior of destroying farm fields for bricks. On the base of accomplishment of solid clay bricks forbidden in 10 cities this year, the policy implementation will be replicated in small and middle sized towns and villages. Push forward the reclamation of farm."

(3) Market Demand

There are about 360 brick plants in Xi'an currently, which annually produce 7.2 billion bricks (amounts to standard bricks) on average. 90% of the plants are TVEs and private plants. They have relative obsolete equipment, low level of management and poor quality of products. With the China's Western Development Program going on, we expect that the bricks demand in the future years in Xi'an will be increase with the rate of 5%-7%, which shows a huge market potential demand.

(4) Promotion of the EE incentives

Through implementation of the project and signing of EE voluntary agreement, managers of enterprise, technical staff and other employees fully realized the close relation between the output, quality as well as EE and their our own labor. This enhances the sense of duty greatly, improved the production efficient and qualified products rate significantly, reduce the energy consumption and strengthen management benefit. In addition, the managers of enterprises realized the energy, environmental and financing policies in China and also collect much useful information which can guide the development of enterprises through project implementation and training.

Case(2) —Gaoping Xinggao Coking Group Co. Ltd.

In order to assist TVEs in the fields of cement, foundry, brick and coke to clear the obstacles of technologies, marketing, policies, financing and internal systems of enterprises when the high efficient and energy conservation technology were adopted, to enhance the competitiveness of TVEs in digesting energy conservation and pollution reduction technologies through market and therefore realize the reduction of CO_2 emissions, GEF raised money to support "Energy Conservation and GHG Emission Reduction in Chinese TVEs" project (hereafter as TVEs project). The aim of which is to reduce GHG emissions through introducing and adopting EE technologies in the fields of brick, cement, foundry and coke. The project will clear the main blocks of marketing, policies and financing in production, sale and adopting EE technologies as well as applying products within the four industries. This project adopted comprehensive, innovative and market transformation ways with great goals to promote TVEs energy conservation implementation. This case is to analysis Gaoping Xinggao Coke Co, which is one of the nine pilot enterprises chosen by TVEs project.

1. Brief Introduction of Plant

Gaopign Xinggao Coking Co locates in Jincheng, Shanxi province and was established in 1996. It has fixed assets of 300 million RMB and 350 employees. The company is the first large sized private enterprise with anthracite as the main materials for coking. It has the production capacity of 0.5 million tons of I grade metallurgy coke and II grade foundry coke.

In order to develop the coke industry with "white coal", Xinggao Coking Co decided the long term plan of parallel development of coke and power and attaches same importance to environmental protection and economic benefits. The first stage construction of waste heat power generation plant of Xinggao Coking Co: condensing

turbine power generation units, and the 8×20t/h waste heat oven and its auxiliary equipments were established and put into production on Sept. 12th, 2005, thus the plant can generate 120 million KWh annually. The waste heat for power generation plant is a typical example of comprehensive utilization of resources. The project was invested 67 million RMB, which included 0.1 million US dollars from GEF to buy, mount and adjust EE equipment and staff training.

2. Technological Measures and EE Management

The anthracite production line with annual output of 0.4 million tons of Gaoping Xinggao Coking Co adapted the QRD—2000 clear-type thermal-recovery stamping mechanical coke oven, designed by Shanxi Chemical and Industrial Research Institute and applied for the invention patent. The equipment is operated through negative pressure and generates power with waste heat. The auxiliary engine introduced hydraulic stamping technology and straight coke receiving technique. During the technological improvement process of production line, Xingao Coking Co carried out "three simultaneities" measure, choose the type of key technologies and equipments as well as the environmental protection machines carefully, make serious research on the production technical process and key technological position so as to improve the design, perfect the treatment capability of the whole production line to the environment and achieved significant energy conservation and environmental protection results.

The smoke emitted by the stamping charged coke oven has the temperature of 1050℃, if the waste heat can be utilized, then the not only local environment can be improved but the heat can be used for oven to heat up the water. When the water becomes superheated steam and be supplied to the turbine units, then power will be generated. The power generation plant adopts 8 waste heat ovens with 20t/h and 2 condensing turbine power generation units with 15MW to produce 120GWh power annually. After one week (Sept.13th-Sept.18th) trial operation of the power generation units, the whole power generation units operated stably and reached the designable

power generation capability.

3. Project Achievements

The project can transform the waste smoke with high temperature to 120 million KWh power annually, conserves 46 thousand tce, reduce CO2 emission by 115 thousand tons and decrease 30 thousand tons of oven ash emissions. The construction of the plant solved the problems of staff warming in Xinggao Coking Co in winter, hot water for staff bath, cooking for staff restaurant, and they also replace the coal with steam of the power plant to boil water for drinking, all of which result in energy conservation of 260 tce(amounts to 364 tons coal for power), CO2 an be reduced by 953.3 tons, and oven ash emission reduction reach 110 tons.

The clean type waste heat reclamation oven which is adopted by the plant does not reclaim coal chemical products. The whole system operates under the negative pressure make completely combustion of the side product of coking for power generation and reduce the harmful emissions in the largest degree; coal and the coke were stamped integral loading and integral unloading so as to avoid pollution to the environment during coal loading and coke discharge. It is clean in the factory without coking smell which is noticed by the national factories of coke for its garden like factory area.

However there are still some problems existing: owning to the high price of oil in the international market, oil conservation should be focused. So someone thinks that it is better to reclaim the chemical products such as benzene and tar than directly combust the smoke of coking, the economic benefits still needs to be demonstrated comprehensively. Therefore, it is not easy to replicate the pilot to the whole country. In addition, the project to transform the smoke of coking with high temperature to 100 million KWh can bring 25 million RMB production value for the enterprise annually, create jobs for 75 persons, and bring profit and tax of 15 million RMB for the enterprise and the society.

Xinggao's achievements in environmental protection and EE gained approval of

the authoritative institutes, has been named as "the pilot coking enterprise for environmental protection" by UNEP, and awarded "excellent enterprise" by four departments including development research center of State Council. The project <The technological improvement plan of annual 0.4 million tons of anthracite for coking> has been listed as "torch plan" project by the State Science and Technology Ministry.

The constructed power generation plant is under condition of clean, less pollution and normal production with full capacity. The project plays a pilot role for the government establishing industrial economic benefit chain in TVEs, make contribution to increase the TVEs economics proportion in the national industry and provide strong demonstration for the government to establish technological regulation for environmental protection in coking enterprise. Up to date, More than 40 national coking enterprises visited Xinggao and decided to replicate the production pattern. Among which, 13 coking enterprises from 8 provinces have dispatched 14 groups of staff to be trained in Xinggao. At the same time, 10 Indian coking enterprises visited Xinggao and began to replicate the production pattern and 3 of which has dispatched staff to be trained in Xinggao.

4. Analysis of Experience and Lessons

(1) Technological Screening

Gaoping Xinggao coking factory was former equipped refined machinery ovens, which originate from Europe and been used for over 150 years. Owing to the high energy consumption and large amount of harmful and poison elements such as smoke, BENZO, BSO, H_2S and CO_2, taking the high cost for treatment into account, the techniques is decreasing and will be obsolete, but it is still be widely used in China. The air of this area which the plant located is polluted seriously and has the typical characteristic of coking enterprises.

The clean type coke over does not reclaim coal gas but to combust them in the upside room of carbonization chamber or in the channel of oven bottom. The heat

from this process can be used for coking. And since air is compensated in the sharing smoke pass on the top of oven, the elements can be combusted completely of coal gas to clear the harm. Hot waste gas enters into the oven to generate steam for power. Since there is negative pressure in carbonization chamber during coking, the waste gas is desulfurized and dust cleared and will have good environmental result.

The low level coking production in China polluted environment and wasted energy. According to the experts, coking production diffused or released 20 billion m3 coking gas directly in 2005. The low level technologies equipment shows in two aspects: one is low level production technologies equipment, the old technologies amounts for larger proportion in coking industry. In coking enterprises of Shanxi TVEs, small type of ovens such as TJ-75 type refined oven, Red flag type oven, small 58 and WJ 663 are still used widely, only half of ovens meet with the requirements of national industrial policies and development trend. The other is that obsolete equipment for pollution control leads to low smoke and dust reclamation rate of coal loading and coke discharge, low treatment rate of desulphurization and De-NOx as well as the deep treatment and reclamation rate of polluted water. Furthermore, we suffered imperfect treatment facilities of environmental protection with low operational efficient.

Currently, Chinese government is setting down more and more severe standard of environmental protection, which forced many coking enterprises with serious pollution to seek for new and clean production ways. With shutting of the primitive coke (including refined coke) oven and machinery coke ovens with the height of carbonization chamber under 4.3 meters, the coke production capacity will be reduced by 30 million tons only in Shanxi. However, the project creates alternative technological way for coking improvement, harmonious development of environmental and economics in coking industry with its advanced techniques, perfect environmental protection results, less investment, large IRR, high resources utilization rate and good quality of coke.

(2) Policies Driven-Incentive System

This is a typical example demonstrating sound interaction between pilot enterprise and policies. On the one hand, the project has adopted clean type of heat reclamation coke oven and techniques of power generation by waste heat which bring sound economic, social and environmental benefits and raised the attention of relative departments of Shanxi and central government. The project has been listed as new project with high benefits by the State and its technologies have been regarded as important replicated technologies of coking industry by Shanxi (an important province for coke production) government. The influence of project to the relative policy makers in TVE bureau is reflected in the guidelines because the LPIC of pilot area was built in TVE bureau. On the other hand, from 1997, the central government began to issue some policies for washing out the old coking techniques. In order to carry out the policies, the local government has issued <The method for restructuring coking industry in Shanxi> in 2003, the TVE bureau in Shanxi has set down <The guidelines about updating and restructuring coking industry in Shanxi>. Both documents have driven the enterprises to carry out the EE technological improvement. In addition, the enterprise signed the voluntary agreement with Gaoping government and enjoyed some favorable policies made by the government.

(3) Financing

A provincial energy fund has been established in Shanxi which supported a group of TVEs including two pilot enterprises to invest EE project.

(4) Market Demand

Shanxi is the coke base of China and even all over the world, and TVEs are the major of coke industry in Shanxi. In 2000, Shanxi government began to restructure in coke industry, put down the primitive coke and refined coke, plan to build a group of modern middle and large sized coking enterprises, enhance the overall equipments level in coking industry and change the old, dirty and rough conditions in coking industry completely. But there are still some enterprises have not introduced suitable

techniques, therefore there is still huge potential for EE and comprehensive utilization of resources. Energy conservation and environmental protection have been become the focus of the world now and also be the important problem for China to solve during we realize the goal of EE and friendly environmental society and the new social rural areas establishment.

(5) Promotion of the EE incentives

Through implementation of the project and signing of EE voluntary agreement, managers of enterprise, technical staff and other employees fully realized the close relation between the output, quality as well as EE and their our own labor. This enhances the sense of duty greatly, improved the production efficient and qualified products rate significantly, reduce the energy consumption and strengthen management benefit. In addition, the managers of enterprises realized the energy, environmental and financing policies in China and also collect much useful information which can guide the development of enterprises through project implementation and training.

Case(3) —Taiyuan Gangyuan Coking Co. Ltd.

In order to assist TVEs in the fields of cement, foundry, brick and coke to clear the obstacles of technologies, marketing, policies, financing and internal systems of enterprises when the high efficient and energy conservation technology were adopted, to enhance the competitiveness of TVEs in digesting energy conservation and pollution reduction technologies through market and therefore realize the reduction of CO_2 emission, GEF raises money to support "Energy Conservation and GHG Emission Reduction in Chinese TVEs" project (hereafter as TVEs project). The aim of this project is to reduce GHG emission through introducing and adopting EE technologies in the fields of brick, cement, foundry and coke. The project will clear the main blocks of marketing, policies and financing in production, sale and adopting EE technologies and products within the four industries. This project adopted comprehensive, innovative and market transformation ways with great goals to promote TVEs energy conservation implementation. This case is to analysis Taiyuan Gangyuan Coking Co, which is one of the nine exemplary enterprises chosen by TVEs project.

1. Brief Introduction of Enterprises

Taiyuan Guangyuan Coking Co locates in the coal chemical area of Dongyu town, Qingxu County, Shanxi province. The company was established in 2002, covers area of 450 mu and has fixed assets of 55 million RMB and 418 employees. The core business of the company is metallurgy coke, exports its own products and imported equipments, parts and materials for production. Gangyuan Coking Co introduced QRD clear-type thermal-recovery stamping mechanical coke oven with 1×40 holes and the advanced techniques of ovens from US and Germany. The project, with the characteristic of high mechanization, good quality of products and big proportion of local coal blending utilization, has been listed as excellent project by the ETC in

Shanxi province. The annual coke output with good quality reached 0.45 million tons, realized production value of 166 million RMB and profit and tax of 40 million RMB. The other coke oven with the same type has been constructed and will be put into use by the end of this year.

The company carried out EE technological renovation - waste heat for power generation. 61.85 million RMB was invested to the project including 99950 US dollars from GEF to support the company to compile the feasibility report and initial design of power generation plant establishment.

2. Technological Improvement Measures and Energy Efficient

The smoke emitted by the stamping charged coke oven, which is used by Gangyuan Co, has the temperature of 1050℃, if the waste heat can be utilized, then the not only local environment can be improved but the heat can be used for oven to heat up the water. When the water becomes superheated steam and be supplied to the turbine units, then power will be generated. Therefore, Guangyuan decided to make full use of the smoke emitted by its oven to establish a power generation plant. The project can not only relieve the smoke pollution with high temperature to the environment but to narrow the gap between supply and demand for power.

According to the amount and heat content, the project will be built as 4×25t/h middle temperature, middle pressure oven with 3×6MW condensing turbine. In addition, the company now has the pressure of 15000m^2 for warming. In winter, the company used their own small ovens for warming which had low combustion efficient and made severe pollution. After construction of the project, the company expect to use the turbine power generation units to extract gas for heat resources and then build a heat exchange station so as to replace the small boiler room and to supply the current facilities for warming and new added warming pressure because the establishment of power plant.

3. Project Achievements

The project was planed to be finished on Mar. 1st, 2005, but it has not been carried out until now owning to the internal reason of the company. The expect EE results include : the annual power supply is 9.27×10^7kW•h after operation, newly added energy stands for 41364.00 tce/y and annual CO_2 reduction will reach 103120.45 tons. After project began to operate, the four ovens for waste heat utilization not only can reclaim all the smoke with high temperature emitted by the 2×40 holes coke oven, but to release to the air the smoke release to the air after passing desulfurizing fittings in order to reduce environmental pollution and make great contribution to environmental protection.

The total investment to the project will be 6184.6RMB with PPI of 4.14 years, IRR of 34.67% and FNPVR of 10.046 million RMB.

4. Analysis of Experience and Lessons

In fact, the feasibility report and initial design of the project have been completed but the technological improvement has not been implemented for many reasons. Since the achievements of TVEs projects have exceeded the original goal, the enterprise will not bring negative influence to the whole project. Moreover, the enterprise may carry out the project when it is possible, therefore, it is not proper to say that the pilot project failed completely. But to analysis its deep reasons can avoid the similar conditions in the future. We think there are two reasons worthy of our attention: on the one hand, the industrial environment in China at that time matters. At that time, the sustainable rapid growth of domestic economy widened the gap of power supply and demand. Especially the rapid growth of high energy conservation leads to industry heavy structure, power consumption for each unit of GDP growth incessant climb back which reduced the power support to the economics. The persistent high temperature, drought and lack of water made the condition even worse. In addition, the coal shortage for power generation and more operational suspension of the power

units without plan also intensify the lack of power supply in some degree. Many enterprise were worried by the black out of large areas, some companies were forced to buy power generation units and generate power by themselves which lead to price soaring of units. Even to buy the power generation units with high price also needs to wait for a long term, hence it is easy to understand why the company gave up the project temporarily while taking its economic condition into account.

On the other hand, it is important to choose suitable enterprises and management team. Through close contact, we noticed that, the management team of the company did not fully understood the significance of the energy conservation and GHG emissions reduction while only focused on the extra benefits brought about by power generation with waste heat to the company. Therefore, when the power generation cannot bring more economic benefits to the company, it invested the capital to other fields such as coal mine and real estate for more benefits but to give up the EE technological improvement.

Case(4) —Huangshi Lufeng Cement Co. Ltd. in Hubeui province

In order to assist TVEs in the fields of cement, foundry, brick and coke to clear the obstacles of technologies, marketing, policies, financing and internal systems of enterprises when the high efficient and energy conservation technology were adopted, to enhance the competitiveness of TVEs in digesting energy conservation and pollution reduction technologies through market and therefore realize the reduction of CO_2 emission, GEF raises money to support "Energy Conservation and GHG Emission Reduction in Chinese TVEs" project (hereafter as TVEs project). The aim of this project is to reduce GHG emission through introducing and adopting EE technologies in the fields of brick, cement, foundry and coke. The project will clear the main blocks of marketing, policies and financing in production, sale and adopting EE technologies and products within the four industries. This project adopted comprehensive, innovative and market transformation ways with great goals to promote TVEs energy conservation implementation. This case is to analysis Huangshi Lufeng Cement Co, which is one of the nine exemplary enterprises chosen by TVEs project.

1. Brief Introduction of Enterprise

Huanshi Lufenf Cement Co was founded in October, 1995 and locates in Tieshan District of Huangshi city. It has rich mine resources such as lime stone mine and clay mine and can make use of local copper mine tailings and mine tailing s from Wuhan Steel and Iron Group. Currently , it has four set of Φ3×11M mechanical shaft kilns, four 2.2×7M grinding machines with an annual production of 500 thousand tons of P.O32.5, P.O42.5 and P.S32.5. The products are welcomed by Wuhan market and the markets around and were awarded of salable products in Wuhan. The company also gained one of the ten top enterprises in cement industry in Hubei province. It has

perfect management system and have got the ISO9002：94 certificate.

In July of 2005, the company carried out EE technological improvement and finished in the middle of March, 2007. The total investment into the project is 7 million RMB and 70 thousand US dollars of which was invested by GEF to compile the feasibility report, buy, mount and adjust EE equipments as well as the staff training.

2. Technological Improvement Measures and Energy Efficient

Currently, the company has four set of mechanical shaft kilns. The main techniques includes five parts: materials, grinding system of materials, the grain-size of cement raw material globule system, milling system for cement production and cement packing system. In order to improve the quality of products and energy efficient, the company finished 16 technological improvements for mechanical shaft kiln at different period under the efforts made by the enterprises and the project so as to perfect the production techniques and enhanced the overall level of production line. The EE technologies adopted by it include:

——pre-uniformity of raw material technology;

——uniformity of raw material and cement technology;

——the raw materials proportioning plan improvement and choosing technology;

——ratios of raw material and heat proportion of black raw material technology: use calorimeter to alter electronic belt balance materials proportioning system;

——pre-grinding technology: Change the former twoΦ150×750 type Hammer Crashing Machines toΦ250×1000 type and add two set of revolving screens to form closed-circuit and grinding technique;

——grinding aids technology;

——application of new mill: a. Change the stepped liner to channel liner b. to

adopt deformed grinding block;

——application of high efficient air separator: replaced the former fourΦ4.0 type rotary air separators in the raw material system byΦ700 type high efficient roller separator; changed the fourΦ2000 type cyclone separators in cement production system toΦ700 type high efficient roller separator to increase the air separators efficiency from 60% to 80%;

——pre-water module and small nodule calcinations technology: through the adjustment to the angle, height and rotary speed of balling pan; to control the water supply by frequency conversion technology; to measure the raw materials by screw auger; so as to control the nodule at Φ4～7mm, speed the clinker burning reaction and increase the output.

——the supporting technology of EE liner of shaft kiln

——dust treatment technology of shaft kiln: choose circle electronic dust collector so as to sustain the dust emission concentration under 50mg/m^3

——quality control and management technology during production process;

——chemical equipment analysis and physical testing technologies;

——comprehensive utilization of resources technology;

——frequency conversion control technology;

——bulk cement technology;

3. Achievements of Project

(1) EE Results

After EE technological improvement, the quality of products is increased, the put of clinker: 14.2t/h; the three-day strength of clinker is over 32.2MPa, 28 –day strength is over 54MPa, the qualified products rate with f-CaO less than 2.5% reaches 90%, the qualified products with Loss≤1% amounts to 98%, the standard rate at one time of cement grinded by open circuit mill stands for 95%. The 3-day resistant strength of 32.5 grade ordinary Portland cement which is the core products of the company is 18-20MPa and the 28-day resistance strength amounts to 38-41MPa. Energy

consumption of clinker is less than 126kg / tcl, heat consumption of clinker reaches 3690kJ / kg, the comprehensive power consumption of each ton of cement is under 67kWh. The annual energy consumption 8720.54 tce and reduce 21740.29 tons of CO_2 emission.

（2） Economic Benefits

Through the technological improvement, the comprehensive power consumption decrease from the former 75 kWh / t to 67 kWh / t; the standard coal consumption of clinker dropped from the former 150kg / t to 126kg / t. If we assume the annual cement production is 0.5 million tons, the company can save 3 million RMB annually and gain back the 7 million investments in three years.

After technological improvement, the company gained honors for itself and its products.

（3） Social Influence

TVEs project is helpful to establish and develop the environmental protection idea of citizens within the pilot area as well as train the staff from the company of EE and environmental protection to enhanced their technological capability. To assist the company to find a way for benefit increase, create more jobs for the surplus labors in the village, enhanced the income of the local farmers and promote, TVEs project plays more important role in the urbanization of villages through pilot company development. And at the same time, the implementation of technological improvement promoted the working environment, pushed forward the environment enhancement and the comprehensive utilization of resources, helped the company to get rid of the pollution fetter and had profound influence to bring the company to a sustainable development way. The project practice has provided a scientific development way for the TVEs to strengthen the capability and undertake a sustainable way. TVEs sustainable and rapid development must push the quick urbanization in China in the future.

（4） Replication of Results and Potential

The project helps the enterprise to solve the problems during development process, during real benefits for it. The company also saw the effects brought about by the technological improvement so that the voluntary of technological improvement was enhanced. This company plays a role of example and had positive influence to the other companies of cement. The base of spontaneously replication is that the enterprise can get the expect benefits through the technological improvements. Only if the base is not changed, the spontaneously replication still will increase in the near future.

4. Analysis of Experience and Lessons

(1) Technological Screening

In the cement industrial policies of "Eleventh Five –Year Plan", the government forbids the shaft kiln cement of any scale, the rotary kiln of other kind and wash out old technical equipment such as the shaft kiln, hollow dry process rotary kiln and wet kiln gradually. This does not mean to shut up all the enterprises with shaft kiln in short term. Especially to the large amount of small towns all over the nation and diffused rural cement markets, it is not proper to develop large and dry process production lines but only suitable for the operation of small and middle sized enterprises. The cement industrial structure of coexistence of small, middle and large sized enterprises will not change for a long time. Small and middle sized enterprises are still the important components of national cement industry. Therefore, we should advocate the technological improvement to the shaft kilns and make the energy consumption and all technologies can meet the national standard and the requirements of conservative society.

(2) Policies Driven-Incentive System

Most of the equipments in existed cement companies cannot meet with the energy conservation and new standard which forced the enterprises to make technological improvements. In addition, the company signed voluntary agreement on energy consumption with Tieshan government of Huangshi city, Hubei province,

promised to realize EE and CO_2 reduction goal and enjoyed the favorable policies made by the local government.

(3) Promotion of the EE incentives

Through implementation of the project and signing of EE voluntary agreement, managers of enterprise, technical staff and other employees fully realized the close relation between the output, quality as well as EE and their our own labor. This enhances the sense of duty greatly, improved the production efficient and qualified products rate significantly, reduce the energy consumption and strengthen management benefit. In addition, the managers of enterprises realized the energy, environmental and financing policies in China and also collect much useful information which can guide the development of enterprises through project implementation and training.

Case(5) —Yingde Baojiang Cement Material Co. Ltd.

In order to assist TVEs in the fields of cement, foundry, brick and coke to clear the obstacles of technologies, marketing, policies, financing and internal systems of enterprises when the high efficient and energy conservation technology were adopted, to enhance the competitiveness of TVEs in digesting energy conservation and pollution reduction technologies through market and therefore realize the reduction of CO_2 emission, GEF raises money to support "Energy Conservation and GHG Emission Reduction in Chinese TVEs" project (hereafter as TVEs project). The aim of this project is to reduce GHG emission through introducing and adopting EE technologies in the fields of brick, cement, foundry and coke. The project will clear the main blocks of marketing, policies and financing in production, sale and adopting EE technologies and products within the four industries. This project adopted comprehensive, innovative and market transformation ways with great goals to promote TVEs energy conservation implementation. This case is to analysis Yingde Baojiang Cement Material Co, which is one of the nine exemplary enterprises chosen by TVEs project.

1. Brief Introduction of Enterprise

Yingde Baojiang Cement Material Co locates in Shihuipu town of Yingde, Guangdong province with the distance of 20 km to Yingde city. The pilot enterprise was founded in 1994 and has 126 employees including 37 technical staff now. It has two sets of shaft kilns with annual output of 200 thousand tons of Portland cement.

It carried out technological improvement in 2005 and finished in the middle of January, 2006. The total investment to the project is 188 million RMB including 0.1 million US dollars by GEF to compile the feasibility report, buy, mount and adjust the equipments and the staff training.

2. Technological Improvement Measures and Energy Efficient Management

To establish a 2500t/d NDP line to replace the current two sets of shaft kilns. After construction of the new line, the former shaft kilns will be shut up. The new line will adopt pre-calciner kilns, composed by Φ4×60m rotary kiln and one stream low pressure cyclone pre-heater of five grade with separate line calciner. The new line will introduce DCS with advanced technology and credible performance to concentrated monitoring, operational and diffused control and realize the modern production and management.

3. Project Achievements

(1) Energy Conservation and CO_2 Reduction Achievement

Yingde Baojiang Cement Material Co established NDP using anthracite as fuel in 2004. After the new line was put into production, the annual energy conservation reached 11,865.53 tce and annual CO_2 emissions reduction realized 29,580.76 tons. Not only the energy and GHG emission reduced greatly, but all types of main contamination emission also dropped significantly, especial the SO_2 emissions reduction which is only 40% of that before the project implementation. The technological results of Yingde Cement Material Co have some use for the reference for the SO_2 emitted enterprises of the same industry within the control area of acid rain.

(2) Economic Benefits

The production of cement is composed by electricity, coal and limestone. From 2004 beginning, owning to the drop of cement price while the raw material, fuel and power price growth, the profit of cement industry slipped down severely. The implementation of the project decreased the production cost of pilot enterprise and gain profit room for the enterprise.

(3) Social Effects

The implementation of the project enhances the environmental protection consciousness in the public and created 108 jobs for farmers which amount for half of the total staff. The project promote the development of enterprise itself and then bring more jobs for farmers, increase the income of them, altered the working environment of enterprise, optimize the utilization of environment and land, improve the welfare of weak groups, enhance the local women's status and strengthened social security of employees in some degree and some extent.

(4) Potential for Replication

Currently, there are still too many shaft kilns and enterprises with other old techniques in Chinese cement industry which leads to the energy waste and severe pollution. During the longer period, the NDP and its equipment possess all the characteristics of modern cement industry and the reflection of cement industry to undertake the new industrialize way. The production capacity of NDP only stood for 40% in the late of 2005, there is nearly 60% production should be washed out or reformed, and replaced by NDP finally.

4. Analysis of Experience and Lessons

(1) Technological Screening

The main burning equipment mainly adopted pre-calcining technology, multi-stage heater, dust clear techniques for environmental and high-degree automation. The NDP is on behalf of the modern technological development level for cement production recognized by the international community. It has the characteristics of large production capacity, high automation, products with good quality, low energy consumption, low harmful emissions and utilization of big amount of industrial waste and becomes the main technology in cement production all over the world.

Currently, there are still too many shaft kilns and enterprises with other old techniques in Chinese cement industry which leads to the energy waste and severe pollution. During the longer period, the NDP and its equipment possess all the

characteristics of modern cement industry and the reflection of cement industry to undertake the new industrialize way. The production capacity of NDP only stood for 40% in the late of 2005, there is nearly 60% production should be washed out or reformed, and replaced by NDP finally.

(2) Policies Driven –Incentive System

In the cement industrial policies of "Eleventh Five –Year Plan", the government forbids the shaft kiln cement of any scale, the rotary kiln of other kind and wash out old technical equipment such as the shaft kiln, Hollow Dry Process Rotary kiln and wet kiln gradually. The pilot enterprise lies in Guangdong and is limited by more policies.

(3) Promotion of the EE incentives

Through implementation of the project and signing of EE voluntary agreement, managers of enterprise, technical staff and other employees fully realized the close relation between the output, quality as well as EE and their our own labor. This enhances the sense of duty greatly, improved the production efficient and qualified products rate significantly, reduce the energy consumption and strengthen management benefit. In addition, the managers of enterprises realized the energy, environmental and financing policies in China and also collect much useful information which can guide the development of enterprises through project implementation and training.

Explanation on Caculation of "Energy Conservation Cost"

1. Defination of Energy Conservation Cost

The energy conservation cost with the unit of yuan/tce(or yuan/kWh) is to divide the annually added costs by the energy amount conserved every year during the life span of the products, and also taking the discount rate into account. Costs of energy conservation (CE) only include the financial costs beyond the baseline (for an example, the financial costs over the baseline – the cement plant itself, after the cement introduced the waste heat power generation technique). Otherwise, the other parts of project activities and the correspond costs irrespective to the energy conservation should not be included in the borderline of energy conservation (for an example, the costs of production enhancement).

2. Method for caculating the costs of energy conservation

The caculation of energy conservation costs of this project adopts the bottom-top methods on the assumption of the same costs on added energy conservation, the formular is as following:

$$CE = \frac{Invest \cdot CRF + (c_2 - c_1) \cdot P_2}{EF}$$

CE—Costs of energy conservation，yuan/tce；

Invest—Investment on the technical improvement of the energy conservation project，yuan

c_2-c_1—The average added cost for each unit of the products，c_2 is the cost of each

unit of products after technical improvement and c_1 is the costs of each unit of product before that, yuan

P_2- The annual production after technical improvement

EF—The annual amount of energy conservation，tce

CRF=I/PWF

PWF——The index of present value.

$$PWF = \sum_{t=1}^{n} \frac{1}{(1+i)^t} = \frac{1}{i}\left[1 - \frac{1}{(1+i)^n}\right]$$

i—Discount rate

n—Life span of the project，year

The costs of energy conservation do not depend on the current price or the expected price of the energy in the future, but are only relevant to the added price and energy efficiency of the energy conservation product. Therefore the technology for energy conservation should be improved and promoted consistently and will be replicated widely only the costs of energy conservation are reduced. If the costs on energy conservation are higher than the charges of energy, the economic benefits of costomers are damaged; otherwise, costomers will gain the economic benefits.

Project Number: *CPR/99/G31/A/1G/37*

Project Title: *Energy Conservation and GHG Emissions Reduction in Chinese TVEs - Phase II*

Pilot Projects: Baseline Data and Achieved/Projected Energy Savings and GHG Emissions Reduction

Annex1 energy savings of pilot enterprises:

				Baseline[1]									Technical Renovation									
No.	Sector	Pilot Plant	Plant Profile	Energy Type	Energy Use in Kind	Conversion Factor [4]	Energy Use in tce	Energy Use/ Unit Product		Annual Output Before the Renovation		Total Annual Energy Use (tce)	CO_2 Coefficient [5]	CO_2 Emissions (t/a.)	Proposed Technical Renovation	Total Investment (10,000RMB Y)	GEF Support (US$)	Project Status	Annual Output After Renovation	Energy Use/Unit Product		Cost of energy saving(¥/tce)	Energy Saving (tce/a) [6]	Energy Recovered (tce/a.) [6]	Total Energy Saving [35] + [36] (tce/a.)	CO_2 Emission Reduction (t/a.)	Remarks
1	Brick-making	Yongxing Shale Hollow Brick Co. Ltd., Xinjie, Sichuan	Raw materials: high quality shale; Products: 16 types in 3 series of high quality shale bricks, including KP1 type perforated bricks with round or rectangular holes; module multiple-hole bricks; KF series hollow brick with over 6 holes; Major equipment: 1 48-chamber Hoffman kiln; Capacity: 80 million bricks/year;	Coal/t	12,703.34	0.686	8,712.23	Coal:	1.28 tce/10,000 regular brick	7,378	10,000 regular brick/a.	9,571.91	2.493	23,862.78	Renovate the production line by replacing its semi-stiff extruding process with a stiff extruding line; increase brick perforated rate from 45% to 60%; retrofit the kiln to improve its heat insulation, reduce heat loss by 15%; enlarge the storage hut.	260	39,950	Completed	Same as that before the technical renovation.	Coal:	0.90 tce/10,000 regular brick	175.96	1,943.06		1,943.06	4,844.06	
				Electricity/MWh	2,244.60	0.383	859.68	Electricity:	0.12 tce/10,000 regular brick											electricity:	0.13 tce/10,000 regular brick						
				Subtotal			9,571.91	Comprehensive:	1.30 tce/10,000 regular brick											Comprehensive:	1.03 tce/10,000 regular brick						
2		Xi'an Luxcun Hollow Brick Plant, Xi'an, Shaanxi	Main product: clay bricks, perforated rate 25-35%. Capacity: 34 million bricks/a. Major equipment: 3 28-chamber Hoffman kilns.	Coal/t	4,000.00	0.800	3,200.00	Coal:	1.25 tce/10,000 regular brick	3,187	10,000 regular brick/a.	4,191.40	2.493	10,449.12	a) Weatherize the clay for half a year to improve the internal structure of the clay. b) Add a fine roll mill to improve the milling results. c) Add a clay purging process to improve the physical property of the clay. d) Replace the Type 40/45 extruder with a Type 50 extruder to increase productivity and reduce electricity use. e) Replace an outdated kiln with an energy-efficient Huffman kiln to reduce energy consumption. f) Add an energy efficient air blower in the kiln.	250	60,000	Completed	5,000 10000 regular bricks/a.	Coal:	1.00 tce/10,000 regular brick	253.25	1,298.11		1,298.11	3,236.15	
				Coal fly ash/t	7,900.00	0.100	790.00													electricity:	0.056 tce/20,000 regular brick						
				Electricity/MWh	525.80	0.383	201.40	Electricity:	0.06 tce/10,000 regular brick											comprehensive:	1.06 tce/10,000 regular brick						
				Subtotal			4,191.40	Comprehensive:	1.32 tce/10,000 regular brick																		
3	foundry	Dalian Jinmen Cast Pipe Co. Ltd, Dalian	Main products: ductile iron pipe fittings (T-joints, four-way unions, reducing joints, etc. in 20 series) and valves of ø50mm to ø2000mm weighing from 5 kg to 10 kg, and valves of stainless steel by precision casting. Major equipment: 5 ton cupola; 500 kg electric oven.	Coal/t	72.00	0.714	51.43	0.125	tce/t. casting	4496	t. casting/a.	562.07	2.493	1,401.25	a) Replace the existing patterning process with fiberglass epoxy patterning process to produce corrosion pipe fittings of ø80mm-1,600mm. B) Renovate the melting process by replacing the sole cupolas with a duplex melting system consisting of a cupola and a medium-frequency induction furnace. c) Develop a recovery system for used foundry sand. d) Construct a coke storage room	530	68,000	Completed	Same as that before the technical renovation.	0.091	tce/t. casting	4,557.10	152.94		152.94	381.27	
				Coke/t	509.00	0.971	494.44																				
				Electricity/MWh	42.30	0.383	16.20																				
				Subtotal			562.07																				
4		Nanjing Moling Foundry, Nanjing, Jiangsu	Products: various kinds of castings, including engine bodies for diesel engines, ductile iron castings for automobiles and civil construction, aluminum alloy castings of air-inlet bent pipes, air-inlet manifold and inlet pipe connections used for automobiles.	Coal/t	1,798.00	0.714	1,284.37	0.606	tce/t. casting	13,245	t. casting/a.	8,020.99	2.493	19,996.27	Build an automatic static pressure moulding line to produce new models of diesel engines.	2,940	100,900	Completed	13,245 t/a.	0.374	tce/t. casting	1,260.40	3,067.36		3,067.36	7,646.92	
				Coke/t	3,740.00	0.971	3,633.04																				
				Electricity/MWh	7,120.00	0.383	2,726.96																				
				Refined Oil/t	256.00	1.471	376.68																				
				Subtotal			8,020.99																				
5	Cement[2]	Huangshi Laifeng Cement Co. Ltd.	Raw materials: self-supplied limestone and clay, copper slag and cinders available from local market. Products: P.O32.5, P.O42.5 and P.S32.5 cement; Key equipment: 4 ø3×11M shaft kilns; Annual capacity: over 500,000 tons of P.O32.5, P.O42.5 and P.S32.5 cement.	Coal/t	72,311.00	0.714	51,651.75	Coal(clinker):	0.168 tce/t. clinker	308,210	t. clinker/a.	64,413.31	2.493	160,582.38	Renovate the raw meal system and shaft kilns	700	70,000	Completed	Same as that before the technical renovation.	coal (clinker):	0.126 tce/t. clinker	101.95	9,028.75		9,028.75	22,508.66	
				Electricity/MWh	33,320.00	0.383	12,761.56	Comprehensive (cement):	0.146 tce/t. cement	440,300	t. cement/a.									Comprehensive (cement)	0.117 tce/t. cement						
				Subtotal			64,413.31																				
6		Yingde Baojiang Cement Co. Ltd., Guangdong	Products: Portland cement clinkers; Annual capacity: 200,000 tons of Portland cement clinkers; Key equipment: two production lines with ø3×10m shaft kilns	Coal/t	33,632.00	0.786	26,424.66	Coal(clinker):	0.133 tce/t. clinker	198,000	t. clinker/a.	29,563.45	2.493	73,701.68	Construct a 2,500 t/D new dry cement rotary kiln to replace the two old shaft kilns. The new line will consist of a ø4.4×60m rotary kiln and a pre-calcinator with a 5-stage low pressure cyclone pre-heater. An advanced DCS controlling system will be adopted to monitor and control the operation of the production line. Construct a Hydraulic electricity station with an installed capacity of 1890kW and annual electricity generation of 5.97GWh	18,800	300,000	Completed	775,000.00 t. clinker/a.	coal (clinker):	0.111 tce/t. clinker	2,083.51	11,865.53		11,865.53	29,580.76	
				Electricity/MWh	8,195.24	0.383	3,138.79	Comprehensive (clinker):	0.149 tce/t. clinker											Comprehensive (clinker)	0.134 tce/t. clinker						
				Subtotal			29,563.45																				
7		Zhejiang Shenhe Cement Co. Ltd	Product: P.O42.5 and P.O32.5 Portland cement; Capacity: 2 million tons of P.O42.5 and P.O32.5 Portland cement; Key equipment: two vertical shaft kilns and two dry-process rotary kilns with capacity of 1,800t/d and 2,500t/d, respectively	Coal/t	101,212.00	0.714	72,295.73	Coal(clinker):	0.096 tce/t. clinker	750,000	t. clinker/a.	97,010.72	2.493	241,847.75	Generate electricity by using waste heat. Installed Capacity 3MW. Annual power production: 20.94GWh/year.	1,776	99,930	Completed	Same as that before the technical renovation.	coal (clinker):	0.096 tce/t. clinker	291.2	8,020.02		8,020.02	19,993.93	
				Electricity/MWh	64,330.00	0.383	24,714.99	Comprehensive (cement):	0.106 tce/t. cement	913,800	t. cement/a.									Comprehensive (cement)	0.106 tce/t. cement						
				Subtotal			97,010.72																				
8	coking[3]	Taiyuan Gangyuan Coke Company	Main product: metallurgical coke (1st grade). Key equipment: QRD-2000 "Clean Type" coking ovens; Designed capacity: 450,000 tons of coke/a.					1.3 ton/ton of coke		450,000.00	t. coke/a.		2.493		Generate electricity by using waste heat from coking ovens. The power plant will be equipped with 4 sets of 25t/h monotherm - medium pressure waste heat boilers,3 sets of 6000kW condensing turbine-generator, annual power production is 108GWh.		99,950	on-going	Same as that before the technical renovation.	1.3 ton/t. coke							
9		Shanxi Xiangpao Coking Group	Products: foundry coke (2nd grade) and metallurgical coke (1st grade); Key equipment: "Clean Type" coking Ovens; Installed capacity: 400,000 ton/a					1.3 ton/ton of coke		400,000.00	t. coke/a.		2.493		Generate electricity by using waste heat from coking oven. The power plant is equipped with 4 sets of 20t/h monotherm - medium pressure waste heat boilers, 1 set of 15MW condensing turbine-generator, annual power production is 120 GWh.	6,700	100,000	Completed		1.3 ton/t. coke		191.70		45,960.00	45,960.00	114,578.28	
Total																31,956	749,830						27,355.73	53,980.02		81,335.75	202,770.03	

Note:

[1]All the data were updated on Jan 31, 2005.

[2]CaCO3 decomposition was not included in the calculation of CO2 emissions in cement projects.

[3]The energy consumption per ton of coke is calculated based on the coking coal consumption, i.e. Lcoking coal/t. coke.

[4]Coal consumption per kWh in power industry is calculated based on the latest data released by the State Power Grid Company in 2002, i.e. 383g/kWh, and conversion factors for raw coal are provided by pilot plants concerned.

[5]CO_2 coefficient is quoted from "A Study on Strategy of Sustainable Development of Energy in China" (1998) issued by Chinese Engineering Academy.

Annex2 Energy-saving of replication enterprises Summary

Sector	region	number of TVEs	Anticipated Results		Actual Results	
			Energy Savings (tce/a.)	CO2 emission Reduction(t/a.)	Energy Savings (tce/a.)	CO2 emission Reduction(t/a.)
Cement	Cement 1	10	276,869.39	690,235.39	144,617.71	360,531.95
	Cement 2	10	136,535.21	340,382.29	53,667.19	133,792.30
Coking	Shanxi	7	306,783.00	764,810.02	4,596.00	11,457.83
Foundry	Tianjing	7	902.67	2,250.35	902.67	2,250.35
	Dalian	8	1,790.51	4,463.73	1,790.51	4,463.73
	Nanjing	6	1,587.30	3,957.14	1,587.30	3,957.14
	Shanxi	10	7,545.92	18,811.99	7,545.92	18,811.99
Brick	Xian	15	9,910.09	24,705.85	9,910.09	24,705.85
	Xiangyang	14	14,396.36	35,890.12	14,396.36	35,890.12
	Shenyang	16	14,792.34	36,877.31	14,792.34	36,877.31
	Chengdu	15	37,312.79	93,020.79	37,312.79	93,020.79
Total		**118**	**808,425.58**	**2,015,404.97**	**291,118.87**	**725,759.35**

cement(I):

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	EE Baseline										Proposed Technical Renovation	Project Investment				Project Status	Start-end date	Anticipated Results												Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product			Output Before Renovation		Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a)		Total (RMB ¥10,000)	GEF (US$)	Others (RMB ¥10,000)			Financial Evaluation			Production After Renovation		Energy Use/Unit Product			Capacity Added (MW)	Operation Hours/a	Energy Savings (tce/a.)	Energy Recovered(tce/a.)	Total (tce/a.)	CO2 emission Reduction(t/a.)	
1	Guangdong GITIC Green Island Cement Co., Ltd	Cement production capacity is one million tons	The company's main production equipment is fully imported from FCB Corporation in France.	Coal(t)	84,471	1.000	84,471	coal-use (clinker)	0.103	tce/t clinker	821,250	t clinker/a				3MW waste heat power generation	1,776	0	Commercial loan	0	Completion of the feasibility study report		Payback period	4.71	year	821,250	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	60,500	0.383	23,172	Electricity-use(cement)	0.108	tce/t cement	1,000,000	t cement/a							Entrustment Loan	0			IRR	26.68	%	1,000,000	t cement/a	Electricity-use(cement)	0.100	tce/t cement					
																			Self-Funding	1,776			NPV	4393	¥10,000									
																			Financial Assistance				Cost of energy saving	0.086	¥/(Kwh									
				Sum Total			107,643																											
2	Jiaozuo Jiangu Cement Co., Ltd	In 2003, the company produced cement 0.64 million tons, sold 0.66 million ton	the main equipments of which are imported from Roumania and the design capacity is 1450t/d,	Coal(t)	84,471	1.000	84,471	coal-use (clinker)	0.103	tce/t clinker	821,250	t clinker/a				3MW waste heat power generation	1,776	0	Commercial loan	0	Completion of the feasibility study report		Payback period	4.71	year	821,250	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	60,500	0.383	23,172	Electricity-use(cement)	0.108	tce/t cement	1,000,000	t cement/a							Entrustment Loan	0			IRR	26.68	%	1,000,000	t cement/a	Electricity-use(cement)	0.100	tce/t cement					
																			Self-Funding	1,776			NPV	4393.00	¥10,000									
																			Financial Assistance	0.000			Cost of energy saving	0.013	¥/(Kwh									
				Sum Total			107,643																											
3	Henan Tongli Cement Co., Ltd	the total production capacity is 1.6 million ton Portland cement per year.	The company owns two new-type dry process cement production lines, one is 2500t/d and the other is 2000t/d	Coal(t)	337,886	1.000	337,886	coal-use (clinker)	0.103	tce/t clinker	3,285,000	t clinker/a				2×7.5MW waste heat power generation	12,015	0	Commercial loan	7,810	Completion of the feasibility study report		Payback period	6.31	year	3,285,000	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	364,997	0.383	139,794	Electricity-use(cement)	0.119	tce/t cement	4,000,000	t cement/a							Entrustment Loan				IRR	17.82	%	4,000,000	t cement/a	Electricity-use(cement)	0.109	tce/t cement					
													477,680	2.493	1,190,856				Self-Funding	4,205			NPV	14801	¥10,000				15	7200	39,970	41,364	75,334	187,808	
				Sum Total			477,680												Financial Assistance				Cost of energy saving	0.131	¥/(Kwh									
4	Lianshi Cement Plant Fujian Cement Co., Ltd	By the end of Mar. 2003, the industry asset is 1.435 billion Yuan RMB, form January to August in 2003, the cement output is 2.0022 million ton.	The company has 5 cement production lines are under running and one is under construction (2500t/d)	Coal(t)	145,291	1.000	145,291	coal-use (clinker)	0.103	tce/t clinker	1,412,550	t clinker/a				6MW waste heat power generation	5,944	0	Commercial loan	2,927	Completion of the feasibility study report		Payback period	6.26	year	1,412,550	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	118,670	0.383	45,451	Electricity-use(cement)	0.111	tce/t cement	1,720,000	t cement/a							Entrustment Loan	0			IRR	18.14	%	1,720,000	t cement/a	Electricity-use(cement)	0.101	tce/t cement					
													190,741.61	2.493	475,518.83				Self-Funding	2,927			NPV	7757	¥10,000				6	7200	13,588	16,546	30,134	75,123	
				Sum Total			190,742												Financial Assistance				Cost of energy saving	0.343	¥/(Kwh									
5	Chongqing Zhongsheng Building Material Cement Co., Ltd	Annual output is more than 2 million ton P.O32.5, P.L32.5 and P.c32.5 ordinary portland cement.	The company owns more than 1300 staff, and occupied 3.311×104 square meters.	Coal(t)	168,943	1.000	168,943	coal-use (clinker)	0.129	tce/t clinker	1,314,000	t clinker/a				6MW waste heat power generation	3,438	0	Commercial loan	0	completed	2004.11~2005.10	Payback period	4.28	year	1,314,000	t clinker/a	coal-use (clinker)	0.129	tce/t clinker					
				Electricity(MWh)	110,000	0.383	42,130	Electricity-use(cement)	0.132	tce/t cement	1,600,000	t cement/a							Entrustment Loan	0			IRR	30.28	%	1,600,000	t cement/a	Electricity-use(cement)	0.122	tce/t cement					
													211,072.00	2.493	526,204.99				Self-Funding	3,438			NPV	9731	¥10,000				6	7000	13,211	16,086	29,297	73,036	
				Sum Total			211,073												Financial Assistance				Cost of energy saving	0.093	¥/(Kwh									
6	Xinping Jingdiqzi Building Material Cement Co., Ltd	Annual output is more than 2 million ton P.O32.5, P.L32.5 and P.c32.5 ordinary portland cement.	The No 1~5 cement production lines are wet-process rotary cement production lines, the company owns two new dry-process production lines of 2500t/d and 5000t/d	Coal(t)	168,943	1.000	168,943	coal-use (clinker)	0.103	tce/t clinker	1,642,500	t clinker/a				6MW waste heat power generation	3,438	0	Commercial loan	0	completed	2004.9~2005.7	Payback period	4.28	year	1,642,500	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	110,000	0.383	42,130	Electricity-use(cement)	0.106	tce/t cement	2,000,000	t cement/a							Entrustment Loan	0			IRR	30.28	%	2,000,000	t cement/a	Electricity-use(cement)	0.097	tce/t cement					
													211,073.00	2.493	526,204.99				Self-Funding	3,438			NPV	9731	¥10,000				6	7000	13,211	16,086	29,297	73,036	
				Sum Total			211,073												Financial Assistance				Cost of energy saving	0.093	¥/(Kwh									
7	Wutong Building Material Cement Co., Ltd	Annual output is more than 2 million ton P.O32.5, P.L32.5 and P.c32.5 ordinary portland cement.	The company owns more than 1300 staff, and occupied 3.311×104 square meters. The No 1~5 cement production lines are wet-process rotary cement production lines, the company owns two new dry-process production lines of 2500t/d and 3000t/d.	Coal(t)	84,471	1.000	84,471	coal-use (clinker)	0.103	tce/t clinker	821,250	t clinker/a				3MW waste heat power generation	1,776	0	Commercial loan	0	completed	2004.9~2005.7	Payback period	4.71	year	821,250	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	60,500	0.383	23,172	Electricity-use(cement)	0.108	tce/t cement	1,000,000	t cement/a							Entrustment Loan	0			IRR	26.68	%	1,000,000	t cement/a	Electricity-use(cement)	0.100	tce/t cement					
													107,643	2.493	268,354				Self-Funding	1,776			NPV	4393	¥10,000				3	7050	6,652	8,100	14,753	36,779	
				Sum Total			107,643												Financial Assistance				Cost of energy saving	0.086	¥/(Kwh									
8	Baoding Taihang Heyi Cement Co.,Ltd	cement output achieved 35 million ton.	One new-type dry process clinker production line and cement mills system with output capacity of 2000t/d is put into construction in 2003.	Coal(t)	114,881	1.000	114,881	coal-use (clinker)	0.103	tce/t clinker	1,116,900	t clinker/a				6MW waste heat power generation	3,479	0	Commercial loan	0	Completion of the feasibility study report		Payback period	5.28	year	1,116,900	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	103,040	0.383	39,464	Electricity-use(cement)	0.113	tce/t cement	1,360,000	t cement/a							Entrustment Loan	0			IRR	22.88	%	1,360,000	t cement/a	Electricity-use(cement)	0.102	tce/t cement					
													154,345.32	2.493	384,782.88				Self-Funding	3,479			NPV	6845	¥10,000				6	7000	13,211	16,086	29,297	73,036	
				Sum Total			154,345												Financial Assistance				Cost of energy saving	0.093	¥/(Kwh									
9	Zhejiang Zhongshuyuan Cement Co., Ltd	Cement production capacity of 3.5 million tons.	6800t/W total installed capacity of the plant.	Coal(t)	41,898	1.000	41,898	coal-use (clinker)	0.103	tce/t clinker	407,340	t clinker/a				2.5MW waste heat power generation	1,578	0	Commercial loan	789	Completion of the feasibility study report		Payback period	5.45	year	407,340	t clinker/a	coal-use (clinker)	0.103	tce/t clinker					
				Electricity(MWh)	53,500	0.383	20,491	Electricity-use(cement)	0.130	tce/t cement	480,000	t cement/a							Entrustment Loan	0			IRR	21.84	%	480,000	t cement/a	Electricity-use(cement)	0.114	tce/t cement					
													62,389	2.493	155,535				Self-Funding	789			NPV	4002	¥10,000				2.5	7920	6,435	7,583	14,019	34,946	
				Sum Total			62,389												Financial Assistance				Cost of energy saving	0.099	¥/(Kwh									
10	Daqing Zhongsanyuan Cement Co., Ltd	Cement production capacity of 3.5 million tons.	24000t/W total installed capacity of the plant	Coal(t)	874,084	1.000	874,084	coal-use (clinker)	1.030	tce/t clinker	848,625	t clinker/a				4.5MW waste heat power generation	2,802	0	Commercial loan	1,401	completed		Payback period	5.29	year	848,625	t clinker/a	coal-use (clinker)	1.030	tce/t clinker					
				Electricity(MWh)	116,800	0.383	44,734	Electricity-use(cement)	0.919	tce/t cement	1,000,000	t cement/a							Entrustment Loan	0			IRR	22.70	%	1,000,000	t cement/a	Electricity-use(cement)	0.905	tce/t cement					
													918,818	2.493	2,290,614				Self-Funding	1,401			NPV	7251	¥10,000				4.5	7920	11,584	13,650	25,234	62,908	
				Sum Total			918,818												Financial Assistance				Cost of energy saving	0.096	¥/(Kwh									
Total																	38,022															276,869	690,235	
Completed																	20,031															144,618	360,532	

Cement(2):

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	C E Baseline										Proposed Technical Reconstion	Project Investment				Project Status	Anticipated Results																Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product			Output Before Renovation		Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a)		Total (RMB Y10,000)	GEF (US$)	Others (RMB Y 10,000)			Start-end date	Financial Evaluation			Production After Renovation		Energy Use/Unit Product			Capacity Added (MW)	Operation Hours/a	Energy Savings (tce/a)	Energy Recovered(tce/a)	Total (tce/a)	CO2 emission Reduction(t/a)	
1	Suzhou Dongwu Cement Co.Ltd.	2500t/d(cement)	rotary kiln,mill,larger fan	Coal(t)	115800	0.717	83036	coal-use (clinker)	0.1071	tce/t clinker	775000	t clinker/a	122500	2.493	305393	3000KW waste heat power generation	2342.00		Commercial loan		Undecided		Payback period	4.80	year	775,000	t clinker/a	coal-use (clinker)	0.1071	tce/t clinker	3	7057			7459	7459	18596	
				Electricity(MWh)	103040	0.383	39464	Electricity-use(cement)	0.0352	tce/t cement	1120000	t cement/a							Entrustment Loan	1342.00			IRR	25.55	%	1,120,000	t cement/a	Electricity-use(cement)	0.0352	tce/t cement							
																			Self-Funding	1000.00			NPV	3103.82	¥ 10,000												
				Sum Total			122500												Financial Assistance				Cost of energy saving	0.18	¥ 1/kwh												
2	Jidong Cement Jilin Co.Ltd.	2500t/d(cement)	rotary kiln,mill,larger fan.	Coal(t)	130000	0.590	88571	coal-use (clinker)	0.1143	tce/t clinker	775000	t clinker/a				3750kW waste heat power generation	2720.16		Commercial loan		Undecided		Payback period	5.40	year	775,000	t clinker/a	coal-use (clinker)	0.1143	tce/t clinker	3.75	7000			8633	8633	21522	Contained the 140000 t clinker per year of buying outside.
				Electricity(MWh)	128000	0.383	49024	Electricity-use(cement)	0.0327	tce/t cement	1500000	t cement/a	137595	2.493	343025				Entrustment Loan	1720.16			IRR	21.46	%	1,500,000	t cement/a	Electricity-use(cement)	0.0327	tce/t cement							
																			Self-Funding	1000.00			NPV	2672.00	¥ 10,000												
				Sum Total			137595												Financial Assistance				Cost of energy saving	0.16	¥ 1/kwh												
3	Jiangsu Henglai Cement&Building Matrial Co.Ltd	5000t/d(clinker)	rotary kiln,mill,larger fan.	Coal(t)	223960	0.702	157214	coal-use (clinker)	0.1014	tce/t clinker	1550000	t clinker/a				6500kW waste heat power generation	4863.02		Commercial loan		Have signed the design contract,try for the sanction.	2006.03-2006.12	Payback period	5.00	year	1,550,000	t clinker/a	coal-use (clinker)	0.1014	tce/t clinker	6.5	7000			14799	14799	36894	The production is clinker.
				Electricity(MWh)	86800	0.383	33244	Electricity-use	0.0214	tce/t clinker	1550000	t clinker/a	190459	2.493	474814				Entrustment Loan	2863.02			IRR	24.20	%	1,550,000	t clinker/a	Electricity-use	0.0214	tce/t clinker							
																			Self-Funding	2000.00			NPV	5881.00	¥ 10,000												
				Sum Total			190459												Financial Assistance				Cost of energy saving	0.16	¥ 1/kwh												
4	Jiangxi Zhengda Cement Co.Ltd.	2500t/d(cement)	rotary kiln,mill,larger fan.	Coal(t)	114400	0.726	83036	coal-use (clinker)	0.1071	tce/t clinker	775000	t clinker/a				3000KW waste heat power generation	2286.48		Commercial loan		Undecided		Payback period	5.20	year	775,000	t clinker/a	coal-use (clinker)	0.1071	tce/t clinker	3	7057			7459	7459	18596	
				Electricity(MWh)	95000	0.383	36385	Electricity-use(cement)	0.0364	tce/t cement	1000000	t cement/a	119421	2.493	297716				Entrustment Loan	1286.48			IRR	22.93	%	1,000,000	t cement/a	Electricity-use(cement)	0.0364	tce/t cement							
																			Self-Funding	1000.00			NPV	2534.00	¥ 10,000												
				Sum Total			119421												Financial Assistance				Cost of energy saving	0.17	¥ 1/kwh												
5	Tianma Cement Co.Ltd.	2500t/d(cement)	rotary kiln,mill,larger fan.	Coal(t)	110800	0.749	83036	coal-use (clinker)	0.1071	tce/t clinker	775000	t clinker/a				3000kW waste heat power generation	2353.65		Commercial loan		Undecided		Payback period	4.90	year	775,000	t clinker/a	coal-use (clinker)	0.1071	tce/t clinker	3	7057			7459	7459	18596	
				Electricity(MWh)	100000	0.383	38300	Electricity-use(cement)	0.0383	tce/t cement	1000000	t cement/a	121336	2.493	302490				Entrustment Loan	1353.65			IRR	25.11	%	1,000,000	t cement/a	Electricity-use(cement)	0.0383	tce/t cement							
																			Self-Funding	1000.00			NPV	3034.00	¥ 10,000												
				Sum Total			121336												Financial Assistance				Cost of energy saving	10.99	¥ 1/kwh												
6	Chongqing Jinjiang Cement Co.Ltd.	2500t/d(cement)	rotary kiln,mill,larger fan.	Coal(t)	117000	0.710	83036	coal-use (clinker)	0.1071	tce/t clinker	775000	t clinker/a				3000KW waste heat power generation	2406.31		Commercial loan		Have signed the design contract,try for the sanction.	2006.03-2006.12	Payback period	5.60	year	775,000	t clinker/a	coal-use (clinker)	0.1071	tce/t clinker	3	7057			7459	7459	18596	
				Electricity(MWh)	100000	0.383	38300	Electricity-use(cement)	0.0383	tce/t cement	1000000	t cement/a	121336	2.493	302490				Entrustment Loan	1406.31			IRR	20.59	%	1,000,000	t cement/a	Electricity-use(cement)	0.0383	tce/t cement							
																			Self-Funding	1000.00			NPV	2203.00	¥ 10,000												
				Sum Total			121336												Financial Assistance				Cost of energy saving	0.18	¥ 1/kwh												
7	Qinglongshan Cement Co.Ltd.	2500t/d(cement)	rotary kiln,mill,larger fan.	Coal(t)	108200	0.769	83036	coal-use (clinker)	0.1071	tce/t clinker	775000	t clinker/a				3000KW waste heat power generation	2330.05		Commercial loan		Completed	2006.03-2006.12	Payback period	4.90	year	775,000	t clinker/a	coal-use (clinker)	0.1071	tce/t clinker	3	7057			7459	7459	18596	
				Electricity(MWh)	90000	0.383	34470	Electricity-use(cement)	0.0383	tce/t cement	900000	t cement/a	117506	2.493	292942				Entrustment Loan	1330.05			IRR	24.78	%	900,000	t cement/a	Electricity-use(cement)	0.0383	tce/t cement							
																			Self-Funding	1000.00			NPV	2940.00	¥ 10,000												
				Sum Total			117506												Financial Assistance				Cost of energy saving	0.18	¥ 1/kwh												
8	Guangda Cement Co.Ltd.	2-5000t/d(cement)	rotary kiln,mill,larger fan.	Coal(t)	466900	0.673	314429	coal-use (clinker)	0.1014	tce/t clinker	3100000	t clinker/a				2~6500KW waste heat power generation	9726.03		Commercial loan		Have signed the design contract,try for the sanction.	2006.03-2006.12	Payback period	4.20	year	3,100,000	t clinker/a	coal-use (clinker)	0.1014	tce/t clinker	13	7000			29598	29598	73788	
				Electricity(MWh)	319200	0.383	122259	Electricity-use(cement)	0.0364	tce/t cement	3360000	t cement/a	436682	2.493	1088649				Entrustment Loan	5726.03			IRR	30.62	%	3,360,000	t cement/a	Electricity-use(cement)	0.0364	tce/t cement							
																			Self-Funding	4000.00			NPV	17053.00	¥ 10,000												
				Sum Total			436682												Financial Assistance				Cost of energy saving	0.16	¥ 1/kwh												
9	Xingyang Ningjiang Building Material Co.Ltd.	1-6000t/d(cement)+6-Vertical Kiln	rotary kiln,mill,larger fan.	Coal(t)	104000	0.759	78957	coal-use (clinker)	0.1371	tce/t clinker	576000	t clinker/a				2500t/d New dry cement production line(rotary kiln);Shut up 6-Vertical kiln	21986.20		Commercial loan	4397.24	Building	2006.01-2006.11	Payback period	6.00	year	775,000	t clinker/a	coal-use (clinker)	0.1073	tce/t clinker			23104		57598		Base on Vertical kiln
				Electricity(MWh)	70400	0.383	26963	Electricity-use(cement)	0.0383	tce/t cement	704000	t cement/a							Entrustment Loan				IRR	19.29	%	900,000	t cement/a	Electricity-use(cement)	0.0383	tce/t cement							
													105920	2.493	264058				Self-Funding	17588.96			NPV	20373.00	¥ 10,000										
				Sum Total			105920												Financial Assistance				Cost of energy saving	485.52	¥ 1/tce												
10	Longyan Chunchi Group	1-1000t/d(cement)+3-Vertical kiln	rotary kiln,mill,larger fan.	Coal(t)	51400	0.768	39478	coal-use (clinker)	0.1371	tce/t clinker	2880000	t clinker/a				2500t/d New dry cement production line(rotary kiln);Shut up 3-Vertical kiln	18510.50		Commercial loan	8000.00	Completed	2006.01-2006.11	Payback period	5.80	year	775,000	t clinker/a	coal-use (clinker)	0.1073	tce/t clinker			23104		57598		Base on Vertical kiln
				Electricity(MWh)	34496	0.383	13212	Electricity-use(cement)	0.0375	tce/t cement	352000	t cement/a							Entrustment Loan				IRR	20.70	%	950,000	t cement/a	Electricity-use(cement)	0.0375	tce/t cement							
													52690	2.493	131337				Self-Funding	10510.50			NPV	19538.00	¥ 10,000										
				Sum Total			52690												Financial Assistance				Cost of energy saving	176.84	¥ 1/tce												
Total																	69324.40																136535.21	340382.29	

Coking:

No.	Company Name	Basic Condition	Main Energy Consumption Facility	Benchmark of Energy Efficiency: Energy Type	Energy Consumption Amount	Conversion Factor	Energy Consumption Amount (tons of tce)	Product Energy Consumption per ton (tons of tce)	Output before Renovation (tons of coke per year)	Total Energy Consumption (tons of tce)	CO_2 Discharge Factor	CO_2 Emission (tons)	Technical Renovation Scheme	Project Investment: Total Investment (ten thousands of RMB Yuan)	Project Support (RMB)	Other (ten thousands RMB Yuan)		Project Progress	Start and Finish Time	Anticipated Results: Financial Assessment			Output after Renovation (ten thousands RMB Yuan per year)	Product Energy Consumption per ton of Capacity (tons of tce per ton of coke)	New Added Unit Installing Capacity (MW)	Annual Utilization (h)	Recovered Energy (tons of tce per year)	Total (tons of tce per year)	CO_2 Emission Reduction Amount (tons per year)	Notes
1	Shanxi Jinjin Luxin Coking Co. Ltd	A private joint-stock company, established in 1993, located at Beixingwu Industrial Zone in Shanxi Jinxin City. The plant occupies 100 hectare. The coking plant equips with QRD-2000 type Clean Heat Recovery Coke Ovens and has 3,000,000 tons of coke production capacity per year. Main products include Grade I metallurgy coke and pearlitegr coke etc. The plant, with fixed asset RMB86,000,000 yuan, has 1200 staffs including 210 technical staffs. Main raw material is coking coal	Heat recovery coking ovens and coal cleaning facility	fine coal	1,337,891t/y	1.028	1,375,352	1.38	100.00	1,384,979	2.493	3,452,753	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	9,233		Commercial loan	6,463	Building		Investment recovery period	5.84	year	100.00	1.31	24	8,000.00	73,536	73,536	183,373.75	
				electric power	78,249,024kWh/y		9,627									Loan by mandate				IRR	21.92	%								
																Fund raised by enterprise	2,770			NPV	5746	ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving	0.0826	RMB Yuan/kWh								
2	Shanxi Fengyang Wenfeng Coking Co. Ltd.	A private joint-stock company, established in 1993, located at Lujiachuang Industry Zone in Shanxi Fengyang City. The plant occupies 56 hectare. The coking plant equips with QRD-2000 type Clean Heat Recovery Coke Ovens and has 500,000 tons of coke production capacity per year. Main products include Grade I metallurgy coke and Grade I foundry coke etc. The plant, with fixed asset RMB70,000,000 yuan, has 1000 staffs including 30 engineers and 40 technical staffs. Main raw	Heat recovery coking ovens and coal cleaning facility	fine coal	655,413t/y	1.01	661,971	1.33	50.00	665,172	2.493	1,658,274	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	6,582		Commercial loan	4,608	Building		Investment recovery period	9.72	year	50.00	1.23	18	7,500.00	51,705	51,705	128,900.57	
				electric power	26,016,000kWh/y		3,201									Loan by mandate				IRR	10.4	%								
																Fund raised by enterprise	1,975			NPV	1286	ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving	0.064	RMB Yuan/kWh								
3	Shanxi Fengyang Longquan Foundry Coking Co. Ltd.	Sunquan Town in Shanxi Fengyang city. The plant occupies 36 hectare. The coking plant equips with QRD-2002 type Clean Heat Recovery Coke Ovens and has 400,000 tons of coking coal production capacity per year. Main products include Grade I metallurgy coke and Special Grade foundry coke etc. The plant, with fixed asset RMB34,160,800 yuan, has 392 staffs including 30 technical staffs. Main raw material is coking coal.	Heat recovery Coking Oven and Coal clean facility	raw coal	739,630t/y	0.8	591,688	1.49	40.00	595,137	2.493	1,483,677	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	4,599		Commercial loan	3,219	Building		Investment recovery period	9.17	year	40.00	1.46	12	8,000.00	36,768	36,768	91,662.62	
				electric power	28,032,000kWh/y		3,449									Loan by mandate				IRR	10.37	%								
																Fund raised by enterprise	1,320			NPV	889	ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving	0.067	RMB Yuan/kWh								
4	Shanxi Gujiao Nanhai Coking Co. Ltd.	A private joint-stock company, established in 1996, located at *Dalinghe Coal Chemical Industry Zone in Shanxi Gujiao City*. The plant occupies 200 hectare. The coking plant equips with QRD-2000 type Clean Heat Recovery Coke Ovens and has 400,000 tons of coking coal production capacity per year. Main products include Grade I metallurgy coke and Grade II metallurgy coke etc. The plant, with fixed asset RMB120,000,000 yuan, has 270 staffs including 56 technical staffs. Main raw material is coking coal.	Heat recovery coking oven and coal cleaning facility	*fine coal*	*525,600t/y*	*1.021*	*536,638*	1.35	40.00	538,427	2.493	1,342,299	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	6,069		Commercial loan	4,248			Investment recovery period	9.22	year	40.00	1.21	18	8,000.00	55,152	55,152	137,493.94	U.S.$ and RMB is exchanged according to the rate of 1:7.8
				electric power	14,541,600kWh/y		1,789									Loan by mandate				IRR	10.39	%								
																Fund raised by enterprise	1,821			NPV	1185	ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving	0.061	RMB Yuan/kWh								
5	Shanxi Lvliang Yaolong Coking Co. Ltd.	A private joint-stock company, established in 1996, located at Jinliao Town in Shanxi Lvliang District Zhongyang County. The plant occupies 16 hectare. The coking plant equips with QRD-2000 type Clean Heat Recovery Coke Ovens and has 400,000 tons of coking coal production capacity per year. Main products include Special Grade foundry coke, Grade I foundry coke and Grade I metallurgy coke etc. The Special Grade foundry coke is exported to Japan and USA.The plant, with fixed asset RMB60,000,000 yuan, has 220 staffs including 26 technical staffs. Main raw material is coking coal.	Heat recovery Coking Oven and Coal clean facility	fine coal	371,222t/y	1.014	379,222	1.46	40.00	582,173	2.493	1,451,342	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	646		Commercial loan		completed		Investment recovery period		year	40.00	1.44	1.5	8,000.00	4,596	4,596	11,457.83	
				electric power	24,800,000kWh/y		7,953									Loan by mandate				IRR		%								
																Fund raised by enterprise				NPV		ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving		RMB Yuan/kWh								
6	Shanxi Taiyuan Wangwang Coal & Coking Co. Ltd.	A private joint-stock company, established in 1996, located at Loufan County in Shanxi Taiyuan City. The plant occupies 16 hectare. The coking plant equips with QRD-2000 type Clean Heat Recovery Coke Ovens and has 400,000 tons of coking coal production capacity per year. Main products include Grade I and Grade II metallurgy coke etc. The plant, with fixed asset RMB70,800,000 yuan, has 240 staffs including 40 technical staffs. Main raw material is coking coal.	Heat recovery coking ovens and coal cleaning facility	fine coal	613,321t/y	1.011	620,068	1.56	40.00	623,145	2.493	1,553,500	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	4,680		Commercial loan				Investment recovery period		year	40.00	1.47	12	8,000.00	36,768	36,768	91,662.62	
				electric power	25,008,000kWh/y		3,077									Loan by mandate				IRR		%								
																Fund raised by enterprise				NPV		ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving		RMB Yuan/kWh								
7	Shanxi Lvliang Fuli Coking Co. Ltd.	A private joint-stock company, established in 1992, located at Lishi City in Shanxi Lvliang District. The plant occupies 16 hectare. The coking plant equips with QRD-2000 type Clean Heat Recovery Coke Ovens and has 400,000 tons of coking coal production capacity per year. Main products include Grade I foundry coke and Grade I metallurgy coke etc. The plant, with total output value RMB307,500,000 yuan, has more than 400 staffs including 56 technical staffs. Main raw material is coking coal.	Heat recovery coking ovens and coal cleaning facility	fine coal	592,273t/y	1.001	592,865	1.49	40.00	595,880	2.493	1,485,579	Waste heat power generation utilizing flue gas with high temperature from coking engineering, converting the heat energy into electric energy.	6,647		Commercial loan				Investment recovery period		year	40.00	1.37	18	7,000.00	48,258	48,258	120,307.19	
				electric power	24,504,000kWh/y		3,015									Loan by mandate				IRR		%								
																Fund raised by enterprise				NPV		ten thousands RMB Yuan								
																State subsidy				Cost of energy-saving		RMB Yuan/kWh								
Total																										306,783	764,810.02	

Dalian' Foundry:

No.	TVEs	Business Profile	Technical Process and Major Energy Use Equipments	EE Baseline									Proposed Technical Renovation	Project			Project Status	Actual Results								
				Energy Type	Energy Consumption (physical quantity)	Conversion factor	Energy Use (tce)	Energy Use/Unit Product		Output Before Renovation		Total Energy Use (tce)	CO2 Coefficient	CO2 Emissions (t/a)		Total (RMB ¥ 10,000)	GEF(US$10,000)	Others (RMB ¥ 10,000)		Start-end Date	Financial Evaluation			Production After Renovation		Energy Use/Unit Product		Energy Savings (tce/a.)	CO2 Emission Reduction (t/a.)
1	Dalian Tianyuan Foundry	Dalian Tianyuan Foundry was founded in 2000, and the factory area occupies 8000 square meter, 5000 square meter for construction. The staff is 85 persons and among them 15 technical persons.	cool-air cupola	Coal (t)			0.00	0.316	tce/t castings	3,000	t castings/a	1,249.36	2.493	3,114.63	Adoption of furnace hot-air cupola instead of cool-air cupola	66.16	1.375	Commercial loan		completed	2006-4-1/2006-9-31	Payback Period	1.59	year	3,000	t castings/a	0.194	tce/t castings	667.36	1,663.72
				Coke(t)	1,250.00	0.971	1,214.25											Entrustment Loan				IRR		%						
				Electricity(MWh)	91.67	0.383	35.11											Self-Funding	55.16			NPV	906.80	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	(2258.18)	RMB/tce						
				Sum Total			1,249.36																							
2	Dalian Baotong Corporation	Dalian Baotong Corporation is located at Huadong Village. The corporation area occupies 24,000 m2, 8000 m2 for construction. The total capital is 30 million Yuan. The main products are valve and pipe juncture.	cool-air cupola	Coal (t)			0.00	0.410	tce/t castings	1,400	castings/a	573.91	2.493	1,430.76	Adoption of intermediate frequency-conversion induced furnace instead of cool-air cupola.	114.64	1.375	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	5.71	year	1,400	t castings/a	0.360	tce/t castings	69.91	174.28
				Coke(t)	583.00	0.971	566.33											Entrustment Loan				IRR	19.26	%						
				Electricity(MWh)	19.80	0.383	7.58											Self-Funding	103.64			NPV	103.37	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	(1169.77)	RMB/tce						
				Sum Total			573.91																							
3	Dalian Jinze Corporation	Dalian Jinze Corporation is located at Minhe Village. The corporation area occupies 40,000 m2, 5000 m2 for construction and 2500 m2 for production. Annual output of steel casting is 800 tons; annual output of iron casting is 1500 tons.	intermediate frequency-conversion induced furnace	Coal (t)	1,825.00	0.644	1,175.30	0.392	tce/t castings	3,000	t castings/a	1,175.30	2.493	2,930.02	With one 1.5t frequency-conversion intermediate-frequency furnace instead of existing 3 small-sized furnaces	232.02	2.000	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	7.85	year	3,000	t castings/a	0.220	tce/t castings	515.30	1,284.64
				Coke(t)		0.971	0.00											Entrustment Loan				IRR	11.41	%						
				Electricity(MWh)		0.383	0.00											Self-Funding	216.02			NPV	16.96	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	143.11	RMB/tce						
				Sum Total			1,175.30																							
4	Dalian Jinzhoumaolong Industry Co., Ltd	It was founded in 1992. The area of the company is 12800 m2 and construction area is 3100 m2. the company produced more than 1200 tonnes of iron casting, 1500 tonnes of spheroidal graphite casting, 1300 tonnes of steel casting.	3t/h cupola	Coal (t)		0.644	0.00	0.368	tce/t castings	1,500	t castings/a	552.34	2.493	1,376.98	Cupola replaced by medium-frequency induction furnace	114.64	1.375	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	6.53	year	1,500	t castings/a	0.310	tce/t castings	87.34	217.73
				Coke(t)	563.00	0.971	546.90											Entrustment Loan				IRR	15.48	%						
				Electricity(MWh)	14.20	0.383	5.44											Self-Funding	103.64			NPV	70.67	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	(1260.39)	RMB/tce						
				Sum Total			552.34																							
5	Dalian Qianbao Iron Casting Co., Ltd	It was founded in 1954 and mechanism transformed to private company in 1998. Now it owns fixed capital of RMB 15000000. The area is 32000m2 and construction area is 15000m2.	3t/h cupola, 4t core holding furnace with duplex melting style	Coal (t)		0.644	0.00	0.301	tce/t castings	5,000	t castings/a	1,506.44	2.493	3,755.56	old cupola and furnace replaced by 2.5t frequency conversion induction furnace with medium-frequency	267.94	1.375	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	4.25	year	5,000	t castings/a	0.280	tce/t castings	106.44	265.36
				Coke(t)	1,388.00	0.971	1,348.30											Entrustment Loan				IRR	29.89	%						
				Electricity(MWh)	412.90	0.383	158.14											Self-Funding	256.94			NPV	466.05	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	(5657.71)	RMB/tce						
				Sum Total			1,506.44																							
6	Dalian Yongxin Precision Steel Casting Co., Ltd	It occupies 7600m2 and the workshops 2600m2. The enterprise has annual productivity of 1.5000tonnes and production value of RMB 3,600,000. The total capital is 10000000 and there are 30staff.	0.4t electric induction furnace	Coal (t)		0.644	0.00	0.377	tce/t castings	1,500	t castings/a	565.31	2.493	1,409.31	Renovate 0.4t electric induction furnace from capacity adjustment into frequency conversion	74.64	1.250	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	6.76	year	1,500	t castings/a	0.320	tce/t castings	83.31	212.67
				Coke(t)		0.971	0.00											Entrustment Loan				IRR	14.61	%						
				Electricity(MWh)	1,476.00	0.383	565.31											Self-Funding	64.64			NPV	41.69	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	(108.64)	RMB/tce						
				Sum Total			565.31																							
7	Dalian Far-east Precision Casting Co., Ltd	It was founded in 2000, located in Huajia town Jingzhou district of Dalian. The total registered capital is 2 million Yuan. The factory area occupies 2400m2, and with 50 employees.	0.25t capacity regulated electric induction furnace	Coal (t)		0.644	0.00	0.518	tce/t castings	485	t castings/a	251.09	2.493	625.98	Renovate 0.25t electric induction furnace from capacity adjustment into frequency conversion	56.14	1.250	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	8.15	year	485	t castings/a	0.450	tce/t castings	32.84	81.88
				Coke(t)		0.971	0.00											Entrustment Loan				IRR	9.97%	%						
				Electricity(MWh)	655.60	0.383	251.09											Self-Funding	46.14			NPV	13.29	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	703.59	RMB/tce						
				Sum Total			251.09																							
8	Dalian Fengming Alloy and Steel Casting Co., Ltd	It locates in Zhanquanjiedao Majia Village, Jinzhou District, Dalian City. Founded in 1987, it is one of earliest TVEs with 3500 m2 workshops majoring in alloy casting. Most of the products were exported.	0.25t capacity regulated electric induction furnace	Coal (t)		0.644	0.00	0.571	tce/t castings	400	t castings/a	228.27	2.493	569.07	0.25t furnace replaced by 3t induction furnace with medium frequency and 3 bridge cranes	330.49	2.000	Commercial loan		completed	2006-4-1/2006-8-31	Payback Period	7.25	year	1,500	t castings/a	0.420	tce/t castings	226.01	563.43
				Coke(t)		0.971	0.00											Entrustment Loan				IRR	13.17%	%						
				Electricity(MWh)	596.00	0.383	228.27											Self-Funding	314.49			NPV	151.89	¥ 10,000						
				Product Oil(t)		1.471	0.00											Financial Assistance				Cost of energy saving	(77.40)	RMB/tce						
				Sum Total			228.27																							
Total																1256.67	12							17385				1790.53	4463.73

Nanjing' Foundry:

No.	TVEs	Business Profile	Major Energy-use Equipments	EE Baseline										Proposed Technical Renovation	Project Investment				Project Status	Start-end date	Actual Results									Remarks[1]
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product		Output Before Renovation		Total energy use (tce)	CO_2 Coefficient	CO_2 Emissions (t/a)		Total (RMB¥ 10,000)	GEF support (US$)	Others (RMB¥10,000)				Financial Evaluation		Production after renovation		Energy Use/Unit Product		Energy Savings (tce/a)	CO_2 reduction Reduction(t/a)	
1	Nanjing Dongjin Machinery Co. Ltd.	mainly produces gray iron casting and nodular iron casting at annual output of 5000t, annual output value of 40 million yuan, approximately US$5 million	uses clay sand casting process, with equipments of 5t/h cupola and MF furnace	Coal (t)	352.000	1.000	352.00	0.333	ton/t	3,200	ton/t castings	1,066.95	2.493	2,659.91	one is to build a new resin sand production line to reduce hot metal single consumption and coke consumption; the other is to modify the cupola, change its profile and apply hot blast operation	201.6	15,000	Commercial loan	81.00	Completed	2005.10-2006.12	Payback period	4.44	year	5,000	ton/t castings	0.23	ton/t castings	540.00	1,346.22	
				Coke(t)	736.000	0.971	714.95											Entrustment Loan	0			IRR	27.00	%							
				Power/MWh		0.383	0.00											Self-Funding Financial Assistance	108.60			NPV Cost of energy saving	143.00	¥ 10,000							
				Produced oil (t)		1.471												Others	0				232.60	¥ 1/tce							
				Sum total			1,066.95																								
2	Nanjing Huafeng Oil Pump Co., Ltd.	mainly produces gray iron casting and nodular iron casting at annual output of 8000 ~ 10000t, annual output value of 40~55 million yuan, approximately US$7	The cupola uses coke as fuel for smelting and pouring of normal castings.	Coal (t)	700.700	1.000	700.70	0.238	ton/t	3,000	ton/t castings	713.19	2.493	1,777.98	build one medium frequency furnace production line of 30000t/a nodular cast iron capacity	158	15,000	Commercial loan	0	Completed	2005.10-2006.12	Payback period	6.64	year	3,000	ton/t castings	0.184	ton/t castings	162.00	403.87	
				Coke(t)		0.971	0.00											Entrustment Loan	0			IRR	13.52	%							
				Power/MWh	32.610	0.383	12.49											Self-Funding Financial Assistance	146			NPV Cost of energy saving	22.00	¥ 10,000							
				Produced oil (t)		1.471												Others	0				379.80	¥ 1/tce							
				Sum total			713.19																								
3	Nanjing Jieli Metal Co., Ltd.	mainly produces gray iron casting and nodular iron casting at annual output of 5000t, annual output value of 40~45 million yuan, approximately US$5 million	uses sand casting process, with molds and cores made by manual operation	Coal (t)			0.00	0.274	ton/t	2,500	ton/t Castings	685.00	2.493	1,707.71	1, Replacement of hand molding by machine molding; 2. Replacement of green core by precoated dry sand core;etc.	132	15,000	Commercial loan		Completed	2005.10—2006.12	Payback period	3.76	year	5,000	ton/t castings	0.21	ton/t castings	512.00	777.82	
				Coke(t)	705.200	0.971	685.00											Entrustment Loan				IRR	34.90	%							
				Power/MWh		0.383	0.00											Self-Funding Financial Assistance	120			NPV Cost of energy saving	137.00	¥ 10,000							
				Produced oil (t)		1.471												Others					166.80	¥ 1/tce							
				Sum total			685.00																								
4	Nanjing Shuangtong Abrasion Resistant Alloy Co.	specialized in production of abrasive products,occupies a land of 22 mu, approximating 14652m2. The annual output capacity is 4000t/a.	wet casting process	Coal (t)			0.00	0.341	ton/t	1,800	ton/t castings	614.33	2.493	1,531.53	build a new lost foam casting process line	165	15,000	Commercial loan	0	Completed		Payback period	4.52	year	2,500	ton/t castings	0.249	ton/t castings	230.00	573.39	
				Coke(t)		0.971	0.00											Entrustment Loan	65			IRR	26.29	%							
				Power/MWh	1,604.000	0.383	614.33											Self-Funding Financial Assistance	68			NPV Cost of energy saving	111.00	¥ 10,000							
				Produced oil (t)		1.471												Others	20				350.30	¥ 1/tce							
				Sum total			614.33																								
5	Nanjing Xuancheng Foundry Co., Ltd.	mainly produces gray iron casting and nodular iron casting at annual output of 5500t, annual output value of 20~30 million yuan, approximately US$3 million.	uses clay sand casting process	Coal (t)			0.00	0.218	ton/t	5,000	ton/t castings	1,089.91	2.493	2,717.15	one is to build a new resin sand production line to reduce hot metal single consumption and coke consumption; the other is to modify the cupola, change its profile and apply hot blast operation	200	15,000	Commercial loan		Completed	2005.10—2006.12	Payback period	6.71	year	5,000	ton/t castings	0.19	ton/t castings	1,141.20	352.01	
				Coke(t)	1,122.000	0.971	1,089.91											Entrustment Loan				IRR	13.24	%							
				Power/MWh		0.383	0.00											Self-Funding Financial Assistance	188			NPV Cost of energy saving	26.00	¥ 10,000							
				Produced oil (t)		1.471												Others					279.40	¥ 1/tce							
				Sum total			1,089.91																								
6	Nanjing Lishui Zhongshan Foundry Co., Ltd.	gray iron casting and nodular iron casting at annual output of 10000t, annual output value of 60~65 million yuan, 315 persons of labour force	uses clay sand casting process, with equipments of 7t/h cupola and MF furnace	Coal (t)			0.00	0.190	ton/t	5,000	ton/t castings	950.13	2.493	2,368.66	one is to build a new resin sand production line to reduce hot metal single consumption and coke consumption; the other is to modify the cupola, change its profile and apply hot blast operation	196	15,000	Commercial loan	0	Completed	2005.10-2006.12	Payback period	7.05	year	5,000	ton/t castings	0.17	ton/t castings	202.10	503.84	
				Coke(t)	978.100	0.971	950.13											Entrustment Loan	0			IRR	11.94	%							
				Power/MWh		0.383	0.00											Self-Funding Financial Assistance	184			NPV Cost of energy saving	15.00	¥ 10,000							
				Produced oil (t)		1.471												Others	0				306.00	¥ 1/tce							
				Sum total			950.13																								
	Total														1052.60	90000.00											1587.30	3957.14	

Shanxi' Foundry:

No.	TVEs	Business Profile	Major Energy-use Equipments	E E Baseline										Proposed Technical Renovation	Project Investment				Project Status	Actual Results									Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product		Output Before Renovation		Total energy use (tce)	CO2 Coefficient	CO2 Emission (Mt.)		Total (RMB¥ 10,000)	GEF support (US$)	Others (RMB¥10,000)			Start-end date	Financial Evaluation			Production after renovation	Energy Use/Unit Product		Energy Savings (tce/a)	CO_2 emission Reduction(t/a)	
1	Shanxi Sanlian Foundry Co. Ltd.	Shanxi Sanlian Foundry Co. Ltd locates in Yuncheng City.It is a specialized casting company focused on key parts of car engine, its main products include cylinder block and head,engine body, gear box casting,It now has more than 600 staffs including about 100 technical workers.	Technical Process raw material-furnace-pouring-shakeout-clearingup-casting Energy -use Equipment-intermediate frequency furnace, air compressor, resin sand molding line, .	Coal (t)			0.00	0.328	tech castings	8,500	tech castings (t)	2,786.71	2.493	6,947.36	Equip front thermal analyzer; Apply the high-quality insulation work slag-congestion	600,184.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.54	year	13,000	t castings/a	0.289	tech castings	505.02	1,359.02	
				Coke(t)		0.971	0.00											Entrustment Loan											
				Power/MWh	7,276.00	0.383	2,786.71											Self-Funding	480,184.00		IRR	36	%						
				Refined Oil(t)		1.471	0.00											Financial Assistance			NPV	136.75	¥10,000						
				Sum total			2,786.71														Cost of energy saving[1]	535.7	¥/tce						
2	Shanxi Fenghua Foundry Co. Ltd	Shanxi Fenghua Foundry Co. Ltd locates in Yicheng Township.It has more than 600 staffs. Its key products are brake disc for car, as well as hub, pliers, etc.	intermediate frequency furnace, air compressor, sand production line.	Coal (t)			0.00	0.270	tech castings	35,000	tech castings (t)	4,053.88	2.493	10,106.31	analyzer, Apply the high-quality insulation work slag-congestion; Set up the heat preservation layer with aluminum silicate fiascle.	712,840.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.22	year	21,000	t castings/a	0.257	tech castings	693.00	1,727.61	
				Coke(t)	1,171.00	0.971	1,138.48											Entrustment Loan			IRR	47.19	%						
				Power/MWh	7,612.00	0.383	2,915.40											Self-Funding	392,840.00		NPV	197.67	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	458.75	¥/tce						
				Sum total			4,053.88																						
3	Shanxi Huaxiang Tongcheung Foundry Co. Ltd	Located in the Economical Technology Development Zone of Linfen City, Shanxi. Huaxiang Tongcheung Foundry Co. Ltd has more than 480 staffs. Its key products are all kinds of precision castings produced by vertical parting flaskless shoot-squeeze moulding line and horizontal parting moulding line.	cupola, air compressor,sand production line, draught fan.	Coal (t)			0.00	0.158	tech castings	33,000	tech castings (t)	5,513.99	2.493	13,743.89	Equip front thermal analyzer; Apply the high-quality insulation work slag-congestion	743,312.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.19	year	38,500	t castings/a	0.146	tech castings	462.00	1,151.77	
				Coke(t)	5,469.00	0.971	5,312.59											Entrustment Loan			IRR	48.12	%						
				Power/MWh	523.25	0.383	200.40											Self-Funding	625,312.00		NPV	214.07	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	505.08	¥/tce						
				Sum total			5,513.99																						
4	Shanxi Tongrong Auto-parts Co. Ltd	Located in the south suburb of Houma City Shanxi Province, Shanxi Tongrong Autoparts Co. Ltd(TACL) is a joint venture enterprise which has currently 700 employees including 200 technical workers.It is engaging mainly in the production of auto components as brake drum, wheel hub and spoke wheel sheave. It is the largest production base of brake drum for heavy truck in China.	cupola, air compressor,sand production line, draught fan.	Coal (t)			0.00	0.207	tech castings	15,000	tech castings (t)	3,106.58	2.493	7,744.69	Equip front thermal analyzer, Apply the high-quality insulation work slag-congestion; Set up the heat preservation layer with aluminum silicate fiascle.	72.16	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.48	year	18,000	t castings/a	0.233	tech castings	1,332.00	3,320.68	
				Coke(t)	3,125.00	0.971	3,035.63											Entrustment Loan			IRR	41.78	%						
				Power/MWh	185.25	0.383	70.95											Self-Fund,ing	68.16		NPV	168.61	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	324.58	¥/tce						
				Sum total			3,106.58																						
5	Yicheng Huaxi Foundry Co. Ltd.	Located in West of Yicheng Township, in south of Yanghou and Jinhan Road, Yichenghuaxi Foundry Co, Ltd has more than 150 staffs. It is engaging in producing single-cylinder body, multi-cylinder body, flywheel, bearing cap, valve, etc.	cupola, foaming machine, drier	Coal (t)			0.00	0.249	tech castings	28,000	tech castings (t)	4,979.86	2.493	12,414.80	Equip front thermal analyzer; Apply the high-quality insulation work slag-congestion; Improve the lost foam pattern casting line.	1,209,120.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.51	year	25,000	t castings/a	0.217	tech castings	800.00	1,994.60	
				Coke(t)	2,885.00	0.971	2,802.49											Entrustment Loan			IRR	43.84	%						
				Power/MWh	3,685.05	0.383	1,277.37											Self-Funding	1,089,120.00		NPV	356.03	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	634.4	¥/tce						
				Sum total			4,979.86																						
6	Pingyao Shuangqing Foundry Co. Ltd.	Located in the south suburb of Houma City Shanxi Province, Pingyao Shuangqing Foundry Co. Ltd is located in Pingyao City, convenient in transportations. It now has more than 800 staffs.Its products include electrical stator frames, endshields, etc	cupola, air compressor,sand production line, draught fan.	Coal (t)			0.00	0.207	tech castings	31,500	tech castings (t)	6,521.38	2.493	16,257.81	Equip front thermal analyzer, Apply the high-quality insulation work slag-congestion; Set up the heat preservation layer with aluminum silicate fiascle.	806,568.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.4	year	36,500	t castings/a	0.160	tech castings	1,713.50	4,270.74	
				Coke(t)	6,560.00	0.971	6,372.38											Entrustment Loan			IRR	44.55	%						
				Power/MWh	389.03	0.383	149.00											Self-Funding	686,568.00		NPV	221.33	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	314.88	¥/tce						
				Sum total			6,521.38																						
7	Pingyao Yongjian Zhongxing Foundry Co. Ltd	Pingyao Yongjian Zhongxing Foundry Co. Ltd locates in Pingyao City. It has more than 400 staffs.It produces large and medium-sized machine tools, as well as parts for speed reducer and equipments for coal dressing and coking, such as lathe bed, housing motor for speed reducer, etc. .	cupola, air compressor,sand production line, draught fan, annealing kiln.	Coal (t)			0.00	0.192	tech castings	9,200	tech castings (t)	1,761.53	2.493	4,391.51	Equip front thermal analyzer, Apply the high-quality insulation work slag-congestion; Set up the heat preservation layer with aluminum silicate fiascle.	777,280.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.32	year	11,000	t castings/a	0.163	tech castings	319.00	795.27	
				Coke(t)	1,779.80	0.971	1,719.38											Entrustment Loan			IRR	40.93	%						
				Power/MWh	110.07	0.383	42.16											Self-Funding	657,280.00		NPV	173.28	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	472.77	¥/tce						
				Sum total			1,761.53																						
8	Shanxi Pingyao Huaxing Motor Casting Co. Ltd	Located in the south suburb of Houma City Shanxi Province. Shanxi Located in Pingyao City,Shanxi Pingyao Huaxing Motor Casting Co. Ltd has more than 600 staffs including nearly 100 technical workers. It is engaging mainly in electric motor casting, including Series Y, Y2, YCT, JO, JT, JI, YD2,BDN,Y2R,etc. more than 300 kinds of castings in total.	cupola, air compressor,sand production line, draught fan,shot blasting machine.	Coal (t)			0.00	0.178	tech castings	22,000	tech castings (t)	3,926.63	2.493	9,789.08	Equip front thermal analyzer; Apply the high-quality insulation work slag-congestion; Set up the heat preservation layer with aluminum silicate fiascle.	615,200.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	1.52	year	23,300	t castings/a	0.243	tech castings	860.20	2,144.48	
				Coke(t)	3,929.00	0.971	3,816.63											Entrustment Loan			IRR	71.69	%						
				Power/MWh	287.20	0.383	110.00											Self-Funding	4,952,096.00		NPV	299.56	¥10,000						
				Refined Oil(t)		1.471	0.00											Financial Assistance			Cost of energy saving[1]	625.73	¥/tce						
				Sum total			3,926.63																						
		Taigu Dasuk Shegang Foundry Co. Ltd. is located in the basin of Middle		Coal (t)			0.00											Commercial loan			Payback period	2.1	year						
				Coke(t)	927.00	0.971	900.49											Entrustment Loan			IRR	50.2	%						
				Power/MWh	78.33	0.383	30.00											Self-Funding	652,104.00		NPV	242.92	¥10,000						

9	Taigu Dunli Mogang Foundry Co. Ltd	Shanxi province and rich resources and convenient transportation. It has more than 100 staffs including more than 10 technical workers. Its products are mainly all kinds of electric power fitting (applicated in transportation and transmission electric power line below 500 KV)	cupola, air compressor,sand production line, draught fan, annealing furnace	Refined Oil(t)		1.471	0.00	0.310	tooth castings	3,000	tooth castings (e)	930.49	2.493	2,319.71	Equip front thermal analyzer, chain-type coal-burning installation, Change galvanizing furnace.	802,104.00	15,000	Financial Assistance		finished	July,2006-November,2006	Cost of energy saving[1]	658.68	Y/Ton	3,600	1 castings/a	0.238	tooth castings	187.20	466.69			
				Sum total			930.49																										
10	Taigu Xingli Mogang Co. Ltd	Located in Taigu Township, Shanxi Taigu Xingli Mogang Co. Ltd has more than 180 staffs.It mainly produces kinds of blanks for all kinds of pipe wrench. Bulb iron is used for producing grooved fittings and grey iron is used for producing anchine and lathe casting	cupola, air compressor,sand production line, draught fan	Coal (t)			0.00	0.338	tooth castings	8,000	tooth castings (k)	2,702.78	2.493	6,738.03	Equip front thermal analyzer; Apply the high-quality insulation work ring-congestion; Introduce the resin sand molding technique	671,736.00	15,000	Commercial loan		finished	July,2006-November,2006	Payback period	2.02	year	9,600	1 castings/a	0.268	tooth castings	672.00	1,675.38			
				Coke(t)	2,700.00	0.971	2,622.75										Extramurous Loan				IRR	52.43	%							
				Power(MWh)	208.88	0.383	80.00										Self-Funding	537,736.00			NPV	216.2	Y/10,000							
				Refined Oil(t)		1.471	0.00										Financial Assistance				Cost of energy saving[2]	282.37	Y/Ton							
				Sum total			2,702.78																										
	Total															6,940,416.16	150,800.00												7,345.92	18,811.99		

Tianjing' Foundry:

No.	TVEs	Business Profile	Major Energy use Equipments	B.E Baseline										Proposed Technical Renovation	Project Investment				Project Status	Start-end date	Actual Results									Remarks [1]
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product		Output Before Renovation		Total energy use (tce)	CO_2 Coefficient	CO_2 Emissions (t/a)		Total (RMB ¥ 10,000)	GEF support (US$)	Others (RMB¥ 10,000)				Financial Evaluation		Production after renovation	Energy Use/Unit Product		Energy Savings (tce/a)	CO_2 reuasion Reduction(t/a)	
1	Baotang'tou Foundry	Main products:	Cold blast cupola(3t/h),cleaning machine,sand mixing machine	Coal (t)	0.00	0.714	0.00	0.149	tce/t castings	3,000	t castings (a.)	446.88	1,114.08	Retrofitting the cold blast cupola into high efficient hot cupola	52.4	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	4.00	year	4,250	t castings/a	0.126	tce/t castings	97.59	243.28	
				Coke(t)	428.50	0.971	416.24										Entrustment Loan	0			IRR	22.95%	%							
				Power/MWh	80.00	0.383	30.64										Self-Funding	39.2			NPV	16.40	¥ 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5.0			Cost of energy saving	-631.90	¥ t/tce							
				Sum total			446.88										Others	0												
2	Bohai (Group) Hengtong Valve Co. Ltd	Main products:	Cold blast cupola(3t/h,5t/h),molding machine,electrical furnace、Heating boiler	Coal (t)	120.00	0.714	85.68	0.229	tce/t castings	5,000	t castings (a.)	1,143.80	2,851.50	Retrofitting two cold blast cupolas into high efficient hot cupolas,building electrical furnace cooling water waste heat reinevo system	90.0	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	4.60	year	6,250	t castings/a	0.190	tce/t castings	242.25	603.94	
				Coke(t)	695.00	0.971	675.12										Entrustment Loan	0			IRR	14.73%	%							
				Power/MWh	1,000.00	0.383	383.00										Self-Funding	76.8			NPV	10.85	¥ 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5.0			Cost of energy saving	-395.07	¥ t/tce							
				Sum total			1,143.80										Others	0												
3	Dazhan Valve General Plant	Main products:	Cold blast cupola(3t/h,5t/h), molding machine	Coal (t)	169.00	0.714	120.67	0.239	tce/t castings	5,000	t castings (a.)	1,197.25	2,984.18	Retrofitting two cold blast cupolas into high efficient hot cupolas	55.8	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	3.50	year	5,500	t castings/a	0.211	tce/t castings	156.47	390.08	
				Coke(t)	714.00	0.971	693.58										Entrustment Loan	0			IRR	31.77%	%							
				Power/MWh	1,000.00	0.383	383.00										Self-Funding	42.6			NPV	25.69	¥ 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5			Cost of energy saving	-572.63	¥ t/tce							
				Sum total			1,197.25										Others	0												
4	Huiyuan Metal Products Plant	Main products:	Cold blast cupola(5t/h,),molding machine,sand mixing machine,shot blasting machine	Coal (t)	60.10	0.714	42.91	0.193	tce/t castings	3,000	t castings (a.)	580.47	2,493	1,447.11	A new 3t/h hot blast cupola to replace the origjnal 5t/h cold cupola,introducing 2 molding machines	46.4	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	3.40	year	4,250	t castings/a	0.163	tce/t castings	121.08	301.86	The baseline date is from the 2005 statistics,and base year is 2004. The account of Financial Evaluation is after-tax statistical data of project Idc i=9%.RMB exchange rate against the dollar is 7.8
				Coke(t)	500.00	0.971	485.70										Entrustment Loan	0			IRR	36.58%	%							
				Power/MWh	135.40	0.383	51.86										Self-Funding	33.2			NPV	28.7	¥ 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5.0			Cost of energy saving	-941.73	¥ t/tce							
				Sum total			580.47										Others	0												
5	Juyuan foundry	Main products:	Cold blast cupola(2t/h,)	Coal (t)	65.00	0.714	46.41	0.132	tce/t castings	2,500	t castings (a.)	329.36	821.10	Retrofitting the cold blast cupola into high efficient hot cupola	47.4	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	4.10	year	3,000	t castings/a	0.110	tce/t castings	65.24	162.63	
				Coke(t)	275.00	0.971	267.14										Entrustment Loan	0			IRR	19.25%	%							
				Power/MWh	41.30	0.383	15.82										Self-Funding	34.2			NPV	9.47	¥ 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5.9			Cost of energy saving	-502.43	¥ t/tce							
				Sum total			329.36										Others	0												
6	Kaiyuan No.3 Valve Co. Ltd.	Main products:	2 cold blast cupola(5t/h,), sand mixing machine,shot blasting machine	Coal (t)	72.00	0.714	51.41	0.164	tce/t castings	2,800	t castings (a.)	458.23	1,145.56	Retrofitting two cold blast cupolas into high efficient hot cupolas	58.4	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	4.2	year	4,250	t castings/a	0.141	tce/t castings	96.28	240.69	
				Coke(t)	336.00	0.971	326.39										Entrustment Loan	0			IRR	19.76	%							
				Power/MWh	210.00	0.383	80.43										Self-Funding	45.2			NPV	13.7	¥ 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5.0			Cost of energy saving	-623.03	¥ t/tce							
				Sum total			458.23										Others	0												
7	Xinhai Paper-making Machinery Co. Ltd	Main products:	2 cold blast cupola(5t/h,)-cleaning machine	Coal (t)	120.00	0.714	85.68	0.277	tce/t castings	1,800	t castings (a.)	498.39	1,342.48	Purchasing a new 7t/h hot blast cupola to replace the original two 3t/h cold cupolas	123.4	1.05	Commercial loan	0	Finished	2005-10-20 to 2006-06-30	Payback period	5.30	year	2,000	t castings/a	0.215	tce/t castings	123.76	308.54	
				Coke(t)	415.00	0.971	403.13										Entrustment Loan	0			IRR	18.47%	%							
				Power/MWh	25.00	0.383	9.58										Self-Funding	210.2			NPV	17.36	Y 10,000.00							
				Produced oil (t)		1.471	0.00										Financial Assistance	5.0			Cost of energy saving	-787.05	Y t/tce							
				Sum total			498.39										Others	0												
to (a)															473.9	7.35										905.61	2,260.92	

Chengdu' Brick:

No.	TVEs	Business Profile[1]	Technical Process and Major Energy-use Equipments[2]	E E Baseline[3]								Proposed Technical Renovation [4]	Project Investment[5]				Project Status	Actual Results										Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product	Output Before Renovation	Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)		Total (RMB ¥ 10,000)	GEF (US$)	Others (RMB ¥ 10,000)			Start-end date	Financial Evaluation			Production after renovation	Energy Use/Unit Product			Energy Savings (tce/a.)	CO_2 emission Reduction(t/a.)	
1	Xinjin Tangzhong Shale Construction Material Ltd.	It is located in Huangdu Village of Xinjin County in Chengdu. There are 165 employees. The leading products are shale hollow bricks and porous bricks.Its fixed asset is more than RMB 4.5 million.	28-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	10,839.50	0.500	5,419.75	Coal 1.63 tce/10,000 bce [7]	3,500	10,000 bce/a	6,281.42	2.493	15,659.57	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressorizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	55.6606	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.16	year	4,200	10,000 common bricks/a	Coal 1.10 tce/10,000 bce		2,467.46	6,151.37	
				External combustive coal (t)	570.50	0.500	285.25	Power 0.16 tce/10,000 bce								Entrustment Loan	0			IRR	49.09	%			Power 0.11 tce/10,000 bce				
				Power/MWh	1,505.00	0.383	576.42									Self-Funding	45.9286			NPV	166.75	¥ 10,000							
				Sum total			6,281.42	C energy consumption[8] 1.79 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	232.83	¥ 1/tce			C energy consumption[7] 1.21 tce/10,000 bce				
2	Xinjin Huayuan Shale Hollow Brick Plant	It is located in Jinhua Village of Xinjin County in Chengdu. There are 150 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 1.5 million.	22-door annular kiln/ artificial drying Technical Process:Raw material-Hammer blow comminution-Beat up-Modeling-Stacking and burning once-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	4,040.00	1.000	4,040.00	Coal 2.02 tce/10,000 bce [7]	2,000	10,000 bce/a	4,388.53	2.493	10,940.61	(1) Build a storeroom; (2) Replace the vacuum brick-making machine; (3) Substitute vertical cutting piece machine for old cutting piece machine; (4) Rebuild a drying room; (5) Rebuild the stacking and burning once kiln to the 38-door stacking and burning twice kiln	157.2166	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	3.03	year	6,000	10,000 common bricks/a	Coal 1.20 tce/10,000 bce		5,425.59	13,526.00	
				External combustive coal (t)	0.00	1.000	0.00	Power 0.17 tce/10,000 bce								Entrustment Loan	0			IRR	39.56	%			Power 0.09 tce/10,000 bce				
				Power/MWh	910.00	0.383	348.53									Self-Funding	147.4846			NPV	617.27	¥ 10,000							
				Sum total			4,388.53	C energy consumption[8] 2.19 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	204.46	¥ 1/tce			C energy consumption[7] 1.29 tce/10,000 bce				
3	Xinjin Huangdu Shunyuan Shale Brick Plant	It is located in Baisha Village of Xinjin County in Chengdu. There are 160 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 2.5 million.	32-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	11,715.42	0.506	5,928.00	Coal 1.60 tce/10,000 bce [7]	3,900	10,000 bce/a	6,852.42	2.493	17,083.07	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	67.9983	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.43	year	4,700	10,000 common bricks/a	Coal 1.15 tce/10,000 bce		2,383.04	5,940.92	
				External combustive coal (t)	616.60	0.506	312.00	Power 0.16 tce/10,000 bce								Entrustment Loan	0			IRR	43.24	%			Power 0.10 tce/10,000 bce				
				Power/MWh	1,599.00	0.383	612.42									Self-Funding	58.2663			NPV	172.32	¥ 10,000							
				Sum total			6,852.42	C energy consumption[8] 1.76 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	289.33	¥ 1/tce			C energy consumption[7] 1.25 tce/10,000 bce				
4	Xinjin Jinhua Gaofeng Machine-Making Brick Plant	It is located in Jinhua Village of Xinjin County in Chengdu. There are 120 employees. The leading products are clay bricks. Its fixed asset is more than RMB 2.5 million.	22-door annular kiln/ natural drying Technical Process:Raw material-Modeling-Cut into pieces-Cut adobe-Natural drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	7,891.36	0.486	3,835.20	Coal 1.70 tce/10,000 bce [7]	2,400	10,000 bce/a	4,456.87	2.493	11,110.98	(1) Shale materials will substitute for the clay materials for brick making. (2) Replace the non-vacuum brick-making machine from 360# to JZK50/45-30, adopting more advanced cutting-piece machines and cutting-adobe machines replacing current ones. (3) Artificial drying replaces the natural drying. (4) Dismantle the 22-door kiln and build a 24-door energy-saving kiln.	249.2058	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	3.69	year	3,600	10,000 common bricks/a	Coal 1.10 tce/10,000 bce		2,373.59	5,917.35	
				External combustive coal (t)	503.70	0.486	244.80	Power 0.16 tce/10,000 bce								Entrustment Loan	0			IRR	23.59	%			Power 0.10 tce/10,000 bce				
				Power/MWh	984.00	0.383	376.87									Self-Funding	239.4738			NPV	191.75	¥ 10,000							
				Sum total			4,456.87	C energy consumption[8] 1.86 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	317.69	¥ 1/tce			C energy consumption[7] 1.20 tce/10,000 bce				

No.	TVEs	Business Profile[1]	Technical Process and Major Energy-use Equipments[2]	E E Baseline[3]								Proposed Technical Renovation [4]	Project Investment[5]				Project Status	Anticipated Results[6]								Remarks
				Energy Type	Energy consumption (physical quantity)	Coversion Factor	Energy use (tce)	Energy Use/Unit Product	Output Before Renovation	Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)		Total (RMB ¥ 10,000)	GEF (US$)	Others (RMB ¥ 10,000)			Financial Evaluation			Production after renovation	Energy Use/Unit Product	Energy Savings (tce/a.)	CO_2 emission Reduction(t/a.)	
5	Xinjin Dongsheng Shale Hollow Brick Plant	It is located in Huangdu Village in Xinjin Country in Chengdu. There are 120 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.0 million.	36-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	13,369.98	0.473	6,324.00	Coal: 1.70 tce/10,000 bce [7]	4,000 10,000 bce/a	7,435.78	2.493	18,537.60	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing, (3) Replace the hammer blow crusher from PC-800 to PC-1200.	60.5736	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.41	year	4,700 10,000 common bricks/a.	Coal: 1.23 tce/10,000 bce	2,486.04	6,197.70	
				External combustive coal (t)	1,006.34	0.473	476.00	Power: 0.16 tce/10,000 bce								Entrustment Loan	0						Power: 0.10 tce/10,000 bce			
				Power/MWh	1,660.00	0.383	635.78									Self-Funding	50.8416		IRR	34.39	%					
				Sum total			7,435.78	C energy consumption[8] 1.86 tce/10,000 bce								Financial Assistance	0		NPV	88.21	¥ 10,000					
																			Cost of energy saving[9]	258.23	¥ 1/tce		C energy consumption[2] 1.33 tce/10,000 bce			
6	Xinjin Tongxing Construction Material Plant	It is located in Huangdu Village in Xinjin Country in Chengdu. There are 130 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.0 million.	24-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	28,700.00	0.171	4,907.70	Coal: 1.72 tce/10,000 bce [7]	3,000 10,000 bce/a	5,625.60	2.493	14,024.62	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	58.8981	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.03	year	5,400 10,000 common bricks/a.	Coal: 1.16 tce/10,000 bce	3,322.08	8,281.95	
				External combustive coal (t)	1,510.53	0.171	258.30	Power: 0.15 tce/10,000 bce								Entrustment Loan	0						Power: 0.10 tce/10,000 bce			
				Power/MWh	1,200.00	0.383	459.60									Self-Funding	49.1661		IRR	63.89	%					
				Sum total			5,625.60	C energy consumption[8] 1.88 tce/10,000 bce								Financial Assistance	0		NPV	399.77	¥ 10,000					
																			Cost of energy saving[9]	204.16	¥ 1/tce		C energy consumption[2] 1.26 tce/10,000 bce			
7	Chengdu Pacific New Construction Material Ltd.	It is located in Huangdu Village in Xinjin Country in Chengdu. There are 168 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.0 million.	30-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	11,703.60	0.529	6,191.20	Coal: 1.72 tce/10,000 bce [7]	3,800 10,000 bce/a	7,150.15	2.493	17,825.33	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	57.6410	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.23	year	4,400 10,000 common bricks/a.	Coal: 1.11 tce/10,000 bce	2,973.60	7,413.19	
				External combustive coal (t)	615.97	0.529	325.85	Power: 0.17 tce/10,000 bce								Entrustment Loan	0						Power: 0.10 tce/10,000 bce			
				Power/MWh	1,653.00	0.383	633.10									Self-Funding	47.9090		IRR	50.09	%					
				Sum total			7,150.15	C energy consumption[8] 1.88 tce/10,000 bce								Financial Assistance	0		NPV	202.83	¥ 10,000					
																			Cost of energy saving[9]	246.74	¥ 1/tce		C energy consumption[2] 1.21 tce/10,000 bce			
8	Chengdu Xinjin Xingsheng Shale Brick Ltd	It is located in Puxing Village in Xinjin Country in Chengdu. There are 140 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.04 million.	28-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	23,878.74	0.214	5,110.05	Coal: 1.63 tce/10,000 bce [7]	3,300 10,000 bce/a	5,922.48	2.493	14,764.74	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	54.2835	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.12	year	4,000 10,000 common bricks/a.	Coal: 1.17 tce/10,000 bce	2,070.76	5,162.41	
				External combustive coal (t)	1,256.78	0.214	268.95	Power: 0.16 tce/10,000 bce								Entrustment Loan	0						Power: 0.11 tce/10,000 bce			
				Power/MWh	1,419.00	0.383	543.48									Self-Funding	44.5515		IRR	54.68	%					
				Sum total			5,922.48	C energy consumption[8] 1.79 tce/10,000 bce								Financial Assistance	0		NPV	231.42	¥ 10,000					
																			Cost of energy saving[9]	268.89	¥ 1/tce		C energy consumption[2] 1.28 tce/10,000 bce			

No.	TVEs	Business Profile[1]	Technical Process and Major Energy-use Equipments[2]	E E Baseline[3]								Proposed Technical Reqovation [4]	Project Investment[5]				Project Status	Anticipated Results[6]								Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product	Output Before Renovation	Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)		Total (RMB ¥10,000)	GEF (US$)	Others (RMB ¥10,000)			Start-end date	Financial Evaluation			Production after renovation	Energy Use/Unit Product		Energy Savings (tce/a.)	CO_2 emission Reduction(t/a.)	
9	Shuangliu Gaofeng Shale Hollow Brick Plant	It is located in Huayang Village in Shuangliu Country in Chengdu. There are 125 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.8 million.	20-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	8,159.05	0.503	4,104.00	Coal: 1.80 tce/10,000 bce.[7]	2,400 10,000 bce/a.	4,729.04	2.493	11,789.51	(1) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (2) Replace the seat and cover of brakes.	48.8563	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	1.85	year	3,000 10,000 common bricks/a.	Coal: 1.20 tce/10,000 bce.		2,012.51	5,017.18	
				External combustive coal (t)	429.42	0.503	216.00	Power: 0.17 tce/10,000 bce								Entrustment Loan	0			IRR	62.86	%		Power: 0.10 tce/10,000 bce				
				Power/MWh	1,068.00	0.383	409.04									Self-Funding	39.1243			NPV	238.08	¥10,000						
				Sum total			4,729.04	C energy consumption[8] 1.97 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	240.49	¥1/tce		C energy consumption[8] 1.30 tce/10,000 bce				
10	Shuangliu Changhong Shale Hollow Brick Plant	It is located in Baisha Village in Shuangliu Country in Chengdu. There are 130 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.0 million.	20-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	7,798.79	0.497	3,876.00	Coal: 1.70 tce/10,000 bce.[7]	2,400 10,000 bce/a.	4,470.66	2.493	11,145.35	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	59.1827	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	1.94	year	3,000 10,000 common bricks/a.	Coal: 1.15 tce/10,000 bce		1,839.52	4,585.93	
				External combustive coal (t)	410.46	0.497	204.00	Power: 0.16 tce/10,000 bce								Entrustment Loan	0			IRR	59.25	%		Power: 0.10 tce/10,000 bce				
				Power/MWh	1,020.00	0.383	390.66									Self-Funding	49.4507			NPV	264.30	¥10,000						
				Sum total			4,470.66	C energy consumption[8] 1.86 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	247.43	¥1/tce		C energy consumption[8] 1.25 tce/10,000 bce				
11	Chengdu Sanli Shale Hollow Brick Ltd.	It is located in Huanglongxi Village in Shuangliu Country in Chengdu. There are 120 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 4.2 million.	22-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	8,792.82	0.500	4,396.41	Coal: 1.71 tce/10,000 bce.[7]	2,700 10,000 bce/a.	5,048.68	2.493	12,586.36	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	55.7652	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.12	year	3,200 10,000 common bricks/a.	Coal: 1.10 tce/10,000 bce		2,144.90	5,347.23	
				External combustive coal (t)	462.78	0.500	231.39	Power: 0.10 tce/10,000 bce								Entrustment Loan	0			IRR	33.58	%		Power: 0.10 tce/10,000 bce				
				Power/MWh	1,098.90	0.383	420.88									Self-Funding	46.0332			NPV	77.81	¥10,000						
				Sum total			5,048.68	C energy consumption[8] 1.87 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	239.74	¥1/tce		C energy consumption[8] 1.20 tce/10,000 bce				
12	Shuangliu Liugong Huineng Shale Brick Plant	It is located in Jiancha Village in Shuangliu Country in Chengdu. There are 120 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 1.5 million.	22-door annular kiln/ natural drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Making adobe-Natural drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	7,825.74	0.505	3,952.00	Coal: 1.60 tce/10,000 bce.[7]	2,600 10,000 bce/a.	4,568.28	2.493	11,388.71	(1) Adopt new felting technical approach to replace the old brick and felt inside the kiln, then enhance pressurization; adopt infrared thermoscope to monitor and control burning temperature; (2) Replace the current electric transformer; (3) Build artificial drying room with 10 paths.	114.2042	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	3.02	year	3,300 10,000 common bricks/a.	Coal: 1.18 tce/10,000 bce		1,564.30	3,899.79	
				External combustive coal (t)	411.88	0.505	208.00	Power: 0.16 tce/10,000 bce								Entrustment Loan	0			IRR	34.80	%		Power: 0.10 tce/10,000 bce				
				Power/MWh	1,066.00	0.383	408.28									Self-Funding	104.4722			NPV	225.54	¥10,000						
				Sum total			4,568.28	C energy consumption[8] 1.76 tce/10,000 bce								Financial Assistance	0			Cost of energy saving[9]	306.81	¥1/tce		C energy consumption[8] 1.28 tce/10,000 bce				

No.	TVEs	Business Profile[1]	Technical Process and Major Energy-use Equipments[2]	E E Baseline[3]								Proposed Technical Renovation [4]	Project Investment[5]				Project Status	Anticipated Results[6]								Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product	Output Before Renovation	Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)		Total (RMB ¥10,000)	GEF (US$)	Others (RMB¥10,000)			Start-end date	Financial Evaluation			Production after renovation	Energy Use/Unit Product		Energy Savings (tce/a.)	CO_2 emission Reduction(t/a.)	
13	Shuangliu Jiancha Shale Brick Plant	It is located in Jiancha Village in Shuangliu Country in Chengdu. There are 100 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 4.55 million.	20-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	7,797.60	0.500	3,898.80	Coal: 1.71 tce/10,000 bce [7]	2,400 10,000 bce/a	4,476.28	2.493	11,159.36	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	56.5737	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.34	year	3,000 10,000 common bricks/a	Coal: 1.15 tce/10,000 bce	1,848.95	4,609.42	
				External combustive coal (t)	410.40	0.500	205.20	Power: 0.16 tce/10,000 bce								Entrustment Loan	0						Power: 0.10 tce/10,000 bce			
				Power/MWh	972.00	0.383	372.28									Self-Funding	46.8417		IRR	47.09	%					
																			NPV	181.18	¥10,000					
				Sum total			4,476.28	C energy consumption [8] 1.87 tce/10,000 bce								Financial Assistance	0		Cost of energy saving[9]	245.83	¥1/tce		C energy consumption[8] 1.25 tce/10,000 bce			
14	Shuangliu Huayang Honghuo Shale Hollow Brick Plant	It is located in Huayang Village in Shuangliu Country in Chengdu. There are 175 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 3.2 million.	22-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	8,828.13	0.498	4,396.41	Coal: 1.71 tce/10,000 bce [7]	2,700 10,000 bce/a	5,056.95	2.493	12,606.98	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	56.0523	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.32	year	3,300 10,000 common bricks/a	Coal: 1.18 tce/10,000 bce	1,958.04	4,881.39	
				External combustive coal (t)	464.66	0.498	231.39	Power: 0.16 tce/10,000 bce								Entrustment Loan	0						Power: 0.10 tce/10,000 bce			
				Power/MWh	1,120.50	0.383	429.15									Self-Funding	46.3203		IRR	48.21	%					
																			NPV	190.95	¥10,000					
				Sum total			5,056.95	C energy consumption [8] 1.87 tce/10,000 bce								Financial Assistance	0		Cost of energy saving[9]	269.23	¥1/tce		C energy consumption[8] 1.28 tce/10,000 bce			
15	Sichuan Qionglai Honglin Brick Plant	It is located in Huilong Village in Qionglai City in Chengdu. There are 120 employees. The leading products are shale hollow bricks and porous bricks. Its fixed asset is more than RMB 4.6 million.	24-door annular kiln/ artificial drying Technical Process:Raw material-Store material-Rough comminution-Further comminution-Store material-Beat up-Modeling-Cut into pieces-Cut adobe-Distribution-Drying-Burning-Finished product Major Energy-use Equipments:hammer blow crusher,beater,brick-making machine,blower	Internal combustive coal (t)	9,519.59	0.485	4,617.00	Coal: 1.71 tce/10,000 bce [7]	3,000 10,000 bce/a	5,595.35	2.493	13,949.20	(1) Install reactive power compensation for the inductance burthen; (2) Adopt new felting technical approach to replace the old brick and felt inside the kiln and strengthen the pressurizing; (3) Replace the hammer blow crusher from PC-800 to PC-1200.	58.6718	12,000	Commercial loan	0	All the services and activities required by the contract have been finished.	June 2005-May 2006	Payback period	2.35	year	3,700 10,000 common bricks/a	Coal: 1.11 tce/10,000 bce	2,442.43	6,088.97	
				External combustive coal (t)	1,057.73	0.485	513.00	Power: 0.16 tce/10,000 bce								Entrustment Loan	0						Power: 0.10 tce/10,000 bce			
				Power/MWh	1,215.00	0.383	465.35									Self-Funding	48.9398		IRR	47.04	%					
																			NPV	188.06	¥10,000					
				Sum total			5,595.35	C energy consumption [8] 1.87 tce/10,000 bce								Financial Assistance	0		Cost of energy saving[9]	239.49	¥1/tce		C energy consumption[8] 1.21 tce/10,000 bce			
Total														1,210.7837	180,000		1064.8037							37312.79	93020.79	

Note:

[1]-[3]. All data are quoted from the Feasibility Study Report, and data of 2004 are used as baseline data.

[4]-[6]. The data arequoted from actual results after the operation of the project.

[7]. bce: brick common equivalent

[8]. e energy consumption: comprehensive energy consumption

[9]. Formula for calculating cost of energy savings:

$$CE = \frac{Invest \cdot \frac{i(1+i)^n}{(1+i)^n - 1} + (c_2 - c_1) \cdot P_2}{EF}$$

Legend:

CE—cost of energy savings, ¥1/tce;

Invest— Initial cost (¥)

i—Discount rate;

n— Project lifecycle (a.)

c_2-c_1-incremental cost per product. c_2 - cost per product after the renovation,c_1- cost per product before the renovation. (¥/10,000 bce)

P2 - annual output after the renovation, (¥/10,000 bce)

EF— annual energy savings (tce/a.)

Shengyang' Brick:

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	EE Baseline					Output Before Renovation	Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)	Proposed Technical Renovation	Project Investment				Project Status	Actual Results								
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product						Total(RMB ¥ 10,000)	GEF (US$)	Others(RMB ¥ 10,000)			Start-end date	Financial Evaluation			Production after renovation	Energy Use/Unit Product		Energy Savings (tce/a.)	CO2 emission Reduction (t/a.)
1	Tonggou No 4 Brick Plant, Sujiatun District, Shenyang	A collectively owned enterprise, established in 1989, with fixed assets of $120,000. Output before the renovation: 26.50 M bricks common equivalent/a ; Total employees: 140	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 2 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	1,858.40	1.000	1,858.40	Coal: 1.46 tce/10,000 bce [2]	7,650	10,000 bce/a / 4,020.41	2.493	10,022.88	1. renew the coal cinder grinding system 2. enlarge the Hoffman kiln by building 8 extra chambers; 3. retrofit the kiln; 4. Introduce power capacitance enhancing devices (PCED) on motors 5.introduce a new energy efficient air blower	57	12,000	commercial loan		accomplished	March - August, 2005	Payback period	2.42	year	3,400	x 10000 bce/a	Coal: 1.23 tce/10,000 bce		806.26	2,010.01
				External combustive coal (t)			0.00	Power: 0.05 tce/10,000 bce								entrustment loan							Power: 0.05 tce/10,000 bce			
				Power/MWh	423.00	0.383	162.01									funds due	47		IRR	83.63	%						
				Sum total			4,020.41	C energy consumption [3] 1.52 tce/10,000 bce								public subsidy			NPV	354.39	x 10000 RMB						
																			Cost of energy saving[4]	55.82	RMB/tce			C energy consumption 1.28 tce/10,000 bce			
2	Hollow Brick Plant, Wastoushan Town, Xihu District, Benxi City	A private owned enterprise, established in 1994, with fixed assets of $4 58,000 Output before the renovation: 35 M bricks common equivalent/a ; Total employees: 140	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 3 dual-spindle mixers, then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,987.50	1.000	4,987.50	Coal: 1.43 tce/10,000 bce	3,500	10,000 bce/a / 5,201.51	2.493	12,967.37	1. renew the coal cinder grinding system 2. retrofit the Hoffman kiln; 3. Introduce reactive power capacitance compensation devices on the transformer 4. introduce a new energy efficient air blower	51	11,900	commercial loan		accomplished	March - August, 2005	Payback period	3.32	year	3,500	x 10000 bce/a	Coal: 1.26 tce/10,000 bce		623.51	1,554.42
				External combustive coal (t)			0.00	Power: 0.06 tce/10,000 bce								entrustment loan							Power: 0.05 tce/10,000 bce			
				Power/MWh	558.78	0.383	214.01									funds due	41		IRR	43.10	%						
				Sum total			5,201.51	C energy consumption 1.49 tce/10,000 bce								public subsidy			NPV	100.22	x 10000 RMB						
																			Cost of energy saving	47.61	RMB/tce			C energy consumption 1.31 tce/10,000 bce			
3	Shenyang Wensheng Brick Plant	A private owned enterprise, established in 1989, with fixed assets of $345,000. Output before the renovation: 55 M bricks common equivalent/a., Total employees: 160	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 4 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	7,870.50	1.000	7,870.50	Coal: 1.43 tce/10,000 bce	5,500	10,000 bce/a / 8,169.78	2.493	20,367.25	1. renew the coal cinder grinding system 2. retrofit the Hoffman kiln; 3. Introduce reactive power capacitance compensation devices on the transformer 4. Introduce power capacitance enhancing devices (PCED) on motors	85	12,800	commercial loan		accomplished	March - August, 2005	Payback period	4.51	year	5,500	x 10000 bce/a	Coal: 1.23 tce/10,000 bce		1,074.78	2,679.42
				External combustive coal (t)			0.00	Power: 0.05 tce/10,000 bce								entrustment loan							Power: 0.04 tce/10,000 bce			
				Power/MWh	781.40	0.383	299.28									funds due	75		IRR	27.85	%						
				Sum total			8,169.78	C energy consumption 1.49 tce/10,000 bce								public subsidy			NPV	91.70	x 10000 RMB						
																			Cost of energy saving	27.15	RMB/tce			C energy consumption 1.29 tce/10,000 bce			
4	Qingshantai Gaotang Hollow Brick Plant, Xiaobengzi District,Shenyang	A private owned enterprise, established in 1978, with fixed assets of $364,000. Output before the renovation: 27.7 M bricks common equivalent/a ; Total employees: 110	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 5 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,088.50	1.000	4,088.50	Coal: 1.48 tce/10,000 bce	2,770	10,000 bce/a / 4,233.60	2.493	10,554.37	1. renew the coal cinder grinding system 2. enlarge the Hoffman kiln by building 8 extra chambers; 3. retrofit the Hoffman kiln; 4. introduce power capacitance enhancing devices (PCED) on motors	57	12,100	commercial loan		accomplished	March - August, 2005	Payback period	2.33	year	3,500	x 10000 bce/a	Coal: 1.27 tce/10,000 bce		781.82	1,949.07
				External combustive coal (t)			0.00	Power: 0.05 tce/10,000 bce								entrustment loan							Power: 0.04 tce/10,000 bce			
				Power/MWh	378.86	0.383	145.10									funds due	47		IRR	87.51	%						
				Sum total			4,233.60	C energy consumption 1.51 tce/10,000 bce								public subsidy			NPV	378.12	x 10000 RMB						
																			Cost of energy saving	70.67	RMB/tce			C energy consumption 1.31 tce/10,000 bce			
5	Shenyang Pingluo Building Material Plant	A private owned enterprise, established in 1988, with fixed assets of $2.54,000. Output before the renovation: 28 M bricks common equivalent/a ; Total employees: 130	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 6 dual-spindle mixers, then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,373.60	1.000	4,373.60	Coal: 1.56 tce/10,000 bce	2,800	10,000 bce/a / 4,519.39	2.493	11,266.84	1.Build a new 44 -- chamber Hoffman kiln; 2.introduce power capacitance enhancing devices (PCED) on motors	109	12,800	commercial loan		accomplished	March - August, 2005	Payback period	2.40	year	3,800	x 10000 bce/a	Coal: 1.14 tce/10,000 bce		1,668.84	4,160.41
				External combustive coal (t)			0.00	Power: 0.05 tce/10,000 bce								entrustment loan							Power: 0.03 tce/10,000 bce			
				Power/MWh	380.65	0.383	145.79									funds due	98		IRR	81.60	%						
				Sum total			4,519.39	C energy consumption 1.61 tce/10,000 bce								public subsidy			NPV	616.64	x 10000 RMB						
																			Cost of energy saving	54.55	RMB/tce			C energy consumption 1.17 tce/10,000 bce			
6	Shenyang Xihuan Hollow Brick Plan	A private owned enterprise, established in 1991, with fixed assets of $315,000. Output before the renovation: 35 M bricks common equivalent/a., Total employees: 160	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 7 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,858.00	1.000	4,858.00	Coal: 1.39 tce/10,000 bce	3,500	10,000 bce/a / 5,058.51	2.493	12,610.86	1. renew the coal cinder grinding system 2. retrofit the Hoffman kiln; 3. Introduce reactive power capacitance compensation devices on the transformer 4. introduce a new energy efficient air blower1.	54	12,300	commercial loan		accomplished	March - August, 2005	Payback period	7.02	year	3,500	x 10000 bce/a	Coal: 1.22 tce/10,000 bce		663.21	1,653.38
				External combustive coal (t)			0.00	Power: 0.06 tce/10,000 bce								entrustment loan							Power: 0.04 tce/10,000 bce			
				Power/MWh	523.52	0.383	200.51									funds due	44		IRR	11.54	%						
				Sum total			5,058.51	C energy consumption 1.45 tce/10,000 bce								public subsidy			NPV	4.38	x 10000 RMB						
																			Cost of energy saving	27.05	RMB/tce			C energy consumption[5] 1.26 tce/10,000 bce			
7	Dongbei Clay Brick Plant	A private owned enterprise, established in 1993, with fixed assets of $969,000. Output before the renovation: 35.2 M	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 8 dual-spindle mixers; then fed into a double-stage vacuum extruder;	Internal combustive coal (t)	4,611.20	1.000	4,611.20	Coal: 1.31 tce/10,000 bce	3,520	10,000 bce/a / 4,813.42	2.493	11,999.87	build a 16-chamber green brick dryer	179	12,600	commercial loan		accomplished	March - August, 2005	Payback period	4.44	year	4,150	x 10000 bce/a	Coal: 1.34 tce/10,000 bce		1,299.74	3,240.25
				External combustive coal (t)			0.00	Power: 0.06 tce/10,000 bce								entrustment loan							Power: 0.08 tce/10,000 bce			
				Power/MWh	528.00	0.383	202.27									funds due	169		IRR	29.79	%						
																			NPV	252.47	x 10000 RMB						

		bricks common equivalent/h ; Total employees: 220	extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Sum total			4,813.42	C energy consumption	1.37 tce/10,000 bce								public subsidy					Cost of energy saving	126.20	RMB/tce			C energy consumption	1.39 tce/10,000 bce			
8	Shenyang Gaokan Town No.6 Red Brick Plant	A private owned enterprise, established in 1985, with fixed assets of $460,000. Output before the renovation: 43.5 M bricks common equivalent/a ; Total employees: 140	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 9 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks, air dried green bricks fired in a Hoffman kiln	Internal combustive coal (t)	6,699.00	1.000	6,699.00	Coal:	1.34 tce/10,000 bce	4,350	10,000 bce/a /	7,148.11	2.493	17,820.23	1.retrofit the 24-chamber green brick dryer; 2. retrofit the Hoffman kiln; 3. introduce FPN frequency controllers onto air blowers	65	12,000	commercial loan		accomplished	March - August, 2005	Payback period	3.92	year	4,350	x 10000 bce/a	Coal:	1.32 tce/10,000 bce	1,084.21	2,702.93
				External combustive coal (t)			0.00	Power:	0.10 tce/10,000 bce								entrustment loan					IRR	34.20	%			Power:	0.07 tce/10,000 bce			
				Power/MWh	1,172.60	0.383	449.11										funds due	55				NPV	106.69	x 10000 RMB							
				Sum total			7,148.11	C energy consumption	1.64 tce/10,000 bce								public subsidy					Cost of energy saving	55.65	RMB/tce			C energy consumption	1.29 tce/10,000 bce			
9	Tieling County Kangqing Red Brick Plant	A private owned enterprise, established in 1988, with fixed assets of $242,000. Output before the renovation: 30 M bricks common equivalent/a ; Total employees: 120	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 10 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,389.00	1.000	4,389.00	Coal:	1.46 tce/10,000 bce	3,000	10,000 bce/a /	4,590.34	2.493	11,443.73	1.retrofit the 24-chamber green brick dryer; 2. retrofit the Hoffman kiln; 3.introduce power capacitance enhancing devices (PCED) on motors	50	11,700	commercial loan		accomplished	March - August, 2005	Payback period	4.76	year	3,000	x 10000 bce/a	Coal:	1.26 tce/10,000 bce	687.34	1,715.53
				External combustive coal (t)			0.00	Power:	0.07 tce/10,000 bce								entrustment loan					IRR	25.77	%			Power:	0.04 tce/10,000 bce			
				Power/MWh	525.70	0.383	201.34										funds due	40				NPV	46.70	x 10000 RMB							
				Sum total			4,590.34	C energy consumption	1.53 tce/10,000 bce								public subsidy					Cost of energy saving	53.36	RMB/tce			C energy consumption	1.30 tce/10,000 bce			
10	Tonggou No.3 Brick Plant, Sujiatun District, Shenyang	A collectively owned enterprise, established in 1992, with fixed assets of $145,000. Output before the renovation: 32 M bricks common equivalent/a ; Total employees: 100	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 11 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,259.20	1.000	4,259.20	Coal:	1.33 tce/10,000 bce	3,200	10,000 bce/a /	4,422.62	2.493	11,023.60	1. enlarge the Hoffman kiln by building 12 extra chambers; 2. retrofit the kiln; 3. Introduce reactive power capacitance compensation devices on the transformer 4.Introduce reactive power capacitance compensation devices on the transformer 5.introduce power capacitance enhancing devices (PCED) on motors introduce power capacitance enhancing devices (PCED) on motors	48	11,200	commercial loan		accomplished	March - August, 2005	Payback period	2.94	year	4,250	x 10000 bce/a	Coal:	1.16 tce/10,000 bce	788.67	1,966.35
				External combustive coal (t)			0.00	Power:	0.05 tce/10,000 bce								entrustment loan					IRR	68.03	%			Power:	0.04 tce/10,000 bce			
				Power/MWh	426.60	0.383	163.42										funds due	38				NPV	248.43	x 10000 RMB							
				Sum total			4,422.62	C energy consumption	1.38 tce/10,000 bce								public subsidy					Cost of energy saving	55.93	RMB/tce			C energy consumption	1.20 tce/10,000 bce			
11	Tonggou Hollow Brick Plant, Shenyang	A collectively owned enterprise, established in 1993, with fixed assets of $485,000. Output before the renovation: 70 M bricks common equivalent/a ; Total employees: 400	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 12 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	9,380.00	1.000	9,380.00	Coal:	1.34 tce/10,000 bce	7,000	10,000 bce/a /	9,692.95	2.493	24,164.52	1.retrofit the kiln; 2.introduce power capacitance enhancing devices (PCED) on motors	54	12,300	commercial loan		accomplished	March - August, 2005	Payback period	3.41	year	7,000	x 10000 bce/a	Coal:	1.18 tce/10,000 bce	1,181.65	2,945.85
				External combustive coal (t)			0.00	Power:	0.04 tce/10,000 bce								entrustment loan					IRR	41.18	%			Power:	0.04 tce/10,000 bce			
				Power/MWh	817.10	0.383	312.95										funds due	44				NPV	106.31	x 10000 RMB							
				Sum total			9,692.95	C energy consumption	1.38 tce/10,000 bce								public subsidy					Cost of energy saving	35.00	RMB/tce			C energy consumption	1.22 tce/10,000 bce			
12	Huangtukan Construction Materials Plant, Yuhong District, Shenyang	A private owned enterprise, established in 1994, with fixed assets of $968,500. Output before the renovation: 32.3 M bricks common equivalent/a ; Total employees: 220	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 13 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,360.50	1.000	4,360.50	Coal:	1.35 tce/10,000 bce	3,230	10,000 bce/a /	4,551.23	2.493	11,346.23	build a 12-chamber green brick dryer	120	12,600	commercial loan		accomplished	March - August, 2016	Payback period	2.10	year	4,000	x 10000 bce/a	Coal:	1.35 tce/10,000 bce	1,051.56	2,627.54
				External combustive coal (t)			0.00	Power:	0.06 tce/10,000 bce								entrustment loan					IRR	69.97	%			Power:	0.12 tce/10,000 bce			
				Power/MWh	498.00	0.383	190.73										funds due	109				NPV	539.77	x 10000 RMB							
				Sum total			4,551.23	C energy consumption[3]	1.41 tce/10,000 bce								public subsidy					Cost of energy saving	57.12	RMB/tce			C energy consumption	1.47 tce/10,000 bce			
13	Dongshezhanzi No. 3 Red Brick Plant, Xinmin City	A private owned enterprise, established in 1984, with fixed assets of $150,000. Output before the renovation: 25 M bricks common equivalent/a ; Total employees: 132	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 14 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	3,880.00	1.000	3,880.00	Coal:	1.55 tce/10,000 bce	2,500	10,000 bce/a /	4,037.10	2.493	10,064.49	1.renew the double-stage vacuum extruder; 2. renew the coal cinder grinding system 3. retrofit the Hoffman kiln; 4. introduce power capacitance enhancing devices (PCED) on motors 5. introduce FPN frequency controllers onto air blowers	54	11,400	commercial loan		accomplished	March - August, 2005	Payback period	2.54	year	2,500	x 10000 bce/a	Coal:	1.24 tce/10,000 bce	842.60	2,106.60
				External combustive coal (t)			0.00	Power:	0.06 tce/10,000 bce								entrustment loan					IRR	53.88	%			Power:	0.04 tce/10,000 bce			
				Power/MWh	410.18	0.383	157.10										funds due	44				NPV	192.52	x 10000 RMB							
				Sum total			4,037.10	C energy consumption	1.61 tce/10,000 bce								public subsidy					Cost of energy saving	62.32	RMB/tce			C energy consumption	1.38 tce/10,000 bce			
14	Mabei Brick Plant, Yuhong District, Shenyang	A private owned enterprise, established in 1987, with fixed assets of $109,000. Output before the renovation: 39 M bricks common equivalent/a ; Total employees: 140	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 15 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	5,475.60	1.000	5,475.60	Coal:	1.40 tce/10,000 bce	3,900	10,000 bce/a /	5,678.82	2.493	14,157.30	1. renew the coal cinder grinding system 2. retrofit the Hoffman kiln; 3. Introduce reactive power capacitance compensation devices on the transformer 4. introduce power capacitance enhancing devices (PCED) on motors; 5. introduce a new energy efficient air blower.	50	11,400	commercial loan		accomplished	March - August, 2005	Payback period	3.60	year	3,900	x 10000 bce/a	Coal:	1.23 tce/10,000 bce	763.65	1,903.78
				External combustive coal (t)			0.00	Power:	0.05 tce/10,000 bce								entrustment loan					IRR	38.23	%			Power:	0.03 tce/10,000 bce			
				Power/MWh	530.60	0.383	203.22										funds due	41				NPV	88.59	x 10000 RMB							
				Sum total			5,678.82	C energy consumption	1.46 tce/10,000 bce								public subsidy					Cost of energy saving	59.13	RMB/tce			C energy consumption	1.26 tce/10,000 bce			

15	Minsheng Brick Plant, Benxi	A private owned enterprise, established in 1981, with fixed assets of $292,000. Output before the renovation: 36 M bricks common equivalent/a.; Total employees: 158	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 16 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	4,903.20	1.000	4,903.20	Coal:	1.36 tce/10,000 bce	3,600	10,000 bce/a	5,135.41	2.493	12,802.58	1. renew the coal cinder grinding system 2. retrofit the Hoffman kiln; 3. introduce power capacitance enhancing devices (PCED) on motors	47	11,200	commercial loan		accomplished	March - August, 2005	Payback period	4.29	year	3,600	x 10000 bce/a	Coal:	1.19 tce/10,000 bce	672.49	1,676.52
				External combustive coal (t)			0.00	Power:	0.06 tce/10,000 bce										IRR	29.81	%			Power:	0.05 tce/10,000 bce		
				Power/MWh	606.30	0.383	232.21												NPV	56.59	x 10000 RMB						
				Sum total			5,135.41	C energy consumption:	1.43 tce/10,000 bce									public subsidy			Cost of energy saving	51.76	RMB/tce		C energy consumption:	1.24 tce/10,000 bce		
16	Mayi Brick Plant, Anshan	A collectively owned enterprise, established in 1980, with fixed assets of $72,700. Output before the renovation: 20 M bricks common equivalent/a.; Total employees: 86	clay and coal cinders mixed in a cased raw-meal feeder (mixer) and 17 dual-spindle mixers; then fed into a double-stage vacuum extruder; extruded columns cut into green bricks; air dried green bricks fired in a Hoffman kiln.	Internal combustive coal (t)	3,192.00	1.000	3,192.00	Coal:	1.60 tce/10,000 bce	2,000	10,000 bce/a	3,320.92	1.493	8,279.05	1.renew the double-stage vacuum extruder; 2.retrofit the Hoffman kiln; 3. introduce power capacitance enhancing devices (PCED) on motors 4. introduce FPN frequency controllers onto air blowers	52	11,700	commercial loan		accomplished	March - august, 2005	Payback period	7.19	year	2,000	x 10000 bce/a	Coal:	1.22 tce/10,000 bce	802.02	1,999.44
				External combustive coal (t)			0.00	Power:	0.06 tce/10,000 bce										IRR	13.99	%			Power:	0.04 tce/10,000 bce		
				Power/MWh	336.60	0.383	128.92												NPV	11.29	x 10000 RMB						
				Sum total			3,320.92	C energy consumption:	1.66 tce/10,000 bce									public subsidy			Cost of energy saving	69.63	RMB/tce		C energy consumption:	1.26 tce/10,000 bce		
Total:															1150	192000												14792.34	36877.31

Note:

1. Remarks: Comparing with the last version of the M&E Form annexed to the draft final report, technical figures in this Form have been updated or revised by verifying with not only feasibility study, progress report, installation report, on-site testing results, the annual EE report (2004) and the first-half-year report (2005) but also the year-end EE report (2005) of each of the plants, which we have just received.

2. bce: brick common equivalent

3. c energy consumption: comprehensive energy consumption

4. Formula for calculating cost of energy savings :

$$CE=\frac{Invest\frac{i}{(1+i)^n-1}+Cost}{EF}$$

Legend:

CE—cost of energy savings, ¥/tce;

Invest— Initial cost (¥)

i—Discount rate;

n— Project lifecycle (a)

c_2-c_1-incremental cost per product. c_2 - cost per product after the renovation;c_1- cost per product before the renovation. (¥/10,000 bce)

P2 - annual output after the renovation, (x 10,000 bce)

EF— annual energy savings (tce/a.)

5. Calculation of energy savings at TVE No. 7 and No. 12. "Artificial drying technology" technology has been applied to replace the "natural drying" technology at the two TVEs. After the renovation, waste heat exhausted from kilns is introduced into the artificial drying chamber as heating energy. This is of a type of waste heat (energy) recycling. Exact energy savings at the two TVEs are calculated by subtracting the power consumption of the newly added blowers from the total heat energy recycled.

Xian' Brick:

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	B-E Baseline								Proposed Technical Renovation	Project Investment			Project Status	Actual Results								Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product	Output Before Renovation	Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)		Total (RMB Y 10,000)	GEF (US$)	Others (RMB Y 10,000)		Start-end date	Financial Evaluation			Production after renovation	Energy Use/Unit Product	Energy Savings (tce/a.)	CO2 emission Reduction(t/a)	
1	Hollow Brick Plant, Baling Town, Baqiao District, Xi' an	This plant was established as a collectively owned plant in the 1980s. It occupies an area of over 80 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1 million RMB Yuan and produces an annual output of 24 million bricks (common brick equivalent). While it has fixed assets of 1.52 million RMB Yuan and produces an annual output of 26.88 million bricks (common brick equivalent) after renovation. At present,the plant employs 100 people including 8 technicals and the salary is 820 RMB Yuan/month on average. The main raw material is clay and cinder. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.36 RMB Yuan/piece and the perforatio rate is over 25 %. The price of the hollow is 1.00 RMB Yuan/piece and the perforatio rate is over 45%. As a result of renovation, brick quality improved and the acceptance rate increases from 78% to 90%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crush+ boxing feeder——coarse rolls-hi-speed fine rolls——mixer——vacuum extruder——vertical column cutter——green brick cutter——natural drying——firing in annual kiln The main energy consumption equipments 1)The repaired 38 chambers annular kiln 2)Cinder crusher 3)Hi-speed fine rolls 4)Mixer 5)Vacuum extruder 6)Column cutter 7)Green brick cutter 8)Exhaust blower	Internal combustive coal: (t)	7200.00	0.196	1,411.20	Coal: 1.25 tce/10,000 bce	2,400	10,000 bcs/a/	3,159.94	2.493	7,877.72	1)Kiln renovation The 38 chambers annular kiln was sealed.The surface backfilling of the annular kiln was carried away and the leaking flue and arch roof was repaired and tamped 2)Equipment renovation a) Purchase a set of new excavator. Install and debug the equipments including cinder crusher, hi-speed fine rolls, vacuum extruder and vertical column cutter. b) Die installation and commissioning 3) Electric equipment renovation 4) Drainage system of green brick yard renovation 5) Staff training	51.6932	12,000.00	Comercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	2.61	year	2,688	10,000 common bricks/a	Coal: 1.000 tce/10,000 bce	707.00	1,762.55	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report.6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination
				External combustive coal: (t)	2160.00	0.733	1,583.28	Power: 0.07 tce/10,000 bce								Entrustment Loan			IRR	46.01	%		Power: 0.054 tce/10,000 bce			
				Power/MWh	432.00	0.383	165.46									Self-Funding	41.76920		NPV	76.63	Y 10,000					
				Sum total			3,159.94	C energy consumption 1.32 tce/10,000 bce								Financial Assistance			Cost of energy saving	103.70	Y1/tce		C energy consumption 1.05 tce/10,000 bce			
2	Hongqi New Type Building Materials co., Xi'an	This plant was established as a collectively owned plant in the 1980s. It occupies an area of over 120 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.1 million RMB Yuan and produces an annual output of 44 million bricks (common brick equivalent). While it has fixed assets of 1.68 million RMB Yuan and produces an annual output of 46 million bricks (common brick equivalent) after renovation. At present, the plant employs 100 people including 10 technical people and the salary is 850 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.40 RMB Yuan/piece and the perforation rate is over 25%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 37%. As a result of renovation, brick quality improved and the acceptance rate increases from 80% to 92%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Boxing feeder→rolls crusher→hi-speed fine rolls→double shaft mixer→two-stage vacuum extruder→column cutter→green cutter→adobe transporting machine→natural drying→firing in annular kiln The main energy consumption equipments 1)New 38 chambers and the repaired 24 chambers annular kiln 2)Boxing feeder 3)Cinder crusher 4)Rolls crusher 5)Hi-speed fine rolls 6)Double shaft mixer 7)Two-stage vacuum extruder 8)Column cutter 9)Green cutter 10)Blower	Internal combustive coal: (t)	16940.00	0.29	4839.76	Coal: 1.10 tce/10,000 bce	4400	10,000 bcs/a/	5109.39	2.493	12737.71	1) Renewing process equipment 1 set of Type Φ800×600 hi-speed fine rolls was introduced. The Type JZK450 vacuum extruder is replaced with a Type JZK500 two-stage vacuum extruder. Replace the original column cutter with the vertical column cutter to reduce wasted column by 10%. 2) Annular kiln renovation The 24 chambers annular kiln was repaired. The arc wall of the kiln was removed, while the vertical wall was kept. The old damp was changed with new type.1 set of type ZFJ-8 blower was introduced. The drainage system was repaired through increasing height of back to reduce loss of adobe when rainy weather or heavy rain. 3) Electric equipments renovation Non-power compensator was added to extruder. Transducer was added to kiln blower.	57.6956	12,000.00	Comercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	1.94	year	4600	10,000 common bricks/a	Coal: 0.97 tce/10,000 bce	632.98	1,578.03	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. The Plant uses the poor coal with low calorific value. 5)Total investment and GEF comes from the renovation actual data .6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from the Feasibility Report.
				External combustive coal: (t)		0		Power: 0.061 tce/10,000 bce								Entrustment Loan			IRR	60.50	%		Power: 0.054 tce/10,000 bce			
				Power/MWh	704.00	0.383	269.63									Self-Funding	47.77160		NPV	126.14	Y 10,000					
				Sum total			5109.39	C energy consumption 1.16 tce/10,000 bce								Financial Assistance			Cost of energy saving	135.89	Y1/tce		C energy consumption 1.02 tce/10,000 bce			
3	Hongfang Building Materials Co.	This plant was established as a collectively owned plant in 2000. It occupies an area of over 130 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.2 million RMB Yuan and produces an annual output of 26 million bricks (common brick equivalent). While it has fixed assets of 1.76 million RMB Yuan and produces an annual output of 30 million bricks (common brick equivalent) after renovation. At present, the plant employs 110 people including 11 technical people and the salary is 870 RMB Yuan/month on average. The main raw material is clay and cinder. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.36 RMB Yuan/piece and the perforation rate is over 26 %. The price of the hollow is 1.02 RMB Yuan/piece and the perforation rate is over 40%. As a result of renovation, brick quality improved and the acceptance rate increases from 78% to 90%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher + boxing feeder——hi-speed fine rolls——mixing extruder——vacuum extruder——vertical column cutter——green brick cutter——natural drying——firing in annular kiln The main energy consumption equipments: 1)The repaired 40 chambers annular kiln 2)Cinder crusher 3)Hi-speed rolls 4)Mixing extruder 5)Vacuum extruder 6)Column cutter 7)Green brick cutter 8)Exhaust blower	Internal combustive coal: (t)	7200.00	0.196	1,411.20	Coal: 1.25 tce/10,000 bce	2,600	10,000 bcs/a/	3,421.64	2.493	8,530.16	1)Annular kiln renovation The 40 chambers annular kiln was sealed. The surface back/filling was carried away and the leaking flue and arch roof was repaired and tamped. 2)Process equipments renovation a)Introduce a set of new excavator. Install and debug the equipments including cinder crusher, hi-speed fine rolls, mixing extruder and vertical column cutter. b)Die installation and commissioning 3)Electric renovation. Transducer was added to kiln blower. Non-power compensator was added to extruder, and hi-speed rolls and mixing extruder apiece. 4)Drainage system of green brick yard renovation 5)Staff training	56.4618	12,000.00	Comercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	2.37	year	3,000	10,000 common bricks/a	Coal: 1.000 tce/10,000 bce	787.19	1,962.47	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report.6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
				External combustive coal: (t)	2400.00	0.763	1,831.20	Power: 0.07 tce/10,000 bce								Entrustment Loan			IRR	50.30	%		Power: 0.054 tce/10,000 bce			
				Power/MWh	468.00	0.383	179.24									Self-Funding	46.53780		NPV	95.33	Y 10,000					
				Sum total			3,421.64	C energy consumption 1.32 tce/10,000 bce								Financial Assistance			Cost of energy saving	101.2	Y1/tce		C energy consumption 1.05 tce/10,000 bce			

4	Baling Liuxun Brick Plant, Baqiao District, Xi' an	This plant was established as a collectively owned plant in 1986. It occupies an area of over 107 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.2 million RMB Yuan and produces an annual output of 21.48 million bricks (common brick equivalent). While it has fixed assets of 1.74 million RMB Yuan and produces an annual output of 24 million bricks (common brick equivalent) after renovation. At present, the plant employs 87 people including 6 technical people and the salary is 860 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×175×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.40 RMB Yuan/piece and the perforation rate is over 25%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 37%. As a result of renovation, brick quality improved and the acceptance rate increases from 83% to 93%. Most of the products are sold on the local market in Xi'an.	Process production and equipments: Boxing feeder→rolls→double shaft mixer→two-stage vacuum extruder→column cutter→green brick cutter→adobe transporting machine→natural drying→firing in annular kiln The main energy consumption 1)The rebuilt 38 chambers annular kiln 2)Boxing feeder 3)Cinder crusher 4)Hi-speed fine rolls 5)Double shaft mixer 6)Two-stage vacuum extruder 7)Column cutter 8)Green brick cutter 9)Blower	Internal combustive coal (t)	9022.50	0.14	1263.15	Coal:	1.20	tce/10,000 bce	2148	10,000 bricks/	2723.61	2.493	6789.96	1)Renewing process equipment Replace the second rolls crusher with Type Φ 800×600 hi-speed fine rolls to eliminate the lime nodules in the clay and to control the raw material fineness. Replace the Type 150 extruder with Type JZK45/40 two-stage vacuum extruder to mix the clay and the interior fuel even. Replace the column cutter with vertical column cutter to reduce the loss of column by 10%. Introduce 1 set of loader to reduce labor and increase production efficiency. 2)Annular kiln renovation Kiln roof was removed, rebuilt and sealed; 1 set of temperature tester was added to annular kiln. Drainage system of green brick yard was repaired by increasing height of back to reduce the loss of green brick when rainy weather or heavy rain. 1 set of Type ZFJ-8 energy conversation blower was introduced. 3)Introducing electric equipments Transducer was added to kiln blower. And non-power compensator was added to extruder.	53.9601	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~2005.08.31	Payback period	3.05	year	2400	10,000 common bricks	Coal:	0.95	tce/10,000 bce	611.47	1,524.40	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent.5)Total investment and GEF comes from the renovated actual data. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from the actual determination.
			External combustive coal (t)	4511.25	0.29	1308.26	Power:	0.071	tce/10,000 bce								Entrustment Loan				IRR	38.52	%			Power:	0.063	tce/10,000 bce			
			Power/MWh	397.38	0.383	152.20											Self-Funding	44.03610			NPV	60.88	Y 10, 000								
			Sum total			2723.61	C energy consumption	1.27	tce/10,000 bce								Financial Assistance				Cost of energy saving	130.67	Y 1/tce			C energy consumption	1.01	tce/10,000 bce			
5	Meiling miao Brick Plant	This plant was established as a collectively owned plant in 1974. It occupies an area of over 100 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.07 million RMB Yuan and produces an annual output of 20 million bricks (common brick equivalent). While it has fixed assets of 1.92 million RMB Yuan and produces an annual output of 30 million bricks (common brick equivalent) after renovation. At present, the plant employs 105 people including 9 technical people and the salary is 860 RMB Yuan/month on average. The main raw material is clay and cinder. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.36 RMB Yuan/piece and the perforation rate is over 26 %. The price of the hollow is 0.95 RMB Yuan/piece and the perforation rate is over 43%. As a result of renovation, brick quality improved and the acceptance rate increases from 80% to 90%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher+boxing feeder→stone-elimination rolls→hi-speed fine rolls→Double shaft mixer→vacuum extruder→column cutter→green brick cutter→natural drying→firing in annular kiln The main energy consumption equipments 1)New 24 chambers annular kiln and the repaired 24 chambers annular kiln 2)Stone-elimination rolls 3)Hi-speed fine rolls 4)Double shaft mixer 5)Vacuum extruder 6)Column cutter 7)Green brick cutter 8)energy conversation blower	Internal combustive coal (t)	5100.00	0.196	999.60	Coal:	1.20	tce/10,000 bce	2,000	10,000 bricks/	2,330.06	2.493	6,307.44	1)Annular kiln renovation a)Constructing a new 24 chambers annular kiln. b)The original 24 chambers annular kiln was sealed. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation Develop installation and commissioning for the equipments including stone-eliminating rolls, double shaft mixer, hi-speed fine rolls, vacuum extruder, column cutter and green brick cutter. 3)Electric equipments renovation Introduce transducer to energy conversation blower and non-power compensator controlling system to extruder. 4)Staff training	85.3175	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~2005.08.31	Payback period	2.47	year	3,000	10,000 common bricks/a	Coal	1.000	tce/10,000 bce	688.83	1,592.59	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
			External combustive coal (t)	1950.00	0.722	1,407.90	Power:	0.06	tce/10,000 bce								Entrustment Loan				IRR	48.36	%			Power:	0.052	tce/10,000 bce			
			Power/MWh	320.00	0.383	122.56											Self-Funding	75.39350			NPV	136.09	Y 10, 000								
			Sum total			2,530.06	C energy consumption	1.27	tce/10,000 bce								Financial Assistance				Cost of energy saving	210.5	Y 1/tce			C energy consumption	1.05	tce/10,000 bce			
6	Qinling Building Materials Co.	This plant was established as a collectively owned plant in 1980. It occupies an area of over 96 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 0.87 million RMB Yuan and produces an annual output of 20 million bricks (common brick equivalent). While it has fixed assets of 1.37 million RMB Yuan and produces an annual output of 30 million bricks (common brick equivalent) after renovation. At present, the plant employs 95 people including 7 technical people and the salary is 950 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.37 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 45%. As a result of renovation, brick quality improved and the acceptance rate increases from 77% to 87%. Most of the products are sold on the local market in Xi'an.	Procaction process and equipments: Cinder crusher+boxing feeder→hi-speed fine rolls→mixer→vacuum extruder→vertical column cutter→green brick cutter→natural drying→firing in annular kiln The main energy consumption equipments: 1)New 24 chambers annular kiln and the repaired 28 chambers annular kiln 2)Cinder crusher 3)Hi-speed rolls 4)Mixer 5)Vacuum extruder 6)Vertical column cutter 7)Green brick cutter 8)Exhausted blower	Internal combustive coal (t)	6500.00	0.196	1,274.00	Coal:	1.25	tce/10,000 bce	2,000	10,000 bricks/	2,641.88	2.493	6,586.21	1)Annular kiln renovation a)A new 24 chambers annular kiln was constructed. b)The original 28 chambers annular kiln was sealed. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation a)A new excavator was introduced. The equipments including cinder crusher, hi-speed fine rolls and vertical column cutter were installed and debugged. b)Die installation and commissioning 3)Electric equipments renovation Transducer controlling system was added to kiln blower. And non-power compensator controlling system was added to extruder, hi-speed fine rolls and mixer apiece. 4)Drainage system of green brick yard renovation 5)Staff training	49.9706	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~2005.08.31	Payback period	1.37	year	3,000	10,000 common bricks/a	Coal:	0.056	tce/10,000 bce	633.96	1,580.46	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report.6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
			External combustive coal (t)	1640.00	0.750	1,230.00	Power:	0.07	tce/10,000 bce								Entrustment Loan				IRR	84.01	%			Power:	0.054	tce/10,000 bce			
			Power/MWh	360.00	0.383	137.88											Self-Funding	40.04660			NPV	167.65	Y 10, 000								
			Sum total			2,641.88	C energy consumption	1.32	tce/10,000 bce								Financial Assistance				Cost of energy saving	114.70	Y 1/tce			C energy consumption	1.11	tce/10,000 bce			

7	Shenwei Wall esterial s Plant, Xi'an	This plant was established as a collectively owned plant in 2000. It occupies an area of over 120 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.25 million RMB Yuan and produces an annual output of 28 million bricks (common brick equivalent). While it has fixed assets of 1.78 million RMB Yuan and produces an annual output of 35 million bricks (common brick equivalent) after renovation. At present, the plant employs 100 people including 7 technical people and the salary is 870 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.40 RMB Yuan/piece and the perforation rate is over 25%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 37%. As a result of renovation, brick quality improved and the acceptance rate increases from 83% to 93% Most of the products are sold on the local market in Xi'an.	Production process and equipments: Boxing feeder→rolls→double shaft mixer→two-stage vacuum extruder→column cutter→green cutter→adobe transporting machine→natural drying→firing in annular kiln **The main energy consumption equipments:** 1)New 24 chambers annular kiln and the repaired 28 chambers annular kiln 2)Boxing feeder 3)Cinder crusher 4)Hi-speed fine rolls 5)Double shaft mixer 6)Two-stage vacuum extruder 7)Column cutter 8)Green brick cutter 9)Blower	Internal combustive coal(t)	11172.56	0.29	3192.00	Coal: 1.14 tce/10,000 bce	2800	10,000 bcs/a	3990.39	2.493	8452.25	1)Raw material treatment The raw material is excavated in advance and used in next year. A high-speed fine rolls was introduced to improve plasticity and homogeneity of the clay so that the Plant can produce thin wall bricks. A cinder crusher was introduced to improve the particle size of the cinder and caloric value was tested periodically. 2)Shaping Non-power compensator was introduced to reduce non-power waste. The die and core were renovated. Column cutter was replaced with vertical column cutter. 3) Drying Drainage system of green brick yard was renovated. Thick wall hollow brick was used for back and it is budgeted to use 36 thousand bricks to increase the back height. 4) Firing The original 24 chambers annular kiln was rebuilt. And the original 28 chambers annular kiln was renovated and sealed. Transducer was added to kiln blower. 5) Finished product The finished product is classified so that the manager can evaluate the management institution of his enterprise.	53.3274	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~2005.08.31	Payback period	1.60	year	3500	10,000 common bricks/a	Coal: 0.95 tce/10,000 bce		591.81	1,724.68	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. The Plant uses the poor coal with low calorific value. 5)Total investment and GEF comes from the renovated actual data 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from the Feasibility Report.
			Power/Wh	518.00	0.383	198.39																									
			Sub-total			3390.39	C energy consumption	1.21 tce/10,000 bce									Financial Assistance					Cost of energy saving	111.13	¥1/tce			Power: 0.063 tce/10,000 bce C energy consumption 1.01 tce/10,000 bce			
8	Shenhua New Type Building Materials Co. Ltd.,Shaanxi	This plant was established as a small privately owned plant in 1981. It occupies an area of over 100 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 0.97 million RMB Yuan and produces an annual output of 22 million bricks (common brick equivalent). While it has fixed assets of 1.47 million RMB Yuan and produces an annual output of 30 million bricks (common brick equivalent) after renovation. At present, the plant employs 98 people including 8 technical people and the salary is 900 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.39 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 0.95 RMB Yuan/piece and the perforation rate is over 45%. As a result of renovation, brick quality improved and the acceptance rate increases from 83% to 93% Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher+boxing feeder→hi-speed fine rolls→double shaft mixer→vacuum extruder→vertical column cutter→green brick cutter→natural drying→firing in annular kiln **The main energy consumption equipments** 1)The repaired 38 chambers annular kiln 2)Cinder crusher 3)Hi-speed fine rolls 4)Double shaft mixer 5)Vacuum extruder 6)Vertical column cutter 7)Green brick cutter 8)Blower	Internal combustive coal(t)	6000.00	0.196	1,176.00	Coal: 1.20 tce/10,000 bce	2,200	10,000 bcs/a	2,821.54	2.493	7,034.11	1)Annular kiln renovation The original 38 chambers annular kiln was sealed. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation a)A new excavator was introduced. And the equipments including cinder crusher, hi-speed fine rolls, vacuum extruder and vertical column cutter were installed and debugged. b)Die installation and commissioning 3)Electric equipments renovation Transducer controlling system was added to kiln blower. Non-power compensator controlling system was added to extruder and hi-speed fine rolls apiece. 4)Staff training	49.8838	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~2005.08.31	Payback period	1.54	year	3,000	10,000 common bricks/a	Coal: 1.020 tce/10,000 bce		620.96	1,548.04	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from the actual determination.
			External Combustive coal(t)	2150.00	0.682	1,466.10	Power: 0.08 tce/10,000 bce										Financial Assistance					Cost of energy saving	118.02	¥1/tce			Power: 0.056 tce/10,000 bce			
			Power/Wh	468.00	0.383	179.24																						C energy consumption 1.08 tce/10,000 bce			
			Sub-total			2,821.54	C energy consumption	1.28 tce/10,000 bce																									
9	Shenliufang No.5, Brick Plant, Baqiao District, Xi'an	This plant was established as a small privately owned plant in 1981. It occupies an area of over 120 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 0.97 million RMB Yuan and produces an annual output of 26 million bricks (common brick equivalent). While it has fixed assets of 1.47 million RMB Yuan and produces an annual output of 27 million bricks (common brick equivalent) after renovation. At present, the plant employs 95 people including 8 technical people and the salary is 900 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.38 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 45%. As a result of renovation, brick quality improved and the acceptance rate increases from 83% to 93%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher+boxing feeder→hi-speed fine rolls→mixing extruder→vacuum extruder→column cutter→green brick cutter→natural drying→firing in annular kiln **The main energy consumption equipments** 1)The repaired 38 chambers annular kiln 2)Cinder crusher 3)Hi-speed fine rolls 4)Mixing extruder 5)Vacuum extruder 6)Column cutter 7)Green brick cutter 8)Blower	Internal combustive coal(t)	5900.00	0.190	1,156.40	Coal: 1.10 tce/10,000 bce	2,600	10,000 bcs/a	3,040.64	2.493	7,580.33	1)Annular kiln renovation The original 38 chambers annular kiln was sealed. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation a)The equipments including cinder crusher, hi-speed fine rolls, mixing extruder, vacuum extruder and vertical column cutter were installed and debugged. b)Die installation and commissioning 3)Electric equipments renovation Transducer controlling system was added to kiln blower. Non-power compensator controlling system was added to extruder and hi-speed fine rolls apiece. 4)Staff training.	50.9854	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~2005.08.31	Payback period	3.17	year	2,700	10,000 common bricks/a	Coal: 0.890 tce/10,000 bce		604.65	1,507.39	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from the actual determination.
			External Combustive coal(t)	2500.00	0.682	1,705.00	Power: 0.07 tce/10,000 bce										Financial Assistance					Cost of energy saving	124.70	¥1/tce			Power: 0.056 tce/10,000 bce			
			Power/Wh	468.00	0.383	179.24																						C energy consumption 0.95 tce/10,000 bce			
			Sub-total			3,040.64	C energy consumption	1.17 tce/10,000 bce																									

10	Shijiada o Hollow Brick Plant	This plant was established as a small privately owned plant in 1980s. It occupies an area of over 87 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.25 million RMB Yuan and produces an annual output of 22 million bricks (common brick equivalent). While it has fixed assets of 1.76 million RMB Yuan and produces an annual output of 26 million bricks (common brick equivalent) after renovation. At present, the plant employs 108 people including 8 technical people and the salary is 880 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.40 RMB Yuan/piece and the perforation rate is over 25%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 37%. As a result of renovation, brick quality improved and the acceptance rate increases from 80% to 92%.Most of the products are sold on the local market in Xi'an.	Production process and equipments: Boxing feeder——hi-speed fine rolls——Double shaft mixing extruder——two-stage vacuum extruder——column cutter-green brick cutter——adobe transporting machine——natural drying——firing in annular kiln. The main energy consumption equipments 1)The rebuilt 38 chambers annular kiln 2)Boxing feeder 3)Cinder crusher 4)Hi-speed fine rolls 5)Double shaft mixing extruder 6)Two-stage vacuum extruder 7)Column cutter 8)Green brick cutter 9)Blower	Internal combustive coal (t)	9240.00	0.79	2639.87	Coal:	1.29	tce/10,000 bce					1)Raw material treatment The raw material is excavated in advance and used in next year to weatherize it. The original rolls crusher and mixer were replaced by hi-speed fine rolls and mixing extruder. A cinder crusher was introduced. Caloric value was tested periodically. The mixing proportion is determined according to caloric value. 2)Shaping Non-power compensator was introduced to reduce non-power waste. The die and core were redesigned so that the Plant can produce high-perfomion rectangular bricks. The original column cutter was replaced. 3)Drying The drainage system of the green brick yard was renovated. With covering, unclosing and slanting the adobe, the drying rate and rate of drying adobe can be improved. 4)Firing Rebuild the original 32 chambers annular kiln. Change setting pattern and setting quantity in a kiln. Add transducer to exhausted blower. 5)Finished product Finished product is classified.	51.27	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	1.70	year	2600	10,000 common bricks/a	Coal:	0.98	tce/10,000 bce	604.76	1,507.67	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. The Plant uses the poor coal with low calorific value. 5)Total investment and GEF comes from the renovated actual data 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual deter mination.
			External combustive coal (t)		0																				Power:	0.057	tce/10,000 bce					
			Power/MWh	374.00	0.383	143.24																										
			Sum total			2781.11	C energy consumption	1.27	tce/10,000 bce	2200	10,000 bcs/a	2,781.11	2.493	6938.29			Financial Assistance			Cost of energy saving	175.33	¥1/tce			C energy consumption	1.03	tce/10,000 bce					
11	Xi'an Oriental Hollow Brick Plant	This plant was established as a small privately owned plant in 1980s. It occupies an area of over 140 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.12 million RMB Yuan and producer an annual output of 2.49 million bricks (common brick equivalent). While it has fixed assets of 1.62 million RMB Yuan and produces an annual output of 40 million bricks (common brick equivalent) after renovation. At present, the plant employs 115 people including 11 technical people and the salary in 820 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.37 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 0.96 RMB Yuan/piece and the perforation rate is over 45%. As a result of renovation, brick quality improved and the acceptance rate increases from 78% to 88%.Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher + boxing feeder——coarse rolls——hi-speed fine rolls——mixing extruder——vacuum extruder——column cutter-green brick cutter——natural drying——firing in annular kiln The main energy consumption equipments 1)The repaired 38 chambers annular kiln 2)Cinder crusher 3)Rolls 4)Mixer 5)Vacuum extruder 6)Column cutter 7)Green brick cutter 8)Exhausted blower	Internal combustive coal (t)	6500.00	0.196	1,274.00	Coal:	1.20	tce/10,000 bce					1)Annular kiln renovation a)A new 24 chambers annular kiln was constructed. b)The original 40 chambers annular kiln was renovated to 30 chambers annular kiln. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation a)A new excavator was introduced. And the equipments including cinder crusher, rolls, mixer and vertical column cutter were renovated, installed and debugged. b)Die installation and commissioning 3)Electric equipments renovation Transducer controlling system was added to exhausted blower. Non-power compensator controlling system was added to extruder, rolls and mixer spiece. 4)Drainage system of green brick yard was renovated. 5)Staff training.	50.4222	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	0.86	year	4,000	10,000 common bricks/a	Coal:	1.050	tce/10,000 bce	696.95	1,737.50	1)The baseline year is in 2004. 2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion facto =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
			External combustive coal (t)	2720.00	0.632	1,719.04	Power:	0.07	tce/10,000 bce																Power:	0.051	tce/10,000 bce					
			Power/MWh	473.10	0.383	181.20																										
			Sum total			3,174.24	C energy consumption	1.27	tce/10,000 bce	2,490	10,000 bcs/a	3,174.24	2.493	7,913.37			Financial Assistance			Cost of energy saving	103.70	¥1/tce			C energy consumption	1.10	tce/10,000 bce					
12	Chang'a n Xibei Buildin g Plant	This plant was established as a small privately owned plant in 2000. It occupies an area of over 100 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.10 million RMB Yuan and produces an annual output of 24 million bricks (common brick equivalent). While it has fixed assets of 1.77 million RMB Yuan and produces an annual output of 30 million bricks (common brick equivalent) after renovation. At present, the plant employs 120 people including 7 technical people and the salary is 850 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.38 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 40%. As a result of renovation, brick quality improved and the acceptance rate increases from 78% to 92%.Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher + boxing feeder——coarse rolls——hi-speed fine rolls——strong strength mixer——vacuum extruder——vertical column cutter-green brick cutter——natural drying——firing in annular kiln The main energy consumption equipments 1)The rebuilt 24 chambers annular kiln and the repaired 38 chambers annular kiln 2)Cinder crusher 3)Hi-speed rolls 4)Strong strength mixer 5)Vacuum extruder 6)Vertical column cutter 7)Green brick cutter 8)Exhausted blower	Internal combustive coal (t)	7000.00	0.197	1,379.00	Coal:	1.15	tce/10,000 bce					1)Annular kiln renovation a)The 24 chambers annular kiln was constructed. b)The original 22 chambers annular kiln was sealed. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation a)A new excavator was introduced. And the equipments including cinder crusher, high-speed fine rolls, strong strength mixer and vertical column cutter were renovated, installed and debugged. b)Die installation and commissioning 3)Electric equipments renovation Transducer controlling system was added to kiln blower. Non-power compensator controlling system was added to extruder, hi-speed fine rolls and strong strength mixer spiece. Non-power compensator was adopted. 4)Drainage system of green brick yard was renovated. 5)Staff training.	67.0904	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	2.46	year	3,000	10,000 common bricks/a	Coal:	0.900	tce/10,000 bce	800.46	1,999.55	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
			External combustive coal (t)	1720.00	0.805	1,384.60	Power:	0.07	tce/10,000 bce																Power:	0.054	tce/10,000 bce					
			Power/MWh	432.00	0.383	165.46																										
			Sum total			2,929.06	C energy consumption	1.22	tce/10,000 bce	2,400	10,000 bcs/a	2,929.06	2.493	7,302.18			Financial Assistance			Cost of energy saving	123.04	¥1/tce			C energy consumption	0.95	tce/10,000 bce					

13	Xiangfa New Building Material s Co., Xi'an	This plant was established as a small privately owned plant in 1997. It occupies an area of over 115 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 3.00 million RMB Yuan and produces an annual output of 23 million bricks (common brick equivalent). While it has fixed assets of 3.50 million RMB Yuan and produces an annual output of 26 million bricks (common brick equivalent) after renovation. At present, the plant employs 90 people including 11 technical people and the salary is 870 RMB Yuan/month on everage. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.36 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 0.98 RMB Yuan/piece and the perforation rate is over 45%. As a result of renovation, brick quality improved and the acceptance rate increases from 83% to 93%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher+ boxing feeder—— course rolls——hi-speed fine rolls——double shaft mixer——vacuum extruder——vertical column cutter--green brick cutter——natural drying——firing in annular kiln The main energy consumption equipments 1)New 28 chambers annular kiln 2)Cinder crusher 3)Hi-speed rolls 4)Double shaft mixer 5)Vacuum extruder 6)Vertical column cutter 7)Green brick cutter 8)Exhausted blower	Internal combustive coal (t)	6500.00	0.196	1,274.00	Coal:	1.20	tce/10,000 bce	2,300	10,000 bce/a	2,928.49	2.493	7,300.72	1)Annular kiln renovation The new 28 chambers annular kiln was constructed. 2)Process equipments renovation a)A new excavator was introduced. And the equipments including cinder crusher, high-speed fine rolls and vertical column cutter were renovated, installed and debugged. b)Die installation and commissioning 3)Electric equipments renovation Transducer controlling system was added to exhausted blower. Non-power compensator controlling system was added to extruder 4)Drainage system of green brick yard was renovated. 5)Staff training.	50.8911	12,000.00	Commercial loan		The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	2.6	year	2,500	10,000 common bricks/a	Coal:	0.930	tce/10,000 bce	628.15	1,565.97	1)The baseline year is in 2004. 2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
			External combustive coal (t)	2360.00	0.632	1,491.52	Power:	0.07	tce/10,000 bce								Entrustment Loan					IRR	46.12	%			Power:	0.062	tce/10,000 bce			
			Power/kWh	425.50	0.583	162.97											Self-Funding	40.96710				NPV	75.70	¥10,000							
			Sum total			2,928.49	C energy consumption	1.27	tce/10,000 bce								Financial Assistance					Cost of energy saving	118.60	¥1/tce			C energy consumption	1.03	tce/10,000 bce			
14	Hongqi St. Xiangyanggou Brick Plant, Baqiao District, Xi'an	This plant was established as a collectively owned plant in 1980s. It occupies an area of over 150 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.07 million RMB Yuan and produces an annual output of 25 million bricks (common brick equivalent). While it has fixed assets of 1.80 million RMB Yuan and produces an annual output of 28 million bricks (common brick equivalent) after renovation. At present, the plant employs 110 people including 10 technical people and the salary is 870 RMB Yuan/month on everage. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.40 RMB Yuan/piece and the perforation rate is over 25%. The price of the hollow is 1.00 RMB Yuan/piece and the perforation rate is over 37%. As a result of renovation, brick quality improved and the acceptance rate increases from 80% to 92%. *Most of the products are* sold on the local market in Xi'an.	Production process and equipments: Boxing feeder—— course rolls——rolls crusher——hi-speed fine rolls——double shaft mixer——double shaft mixing extruder——two-stage vacuum extruder——column cutter--green brick cutter——adobe transporting machine——natural drying——firing in annular kiln The main energy consumption equipments 1)The repaired 40 chambers annular kiln 2)Boxing feeder 3)Cinder crusher 4)Rolls crusher 5)Hi-speed rolls 6)Double shaft mixer 7)Double shaft mixing extruder 8)Two-stage vacuum extruder 9)Column cutter 10)Green brick cutter 11)Blower	Internal combustive coal (t)	10062.50	0.29	2874.86	Coal:	1.15	tce/10,000 bce	2500	10,000 bce/a	3032.84	2.493	7560.88	1)Renewing process equipments Replace the original extruder with Type JZK50/45 two-stage vacuum extruder. Add 1 set of new hi-speed fine rolls and 1 set of new double shaft mixing extruder. Renew die, mould and core. Replace the original column cutter with vertical column cutter. Introduce 1 set of loader to transport raw material. 2)Annular kiln renovation The wall of the annular kiln was repaired and the internal and external wall and kiln door were sealed. 1 set of Type ZFI-8 blower was introduced. The drainage system of green brick yard was renovated to reduce loss of adobe when rainy weather or heavy rain. 3)Non-power compensator controlling system was added to extruder.	72.75	12,000.00	Commercial loan	-	The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	3.70	year	2800	10,000 common bricks/a	Coal:	0.94	tce/10,000 bce	509.23	1,518.95	1)The baseline year is in 2004. 2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. The Plant uses the poor coal with low calorific value. 5)Total investment and GEF comes from the renovated actual data. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual deter mination.
			External combustive coal2(t)			0	Power:	0.063	tce/10,000 bce								Entrustment Loan					IRR	66.23	%			Power:	0.056	tce/10,000 bce			
			Power/kWh	412.50	0.383	157.99											Self-Funding	62.82140				NPV	62.95	¥10,000							
			Sum total			3032.84	C energy consumption	1.21	tce/10,000 bce								Financial Assistance					Cost of energy saving	187.18	¥1/tce			C energy consumption	1.00	tce/10,000 bce			
15	Xinyue Industry and Trade Co. Ltd.	This plant was established as a privately owned plant in 2000. It occupies an area of over 110 mu (1mu=1/15 hectare). Prior to the project, the plant has fixed assets of 1.08 million RMB Yuan and produces an annual output of 34 million bricks (common brick equivalent). While it has fixed assets of 1.59 million RMB Yuan and produces an annual output of 45 million bricks (common brick equivalent) after renovation. At present, the plant employs 97 people including 8 technical people and the salary is 880 RMB Yuan/month on average. The main raw material is clay and coal. The two main products are fired perforated brick (module 240×115×90) and fired hollow brick (module 240×240×115). The price of the perforated is 0.38 RMB Yuan/piece and the perforation rate is over 26%. The price of the hollow is 0.92 RMB Yuan/piece and the perforation rate is over 45%. As a result *of renovation, brick qualuty improved* and the acceptance rate increases from 80% to 90%. Most of the products are sold on the local market in Xi'an.	Production process and equipments: Cinder crusher+ boxing feeder—— coarse rolls——hi-speed fine rolls——double shaft mixer——vacuum extruder——column cutter--green brick cutter——natural drying——firing in annular kiln The main energy consumption equipments 1)2 sets of repaired 30 chambers annular kiln 2)Cinder crusher 3)Hi-speed fine rolls 4)Double shaft mixer 5)Vacuum extruder 6)Column cutter 7)Green brick cutter 8)Exhausted blower	Internal combustive coal (t)	8500.00	0.196	1,666.00	Coal:	1.23	tce/10,000 bce	3,400	10,000 bce/a	4,424.74	2.493	11,029.61	1)Annular kiln renovation The original 2 sets of 30 chambers annular kiln were sealed. The surface backfilling was carried away and the leaking flue and arch roof was refilled and tamped after repairing. 2)Process equipments renovation A new excavator was introduced. And the equipments including cinder crusher, high-speed fine rolls and vacuum extruder were installed and debugged. 3)Electric equipments renovation Transducer controlling system was added to exhausted blower. Non-power compensator controlling system was added to extruder, hi-speed fine rolls and mixer apiece. 4)Drainage system of green brick yard was renovated. 5)Staff training.	50.7356	12,000.00	Commercial loan	-	The renovation project had been completed according to the technical plan.	2005.03.10~ 2005.08.31	Payback period	1.06	year	4,500	10,000 common bricks/a	Coal:	1.097	tce/10,000 bce	641.64	1,599.61	1)The baseline year is in 2004.2)The data in Business Profile column comes from field investigation. 3)Phisical quantity of energy consumption comes from the Feasibility Report. 4)Conversion factor is derived from formula, that is Conversion factor =Factual calorific value of fuel/ Calorific value of coal equivalent. 5)Total investment and GEF comes from the Installation and Commissioning Report. 6)Payback period, IRR and NPV is calibrated on the basic data after renovation. 7)Energy consumption of unit product comes from actual determination.
			External combustive coal (t)	3770.00	0.666	2,310.82	Power:	0.07	tce/10,000 bce								Entrustment Loan					IRR	107.00	%			Power:	0.062	tce/10,000 bce			
			Power/kWh	646.00	0.383	247.42											Self-Funding	40.81160				NPV	228.75	¥10,000							
			Sum total			4,424.24	C energy consumption	1.30	tce/10,000 bce								Financial Assistance					Cost of energy saving	118.30	¥1/tce			C energy consumption	1.16	tce/10,000 bce			
Total																852.45	18000.00												9910.05	24705.85	

Xianyang' Brick:

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	EE Baseline: Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product			Output Before Renovation		Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)	Proposed Technical Renovation [3]	Project Investment: Total (RMB Y 10,000)	GEF (US$)	Others (RMB Y 10,000)		Project Status	Anticipated Results: Start-end date	Financial Evaluation			Production after renovation		Energy Use/Unit Product			Energy Savings (tce/a.)	CO2 emission Reduction(t/a.)	Remarks
1	Zhou Ling Hollow Brick Plant	The Plant was built in 1997, which is a township and village brick-making enterprise with acreage 6.67 ha. The Plant had fixed assets of 3.1 million Yuan (RMB) with annual capacity of 50 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 3.75 million Yuan (RMB) with annual capacity of	Technical Process: Box clay feeder+ Coal crusher +Coal Feeder →Roller mill →Double-shaft mixer→ Two-stage de-airing extruder→ Mud column cutter→ Cutter→ Conveying machine for	Internal combustive slag (t)	18,000.00	0.197	3,546.00	Coal:	1.170	tce/10,000 bce	5,000	10,000 bce/a./	6,241.23	2.493	15,559.37	① Reconstructing annular kilns ● Demolishing the 30-door kiln and reconstructing a new energy saving annular kiln according to new-style drawings. ● Dealing with the 34-door annular kiln by airtightness and heat insulation Carrying away the backfilling clay in surface, then repairing the air-leakage flue and kiln roof, lastly tamping backfilling clay enough completely. ② Reconstructing	65.0022	8,400.00	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	0.86	year	5,600	10,000 common bricks /a.	Coal:	0.998	tce/10,000 bce	1,035.69	2,581.98	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	2,550.00	0.903	2,302.65	Power:	0.079	tce/10,000 bce									Entrustment Loan	0			IRR	77.76	%			Power:	0.065	tce/10,000 bce			
				Power/MWh	1,025.00	0.383	392.58												Self-Funding	58.0554			NPV	197.77	￥10,000								
				Sum total			6,241.23	C energy consumption	1.248	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	86.07	￥1/tce			C energy consumption[2]	1.063	tce/10,000 bce			
2	Liucun Brick Plant, Dizhang, Weicheng District, Xian Yang	The Plant was built in 1984, which is a village brick-making enterprise with acreage 4.002 ha. The Plant had fixed assets of 1.1 million Yuan (RMB) with annual capacity of 37.5 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.50 million Yuan (RMB) with annual capacity of 41 million bricks (equal	Technical Process: Clay +Slag→ Roller mill→ Double-shaft mixer→ Two-stage de-airing extruder→ Mud column cutter→ Cutter→ Conveying green brick by manual work →Natural drying→	Internal combustive coal (t)	5,799.96	0.643	3,729.37	Coal:	1.170	tce/10,000 bce	3,750	10,000 bce/a./	4,650.32	2.493	11,593.24	① Firing brick with slag as internal combustive coal fuel by admixing slag into raw material. ② Strengthening crushing of raw materials by installing a high speed fine roller mill. ③ Strengthening crushing of slag by installing a new high speed coal crusher. ④ Reconstructing the extruder mouth, promoting de-airing extruding pressure and ensuring high strength for green brick to shape while slag adding to	50.7365	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	0.97	year	4,100	10,000 common bricks /a.	Coal:	0.936	tce/10,000 bce	1,017.15	2,535.75	1.基准年为2004年； 2.企业基本情况栏中的数据来自于实地调查； 3.能源消耗实物量来自于该厂可行性研究报告； 4.内燃炉渣和外燃煤的折标系数是由实测该燃料的发热量经公式换算而来，即折标系数＝燃料的实测发热量/标煤发热量； 5.总投资和项目支持资金来自于咸阳地区推广企业技术改造进度报告； 6.财务评价中的投资回收期来自于该企业可行性研究报告，内部收益率和净现值根据该企业技术改
				External combustive coal (t)	1,023.50	0.643	658.11	Power:	0.070	tce/10,000 bce									Entrustment Loan	0			IRR	68.94	%			Power:	0.056	tce/10,000 bce			
				Power/MWh	686.25	0.383	262.83												Self-Funding	43.7897			NPV	132.09	￥10,000								
				Sum total			4,650.32	C energy consumption	1.240	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	63.29	￥1/tce			C energy consumption[2]	0.992	tce/10,000 bce			
3	Xiwu Vacuun Brick Plant, Xingping City	The Plant was built in 1996, which is a township and village brick-making enterprise with acreage 13.34 ha. The Plant had fixed assets of 1.5 million Yuan (RMB) with annual capacity of 38 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 2 million Yuan (RMB) with annual capacity of	Technical Process: Clay +slag→ Roller mill→ Double-shaft mixer →de-airing extruder→ Mud column cutter→ Cutter→ Conveying green brick by manual work →Natural drying→	Internal combustive coal (t)	3,802.95	0.643	2,445.30	Coal:	1.170	tce/10,000 bce	3,800	10,000 bce/a./	4,712.34	2.493	11,747.85	① Firing brick with complete internal combustive fuel by admixing slag into raw material. ② Strengthen crushing of raw materials by installing a high speed fine roller mill. ③ Strengthen crushing of slag by installing a new high speed coal crusher. ④ Renovating the die and increasing extrusion pressure of de-airing extruder, which can ensure high strength of the green bricks after adding slag into	50.1576	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	0.91	year	4,200	10,000 common bricks /a.	Coal:	0.998	tce/10,000 bce	743.77	1,854.22	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	3,111.51	0.643	2,000.70	Power:	0.070	tce/10,000 bce									Entrustment Loan	0			IRR	73.33	%			Power:	0.065	tce/10,000 bce			
				Power/MWh	695.40	0.383	266.34												Self-Funding	43.2108			NPV	141.52	￥10,000								
				Sum total			4,712.34	C energy consumption	1.240	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	72.06	￥1/tce			C energy consumption[2]	1.063	tce/10,000 bce			
4	Zhouling Zhuoxing Hollow Brick Plant	The Plant was built in 1997, which is a village brick-making enterprise with acreage 4.002 ha. The Plant had fixed assets of 1.2 million Yuan (RMB) with annual capacity of 32 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.6 million Yuan (RMB) with annual capacity of 34 million bricks (equal	Technical Process: Box feeder+Coal crusher+Coal Feeder→ Roller mill→ Double-shaft mixer→ Two-stage de-airing extruder→ Mud column cutter→ Cutter→ Conveying machine for	Internal combustive slag (t)	8,000.00	0.197	1,576.00	Coal:	1.223	tce/10,000 bce	3,200	10,000 bce/a./	4,157.87	2.493	10,365.58	① Constructing annular kiln with 30 doors Demolishing the 28-door kiln, and constructing a new energy- saving 30-door annular kiln according to formal standard drawings, at the same time, the quality of the kiln should be controlled strictly so as to ensure good heat insulation and airtight performance, which will attain the purpose of saving energy and increasing output. ② Purchasing a new 50-type loader	58.2208	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.5	year	3,400	10,000 common bricks /a.	Coal:	0.980	tce/10,000 bce	861.34	2,147.32	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	2,440.00	0.958	2,337.52	Power:	0.076	tce/10,000 bce									Entrustment Loan	0			IRR	45.59	%			Power:	0.066	tce/10,000 bce			
				Power/MWh	638.00	0.383	244.35												Self-Funding	51.2740			NPV	85.11	￥10,000								
				Sum total			4,157.87	C energy consumption	1.299	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	95.55	￥1/tce			C energy consumption[2]	1.046	tce/10,000 bce			
5	Nanyuzi Hollow Brick Plant	The Plant was built in 1992, which is a township brick-making enterprise with acreage 4.002 ha. The Plant had fixed assets of 0.9 million Yuan (RMB) with annual capacity of 24 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.4 million Yuan (RMB) with annual capacity of 20 million bricks (equal to common brick). Now	Technical Process: Box clay feeder+ Box fly ash feeder→ Roller mill→ Double-shaft mixer→ Two-stage de-airing extruder→ Mud column cutter→ Cutter→ Conveying machine for green brick→ dryer→ Firing by the annular	Internal combustive coal+fly ash (t)	1,850.00	0.246	455.10	Coal:	1.212	tce/10,000 bce	2,000	10,000 bce/a./	2,564.04	2.493	6,392.16	① Adding a new grab ② Installing a drum screen so as to eliminating the larger lime nodules existed in raw material ③ Dealing with the 24-door annular kiln by airtightness and heat insulation Carrying away the backfilling clay in surface, then repairing the air-leakage flue and kiln roof, lastly backfilling clay enough tamping completely. ④ Installing a fly-ash feeder and a mixer, and adding 30% fly-ash into clay. ⑤ Replacing a professional energy-saving fan which	49.6200	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.4	year	2,400	10,000 common bricks /a.	Coal:	0.805	tce/10,000 bce	986.45	2,459.23	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient = Practical calorific value of the fuel/ Calorific value of
				External combustive coal +fly ash(t)	8,000.00	0.246	1,968.00	Power:	0.070	tce/10,000 bce									Entrustment Loan	0			IRR	49.20	%			Power:	0.066	tce/10,000 bce			
				Power/MWh	368.00	0.383	140.94												Self-Funding	42.6732			NPV	81.16	￥10,000								
				Sum total			2,564.04	C energy consumption	1.282	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	64.03	￥1/tce			C energy consumption[2]	0.871	tce/10,000 bce			

Xianyang' Brick:

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	E E Baseline											Proposed Technical Renovation [3]	Project Investment				Project Status	Anticipated Results									Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product			Output Before Renovation		Total energy use (tce)	CO2 Coefficient	CO2 Emissions (t/a.)		Total (RMB Y 10,000)	GEF (US$)	Others (RMB Y 10,000)			Start-end date	Financial Evaluation			Production after renovation		Energy Use/Unit Product			Energy Savings (tce/a.)	CO2 emission Reduction(t/a.)	
6	Chatian Brick Plant, Maquan Town, Qindu District	Chatian Brick Plant, Maquan Town, Qindu District was built in 1985, which is a township and village brick-making enterprise with acreage 6.67 ha. The Plant had fixed assets of 1.0 million Yuan (RMB) with annual capacity of 32 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.6	Technical Process: Clay+Slag→Roller mill→Double-shaft mixer→De-airing extruder→Mud column cutter→Cutter→Conveying green brick by manual work→Natural drying→Setting by	Internal combustive coal (t)	4949.30	0.643	3,182.40	Coal:	1.170	tce/10,000 bce	3,200	10,000 bce/a./	4,000.00	2.493	9,972.01	① Firing brick with slag as Internal combustive fuel by adding slag into raw material. ② Strengthening crushing of raw materials by installing a high speed fine roller mill. ③ Strengthening crushing of slag by installing a new high speed coal crusher. ④ Installing a new de-airing extruder, promoting vacuum extruding pressure and ensuring high strength for green brick to shape while slag adding to	58.7997	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.7	year	3,500	10,000 common bricks /a.	Coal:	0.878	tce/10,000 bce	1,092.00	2,722.37	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ *Energy consumptions* (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	873.41	0.643	561.60	Power:	0.080	tce/10,000 bce									Entrustment Loan	0			IRR	39.90	%			Power:	0.060	tce/10,000 bce			
				Power/MWh	668.41	0.383	256.00												Self-Funding	51.8529			NPV	70.13	¥10,000								
				Sum total			4,000.00	C energy consumption	1.250	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	70.3	¥1/tce			C energy consumption[2]	0.938	tce/10,000 bce			
7	Dongjiao Construction Materials Co., Weicheng District, Shaanxi Province	The Plant was built in 2004, which is a joint-stock enterprise with acreage 8.404 ha. The Plant had fixed assets of 1.8 million Yuan (RMB) with annual capacity of 20 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 2.30 million Yuan (RMB) with annual capacity of 22 million bricks (equal to	Technical Process: Clay+Slag+faulty coal→Double-shaft mixer→High speed roller mill→Two-stage de-airing extruder→Mud column cutter→Cutter→Conveying green brick by manual work	Internal combustive coal (t)	3,443.23	0.643	2,214.00	Coal:	1.230	tce/10,000 bce	2,000	10,000 bce/a./	2,600.17	2.493	6,482.23	① Firing brick with slag and fly-ash as Internal combustive fuel by admixing slag and fly-ash into raw material. ② Reconstructing annular kiln ● Building residual heat utilization system. ● Using fire-resistance and heat-insulating spraying materials for annular kiln *and reducing air-leakage* and heat loss of kiln. ③Constructing an new manpower dryer which can utilize the residual heat and	50.1989	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.8	year	2,200	10,000 common bricks /a.	Coal:	0.898	tce/10,000 bce	772.39	1,925.57	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	382.58	0.643	246.00	Power:	0.070	tce/10,000 bce									Entrustment Loan	0			IRR	36.41	%			Power:	0.051	tce/10,000 bce			
				Power/MWh	366.00	0.383	140.18												Self-Funding	43.2521			NPV	51.71	¥10,000								
				Sum total			2,600.17	C energy consumption	1.300	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	90.03	¥1/tce			C energy consumption[2]	0.949	tce/10,000 bce			
8	Pinglin g Jingwei Brick Plant, Qindu District	The Plant was built in 2001, which is a township and village brick-making enterprise with acreage 4.669 ha. The Plant had fixed assets of 0.5 million Yuan (RMB) with annual capacity of 30 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.0 million Yuan (RMB) with annual capacity of 33 million bricks (equal	Technical Process: Box clay feeder+Coal crusher+Coal Feeder→Roller mill→Double-shaft mixer→Two-stage de-airing extruder→Vertical mud column cutter→Cutter→Conveying machine for green brick→Firing by the	Internal combustive coal+slag (t)	6,200.00	0.429	2,657.94	Coal:	1.229	tce/10,000 bce	3,000	10,000 bce/a./	3,847.60	2.493	9,592.07	① Reconstructing annular kiln Demolishing the original kiln roof and side wall, tamping backfilling clay again and reconstructing the kiln roof can ensure good heat insulation and airtight performance, which will attain the purpose of saving energy and increasing output. ② Reconstructing process equipment ● *Purchasing a new loader* ● Purchasing a new two-stage de-airing extruder can ensure the quality of hollow	49.7234	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.2	year	3,300	10,000 common bricks /a.	Coal:	0.990	tce/10,000 bce	744.26	1,855.44	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient = Practical calorific value of
				External combustive coal (t)	1,600.00	0.643	1,028.80	Power:	0.054	tce/10,000 bce									Entrustment Loan	0			IRR	57.10	%			Power:	0.067	tce/10,000 bce			
				Power/MWh	420.00	0.383	160.86												Self-Funding	42.7766			NPV	100.41	¥10,000								
				Sum total			3,847.60	C energy consumption	1.283	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	87.55	¥1/tce			C energy consumption[2]	1.057	tce/10,000 bce			
9	Jianqian g Brick Plant, Qindu District	The Plant was built in 2001, which is a township and village brick-making enterprise with acreage 4.002 ha. The Plant had fixed assets of 1.0 million Yuan (RMB) with annual capacity of 31 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.5 million Yuan (RMB) with annual capacity of	Technical Process: Box clay feeder+Hammer mill+Coal Feeder→Roller mill→Double-shaft mixer→Two-stage de-airing extruder→Mud column cutter→Cutter→Conveying machine for	Internal combustive slag (t)	8,200.00	0.197	1,615.40	Coal:	1.203	tce/10,000 bce	3,100	10,000 bce/a./	3,979.31	2.493	9,920.41	① Constructing a new annular kiln with 28 doors Demolishing the original kiln and constructing a new 28-door annular kiln according to formal standard drawings, at the same time, the quality of the kiln should be controlled strictly so as to ensure good heat insulation and airtight performance, which will attain the purpose of saving energy and increasing output. ② Purchasing a new Model 250 hammer mill, which can	49.6200	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.0	year	3,500	10,000 common bricks /a.	Coal:	0.948	tce/10,000 bce	947.26	2,361.53	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	2,440.00	0.866	2,113.04	Power:	0.081	tce/10,000 bce									Entrustment Loan	0			IRR	64.53	%			Power:	0.065	tce/10,000 bce			
				Power/MWh	655.00	0.383	250.87												Self-Funding	42.6732			NPV	118.04	¥10,000								
				Sum total			3,979.31	C energy consumption	1.284	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	68.60	¥1/tce			C energy consumption[2]	1.013	tce/10,000 bce			
10	Xi' an Lingzha o New Buildin g Materia ls Co.	The Plant was built in 1993, which is a township and village brick-making enterprise with acreage 10.005 ha. The Plant had fixed assets of 1.0 million Yuan (RMB) with annual capacity of 26 million bricks (equal to *common brick) before* technical renovation. After technical renovation, The Plant has fixed assets of 1.4 million Yuan (RMB) with annual capacity of	Technical Process: Box clay feeder+Coal crusher+Coal batch machine (inherent fuel)→Roller mill→Double-shaft mixer→Two-stage de-airing extruder→Vertical mud column cutter→Cutter→Conveying	Internal combustive coal (t)	4,185.07	0.643	2,691.00	Coal:	1.150	tce/10,000 bce	2,600	10,000 bce/a./	3,209.08	2.493	8,000.23	① Standardizing of process flow; ② Reconstructing the 34-door annular kiln with main treatment of heat preservation and preventing air leakage, ● Demolishing the original kiln roof and reconstructing kiln roof with treatment of preventing air leakage, ● Replacing kiln air dampers and the covers of fire holes.	39.6960	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.5	year	2,800	10,000 common bricks /a.	Coal:	0.800	tce/10,000 bce	1,022.73	2,549.66	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	465.01	0.643	299.00	Power:	0.084	tce/10,000 bce									Entrustment Loan	0			IRR	45.57	%			Power:	0.069	tce/10,000 bce			
				Power/MWh	572.00	0.383	219.08												Self-Funding	32.7492			NPV	72.51	¥10,000								
				Sum total			3,209.08	C energy consumption	1.234	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	60.89	¥1/tce			C energy consumption[2]	0.869	tce/10,000 bce			

Xianyang' Brick:

No.	TVEs	Business Profile	Technical Process and Major Energy-use Equipments	EE Baseline										Proposed Technical Renovation [3]	Project Investment					Project Status	Anticipated Results										Remarks
				Energy Type	Energy consumption (physical quantity)	Conversion Factor	Energy use (tce)	Energy Use/Unit Product			Output Before Renovation		Total energy use (tce)	CO2 Coefficient	CO2 Emission (t/a.)		Total (RMB ¥ 10,000)	GEF (US$)	Others (RMB ¥ 10,000)				Start-end date	Financial Evaluation			Production after renovation		Energy Use/Unit Product			Energy Savings (tce/a.)	CO2 emission Reduction(t/a.)	
11	Weihe Jigang Building Materials Co.	The plant was built in 1996, which is a private enterprise with acreage 23.345 ha. The Plant had fixed assets of 1.45 million Yuan (RMB) with annual capacity of 23 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 2.25 million Yuan (RMB) with annual capacity of 55 million bricks (equal to	**Technical Process:** Box clay feeder+ Coal crusher + Coal Feeder →High speed roller mill→ Double-shaft mixer→ Two-stage de-airing extruder→ Mud column cutter→ Cutter→ Conveying machine for	Internal combustive coal (t)	3,240.00	0.767	2,485.08	Coal:	1.201	tce/10,000 bce	2,300	10,000 bce/a./	2,955.00	2.493	7,366.81	① Standardization of process flow ② Constructing a new production line of 32-door annular kiln ③ Repairing the air-leakage of the annular kiln, replacing kiln brake and installing new speed adjuster and energy-saving device.	82.0880	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	0.51	year	5,500	10,000 common bricks /a.	Coal:	0.800	tce/10,000 bce	2,330.80	5,810.68	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	360.00	0.767	276.12	Power:	0.084	tce/10,000 bce									Entrustment Loan	0			IRR	130.53	%			Power:	0.061	tce/10,000 bce			
				Power/MWh	506.00	0.383	193.80												Self-Funding	75.1412			NPV	467.38	¥10,000								
				Sum total			2,955.00	C energy consumption	1.285	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	37.38	¥1/tce			C energy consumption[3]	0.861	tce/10,000 bce			
12	Chang'an Zhoudu Wall Materials Co. Ltd	The Plant was built in 2003, which is a private enterprise enterprise with acreage 23.345 ha. The Plant had fixed assets of 1.5 million Yuan (RMB) with annual capacity of 25 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 2.0 million Yuan (RMB) with annual capacity of 27.5 million bricks	**Technical Process:** Box clay feeder+ hammer crusher+ Internal combustive fuel feeder→ High speed roller mill→ Double-shaft mixer→ Two-stage de-airing extruder→ Mud column cutter→	Internal combustive coal (t)	4,320.00	0.625	2,700.00	Coal:	1.200	tce/10,000 bce	2,500	10,000 bce/a./	3,191.50	2.493	11.00	① Standardizing of process flow; ② Reconstructing the 36-door annular kiln with main treatment of heat preservation and preventing air leakage; ● Demolishing the original kiln roof and reconstructing kiln roof with treatment of preventing air leakage; ● Replacing kiln air dampers and the covers of fire holes; ③ Replacing the equipments ● Installing a new high	49.7027	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.4	year	2,750	10,000 common bricks /a.	Coal:	0.850	tce/10,000 bce	1,005.40	2,506.46	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	480.00	0.625	300.00	Power:	0.077	tce/10,000 bce									Entrustment Loan	0			IRR	47.11	%			Power:	0.061	tce/10,000 bce			
				Power/MWh	500.00	0.383	191.50												Self-Funding	42.7559			NPV	76.29	¥10,000								
				Sum total			3,191.50	C energy consumption	1.277	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	62.26	¥1/tce			C energy consumption[3]	0.911	tce/10,000 bce			
13	Chang'an District Xidu Building Materials Co.Ltd	The Plant was built in 1993, which is a township and village brick-making enterprise with acreage 6.67 ha. The Plant had fixed assets of 1.5million Yuan (RMB) with annual capacity of 25 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.95 million Yuan (RMB) with annual capacity of	**Technical Process:** Box clay feeder+ fly ash+ Internal combustive fuel feeder→ High speed roller mill→ Double-shaft mixer→ De-airing extruder→ Vertical mud column cutter →Cutter→ Natural drying	Internal combustive coal (t)	2700.00	0.958	2,586.60	Coal:	1.150	tce/10,000 bce	2,500	10,000 bce/a./	3,065.50	2.493	11.00	① Replacing the equipments ● Installing a new high speed fine crushing roller mill; ● Installing a new coal(internal combustive fuel) feeder; ● Self-manufacturing a conveyor; ● Installing a new machine set of vertical mud column cutter and a vertical cutter; ② Innovating the machinery Manufacturing die, core bridge and die throat;	45.0798	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.3	year	2750	10,000 common bricks /a.	Coal:	0.850	tce/10,000 bce	866.80	2,160.93	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	300.00	0.958	287.40	Power:	0.077	tce/10,000 bce									Entrustment Loan	0			IRR	52.27	%			Power:	0.061	tce/10,000 bce			
				Power/MWh	500.00	0.383	191.50												Self-Funding	38.1330			NPV	80.42	¥10,000								
				Sum total			3,065.50	C energy consumption	1.226	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	66.98	¥1/tce			C energy consumption[2]	0.91	tce/10,000 bce			
14	Luxing Xinzhuang Brick Plant	The Plant was built in 2003, which is a private enterprise enterprise with acreage 6.67 ha. The Plant had fixed assets of 1.0 million Yuan (RMB) with annual capacity of 20 million bricks (equal to common brick) before technical renovation. After technical renovation, The Plant has fixed assets of 1.5 million Yuan (RMB) with annual capacity of 23.4 million bricks	**Technical Process:** Box clay feeder+ hammer crusher+ Internal combustive fuel feeder→ High speed roller mill→ Double-shaft mixer→ Two-stage de-airing extruder→ Vertical mud column cutter	Internal combustive coal (t)	2210.00	0.961	2,123.81	Coal:	1.25	tce/10,000 bce	2,000	10,000 bce/a./	2,667.12	2.493	11.00	① Standardization of process flow chart ② Reconstructing the 34-door annular kiln with main treatment of heat preservation and preventing air leakage ● Demolishing the original kiln roof and reconstructing kiln roof with treatment of preventing air leakage ● Replacing kiln damper and the covers of fire holes ③ Replacing the equipments ● Purchasing a new loader ● Installing a new high	53.5565	8,400	Commercial loan	0	The project has been completed according to the renovation plan	2005.03.10 ~ 2005.08.31	Payback period	1.6	year	2,340	10,000 common bricks /a.	Coal:	0.850	tce/10,000 bce	970.30	2,418.97	① Base year is in 2004. ② The data on the column of 'Business Profile' come from field survey. ③ Energy consumptions (physical quantity) come from The Feasibility Study Report. ④The conversion coefficients of internal combustive coal and external combustive coal were calculated according to their calorific value that is measured practically. That is to say, 'The conversion coefficient =
				External combustive coal (t)	390.00	0.961	374.79	Power:	0.084	tce/10,000 bce									Entrustment Loan	0			IRR	41.92	%			Power:	0.069	tce/10,000 bce			
				Power/MWh	440.00	0.383	168.52												Self-Funding	46.6097			NPV	68.97	¥10,000								
				Sum total			2,667.12	C energy consumption	1.33	tce/10,000 bce									Financial Assistance	0			Cost of energy saving	72.91	¥1/tce			C energy consumption[2]	0.919	tce/10,000 bce			
Total																														14396.36	35890.12	