JICA OFFICIAL FACSIMILE MESSAGE

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DATE: 12. Jul. 2002

To: MD, MI 鉱工業開発協力部長 殿

C.C./ I sent to:

From: RR, CN 中国事務所長

Subject: 鉄鋼業環境保護技術向上プロジェクトに係る討議議事録の署名について

別送書類 有 ☐Requests for arrangements ☐Please reply ☒For your information ☐Others

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標記に関し、7月10日（水）に中国事務所と中国鋼鉄研究総院の間で討議議事録への署名を了しましたので、下記の通り報告します。

記

1. 日時：7月10日（水）17：30～

2. 署名者：日本側：ＪＩＣＡ中国事務所 田中孝 次長
中国側：中国鋼鉄研究総院 田志凌 副院長

3. 主な出席者：
日本側：日本大使館 星野光明一等書記官、ＪＩＣＡ中国事務所田中孝次長、望戸所員、野宮専門家他
中国側：国家科技部国際合作司 阮湘平主任、同司姜小平官員、形継俊官員
中国鋼鉄工業協会国際部 楊遵慶主任
中国鋼鉄研究総院干勇院長、田志凌副院長、外事処幹部他
マスコミ（冶金日報、科技日報）

4. 式次第：1）要人挨拶
2）署名式
3）記念写真撮影

添付：討議議事録（和文、中文）
プロジェクト・ドキュメント

鉄鋼業環境保護技術向上プロジェクトのための技術協力に関する
日本国際協力事業団と
中華人民共和国実施責任機関である鋼鉄研究総院との
討議議事録

2002年4月12日に署名された第三次短期調査団の協議議事録に関連し、国際協力事業団（以下「JICA」という）は中華人民共和国事務所代表者を通じ、鉄鋼業環境保護技術向上プロジェクトの実施について、有効な実施のための両国政府がとるべき必要な措置に関して中華人民共和国（以下「中国」という）実施責任機関である中国鋼鉄研究総院（以下「中国側」という）と意見を交換し、一連の協議を行った。

協議の結果、JICAと中国鋼鉄研究総院は、それぞれの政府に対し、ここに添付する附属文書に記載する諸事項について勧告することに合意した。

2002年7月10日に北京市で、等しく正文である日本語、中国語による本書各２通を作成し、双方の合意のもとに署名した。

2002年7月10日

田中　孝
中華人民共和国事務所　次長
国際協力事業団
日本国

田　志凌
副院長
鋼鉄研究総院
中華人民共和国

付属文書

Ⅰ　両国政府の協力

1　中華人民共和国政府（以下「中国」という）は、日本国政府と協力し、鉄鋼業環境保護技術向上プロジェクト（以下「当該プロジェクト」）を実施する。
2　当該プロジェクトは附表Ⅰの基本計画に基づいて実施される。

Ⅱ　日本国政府のとるべき措置

日本国において施行されている法律及び規則に従い、日本国政府は、技術協力計画の通常の手続きにより、日本国の負担においてJICAを通じ以下の措置をとる。

1　日本人専門家の派遣

日本国政府は、附表Ⅱに掲げる日本人専門家の役務を提供する。

2　機材供与

日本国政府は、附表Ⅲに掲げる当該プロジェクトの実施に必要な機械、機材、その他の資材（以下「機材」という）を供与する。機材は、陸揚げの港及び（又は）空港において、中国関係当局にCIF建てにて引き渡されることにより中国政府の財産となる。

3　研修員受入れ

日本国政府は、日本国における技術研修のため当該プロジェクトに関係する中国人を受入れる。

Ⅲ　中国政府のとるべき措置

1　中国政府は、当該プロジェクトの関係者、受益グループ及び関係機関を十分かつ積極的に当該プロジェクトに関与させることにより、日本の技術協力実施期間中及び終了後、当該プロジェクトの自立的な運営が維持されることを確保するために必要な措置をとる。

2　中国政府は、日本の技術協力の結果として自国民によって得られた技術及び知識が中国の経済及び社会の発展に貢献することを保証する。

3．　中国政府は、上記Ⅱ・1に掲げる日本人専門家及びその家族に対し、附表Ⅳに掲げる中国における特権、免除及び便宜を与えると共に、同様の任務を遂行する第三国又は国際機関の専門家と劣らないの特権、免除及び便宜を付与する。

4．　中国政府は、上記Ⅱ・2に掲げる機材が、附表Ⅱに掲げる日本人専門家との協議のもと当該プロジェクト実施のために有効に使用されることを保証する。

5．　中国政府は、中国人が日本における技術研修を通じて得た知識及び経験が、当該プロジェクト実施のために有効に使用されることを保証するために必要な措置をとる。

6．　中国政府は、中国において施行されている法律及び規則に従い、中国側の負担において、当該プロジェクトに次のものを提供するため必要な措置をとる。
（1）　附表Ⅴに掲げる中国人カウンターパートおよび事務職員の役務。
（2）附表Ⅵに掲げる土地、建物および附帯施設。
（3）　上記Ⅱ—2に掲げるJICAから供与する機材以外で、当該プロジェクトの実施に

必要な機械、装置、器具、車両、工具、予備品及びその他の必要な物品の供給及び更新。

（４） 中国における日本人専門家の公務出張に対する交通の便宜及び北京市内交通費。

７． 中国政府は、中国において施行されている法律及び規則に従い、次の経費を負担するために、必要な措置をとる。

（１） 上記Ⅱ・２に掲げる機材の中国内における輸送、据付け、操作及び維持管理に必要な経費。

（２） 上記Ⅱ・２に掲げる機材に対し、中国国内において課せられる関税、国内税及びその他の課徴金。

（３） 附表Ⅶに掲げる当該プロジェクトの実施に必要な運営費。

Ⅳ 当該プロジェクトの管理体制

１．鋼鉄研究総院副院長（国際協力担当）は、総括責任者として当該プロジェクトの実施に係る全ての責任を負う。

２．当該プロジェクトのセンター所長は実施責任者としてプロジェクトの運営、管理及び技術的事項について責任を負う。

３．日本人チーフアドバイザーは、当該プロジェクトの責任者に対して当該プロジェクトの実施に関する事項について指導及び助言を与える。

４．日本人専門家は、中国人カウンターパートに対して当該プロジェクトの実施に関する技術面の事項について必要な技術指導及び助言を与える。

５．当該プロジェクトの技術協力を効果的かつ成功裡に実施するために、附表Ⅷに掲げる機能及び構成による合同調整委員会が設置される。

Ⅴ 合同評価

当該プロジェクトの達成度を確認するため、協力期間中頃及び協力期間終了前約６ヶ月の間に、JICA 及び中国側関係当局を通じて両国政府により合同で当該プロジェクトの評価が実施される。

Ⅵ 日本人専門家に対する請求

中国政府は、当該プロジェクトの技術協力に携わる日本人専門家に対し、その職務遂行に起因し、又はその遂行中に、若しくはその遂行に関連した請求が発生した場合には、日本人専門家の故意または重大な過失による場合を除き、いかなる場合においてもその責任を負う。

Ⅶ 相互協議

両国政府は、本附属文書から生ずる、または本付属文書に関連する主要事項について相互に協議を行う。

Ⅷ 当該プロジェクトの理解及び支援を促進するための措置

中国政府は、当該プロジェクトに対する中国国民の支援を促進することを目的として、中国国民に広く当該プロジェクトを知らしめるため、適切な処置を取る。

Ⅸ　協力期間

本附属文書に基づく当該プロジェクトの技術協力期間は、2002年9月1日から5年間とする。

附表Ⅰ　基本計画
附表Ⅱ　日本人専門家
附表Ⅲ　供与機材
附表Ⅳ　日本人専門家に対する特権、免除及び便宜
附表Ⅴ　カウンターパート及び事務職員
附表Ⅵ　土地、建物及び附帯施設
附表Ⅶ　中国側運営費
附表Ⅷ　合同調整委員会

附表Ⅰ　基本計画

1　プロジェクトの上位目標

冶金燃焼環境保護・省エネルギー技術が中国の鉄鋼業に普及する。

2　プロジェクトの目標

センターが冶金燃焼環境保護・省エネルギー技術を中国の製鉄所に対し指導できる。

3　成果

0）プロジェクト実施体制が確立する。
1）機材が整備される。
2）燃焼技術改善能力が向上する。
3）排煙処理技術を修得する。
4）工場燃焼・環境診断技術を修得する。
5）冶金燃焼環境保護・省エネルギー技術の普及活動が実施できる。

4　活動内容（各成果に到達するための活動）

成果 0）に対する活動
- 0)1　中国側職員を配置する。
- 0)2　日本側専門家を配置する。
- 0)3　運営委員会を設立する。
- 0)4　業務分掌を作成する。
- 0)5　実施計画（APO）を作成する。
- 0)6　モニタリングを行う。

成果 1）に対する活動
- 1)1　機材を設置する。
- 1)2　機材を運用する。
- 1)3　機材を保守管理する。
- 1)4　機材用マニュアル類を整備する。

成果 2）に対する活動
- 2)1　燃焼技術の現状を把握する。
- 2)2　実験計画を策定する。
- 2)3　実験を行う。
- 2)4　実験の成果をとりまとめる。
- 2)5　燃焼の解析を行う。
- 2)6　改善案を作成する。

成果 3）に対する活動
- 3)1　排煙処理技術の現状を把握する。
- 3)2　排煙処理技術資料の収集・整理を行う。
- 3)3　排煙処理技術に関し、製鉄所に助言或いは改善案を提示する。

成果 4）に対する活動
- 4)1　診断技術に関する実習を行う。
- 4)2　製鉄所を選定し、診断案を作成する。
- 4)3　工場燃焼・環境診断を行う。
- 4)4　診断マニュアルを作成する。

成果5）に対する活動

5)1　関連資料を作成する。

5)2　ホームページを開設する。

5)3　セミナーを実施する。

5)4　実験炉を使用したデモンストレーションを行う。

5)5　工場と技術交流を行う。

附表Ⅱ　日本人専門家

1.　長期専門家

（1）チーフアドバイザー
（2）鉄鋼環境保護技術　兼　業務調整員
（3）工業炉燃焼技術

2.　短期専門家

当該プロジェクトに関するその他の分野の短期専門家については、プロジェクトの円滑な実施のために必要に応じ派遣される。

附表Ⅲ　供与機材

1. 燃焼実験用機材
2. 計測解析用機材
3. 工場診断用機材

附表Ⅳ　日本人専門家に対する特権、免除及び便宜

1　日本人専門家及びその家族に海外から送金される報酬に対して、又はそれに関連して課せられる所得税及びいかなる課徴金も免除する。

2　日本人専門家及びその家族が持ち込む又は持ち出す個人的使用品並びに業務に関連する機材に課せられる関税を免除する。

3　日本人専門家及びその家族に対して医療の便宜を提供する。

附表Ⅴ　カウンターパート及び事務職員

1　当該プロジェクトの総括責任者
　　鋼鉄研究総院　副院長（国際協力担当）

2　当該プロジェクトの実施責任者：
　　冶金燃焼環境保護・省エネルギー技術センター所長

3　下記専門分野のカウンターパート
　　1）燃焼分野
　　2）排煙処理技術
　　3）工場燃焼・環境診断技術

4　事務要員

5　通訳

6　その他当該プロジェクト実施に必要な人員
　　1）　運転手
　　2）　機材の運転、保守要員
　　3）　その他支援要員

附表VI　土地、建物および附帯施設

1　プロジェクトの実施に必要な用地、建物、および附帯施設
2　日本国政府から供与される機材の据付と保管に必要な建物、及び附帯施設
3　チーフアドバイザー用の事務室、鉄鋼環境保護技術兼業務調整員及びその他の専門家のための適切な事務室及び必要施設

附表 VII　中国側運営費

単位：万元

年度	項目							合計
	供与機材輸送据付調整	自己調達建設	学術活動	科学研究経費（注）	人件費	管理費（ｵﾌｨｽ賃貸電気水道）	旅費	
第１年度	200	200	10	90	100	60	40	700
第２年度	100	50	10	40	100	60	40	400
第３年度	0	0	5	45	150	90	60	350
第４年度	0	0	5	45	150	90	60	350
第５年度	0	0	5	45	150	90	60	350
累計	300	250	35	265	650	390	260	2150

注：科学研究費は材料、燃料、設備維持管理費を含む。

附表Ⅷ　合同調整委員会

１　機能

合同調整委員会は、少なくとも年１回及び必要が生じたときに開催し、次の機能を持つものとする。

（１）　議事録の枠内に沿って策定さる当該計画の年次活動計画を承認する。
（２）　技術協力計画全体の進捗及び上記年次計画の達成に関する検討を行う。
（３）　技術協力計画から生じる、或いは技術協力計画に関連する主要事項につき検討し意見交換を行う。

２　構成

（１）　委員長
　　鋼鉄研究総院副院長（国際協力担当）

（２）　委員
〈中国側〉
　a. 科学技術部の代表
　b. 国家経済貿易委員会の代表
　c. 中国鋼鉄工業協会の代表
　d. 鋼鉄研究総院の代表
　e. 冶金燃焼環境保護・省エネルギー技術センターの代表
　f. 鋼鉄研究総院が必要と認めて派遣する者
〈日本側〉
　a. チーフアドバイザー
　b. 業務調整員
　c. その他の派遣専門家
　d. JICA 中国事務所の代表
　e. JICA が必要と認めて派遣する者

（注）在中国日本国大使館員はオブザーバーとして合同調整委員会に参加できる。

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
THE CENTRAL IRON AND STEEL RESEARCH INSTITUTE
ON JAPANESE TECHNICAL COOPERATION
FOR THE PROJECT FOR IMPROVEMENT OF ENVIRONMENTAL PROTECTION TECHNOLOGY FOR METALLURGICAL COMBUSTION

Japan International Cooperation Agency (hereinafter referred to as "JICA") had a series of discussions through the Resident Representative of JICA in the People's Republic of China, with the Central Iron and Steel Research Institute with respect to desirable measures to be taken by both Governments for the successful implementation of the Project for Improvement of Environmental Protection Technology for Metallurgical Combustion in the People's Republic of China.

As a result of the discussions, both sides agreed to summarize the matters referred to in the document attached hereto as a supplement to the Record of Discussions.

Beijing, July 10, 2002

Takashi Tanaka
Deputy Resident Representative
JICA China Office
Japan International Cooperation Agency
Japan

Zhiling Tian Prof., Dr.
Vice President
Central Iron and Steel Research Institute
People's Republic of China

THE ATTACHED DOCUMENT

As a result of the discussions, both sides agreed the Project Document for rationalization of the plan and justification of the project implementation. The both sides as attached herewith agreed the contents of the Project Document

ANNEX PROJECT DOCUMENT

Project for Improvement of Environmental Protection Technology for Metallurgical Combustion

Project Document

July 2002

Japan International Cooperation Agency

Contents

Tables

ANNEXES

Abbreviations

AIJ	Activities Implemented Jointly
CISA	Chinese Iron and Steel Association
CISRI	Central Iron and Steel Research Institute
CP	Cleaner Productions
GAP	Green Aid Plan
GDP	Gross Domestic Products
CDQ	coke dry quenching
GNP	Gross National Products
JBIC	Japan Bank for International cooperation
JCC	Joint Coordinating Committee
JI	Joint Implementation
JICA	Japan International Cooperation Agency
MITI	Ministry of International Trade and Industry
NEDO	New Energy Development Organization
PCM	Project Cycle Management
PDM	project design matrix
SDPC	State Development Planning Commission
SEPA	State Environmental Protection Agency
SETC	State Economic and Trade Commission
SSTC	State Science and Technology Commission
TRT	top pressure recovery power generation
UNEP	United Nations Environmental Plan
WHO	World Health Organization

The following report is a summary of the project called 'Improvement of Environmental Protection Technology for Metallurgical Combustion', a technical cooperation project between Japan International Cooperation Agency (JICA) and Central Iron Steel Research Institute (CISRI), Beijing, China. The report is prepared in the form of Project Document, a standardized appraisal JICA utilizes to review and study feasibility of the project prior to project implementation.

The purpose of the project was defined to increase the capacity of CISRI allowing them to teach steel works in China metallurgical combustion technology through technological transfer from the Japanese steel industry. The project intends to promote improved technologies in metallurgical combustion and energy-conservation to Chinese steel works.

The objectives of the project is to accelerate research and development of environmental conservation technologies, to develop human capacity of the related fields through technology transfer of environmental conservation which is expected immediate impact to overall environmental conservation efforts in the steel industry in China.

Considering the vast land areas, the population, and magnitude of environmental threats affecting the air qualities of China, technical assistance provided by Japan has its limit. It is almost impossible for Japan alone impacts effectively all considerable measures to eliminate air pollution in China. The basic strategy of the project is to assist CISRI as a technology center to improve air quality, to support their efforts to promote environmental conservation technologies and equipment.

This technical cooperation is considered feasible and effective to reach such objectives. In addition to this technology transfer through the planned five-year long technical cooperation and policy dialogue, it is expected to increase China's self-help efforts and the legal framework to promote such technologies to the steel industry.

1. Introduction

Recent economic expansion has created various environmental problems in many cities in China. These problems are becoming increasingly threats to human environment. The Chinese government has pledged so-called 'Energy Reduction Target' in their Tenth Five Year Plan (hereinafter referred as the 10-5 Plan) to reduce the energy consumption level as much as 400 million tons equivalents to standardized coal annually, and to improve air quality significantly. The government established a national research and development center, the Energy and Environmental Conservation Center for Metallurgical Combustion (hereinafter referred as the Center) on the premises of Central Iron and Steel Research Institute (CISRI) in Beijing, China.

While China lacks experiences in energy conservation and environmental protection in the steel works, the government of she requested Japan to provide technical assistance to improve the capacity of the human resources and to promote the technologies related to environmental protection of the steel industry. Japan responded by dispatching study teams to CISRI on August and December in 2001 to investigate the possibility of technical assistance of Japan International Cooperation Agency (JICA). The teams studied about the on-going measures related to such issues as environmental protection and energy conservation, field practice for energy conservation, research environments, organization and institutional capacities of CISRI, and necessary equipment to implement the technical assistance. The team further studied feasibility of the project through dialogue with the Chinese government.

This paper describes background of the project to clarify the political, economical and social position of the project in the Chinese context. Then issues and problems in the environmental protection technologies in metallurgical combustion and energy-conservation are analyzed, followed by the project strategy and basic design. Finally, overall relevance of project implementation is assessed based on the result of preliminary assessment.

2. Background

2-1. Socio-economic Conditions of China

2-1-1 Political, economic and social conditions

(1) Socio-economic Conditions

Since 1978, China has dismissed its Soviet-style central planned economic system while introducing more market oriented economic reform. The transition aims to transform her economic systems more open and market driven economic structures. Such dynamic transitions may bring not only transformation of economic structures but also that of political systems. In the industrial sector, a rapid transition to market economy by encouraging small and medium sized private enterprises is in progress. This brings increased economic expansion, trade and capital investment, which provide better standard of living and strengthened economic ties between China and the rest of the world. As a result, Gross Domestic Products (GDP) has quadrupled since 1978 and per

capita GDP has grown by $840. Having 1.3 billion people, China already became the second largest economy in the world.

The challenges are that various issues resulting from the rapid transition to market economy. The government is taking actions for structural reforms including the 'Three Major Reforms', a combination of the state-owned enterprises reform, financial reform, and administrative reform. On the other hand, a few issues that may be potentially destabilizing the social system become visible as the result of the rapid transition.

(2) The Tenth Five Year Plan (10-5 Plan)

The State Development Planning Commission (SDPC) submitted National People's Congress the Tenth Five Year Plan for National Economy and Social Development (10-5 Plan) in March 2001. The plan, which was approved in the Congress, is to point out the national-level development framework by showing the blueprint between 2001 and 2005. The plan consists of nine sections and 26 chapters covering such areas as national economy, social development, agriculture and rural economy, structural reform of industrial sector, improvement of national competitiveness, information technology, science and technology, education, population, open-economy, national defense, and macro-control reform. The plan identifies four major issues as development challenges of Chinese socio-economy. They are (a) development of market-oriented economic system and sustained growth, (b) strategy for sustainable development, (c) reduction of regional disparity, and (d) employment and improvement of social welfare and safety nets.

(3) Japan's Basic Policy Related to Economic Assistance to China

China has become one of the biggest Japanese-aid recipient countries since Japan started economic assistance through ODA in 1979.

There are five reasons for Japan to aid China. They are; (a) both countries locates closely not only geographically but politically and historically; (b) firm and extended friendship between both countries leads to peace and prosperity in Asia-Pacific as well as in the world; (c) economic relations have been deepen and expanded in G-G based economic cooperation, private investment, trade, resource development cooperation and so forth; (d) the Chinese government highly prioritized economic modernization and is promoting open policy and economic revolution; (e) Chinese Gross National Products (GNP) per person is as low as $840 (1999) and highly demand an external aid. Japan has supported self-help economic development and livelihood improvement in China based on its aid policy to support modernization effort by the Chinese government.

These days surroundings of ODA to China is changing to harsh tone. This is because argument of efficiency and effectiveness of ODA in Japan arose along with Japanese economic recession. In this situation, the Japanese government made an official announcement of 'Economic Cooperation Plan to China' in October 2001. In this Plan, Japanese aid aims to (a)

promotion of Chinese initiatives (b) fully understanding by The Chinese government on the fundamental rules of Japanese ODA principles (c) effective and efficient use of aid resources (d) aid with Japanese human face, and (e) effort to keep high transparency.

According to the Plan, future economic cooperation to China will prioritize environment conservation, livelihoods improvement, social development, human resource development, institution building, and technology transfer, rather than conventional infrastructure construction in the coastal area. In practice, following six areas are selected as more important issues to address: (a) global issues such as environmental problems, (b) political and economic reform, (c) mutual understanding, (d) poverty reduction, (e) assistance to private sectors, and (f) multi-national cooperation.

2-1-2 Issues and Problems Addressed

(1) Environmental issues in China

The recent economic expansion puts significant pressures to environment and ecosystems in China. In particular, urban air pollution is identified as one of the most serious social phenomena of economic growth in China. For instance, World Health Organization (WHO) published a report in 1988 on air quality of 272 cities in 54 countries. Out of ten cities where air pollution is the most serious environmental threats, seven are located in China. The government has sought for comprehensive measures to improve the air quality. While decentralization is a thriving trend in China, the central government relies on local governments on various policies and measure for environmental protection. For example, Air Pollution Prevention Law (revised in April 2000) has been enacted since September 2000 in China. Effectiveness of enforcing environmental qualities has been an issue while the majority of environmental threats spread and impact beyond the administrative boundaries.

(2) Environmental Laws in China

While the degradation of environment gradually recognized as a threat to the society, the government recognizes increased needs of efficient use of natural resources and environmental protection. In order to harmonize development of priority sectors and natural resources, the government of China has studied and learned from lessons of other nations, and they have reformed legal systems concerning environmental protection.

The current constitution (1982) affirms in the article 10, the state's role in rational use of natural resources, protection of endangered species, and prohibition of destruction of natural resources. It also acknowledges the government's responsibilities in rational use of land (article 10), protection and improvement human habitat, preventing pollution, afforestation and reforestation (article 26).

The Environmental Protection Law established in 1989 plays an important role as a fundamental framework for environmental protection. It set standards of administrative measures of environmental protection in China. Basic philosophy behind the legal structure is to bring

environmental protection into line with economic development. In order to achieve such vision, the law stipulates the basic framework of environmental management, conservation, improvement and the enforcement of so-called "*polluter*-pays principle" for cost recovery and compensation.

Pollution prevention is ruled by such laws as Marine Environmental Protection Law (1982), Water Pollution Prevention Law (1984), Air Pollution Prevention Law (1987), Law for Prevention of Environment Pollution by Solid Wastes (1995), and Noise Prevention Law (1996). In addition, such laws as Wildlife Protection Law (1988) and Water and Soil Prevention Law (1991) set rules to protect ecosystems. These laws stresses appropriate management of environmental resources.

Another category of laws to administer use of natural resources include Forest Law (1984), Fishery Law (1986), Mineral Resources Law (1986), Land Management Law (1986), Water Law (1988), Coal Law (1996), and Energy Conservation Law.

(3) Measures to prevent air pollution

The government of China identifies urban air pollution one of major priorities area in the environmental prevention master plan (3321 program). Areas seriously affected by sulfur dioxide and acid rain are designated as the Two Control Zone to strengthen air pollution prevention measures. The designated areas receive increased funding to improve the environmental quality in the timely manner. Such measures may be expected to bring significant structural changes in the local industry, while the most of designated zones were so-called the vanguard of recent economic expansion in China.

Table-1 Description of 「Two Controlled Zones」

Category	Geological Characteristics	Magnitude of Environmental Threats	Target	Preventive Measures
Sulfur dioxide control zone	63 cities 290 thousand ㎢ (3.0 % of national territory)	60% of total emission from all sulfur dioxide sources	1. All local sources observe the emission requirements by 2000. 2.Reduced emission of sulfur dioxide to the year 2000 level by 2010	1.Controlled use and mining of high sulfur-content coals. 2.Prioritize emission gas reduction from coal thermal power plants 3.Development of sulfur dioxide reduction technologies and facilities. 4.Improved environment monitoring
Acid rain control zone	14 provinces 800 thousand ㎢ (8.4 % of national territory)	Acid rain occurs regularly. Unusual acidity of rain water. Serious threat to vegetation and ecosystems.	Significantly reduced the affected area where pH level is less than 4.5 by 2010.	1.Controlled use and mining of high sulfur-content coals. 2.Prioritize emission gas reduction from coal thermal power plants

				3.Development of sulfur dioxide reduction technologies and facilities. 4.Improved environment monitoring

Source : Overseas Environmental Cooperation Center

(4) Initiatives for Cleaner Production (CP)

The Chinese government has identified the needs of improving legal framework, technological development and implementing pilot projects in Cleaner Productions (CP) for it is one of the most effective measures to improve overall quality of environment, to increase sufficiency of resource utilization, and to increase competitiveness of industry. Although the government issued a draft of the CP Law in July 2000, it is still yet to be enacted. According to the draft, the government takes necessary measures to promote CP and provides rules and measures taken by central and local governments, and by enterprises. Various agencies and departments issued ruling and guidelines accordingly. In particular, the State Economic and Trade Commission (SETC) and State Environmental Protection Agency (SEPA) play central role to promote CP.

SETC issued a guideline for CP selecting 10 model cities, including Beijing and Shanghai, to promote CP. The guideline initiate the model cities to draft necessary regulations and to select model factories for promotion of CP. Model factory would be selected from five priority industrial sectors, petrochemical, steel, chemical, light industry and ship building. Taiyuan city, one of the ten model cities, for example, has completed issuing regulations with a technical assistance from United Nations Environmental Plan (UNEP).

In the steel industry, these issues, (a) development of powdered coal blower, (b) abolishing open hearth furnaces, (c) development of continuous casting technology, (d) development of materials used in furnaces and (e) development of strip mills, hot and cold mills, (f) utilization of secondary energy and waste treatment technologies are identified as priority.

2-2. Description of Combustion Technology and Energy Conservation in China Metallurgical Industry

2-2-1 Economic Growth and Energy Consumption of China

China consumes 1.322 billion coal equivalent tons of energy in 1998, which is the second largest energy market next to the United States. The total energy consumption equals to 9.4 percent of total energy consumption of the world. Coal dominates as much as 71 percent of total consumption. The total energy consumption consists of 1.19 billion tons of coal, 190 million tons of oil, 21.17 billion cubic meter of natural gas. These figures represent the first, fourth and twenty first place of world energy consumption respectively.

Table-2 illustrates the long-term trend of energy consumption in China. It indicates a significant improvement of energy use in the past ten years. While she experienced astonishing economic

growth by 380% increase of GDP between 1991 and 1999, energy consumption only increased by 125%. In addition, energy consumption per GDP10, 000 yuan shows 4.8 ton in 1991 to 1.59 tons in 1999, significant improvement of energy use.

Table- 2 Trend of Energy Consumption (1991-1999)

Item	Unit	1991	1995	1996	1997	1998	1999
Year-End Population	10^4person	115,823	121,121	122,389	123,629	124,810	125,909
Urban	10^4person	30,543	35,174	35,950	36,989	37,942	38,892
Rural	10^4person	85,280	85,947	86,439	86,637	86,868	87,017
Gross Domestic Products	10^8yuan	21,618	58,478	68,594	74,463	78,245	81,911
Agriculture	10^8yuan	5,289	11,993	13,884	14,211	14,552	14,457
Industry	10^8yuan	9,102	28,538	33,613	37,223	38,619	40,418
Service	10^8yuan	8,087	24,718	29,083	32,412	33,388	34,975
Total Energy Consumption	10^4tce*	103,783	131,176	138,948	137,799	132,214	130,119
Energy Efficiency	tce/person	0.896	1.083	1.135	1.115	1.059	1.033
Energy Efficiency	tce/10^4yuan	4.801	2.243	2.026	1.851	1.688	1.589

* Coal equivalent calculation

(Source: Department of Industry and Statistics, National Bureau of Statistics, PRC)

2-2-2 Characteristics of Energy Consumption of the Chinese steel industry

China's environment is seriously affected by the steel industry for its size and inefficient energy use. The Chinese steel industry has contributed as key industry to the national development and modernization. The number of steel-related enterprises whose sales revenue exceeds 5 million counts by 4,376 in 2000, employing 2.61 million workers. Currently, there are 2,506 steel works and employing 1.27 million workers. Total annual production of crude iron counts by 127 million tons and that of steel materials marks 131.5 million tons annually. GDP share of the steel works occupies about 4.1

Energy consumption of the Chinese steel industry is one the most significant issues to improve the overall quality of environment in China. It is estimated that there are 120 thousand industrial furnaces in China. The total energy consumption is estimated as much as 25% of that of whole China. The number of furnaces for rolling mill is estimated as much as 20 thousand in China. Of all the mills, 45% is burns oil, 45% is mixture of blast furnace gas and coke oven gas, and the rest is coal-heated furnace. Estimated energy consumption of all the steel works in China as whole accounts for 10.6% of the entire industry, which equals to 129 million tons coal equivalent per annum. The energy sources are electricity 26.8%, coal 70%, fuel oil 3% and natural gas 0.2%. While the volume of coal is estimated roughly 100 million tons per annum, its efficiency of energy use is much lower than that of other industrialized nations. Table-3 illustrates the comparison of energy consumption in selected countries. The steel industry is identified as one of major sources of air pollutants causing serious air pollution in China. Total emission of sulfur dioxide accounts 790 thousand tons per annum in 1998 and it is 7% of total emitted by the industry sector in China. The desulphurization rate of the steel industry is only 16% which is lower than other sectors.

Table-3 Energy Efficiency Comparison (1980-1999) Unit: kgce/ton

Country	1980	1985	1990	1995	1999
China (key enterprises only)	1201	1062	N/A	976	833
Japan	705	640	N/A	656	680
United States	880	761	757	N/A	N/A
United Kingdom	794	721	N/A	721(1994)	N/A
France	826	764	N/A	735(1994)	N/A

Source: Energy Statistics of China (1997-1999)

Considering the fact that the data for China only includes large and medium enterprises where relatively up-to-date facilities are equipped, the gap in energy use efficiency against other industrial nations are significant. The table shows evidence that the energy efficiency of Japan is the highest among the countries listed.

2-3. The Chinese government's Strategy

2-3-1 The guideline for the steel industry in the 10-5 Plan

In June 2001, following the approval of the 10-5 Plan, SETC proposed a steel-industry specific guideline. It provides a fundamental framework of the steel industry in line with the 10-5 Plan during its planning period (2001-2005). The plan proposes various scenarios for structural reform.

One of examples is to improve product mix through prioritization and concentration by demolishing and abandoning aged and unproductive facilities and plants. The market share of domestic steel products was 86% in 1995. It reached by 90% in 2000. The technical level has increased in the recent years so such products as rails, steel plates, rolled iron sheets for containers, steel plates for bridges and sheet metals for line pipes may be produced domestically.

Upgrading and improvement of aged production facilities are underway. Several enterprises are established with up-to-date facilities and equipment such reform and modernization of production facilities has forced open-hearth furnace out from facilities by 2000. On the other hand, advanced equipment such as bar mills, which are predominantly imported from overseas, became available from domestic manufacturers. Overall goals for series of reforms in production facilities and technologies aim at renewal of aged equipment supporting of advanced technologies, promotion of CP and cost reduction.

Recognizing the needs that sustainable growth is essential to overall welfare of the society, the steel industry needs to transform into a pollution-free industry. In order to achieve such a vision, it should allocate substantial funding to such areas as energy conservation, environmental protection, efficient use of natural resources, and promoting CP.

The target of energy efficiency improvement in the plan is to reduce the energy consumption by 800-kg coal equivalent per one ton of production of crude iron from current level of 920kg coal equivalent. In addition, overall emission of pollutant would be reduced by 10% of the year 2000

level. These figures would contribute to the national goal of energy reduction by 400 million tons coal equivalent between 2001 and 2005.

Table-4 Proposed Targets of Iron Industry in the 10-5 Plan

Issues	Targets	Time-lines	Note
Market Share	The share of domestic steel products accounts by 95%, 10% increase from the figure in 2000.	by 2005	
Quality	Increased weight of quality steel production comparable to global standard by 70% from 30% in 2000	by 2005	
Energy Consumption	Energy efficiency improved by 800kg/ton per ton of crude iron production from 920kg/ton at 2000 level	by 2005	
Environmental Protection	Major pollutants reduced by 10% compare to 2000 level	by 2005	
Water Conservation	Use of water except recycled reduced by 16 m3 per ton of crude iron production from 30 m3 at 2000 level	by 2005	Applied to large and mid-sized enterprises Recycled water excluded
Labor Productivity	Crude iron production per worker increased by 250 ton/person from 100 ton/person at 2000 level	by 2005	
Product Concentration	The crude iron production share of top ten major enterprises increased by 80% from 50% in 2000 level	by 2005	

Source: The Tenth Five Year Plan

2-3-2 List of Industries, Products and Technologies Currently Encouraged by the State Promulgated Jointly by the SDPC and the SETC

SDPC and SETC jointly issued a list for priority technologies and equipment of selected industries in September 2000. The list, consists of 28 sectors, 526 products and technologies, aims for strategic adjustment of economic structures, promotion of high-tech production and increased competitiveness.

The list consists of 30 advanced technologies for the steel industry such as sintering process, coke dry quenching (CDQ), top pressure recovery power generation (TRT), various measures to extend the life span of blast furnaces, pre-treatment of hot-metal, external refining of molten steel, and high-efficiency and high-precision continuous casting technologies. SETC insists the steel industry to adopt these advanced technologies by selecting specific steel works to maximize the effects of strategic investment initiatives. As a result, SETC attempts to increase the scale merits and efficiency, and benefits of automation.

2-3-3 Administrative Arrangements and Adjustments

The current political and economic transitions occurring in China influence administrative arrangements, ownership and governance of state-owned industries of the steel industry. Previously, all steel works are state-owned and classified into two classes of enterprises, (a) major state enterprises and (b) public enterprises administered by local governments. Though these enterprises are still controlled by the state, arrangements of governing these enterprises are significantly changing since 1998. The goals of such adjustments are to separate state and enterprises completely to meet with ever-changing market conditions, to furnish and improve conditions allowing private enterprises governed by individual management.

One of major adjustments was abolition of nine industry-sector bureaus including steel bureau in February 2001, the authority to control the respective industry is transferred to SETC. This motion is considered as one of the government's initiatives to meet with series of on-going reforms. While the Steel and Non-steel section of Industry Planning department at SETC is in charge of the administration, its authority, however, is only limited to macro-level production planning and other related policies and management.

At the same time, the state indirectly controls over the industry since above reform in February 2001. In the steel industry, day-to-day administrative authority previously held by the government was transferred to a newly established Chinese Iron and Steel Association (CISA). CISA, established by 125 steel-related enterprises as one of ten industry-specific associations, has its mission to coordinate and manage underlying industry's self-interests. Other roles of the association include to act as an intermediary between government and the industry, and to represent the industry in various committees and conferences.

2-3-4 Industry Reform

In addition to the above administrative reform, the steel industry in China is midst of structural reform. It is in line with the late State Bureaus of Steel Industry's "three step initiatives" issued in July 2000. The overall goal of the initiatives is to improve overall level of the steel industry up to global competitors by 2005, and to boost technical levels of major enterprises to the levels comparable to world s advanced steel works.

The first phase of the initiative is to abolish enterprises that have various problems such as low productivity, causing environmental pollution, and low energy efficiency. It is to create fair market environment, which enables large and mid-sized enterprises, can compete. As listed in the Table 5, only top 67 enterprises produce approximately 90% of entire crude iron output. At the time of writing, the number of steel works to be demolished is not certain. All 1,042 steel works but the 67 may be eliminated due to their low productivity.

The government of China initiates the steel industry to undertake drastic structural adjustment, foresees formation of large-scale steel works encompassing tens of enterprises in a region. In the

long run, the government initiates to make these enterprises competitive in the global market. To achieve this, the government set three phases strategy. The target of the second phase is to increase specialization through division of production, and to reduce redundancy of product mix. And in the third phase, the targets are to form international conglomerates, to increase division of production within the group of companies, to terminate low profit-making products, and to strengthen profitability and competitiveness.

Table-5 Shares and Number of Enterprises by Crude Iron Production (1999)

Size of Iron Works by Annual Crude Iron Production (ton)	No of Enterprises	Cumulative Total	Share of Crude Iron Production (%)	Cumulative Total of Share of Crude Iron Production (%)
5million ton and up	4	4	26.7	26.7
1 million and up to less than five million tons	34	38	51.5	78.2
Half million and up to less than 1 million tons	14	53	7.5	85.7
0.30million ton and up to half million tons	11	63	3.5	89.2
0.2 million to and up to 0.3 million tons	4	67	0.8	90.0

Source: State Economic and Trade Commission (2000)

2-4. Initiatives to improve Metallurgical Combustion Technology by the Chinese government and Other Organizations

2-4-1 Initiatives by the Chinese government

As described in the previous sections, the government of China identifies practices by the steel industry one of major causes of serious air pollution. She takes various measures to advance counter measures such as the 10-5 Plan and other legal and other ruling to support these initiatives to reduce air pollution.

2-4-2 Initiatives by the Japanese government

The basic policy related to economic assistance to China was reviewed and revised on October 2001 (see 2-1-1(3)).

A significant event in recent technical cooperation between Japan and China in environmental sector begins from June 1995, when high-level delegation consisting governmental officials and the private sector experts to study the aid policy on environmental issues in China was dispatched. The team has had a series of meeting with various branches of The Chinese government to exchange views on issues and measures for environmental problems in the region. The both sides had a dialogue on technical cooperation for environmental problems with a mid and long-term view. Japan explained her principles on cooperation emphasizing (a) technical assistance to reduce air pollution and acid rain, (b) transferring technologies and know-how based on Japan s past experiences dealing with the problems, (c) taking a comprehensive approach jointly provided by central and local governments, and the private sector, (d) cooperation with other countries and

international organizations, and (e) supporting grass-roots level activities. The Chinese government expressed her strong support.

In line with these principles, the Japanese government has provided various technical assistance to China in the form of (a) technical cooperation by JICA, (b) yen loan mainly provided by Japanese Bank for International Cooperation (JBIC), (c) Green Aid Plan (GAP) promoted by former Ministry of International Trade and Industry (MITI) and related initiatives provided by New Energy Development Organization (NEDO), (d) local governments and private initiatives

(1)Technical Cooperation by JICA

One of a few technical cooperation projects undertaken by JICA is Japan-China Friendship Center for Environment Protection Project in Beijing. The goal of the project is to provide technical assistance to develop pollution control technologies, which has immediate effects to reduce pollution and increase human capacity in the field. In addition to Japan' s provision of grant aid to the center, JICA has undertaken project-type technical cooperation to support research and development of the center, and to increase human capacity. The center, administered by SEPA, is comprehensive research and development center directory managed by SEPA. The center acts as a contact point to international cooperation in the field. It also serves as the site for the National Environmental Protection Priority Project and the site for environmental science research, technical development, technical exchange, and human resources development.

Inaugurated in May 1995, the Center hosted the first conference of Japan-China Environmental Cooperation Forum consisting of both countries' central governments, local governments, and the private sector. The conference covered such issues as air pollution, acid rain, water pollution and other issues that need immediate action to deal with.

In addition, when Japanese Prime Minister Ryutaro Hashimoto visited China, he proposed Japan-China Environmental Cooperation Plan that supports (a) environmental information network linking hundred cities through computer-based database and monitoring system, and (b) Japan-China environmental development model city aiming to reduce air pollution and acid rain, to promote circulatory production and social systems, and to implement counter measures for global warming. China supports the plan.

The final evaluation of Phase II of the project was done in September 2000. The evaluation result says as follows: 'the activities in the project and their outcome have been commonly known gradually. These activities contributed to build fundamental environment for the Center to play a leading role in environmental research and information dissemination in China.' Phase IV started in April 2002.

JICA has also provided technical assistance to CISRI since 1994. Table-6 summarizes the previous technical cooperation to CISRI.

(a)

Table - 6 Technical Cooperation to Central Steel Research Institute

Duration	Description	Purpose and Activities	Notes
1994.1 ~1997.1	Long-term expert x 1	Technological research and development for steel works, and pretreatment aiming energy conservation.	
1997	Provision of equipment	Devises related to the above technical areas	
1998.10 ~2001.10	Long-term expert x 1	Steel manufacturing and technology transfer of environmental protection and prevention of air pollution	

(2) Yen loan provided by JBIC

Government loan to China started from 1979 and the total amount up to March 2001 accounts 2,700 billion yen for 285 approved projects. Development of economic infrastructure, agriculture, environment, primary health and medicine, and human capacity building are identified as priority areas. Government loan is one of important facilities in Japan' s aid policy that provide rehabilitation of economic infrastructure, agricultural development and sustainable development utilizing vast natural resources. The characteristics of recent loans are directed to environmental improvement and poverty alleviation. Table-7 illustrates summary of Japan-China Environmental Development Model City Plan, yen-loan supported projects which has close relation to the project. The plan was proposed in 1997 between two countries. Dalian, Chongqing, and Guiyang are initially selected as the model city. Experts from both sides has reviewed possible cooperation and decided that Japan contributes to finance and technology among other elements to tackle environmental problems such as institutions and incentives. Experts sproposed master plan and recommendation for priority projects in April 1999.

Table -7 Japan-China Environmental Development Model City

Model Cities	Loan amount (Japanese Yen)	Conditionality	Project Description
Environmental Model City (Guiyang)	8,169million	Two country tied	Emission control devises, monitoring devises, clean coal production
Environmental Model City (Dalian)	3,202million	Two country tied	Dust catcher, refining kilns cement mills and improved equipment for other pollution sources
Environmental Model City (Chongquing)	8,169million	Two country tied	Natural gas distribution system, monitoring devises, emission control devises

Source: JBIC

(3) GAP and technical cooperation by NEDO

NEDO has provided technical assistance in energy development, environmental issues to developing countries through grants and loans targeted to develop pollution control, solid waste management, recycling and energy conservation technologies. NEDO started assisting such

projects in China since 1992, and implemented 34 projects including human resources development, research and development, implementation of pilot projects.

Table-8 Energy conservation projects by GAP

Category		Name of Technologies	Origin of Technologies	From (to) year	Expected energy-conservation
completed		Blast Furnace Hot Stove Waste Heat Recovery	Nippon Steel	1995	6,300kl/yr
		Coal Moisture Control	Nippon Steel	1996	6,020kl/yr
		Sinte cooler Waste Heat Recovery	Sumitomo Steel	1997	5,390kl/yr
		Blast Furnace Top Pressure Recovery Power Generation	Kawasaki Steel	1998	8,105kl/yr
	AIJ	Coke Dry Quenching	Nippon Steel	2000	35,000kl/yr
	AIJ	Energy Conservation Facility in Electric Furnace Used for Ferro Alloy Refining	NKK	2000	6,810kl/yr
		Waste Gas Recovery from Oxygen Converter	Nippon Steel	2001	N/A
		Hot Stove Waste Heat Management	Nippon Steel	2001	N/A
		High-efficiency Combustion System in Re-heating Furnace for Iron and Steel	Nippon Steel	2001	N/A
	(Total energy-conservation expected)				67,625kl/yr

Sources: Japan Iron and Steel Manufacturing League (1998) revised by JICA

Characteristics of NEDO's projects are that they are built upon various lessons learned through implementing counter-measures against pollution in Japan. Based on these technologies developed in Japan, NEDO provided technical assistance to various developing countries. NEDO has implemented 518 projects in energy conservation, 332 projects in environment between 1970 and 1999 all over the world. . There are six projects completed within the scope of GAP while 3 other projects are on progress. Table-8 summarizes these projects.

Of nine model projects, 2 are implemented as Activities Implemented Jointly (AIJ) defined by the inter-governmental panel on climate change. AIJ is a facility to reduce effects of green house effects gas emission and it is implemented as pilot case for Joint Implementation (JI) that was planned to start from the year 2000. JI was designed to reduce absolute volume of green house effect gas through cooperation and provision of such technologies as reduction, absorbing and fixing. In addition, the Japanese government uses a special initiative, a framework to promote JI during the pilot phase of inter-governmental treaty for climate change (AIJ Japan Program) to assist initiatives by local and central governments, the private sector and NGOs implementing green house gas reduction. Of listed in Table-8, total reduction of energy consumption is calculated by 67,625kl equivalent to oil per year. .

(5)Technical cooperation provided by local government

In addition to official development assistance by the Japanese government, local governments provide technical assistance overseas. While some local governments have experiences and technical expertise in dealing with environmental problems, they can utilize such expertise in developing world. These initiatives are categorized broadly into two, (a) local government's own initiative funded by subsidy or own sources; and (b) providing technical expertise to inter-governmental assistance. Many of these initiatives are initially undertaken as part of sister city or friendship programs. One significant example is the case between Kita-Kyushu city and Dalian. Kita-Kyushu has accumulated expertise in environmental management since 1950 s and overcome these problems successfully. Kita-Kyushu provided Dalian its lessons and technical expertise and implemented Environmental Cooperation Program with their own initiatives since 1993. The program was adopted as priority program within the scope of environmental master plan by central government in 1994. The goal of the program is to construct Dalian balanced with economic prosperity and environment.

3. Environmental Protection Technology in Metallurgical Combustion and Energy-conservation

3-1. Regulatory Systems for Promoting Technologies in Metallurgical Combustion and Energy-conservation

3-1-1 Governmental Incentives

In the previous sections, a various incentives to promote environmental protection in metallurgical combustion and energy-conservation are discussed. Table-9 summarizes these incentives. The following sections explain National Priority Technology Adjustment Projects and Research and Development Grants for Science and Technology Development Organizations.

Table - 9 Incentives to Promote Environmental Protection in Metallurgical Combustion technology and Energy-conservation

Items	Key administrative departments	Description	Note
The 10-5 Plan and Its Guideline for the Steel Industry	SDPC, SETC	Master Plan, provides legal framework as public law	
List of Industries, Products and Technologies Currently Encouraged by the State Promulgated Jointly by the State Development Planning Commission and the State Economic and Trade Commission	SDPC, SETC	Provides lower tariff for imported products	
Guideline for Cleaner Production	SETC	Promotion through pilot projects in 10 model cities	CP Law is not enacted
National Priority Technology Adjustment Projects	SDPC, SETC, Department of Finance	Soft loan to priority technologies funded by issuing a new type of bond	
Research and Development	Department of	Grants to designated	

Grants for Science and Technology Development Organizations	Science and Technology	researches, soft loan to cover consulting fee for adapting the technologies developed	

3-1-2 National Priority Technology Adjustment Projects

National Priority Technology Adjustment Projects provides loans to the mid- and large-sized 512 state-owned enterprises. The purpose of the loan is to accelerate reaching the national goals listed in the 10-5 Plan and to increase competitiveness through promotion of advanced technologies. The loan is funded by issuing a government discount bond designated to structural adjustment and is allocated to such priority industries as the steel, petrochemical, spinning, machinery, information, nonferrous metals, military related industries. SDPC and Department of Finance are in charge of the provision and the administration of the loan.

3-1-3 Research and Development Grants for Science and Technology Development Organizations

Research and Development Grants for Science and Technology Development Organizations is administered by Department of Finance. It is designated for research and development of advanced technologies through provision of research grants and soft loan to cover partial expenses related to technical consulting fee to adopt such technologies. The project is designated to be eligible for receiving fund since it is considered by the government that one of the most important technologies for environmental conservation

3-2. Issues and Problems

The issues and problems on environmental protection technologies in metallurgical combustion and energy-conservation are summarized as follows.

3-2-1 Needs to meeting higher environmental technical standards and quality

Environmental issues became most important managerial issues for the steel industry. Failure of meeting governmental regulations and protecting environmental quality would significantly affect its own existence. The government has announced that it would close down 200 plus small-scale steel works for they failed comply with environmental regulations (See 2-3-4). Even Beijing Metropolitan Steel works, one on the major enterprise in China, has been asked to relocate for it has disputes with neighborhoods and strengthened environmental standards in Beijing hosting Olympic games.

The steel industry is aware of importance to increase capacity in environmental protection, to acquire advanced knowledge and to increase skills for effective environmental management. They recognize it is important not only to increase competitiveness but also to comply with the government's determination to adjust economic structures.

3-2-2 Delay in adopting advanced technologies

The steel industry in China still employs out-dated production lines and facilities. Delay in adopting advanced technologies is identified as a serious problem in the industry. In particular, the problems are significant in refining process. Adoption of the treatment technologies for pig iron and external refining technologies are very limited. Low energy efficiency causes air pollution for it is as much as 20 to 30% lower than that of other industrialized nations. There needs to increase energy efficiency of industrial kilns for it is mere 22%, much lower than global norms. Other technologies, such as improvement of pig iron production, adoption of TRT and CDM are identified as priority for development and introduction to the steel industry in China.

3-2-3 Lack of personnel, experience and expertise

While China s economic expansions in the recent years are accelerated with relatively loose environmental regulations, it lacks personnel, experience and expertise in overall environmental management. Particularly, the administrative arrangements do not support field application of outputs from research and development. Lack of systematic accumulation of learning hinders technical adjustments in the field applications. According to SETC, only 19 enterprises have technology center certified by the government.

3-2-4 Reliant to imported key technologies

At the time of writing, only limited number of key technologies is produced in China. Majority of key technologies still rely on expensive imported machines. It is recognized that priority technologies listed in section 2-1-2(4) (Powdered coal blow technologies, continuous casting, development of materials for kiln, strip mills, cold and hot mills for casting and recycle and utilization of secondary energy and environmental protection) need to be produced in China. (Continuous casting is developed by CISRI)

One serious effect of reliance of foreign technologies is that reliance creates delay in renew and improvements of production facilities because of higher costs and longer delivery. Such problem eventually cost duplicated investment in the long-run.

3-2-5 Delay in emission and sewage treatment

Majority of industrial kilns does not equipped with emission and sewage treatment facilities. Only 9.9% of sulfur oxide emitted from industrial kiln received treatment. The cost incurred for environmental conservation is deemed as uneconomical. The recovering cost is generally paid by society as a whole while such cost is not internalized in the cost of goods and services. The industries in general do not regard the penalties and the recovering cost as a risk of management. In the case that the industry pay the cost, it reflects prices of goods and service, which weakens industries' competitiveness. Therefore it is one of major reasons why the incentives for the industry to pay such environmental remedies are still low in China. Given the economic transition in China, this trend is intensified without enforcement regulations and governmental intervention.

4. Project Strategy

4-1. Overall Strategy

Considering the issues and problems in the steel industry explored in the previous sections, the introduction of advanced technologies and human resource development are the most urgent items of business for achieving the 10-5 Plan. Advanced technologies are in demand to use and maintain effective machinery for energy- and environmental-conservation in metallurgical combustion. Also in demand are the human resources to develop and explore these technologies further. In addition, it is significant to develop institutions with the capacity to instruct and disseminate the advanced technologies to the steel industry.

4-2. Project Strategy

4-2-1. Implementation of technical cooperation

SDPC and SETC planned to set up a Technology Center for Environmental Protection and Energy Saving for Metallurgical Combustion (hereinafter the Center) in CISRI, aiming to promote advanced technologies in the steel industry. The Center has both a combustion laboratory and an environmental protection laboratory. The Center is in charge of the R & D of highly efficient combustion and environmental protection technologies and of human resource development. The final objective is to disseminate highly efficient combustion and environmental protection technologies to the Chinese steel industry.

The Project is positioned under this plan. The strategy of the project is to utilize Japanese experience, human resources and technology to train Chinese experts and to improve the institutional capacity to provide instruction on advanced technologies in environmental protection.

The Center benefits from the technology transfer of advanced technologies by Japanese experts and the training of Chinese experts in Japan. Japanese experts transfer an anti-pollution technology to the Japanese steel industry, that is, technologies of environmental protection in metallurgical combustion and energy conservation. The Chinese side aims to raise the technology standard in China by researching and developing appropriate technologies from among the transferred technologies. The team of Chinese and Japanese experts disseminate appropriate technologies and improve Chinese engineers through a factory audit. Chinese experts participate in a training course in Japan and establish the technologies. In addition, the equipment required to enhance the technology transfer is donated to the Project.

4-2-2 Area of technology transfer

(1) Advice on environmental protection and energy conservation in the steel industry

To solve the serious air pollution problem, the project is given general information about energy efficiency and environmental protection technologies in the steel industry. The information and advice are delivered by two long-term experts of furnace combustion technology and steel environmental protection, and short-term experts of areas such as energy conservation, measurement techniques, analysis and assessment, combustion auditing and exhaust gas treatment. Follow-up support from Japan, such as technology information, is indispensable since this area of transfer is quite large.

(2) Experiment combustion technology of industry furnace (heating furnace, heat-treatment furnace, etc) including measurement, analysis and assessment techniques

This is the main focus of the project. A lot of content is covered in this area, such as the operation and management of equipment, instructions on the combustion experiment, improvement of both the experiment plan and experiment equipment, advice on developing appropriate technologies, a numerical analysis of combustion (heat fluid analysis), assessment methods of simulation and reflection on technology development. A long-term expert transfers technologies on furnace combustion technology and by short-term experts on industry furnaces, combustion technology, measurement technique, analysis and assessment. Combustion numerical analysis, in particular, requires the regular assistance of short-term experts. Japan accepts Chinese experts in four areas: industry furnaces, combustion technology, measurement techniques and analysis and assessment.

(3) Advice on improving combustion technology

Development of combustion technology is the key to environmental protection and energy conservation. The project gives advice on analyzing the present situation in combustion technology, the experiment process from the plan, implementation of assessment, and the analysis and betterment plan for combustion. A long-term expert on industry combustion technology and short-term experts on industry furnace and combustion technology are in charge of this area. Chinese experts participate in a training course for related areas in Japan.

(4) Exhaust gas treatment technologies

Much like acid rain, which affects Japan, exhaust gas treatment is significant for environmental protection in the steel industry. The main ways to address the issue are through analysis of the present situation, collection and accumulation of exhaust gas treatment information, and advice and information dissemination. Short-term experts in those areas are the main operators and there is no equipment provision exclusively for this area. Chinese experts in those fields participate in a training course in Japan.

(5) Factory audit technology

To prove the experimental results reliable and demonstrative, it is necessary for the Chinese experts to conduct real experiments in factories and to master experimental operations, measurement techniques and analysis techniques. Through instructions on the experiments, seminars and lectures, the Chinese experts acquire skills in Japan equivalent to those of a energy manager in heat. They include essential combustion calculation, heat theory and energy-conservation techniques. Audit instructors are trained through experience in experimentation. They may need to serve as advisors on constructing a better infrastructure.

Short-term experts on industry combustion and environment diagnosis are dispatched and Chinese experts in the same area participate in a training course in Japan.

(6) Information dissemination about combustion technology of industry furnace

Information dissemination and learning support is one of the project s summary activities. The activities are a documentation of related issues, setting up homepages, demonstrating operation of experiment furnaces, and a staff exchange program. Seminars support the learning process of factory workers and the dissemination of information on appropriate technology, such as an exchange of energy source.

5. Basic Design of the Project

5-1. Project Purpose

The Project Purpose is that which is actually attainable by the completion of a concerned project. It is described as a practical benefit for or impact on target groups. Here, the Project Purpose is defined as "enabling the Center to teach technologies related to energy conservation and environmental protection in metallurgical combustion to ironworks in China."

5-2. Overall Goal

The Overall Goal is the development result that is expected three to five years after accomplishing the objectives of a specific project.

The overall goal of this project is "for technologies related to energy conservation and environmental protection in metallurgical combustion to be widely accepted by the iron and steel industry in China. As a result of the continuous use of new technologies and the improvement of combustion technology, the project contributes to curtailing NOx and Sox emissions, which cause serious air pollution in China.

In order to achieve the Overall Goal from the Project Purpose, it is essential that acquired technologies be widely disseminated not only in CISRI but in the Chinese steel industry as well. The consistent policy of the Chinese government for environmental protection and energy conservation is an important and essential condition.

5-3. Project Outputs and Activities

5-3-0 Output 0 and activities

Output 0 is that the "Project becomes operational. Here, the Center s management and administration are strengthened. The following are its activities:

0.1 To assign Chinese associates

0.2 To assign Japanese experts

0.3 To establish a Joint Operation committee

0.4 To prepare a job description

0.5 To prepare an annual Plan of Operation

0.6 To monitor the project implementation regularly

5-3-1 Output 1 and Activities

Output 1 is that "Equipment is furnished. It implies a preparation of the surroundings for activities 2 and later activities.

1.1 To install equipment

1.2 To make equipment operational

1.3 To maintain equipment

1.4 To furnish manuals for equipment

5-3-2 Output 2 and Activities

Output 2 is that the "Capacity to improve combustion technology is increased. The purpose is to transfer technologies of measurement, analysis and assessment, combustion analysis and drafting of improvement proposal.

2.1 To review existing combustion technology

2.2 To prepare experiment plan

2.3 To undertake experiments

2.4 To compile outcomes from the experiments

2.5 To analyze combustion

2.6 To propose improved combustion methodologies

5-3-3 Output 3 and Activities

Output 3 is that "Exhaust gas treatment technologies are mastered. The following activities are planned for the improvement of exhaust gas treatment technologies.

3.1 To assess the present conditions of smoke and soot treatment technologies

3.2 To collect and catalog technical information about smokes and soot treatment technologies

3.3 To advise or propose plans to improve smoke and soot treatment technologies to steelworks

5-3-4 Output 4 and Activities

Output 4 is that "Factory audit technologies for combustion and the environment are mastered. Practical technologies of measurement and analysis and assessment are required in order to expand the developed technologies of environmental protection and energy conservation in factories.

4.1 To implement training on technologies

4.2 To select steelworks and prepare audit plans

4.3 To undertake factory audit of combustion systems and production environment

4.4 To prepare manuals for factory audit

5-3-5 Output 5 and Activities

Output 5 is that "Dissemination activities for environmental protection and energy conservation technology in metallurgical combustion can be carried out.

5.1 To prepare and publish promotional materials

5.2 To setup web pages to promote the project

5.3 To organize seminars

5.4 To undertake technical demonstration using the experimental furnace

5.5 To undertake technical exchange activities with iron smelting industry

5-4 Plan of Operation

The main activity of the project is to increase the capacity to promote combustion technology improvement by using equipment for combustion experiments. The process for all project activities is as follows. Activities such as the establishment of the Project s operational structure and system and equipment maintenance (Activities 0 and 1) are started before the equipment for combustion experiment is installed. With the combustion experiment equipment, necessary experiments are started while learning measurement and analysis methods (Activities 2). Acquired technologies are utilized practically in Activities 4, model factory audit. Activities 3, learning exhaust gas treatment technologies, should be started before Activities 4, since they are utilized to make proposals to model factories in Activities 4. To sum up, those activities and

output at the Center, dissemination activities such as hosting seminars, homepage set up and technology exchange are all executed (Activities 5).

Tentative Schedule of Implementation and Plan of Operation are shown in Annexes 4 and 5.

5-5 Inputs

5-5-1 Inputs to be made by the Government of Japan

(1) Japanese Experts

A. Long-term experts

The long-term experts below are to be dispatched.

a. Chief Advisor

b. Metallurgical Environmental Conservation Technology and Project Coordinator

c. Industrial Furnace Combustion Technology

B. Short-term experts

Short-term experts are to be dispatched as needed.

(2) Training of Counterpart Personnel in Japan

During the project, the Chinese personnel will be provided with training in Japan to compliment the technology transfer. Three to four counterparts are to be received in Japan for one to two months per year.

(3) Provision of Equipment

Equipment will be determined within the limit of the budgetary funds appropriated for the cooperation program and in accordance with the area of technology transfer and priorities. The tentative list of equipment to provide is in Annex 7.

5-5-2 Inputs to be made by the Chinese government

(1) Staff Assignment

CISRI has agreed to assign a full-time staff for the project. The counterpart list for the first year is in Annex 8.

(2) Budget

CISRI appropriated the budget for the project, such as for equipment installation, research material, fuel, facility maintenance and operation, personnel expenses, utilities, travel expenses and so forth. The appropriated budget is listed in Annex 9.

(3) Facilities and Utilities

CISRI provides office space for long-term experts, facilities, machinery, and equipment apart from equipment to be provided by the Japanese Government in the Metallurgical Process Unit, in order to promote the smooth transfer of technology. Combustion experiments to be provided by the Japanese Government will be installed after the removal of existing CISRI combustion. The expense for removal is to be allocated by CISRI.

(4) Procurement of equipment

Equipment not provided by the Japanese Government will be procured by the CISRI.

5-6 Analyses of External Conditions and Risk Factors

External conditions are those that result in the successes of a specific project. They are out of the scope of the project s control, and whether or not they will occur is uncertain.

The external conditions for the project are as follows:

a. The Chinese government maintains the policies on environmental and energy conservation.

b. The Chinese government takes necessary measures to improve energy conservation and environmental protection in metallurgical combustion.

c. The Chinese government requests that the private sector adopt advanced technologies to improve energy conservation and environmental protection in metallurgical combustion.

d. Ironworks maintain sufficient funds to invent technologies in energy conservation and environmental protection.

e. Steelworks accept factory audit for combustion and the environment.

f. Trained Chinese associates stay in CISRI.

g. Ironworks have plans to improve technologies for smoke and soot treatment.

h. Price of energy does not fluctuate significantly.

i. CISRI continues to promote modern technologies for energy conservation and environmental protection in metallurgical combustion.

5-7. Project Management and Implementation Structure

5-7-1. Implementation Organization - CISRI

CISRI, the implementation organization of the project, was founded in Beijing in 1952 as the most advanced iron and steel metallurgical research and development organization. It used to be affiliated with the Ministry of the Metallurgical Industry. It is now a government corporation directly responsible to the central government.

CISRI, with some national institutions related to both research centers and inspection centers and with accumulated advanced technologies, has been among the most influential institutions in the iron and steel industry. It can be said that CISRI's history is the history of the Chinese steel industry. According to an appraisal of the industrial research institutions across China by the State Science and Technology Commission (SSTC), CISRI has ranked at the top in both comprehensive scientific and technological strength and operating effectiveness.

CISRI currently has a total of 2,000 staff members, 70% of whom are scientific and technological personnel, and five of whom are members of the Chinese Academy of Sciences and the Chinese Academy of Engineering. CISRI is entitled to confer doctorate degrees in three disciplines and master degrees in seven disciplines. There is a post-doctorate station at CISRI as well.

In addition to the headquarters in Beijing, CISRI has four (4) branch institutes around the country. High-tech industrial groups, wholly-owned subsidiary companies and joint ventures under CISRI have been active in technology transfer and technical consultation, contributing to the dissemination of the research results to the industry.

CISRI now publishes 16 periodicals, including eight major academic journals in the steel and metallurgical industry. CISRI also plays a leading role in the administration of academic circles.

CISRI s organizational chart is shown in Annex 1.

5-7-2 The status of CISRI

The organizational and financial status of CISRI is complicated due to its history in governmental reform.

Regarding personnel management, CISRI has strong ties to the Communist Party of China (CPC). CPC has a committee to supervise 163 big government corporations, including CISRI, and the committee has the authority to decide personnel matters of those corporations. CISRI is not an exception.

Financially, the budget for academic research and projects by CISRI comes from SSTC. SSTC has been the contact between CISRI and JICA for the project.

In terms of metallurgical administration, SETC supervises and administers 242 scientific research institutes, one of which is CISRI. CISRI has been industrializing with other institutes since 1999 and has finished commercial registration by now. CISRI is also listed in the stock market with other industrialized research institutions.

CISRI is now in transition after industrialization, seeking new corporate governances such as the role of a board of directors and the ways of management. It is certainly different from what CISRI used to be.

5-7-3 Project Implementation Structure

The organizational structure for the implementation of the project is shown in Annex 2. The project is established in the Institute of Metallurgical Technology with support from the Department of Science and Technology Development and the Foreign Affairs Office.

The Joint Coordinating Committee (JCC) is established as a decision-making authority. JCC is to be chaired by the vice president of CISRI, and consists of stakeholders in the project, such as project staff from both the Chinese and Japanese sides, SSTC, CISA, and SETC. JCC will discuss and decide on policy and management, achievement of the Project Purpose and the Overall Goal. The JCC member list is shown in Annex 10.

5-8. Obligation and Prerequisite - Intellectual Property Right

Both governments have agreed to discuss and settle on a separate agreement if an intellectual property right is included in the basic technologies or knowledge provided by the Japanese experts in this project.

6. Review of Project Validity

6-1. Relevancy

6-1-1 Qualification as an ODA project

Overall qualification as an ODA project is judged by whether or not the project has common goods and equity. In light of such criteria, the relevancy of the project is reviewed as follows:

(1) The project has a high level of public interests;

The project will transfer some key technologies to develop environmental protection technologies in metallurgical combustion and energy conservation by China s own initiatives in the long run. The technologies are already designated as one of the priorities listed in the 10-5 Plan. According to the 10-5 Plan, the development and promotion of such technologies through technical cooperation have a higher level of urgency in order to fulfill the Plan s energy conservation target.

Various environmental benefits are expected as short-term effects of the proposed technology transfer. The most immediate may be significant improvement in energy efficiency. In the long run, air pollution is expected to be greatly reduced after overall emissions from steelwork are reduced. This should result in improvement in air quality benefits for the Chinese public. Therefore, the proposed project has a high level of public interests and relevancy.

(2) The project inherits high risks for technical development and it prohibits entry by the private sector into the market;

The project inherits the high risks in technical development that prohibit the private sector from entering the market. A large-scale investment, as well as unspecified duration of research and

development is necessary for the project. The project involves high level risks for the private sector to implement similar research and development projects.

Other risks for the private sector development may be the lack of financial support from the market. It may be difficult for the private sector to implement similar research and development projects because of the availability of finance through the market, and risk management for project finance is still less developed in the Chinese banking system. In addition, given the size of the market, some kind of policy support, such as a legal framework, new regulations, tax incentives and soft loans and grants, is essential to promote the project. It is very difficult for the private sector to penetrate the market; as such influence to the steel industry is essential for the project s success.

In another case, foreign firms may introduce technologies developed outside China. Considering the Chinese special conditions in the steel industry, particularly the wide variety of energy sources they use, the localization of technologies through close cooperation with local researchers is essential for effective product development. It is not feasible for such foreign companies to introduce foreign technologies without adopting local conditions. As in the above case, policy-level support is essential for promoting the technologies to iron mills with assistance from an influential Chinese organization other than CISRI.

Considering all of these facts, CISRI is in the best position in China to develop and promote the technologies. If JICA does not support the project, the development of such technologies may be significantly delayed. Therefore it is relevant to support CISRI.

(3) Development Risks

Significant development risks still exist even for CISRI. CISRI expects to recover the cost of developing the technologies through the consultation services it provides to steelworks in China. It may take some years to recover such costs. Given the limited size of the market, such cost recovery mechanism has a significant uncertainty.

As analyzed in section (1) above, the project's urgency, equity and public good are high, and development risks need to be minimized in order for such technology development to transpire. JICA's support will help minimize such risks if it is arranged properly. Therefore the project has high relevancy to be implemented as an ODA project.

6-1-2 Consistency with the Country Assistance Plan

(1) Compliance with the priority sectors and guidelines

Other sector-related projects from Japan are listed in section 2-4-2.

The environmental sector is identified as one of the priority areas for Japan's economic cooperation. The challenge is how to effectively maximize the impact of economic assistance against environmental issues expanding the entire nation. Considering the vast land areas, the

population, and magnitude of environmental threats facing by the air quality of China, technical assistance from Japan has its limit. It is almost impossible for Japan alone to effectively impact all considerable measures to eliminate air pollution in China. The basic strategy of the project is to assist CISRI as a technology center to improve air quality, and to support their efforts to promote environmental conservation technology and equipment. In light of such a strategy, it would be effective to promote different technologies to improve metallurgical combustion and energy conservation through CISRI.

(2) Matching with the perceived needs of China

In their 10-5 Plan, the Chinese government set a target to decrease the energy consumption of the steel industry by 14% before 2005. The technologies transferred by the project are identified as priority technologies. For Chinese steelworks as beneficiaries of the project, increased competitiveness through energy conservation is one of priority implementations.

(3) Participatory Project Planning

The process for formulating the project has relied on the efforts of long-term experts assigned to CISRI since 1998. The experts and CISRI have had several meetings and discussions about the details and arrangements that need to be implemented for the projects. In such process, both sides incorporate with the comments, recommendations and input from steelworks to furnish the project design. The project employed the Project Cycle Management (PCM) method encourages input into the basic project design and participation from a wide range of stakeholders. The project requires CISA to provide their comments and recommendations to the project in order to incorporate with the industry s strategic direction.

(4) Technical advantages of Japan

It has been acknowledged that the Japanese steel industry holds a high technical advantage over the world's leading industrial countries. As discussed in the previous section (Table-3), the energy efficiency of Japan's crude iron production is at the world s highest level. The Japanese steel industry has years of experience and expertise in applying improved combustion and energy conservation technologies onto production lines. Therefore, Japan is in the advantageous position of providing technical assistance to CISRI in the project.

6-2. Effectiveness

The project s effectiveness is evaluated by whether the project benefits the designated target group. The logical structures of the project, appropriateness of the objective-setting, and important outside conditions are reviewed. For the project document preparation, these items are reviewed using a project design matrix (PDM) (Annex 3).

6-2-1 Logical structure of the project

(1) Logic between activities and output

There are six output items listed in the PDM of the proposed project. In order to achieve these output items, a total of 28 activities are identified and listed in the PDM. Of the 28 activities, all are necessary and logically constructed in accordance with outside conditions.

There are four important outside conditions on the activity-level, namely that e) steelworks accept the factory audit for combustion and the environment, f) trained Chinese associates stay in CISRI; g) ironworks have plans to improve technologies for smoke and soot treatment; h) the price of energy does not fluctuate significantly; and i) the CISRI continues to promote modern technologies for energy conservation and environmental protection in metallurgical combustion. All of the outside conditions listed here are out of the hands of the project's control but they are all necessary for implementing the project.

(2) Logic between Outputs to purpose

Six output items are linked to one purpose. Of the six output items, five, namely 0) project becomes operational; 1) equipment is furnished; 2) capacity to improve metallurgical combustion technology is increased; 3) exhaust gas treatment technologies are mastered; and 5) dissemination activities for environmental protection and energy conservation technology in metallurgical combustion can be carried out, do not have outside conditions . While all considerable conditions related to the five output items to reach the purpose are all internalized, there is no need to list any outside conditions to these items.

Remaining outcome, that 4) factory audit technologies for combustion and the environment are mastered, has one outside condition, that steelworks accept the factory audit for combustion and the environment. It is necessary to implement the project because factory audit work is an essential activity for training the Center s researchers. It is only successful when the designated steel factories accept the audit, entrance, and inspection by Japanese experts. These are the key elements for success in the intended technology transfer.

(3) Logic of purpose and overall goal

The overall goal of the project is that "Technologies for energy conservation and environmental protection in metallurgical combustion are widely accepted by the iron and steel industry in China. The most significant condition to reaching the goal is how the project and other concerned bodies take actions to promote the output and to support the dissemination of new technologies amongst all steelworks in China. Within the project's scope, CISRI (along with the Center) identifies a few important issues, such as the development of advanced technologies, timely implementation, needs-based product development, and perfect localization. These issues are already internalized within the scope of the project and already discussed thoroughly for compliance. Therefore these issues are not listed as outside conditions.

6-2-2 Objectives-setting

The objective is that "10 technical proposals for improvement on energy conservation and environmental protection in metallurgical combustion are proposed to ironworks. The proposed number "10" comes from the plan of operation: that at least six proposals will be presented from factory diagnoses, which will conduct approximately two cases per year from the third year of the project. The remaining four proposals are estimated to be completed simply from research or as by-products from those factory diagnoses.

This objective details the contents of the project, describing the direct output of its activities.

6-2-3 Are important outside conditions fulfilled?

There are three important outside conditions to reach the overall goals, namely that b) the Chinese government takes necessary measures to improve energy conservation and environmental protection in metallurgical combustion; c) the Chinese government requests that the private sector adopt advanced technologies to improve energy conservation and environmental protection in metallurgical combustion; and d) Ironworks maintain sufficient funds to develop technologies for energy conservation and environmental protection. All of these three need to be included in a joint policy discussion with the concerned branches of the government. The issues are important to both the Japanese and Chinese sides for the project s success.

6-3. Efficiency

The efficiency of the project is judged by inputs described in 5-5 and outputs from it.

In general, improvement of combustion technology contributes 30 % of energy-conservation. Considering energy consumption volume of industrial furnaces in China, energy-conservation can be about 40 % in China. In addition, it is estimated that the long-term effect of the successful implementation would be a reduction of 2 million tons of standardized coal.

In particular, the transfer of measuring and analytical capacities through improved combustion and factory audit is considered to be fundamental, as they have broad applications. Therefore, the technological impact on Chinese combustion technology in general is considered significant. These are not only the basis for environmental conservation, but also possible broader applications to environmental protection technologies in production.

6-4. Impact

Impact resulting from the project is judged by a long-term perspective and possible indirect ripple effects. Based on the PDM, the following items are being reviewed, as the project has not yet been implemented.

6-4-1 Probability of achieving overall goal

Based on the previous discussion in section 6-2-1and 6-2-3, the probability of reaching the overall goal is considered to be high. The following are reasons for the assessment:

(1) The project s expected transfer of core technologies is one of the priorities listed in the 10-5 Plan as a national priority project for structural adjustment. Administrative support from the central government would be expected for provision to CISRI and steelworks, which adopt the technologies.

(2) The technologies expected to be transferred match the needs of Chinese steelworks. The incentives for adopting such technologies are expected to be high.

(3) While CISRI has impressive credentials in the steel industry, their initiatives for structural adjustments, their network of highly trained experts and their technical expertise have always been respected. These credentials will support the promotion of the technologies developed.

(4) CISRI assigned the highest level of researchers to the project.

(5) Chinese experts from CISRI have a successful history of localizing technologies introduced from foreign countries. The project can utilize their past experiences. Therefore the probability of success is high in this project.

6-4-2 Estimated impact by project

The following are descriptions of the proposed project s socioeconomic impact:

(1) Policy implications and impacts

Given the high credentials CISRI holds, the transferred technologies and improved combustion technology developed in CISRI would become a de facto standard in China when promoted successfully. In addition, combustion technology itself has a vast application; the CISRI s development could be utilized in furnaces in industrial and other purposes.

(2) Institutional impact

The qualifications required for undertaking a factory audit are comparable with those of a Japanese license for energy managers in heat. While an on-going effort of the Japan-China Friendship Center for Environmental Protection project includes the establishment of credentials comparable with the Japanese license for energy managers in heat, links to such projects may bring about positive outcomes. Credentials are great incentives for individual engineers, contributing to a wider dissemination of the technologies.

(3) Socio-Cultural impact

The socio-cultural impact can be measured by the extent to which the improved technologies at the Center will be adopted by ironworks in the country. The dissemination strategy is to target about 60 large corporations (Table 5), all of which share almost 90% of the market of the crude iron in total. This strategy should bring about efficient dissemination activities. For reference, the objective of technology dissemination is set as "30% of ironworks adopted technologies for energy conservation and environmental protection in metallurgical combustion. This percentage comes from estimation that 115 to 140 out of 420 existing heating furnaces in China (i.e. 30%) will adopt the new technologies by three to five years after the completion of the project.

6-4-3 Technical impact

(1) Numbers to receive technical transfer

If limited to researchers, the estimated number of personnel directly receiving a technical transfer would be estimated at 52 to 77 in the five years of cooperation according to the implementation plan prepared by CISRI. Within the same period, three to four persons, will receive off-site training in Japan, totaling a maximum of 20 people in five years.

(2) Area of Technology Transfer

As listed in section 4-2-3, the project expects to transfer these technologies by Japanese experts. While the Chinese steel industry is in need of these technologies to improve metallurgical combustion and energy conservation that aims for reduced air pollution, the technological impact should be maximized through Chinese experts' own initiatives when their technical assistance is provided.

6-4-4 Economic impacts

Direct economic impacts resulting from the proposed project are: (1) possible energy-conservation from improved combustion technology, (2) economic impacts incurred by a reduction of air pollution, and (3) benefit from green-house effects gas. In addition, (4) the development of the environmental services market through the promotion and provision of new technologies and factory audit, (5) the creation of the environmental services industry resulting from (4), (6) improved occupational health by an improved general production environment, and (7) reduced health risks of the surrounding residents of steelworks are all identified as indirect benefits.

It is very difficult to thoroughly estimate these impacts since a means of collecting reliable environmental data is hardly available in China. The magnitude of impact is only estimated when the number of steelworks that may be accepting the combustion technology are accurately estimated.

6-5. Sustainability of the Project

6-5-1. Institutional capacity

Both the CISRI's positioning within the Chinese steel industry and the institutional capacity were summarized in 5-7. The overall evaluation is as follows:

CISRI has been one of the most influential institutions in the steel industry, with its advanced technologies and capable qualified staff. This status will not be changed so easily in the near future, although its status was changed from an institution directly responsible to the government to an independent government corporation. It is considered to have excellent management ability because it already holds several national institutions in charge of material experiments and quality certifications. Corporations under the CISRI will contribute to the marketing and commercialization of products by CISRI.

Considering these aspects, CISRI is thought to have the institutional ability to implement the project and is capable of carrying out the expansion of technologies transferred by Japanese experts.

6-5-2 Financial capacity

In 2000, CISRI s total income was about 660 million yuan (about 9.9 billion yen). As described above, CISRI's management is now changing from that of government organizations to that of independent corporations.

6-5-3 Social, environmental and technical acceptability

According to CISRI, a number of steelworks have already expressed an interest in adopting improved combustion and energy-conservation technologies. If the proposed research and development is promptly undertaken, the overall acceptability of the project would be high. Though the positioning of CISRI has become incorporated, it still holds the highest-level of technical standards, which comes with a significant amount of influence among the steel industry. Combined with CISA's initiatives to strengthen the steel industry's competitiveness in the global market, CISRI will continue to play a leading role in technical adjustment in the Chinese steel industry for years to come. One strong case is that Metropolitan Steelworks have adopted high efficiency continuous casting by closely collaborating with CISRI in the past. The steelworks has expressed high expectations for the development of improved combustion technology.

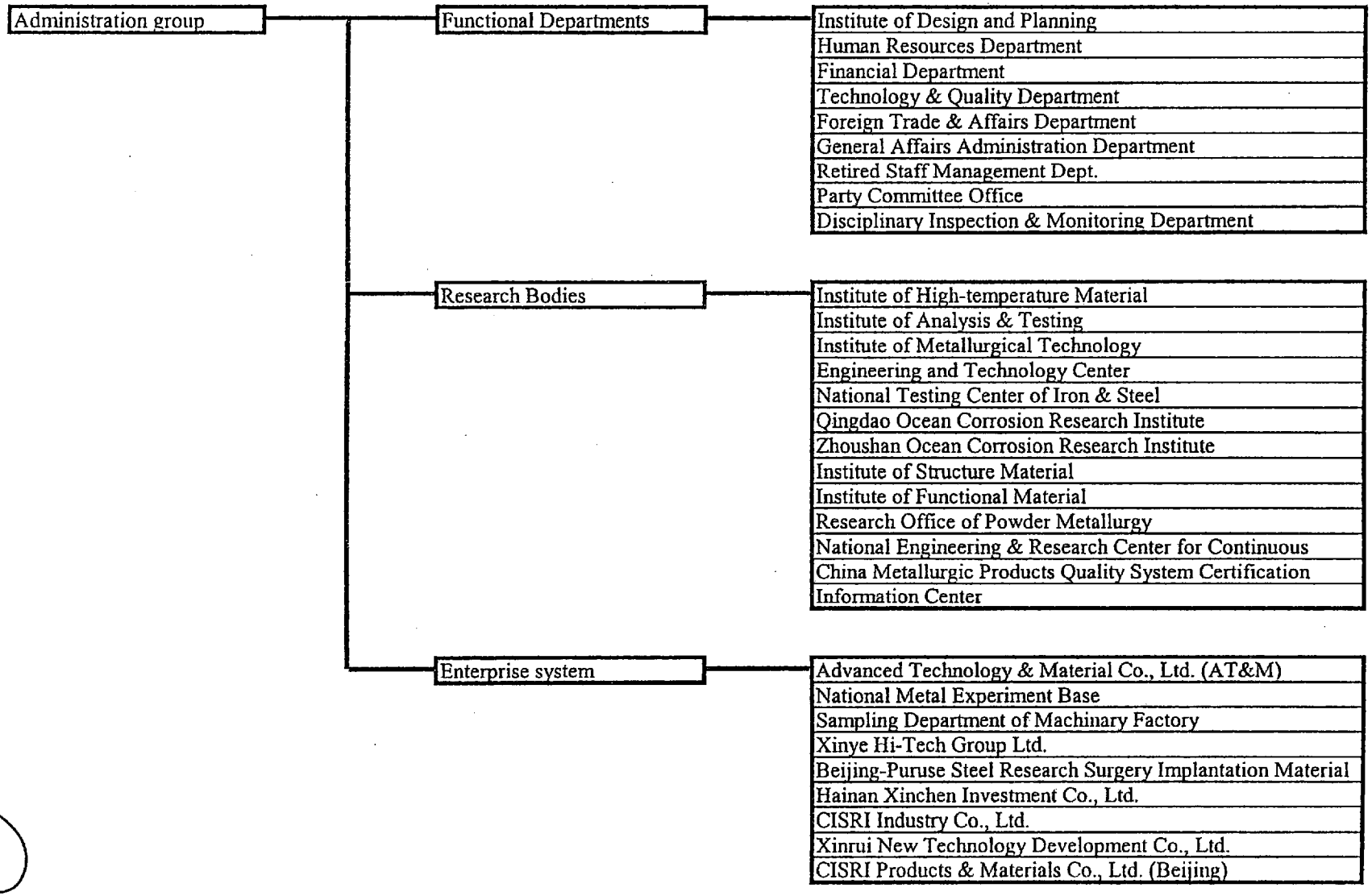
6-6 Overall assessment

Summing up the points made above, the project has a high relevance for implementation.

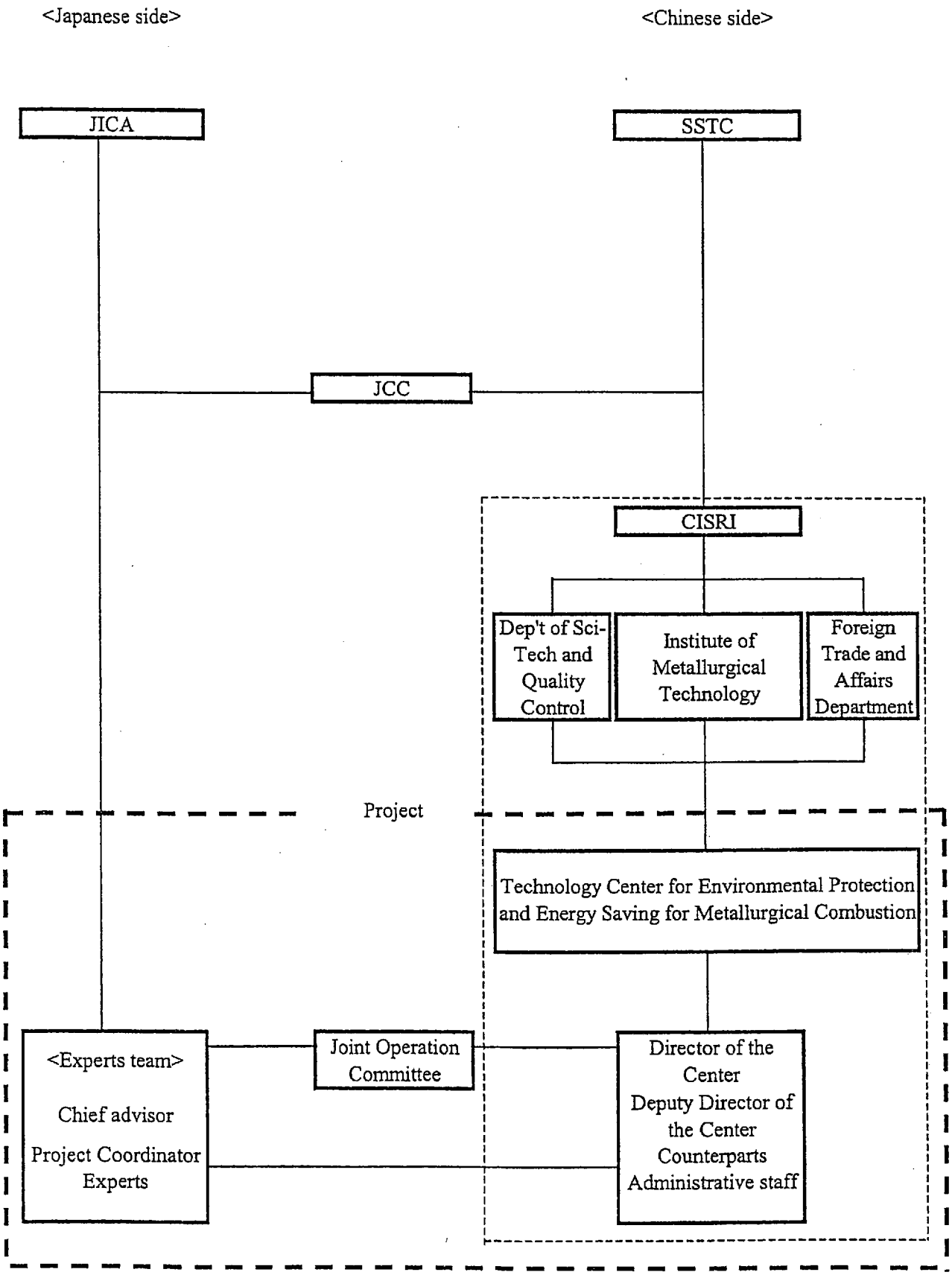
The project s high level of public interests includes such issues as environmental protection and energy-conservation. It also brings a variety of environmental benefits, such as a reduction in gas emissions. It fits in with the Japanese aid policy to China and complies with the Japanese Country Assistance Plan, while it matches the perceived needs of China. It has been confirmed that the project implementation is structured logically enough to make social, economic and technical impacts through technology transfer. CISRI, an implementing organization of the project, is capable of maintaining and exploring transferred technologies because it is well-organized and influential in the steel industry.

Considering the vast land areas, the population, and magnitude of environmental threats affecting the air qualities of China, technical assistance provided by Japan has its limit. In view of the above considerations, providing assistance for improvement combustion technology at CISRI would be helpful to assist CISRI as a technology center to improve air quality, to support their efforts to promote environmental conservation technologies and equipment.

ANNEX 1 Organization of Central iron & Steel Research Institute



ANNEX 2 Organizational structure for the implementation of the project



ANNEX 3: Project Design Matrix (PDM)

People's Republic of China "Improvement of Environmental Protection Technology for Metallurgical Combustion" Project

Implementing agency (Japan): Japan International Cooperation Agency (JICA) Implementing agency (China): Central Iron & Steel Research Institute (CISRI)

Prepared on 2002/4/11 Duration of Cooperation: Year 2002 to 2007 (5 years)

Project Area: People's Republic of China Target Group: Iron Mills in China

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
Overall Goal Technologies of energy conservation and environmental protection in metallurgical combustion are widely accepted by the iron and steel industry in China.	1. More than 30% of ironworks adopted technologies for energy conservation and environmental protection in metallurgical combustion.	1.1 Interviews 1.2 Data collection through printed sources etc.	a. The Chinese government maintains the policies on environmental and energy conservation
Purpose Enabling the Center* to teach technologies related to energy conservation and environmental protection in metallurgical combustion to ironworks in China. *The Center= Energy Saving and Environmental Protection Center for Metallurgical Combustion	1. 10 of technical proposals for improvement on energy saving and environmental protection in metallurgical combustion are proposed to iron works.	1. Summary of technical proposals and documents submitted from the Center to iron industry.	b. The Chinese government takes necessary measures to improve energy conservation and environmental protection in metallurgical combustion. c. The Chinese government requests that the private sector adopt advanced technologies to improve energy conservation and environmental protection in metallurgical combustion. d. Ironworks maintain sufficient funds to invent technologies in energy conservation and environmental protection.
Outcomes 0.Project becomes operational.	0.1 All project members for the project are assigned as planned. 0.2Allocation of work and responsibility within the scope of the project are clarified.	0.1 Interviews and project reports 0.2 Job descriptions, minutes of regular meetings during the project implementation periods	
1.Equipment is furnished.	1.1 By December 2003, all equipment would have been operational as planned.	1.1 Operational records of equipment provided 1.2 Questionnaires asking about the use of equipment before and after the project, reports on experiments using the equipment, and interview to Chinese project members	

		to Chinese project members	
Outcomes (con d) 2. Capacity to improve combustion technology is increased.	2.1 More than 90% of Chinese project members comprehend and gain new technologies 2.2 More than 90% of Chinese project members utilize the new knowledge and technologies in their work.	2.1 Questionnaires to Chinese project members before and after the training, self-evaluation 2.2 Records and documents on technical advise provided	
3. Exhaust gas treatment technologies is mastered.	3.1 More than 90% of Chinese project members comprehend and gain new technologies.	3.1 Questionnaires for Chinese project members before and after the training, self-evaluation	
4. Factory audit technologies for combustion and the environment are mastered.	4.1 Factory audit of 6 industrial furnaces are undertaken.	4.1 Records of factory audit, documents and records of advises for industrial furnaces	e. Steelworks accept factory audit for combustion and the environment.
5. Dissemination activities for environmental protection and energy conservation technology in metallurgical combustion can be carried out.	5.1 8 times of seminars, field trips, demonstrations of new technology, and introduction of new technologies 5.2 More than 75% of participants of the above activities give positive feedback, such as there was a new learning .	5.1 Record of seminars. Handouts provided in the seminars, and name records of participants 5.2 Questionnaires for participants before and after the seminars, self-evaluation	
<u>Activities</u> 0.1 To assign Chinese associates 0.2 To assign Japanese experts 0.3 To establish Joint Operation Committee 0.4 To prepare job description. 0.5 To prepare Annual Plan of Operation (APO). 0.6 To monitor the project implementation regularly	<u>Inputs</u> (From Japan) A. Dispatch of long-term and short-term experts (1) Long-term experts a. Chief advisor b. Metallurgical environmental protection technology and project coordinator d. Industrial furnace combustion technology (2) Short-term experts Dispatch as necessary	**Inputs** (From China) A. Chinese project members assigned to the Center a. Director of the Center b. Deputy Director of the Center c. Researchers d. Interpreters e. Maintenance f. Administrative Assistants (Administrator, Accounting, Driver)	f. Trained Chinese project staff stay in CISRI.
1.1 To install equipment 1.2 To make equipment operational 1.3 To maintain equipment 1.4 To furnish manuals for equipment			

Activities (cont d) 2.1 To review existing combustion technology 2.2 To prepare experiment plan 2.3 To undertake experiments 2.4 To compile outcomes from the experiments 2.5 To analyze combustion 2.6 To propose improved combustion methodologies	**Inputs (cont d)** B. Counterpart training in Japan 3-4 trainees/year, 1-2 month in duration C. Provision of equipment Equipment for combustion experiments Equipment for measurement and analysis Equipment for factory diagnosis Other equipment and consumables	**Inputs (cont d)** B. Local operational costs C. Facilities and utilities D. Procurement of locally-available equipment	g. Ironworks have plans to improve technologies for smoke and soot treatment.
3.1 To assess the present conditions of smoke and soot treatment technologies 3.2 To collect and catalog technical information on smoke and soot treatment technologies 3.3 To advise or propose plans to improve smoke and soot treatment technologies to steelworks			
4.1 To implement training on technologies 4.2 To select steelworks and prepare diagnosis plans。 4.3 To undertake factory diagnosis of combustion systems and production environment 4.4 To prepare manuals for factory diagnosis			
5.1 To prepare and publish promotional materials 5.2 To set up web pages to promote the project 5.3 To organize seminars 5.4 To undertake technical demonstration using the experiential furnace 5.5 To undertake technical exchange activities with iron smelting industry			**Preconditions** g. Price of energy does not fluctuate significantly。 h. CISRI continues to promote modern technologies for energy conservation and environmental protection in metallurgical combustion.

ANNEX 4 Tentative Schedule of Implementation (TSI)

Calender year	2001			2002				2003				2004				2005				2006				2007		
Japanese fiscal year (*1)	2001			2002				2003				2004				2005				2006				2007		
	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III
Cooperation period																										
Japanese side																										
1. Study teams																										
(1) 1st Preliminary study team																										
(2) 2nd Preliminary study team																										
(3) 3rd preliminary study team																										
(4) Record of Discussion (R/D)																										
(5) Project consultation team (when necessasity arises)																										
(6) Mid-term evaluation team																										
(7) Final evaluation team																										
2. Dispatch of experts																										
1) Long-term experts (*2)																										
(1) Chief advisor																										
(2) Metallurgical environment protection and Project Coordinator																										
(3) Industrial furnace combustion																										
2) Short-term experts (*3)																										
3. Counterpart training in Japan (*4)																										
4. Equipment provision																										
Chinese side																										
1. Project staff																										
2. Facilities and utilities																										
3. Equipment procurement																										
4. Local operational cost																										
5. Submission of request forms																										
A1 Dispatch of experts																										
A2-3 Counterpart training in Japan																										
A4 Equipment Provision																										
Joint Coordination Committee																										

*1. Japanese fiscal year starts April and ends March in the following year.
*2. Long-term experts can substitute in the cooperation period.
*3. Short-term experts will be despatched as necessity arises.
*4. Counterparts will be accepted every Japanese fiscal year.
*5. TSI can be changed according to the achievement of the Project.

ANNEX 5 Plan of Operation (PO)

Calendar year	2002	2003	2004	2005	2006	2007	Responsible person	Inputs	
Japanese fiscal year (*1)	2002	2003	2004	2005	2006	2007		Japanese side	Chinese side
	I II III IV	I II III IV	I II III IV	I II III IV	I II III IV	I II III			
Cooperation period									
0. Project becomes operational.									
0-1 To assign Chinese project members									
0-2 To assign Japanese experts									
0-3 To establish a Joint Operation Committee							PM/CA	LE, PC	CP, AS
0-4 To prepare a job description							PM/CA	LE, PC	CP, AS
0-5 To prepare an annual plan of operation (APO)							PM/CA	LE, PC	CP, AS
0-6 To monitor the project implementation regularly							PM/CA	LE, PC	CP, AS
1. Equipment is furnished.									
1-1 To install equipment							PM/CA	LE, SE, PC	CP, AS
1-2 To make equipment operational							PM/CA	LE, SE	CP
1-3 To maintain equipment							PM		CP
1-4 To furnish manuals for equipment							PM/CA	LE	CP
2. Capacity to improve combustion technology is increased.									
2-1 To review existing combustion technology							PM/CA	LE	CP
2-2 To prepare experiment plan							PM/CA	LE, SE	CP
2-3 To undertake experiments							PM/CA	LE, SE	CP
2-4 To compile outcomes from the experiments							PM/CA	LE, SE	CP
2-5 To analize combustion							PM/CA	LE, SE	CP
2-6 To propose improved combustion methodologies							PM/CA	LE, SE	CP
3. Exhaust gas treatment technologies is mastered.									
3-1 To assess the present conditions of smoke and soot treatment technologies							PM/CA	LE, SE	CP
3-2 To collect and catalog technical information on smoke and soot treatment technologies							PM/CA	LE, SE	CP
3-3 To advise or propose plans to improve smoke and soot treatment technologies to steelworks							PM/CA	LE, SE	CP
4. Factory audit technologies for combustion and the environment are mastered									
4-1 To implement training on technologies							PM/CA	LE, SE	CP
4-2 To select steelworks and prepare diagnosis plans							PM/CA	LE, SE	CP
4-3 To undertake factory diagnosis of combustion systems and production environment							PM/CA	LE, SE	CP
4-4 To prepare manuals for factory diagnosis							PM/CA	LE, SE	CP
5.Dissemination activities for environmental protection and energy conservation technology in metallurgical combustion can be carried out.									
5-1 To prepare and publish promotional materials							PM/CA	LE, SE	CP
5-2 To setup web pages to promote the project							PM		CP
5-3 To organize seminars							PM/CA	LE, SE	CP
5-4 To undertake technical demonstration using the experimental furnace							PM/CA	LE, SE	CP
5-5 To undertake technical exchange activities with iron smelting industry.							PM/CA	LE, SE	CP

<Japanese side> CA: Chief advisor, PC: Project Coordinator, LE: Long-term experts, SE: Short-term experts

<Chinese side> PD: Project director, PM: Project manager, CP: Counterpart, AS: Administrative staff

*1 Japanese fiscal year starts in April and ends in March.

*2 PO can be changed according to the achievement of the Project.

ANNEX 6 Annual Plan of Operation (APO)

Calendar year	2002												2003												2004			Person in charge	Inputs	
Japanese fiscal year (*1)	2002												2003																Japanese side	Chinese side
	I			II			III			IV			I			II			III			IV							
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3					
Cooperation period																													
0. Project becomes operational.																													
0-1 To assign Chinese project members																													
0-2 To assign Japanese experts																													
0-3 To establish a Joint Operation committee																												PD/CA	LE, PC	CP, AS
0-4 To prepare a job description																												PD/CA	LE, PC	CP, AS
0-5 To prepare an annual plan of operation (APO)																												PD/CA	LE, PC	CP, AS
0-6 To monitor the project implementation regularly																												PD/CA	LE, PC	CP, AS
1. Equipment is furnished.																													
1-1 To install equipment																												PD/CA	LE, SE, PC	CP, AS
1-1-1 To discuss design of equipment for combustion experiments procured by Japan																												PD/CA	LE, SE	CP
1-1-2 To prepare the combustion laboratory																												PD		CP, AS
1-1-3 To install equipment for combustion experiments procured by China																												PD		CP, AS
1-1-4 To install equipment for combustion experiments procured by Japan																												PD/CA	LE, SE, PC	CP, AS
1-1-5 To install measurement equipment																												PD/CA	LE, SE, PC	CP, AS
1-1-6 To intall analysis equipment																												PD/CA	LE, SE, PC	CP, AS
1-1-7 To install equipment for factory audit																												PD/CA	LE, SE, PC	CP, AS
1-2 To make equipment operational																												PD/CA	LE, SE	CP
1-3 To maintain equipment																												PD		CP
1-4 To furnish manuals for equipment																												PD/CA	LE	CP
2. Capacity to improve combustion technology is increased.																													
2-1 To review existing combustion technology																												PD/CA	LE	CP
2-1-1 To review the combustion of basic experimental furnace																												CA/PD	LE	CP
2-1-2 To review the present situation of the iron works																												PD/CA	LE	CP
2-2 To prepare experiment plan																												PD/CA	LE, SE	CP
2-3 To undertake experiments																												PD/CA	LE, SE	CP
2-3-1 To carry out experiment with basic experiment furnace																												PD/CA	LE, SE	CP
2-3-2 To carry out experiment with multi-experiment furnace																												PD/CA	LE, SE	CP
2-4 To compile outcomes from the experiments																												PD/CA	LE, SE	CP
2-5 To analyze combustion																												PD/CA	LE, SE	CP
2-5-1 To learn analysis and assessment technologies																												PD/CA	LE, SE	CP
2-5-2 To carry out analysis																												PD/CA	LE, SE	CP
2-6 To propose improved combustion methodologies																												PD/CA	LE, SE	CP
3. Exhaust gas treatment technologies is mastered.																													
3-1 To assess the present conditions of smoke and soot treatment technologies																												PD/CA	LE, SE	CP
3-1-1 To review air pollution prevention system in China																												PD/CA	LE	CP
3-1-2 To review air pollution prevention situation in China																												PD/CA	LE	CP
3-1-3 To review air pollution prevention system in Japan																												PD/CA	LE	CP
3-1-4 To review air pollution prevention situation in Japan																												PD/CA	LE, SE	CP
3-2 To collect and catalog technical information on smoke and soot treatment technologies																												PD/CA	LE, SE	CP
3-2-1 To collect information on smoke and soot treatment technologies																												PD/CA	LE, SE	CP
3-2-2 To collect information related to smoke and soot treatment technologies																												PD/CA	LE, SE	CP
3-3 To advise or propose plans to improve smoke and soot treatment technologies in steelworks																												PD/CA	LE, SE	CP
4. Factory audit technologies for combustion and the environment are are mastered.																													
4-1 To implement training on technologies																												PD/CA	LE, SE	CP
4-2 To select steelworks and prepare diagnosis plans																												PD/CA	LE, SE	CP
4-3 To undertake factory diagnosis of combustion systems and production environment																												PD/CA	LE, SE	CP
4-4 To prepare manuals for factory diagnosis																												PD/CA	LE, SE	CP
5. Dissemination activities for environmental protection and energy conservation technology in metallurgical combustion can be carried out																													
5-1 To prepare and publish promotional materials																												PD/CA	LE, SE	CP
5-2 To setup web pages to promote the project																												PD		CP
5-3 To organize seminars																												PD/CA	LE, SE	CP
5-4 To undertake technical demonstration using the experiential furnace																												PD/CA	LE, SE	CP
5-5 To undertake technical exchange activities with iron smelting industry																												PD/CA	LE, SE	CP

<Japanese side> CA: Chief advisor, PC: Project coordinator, LE: Long-term experts, SE: Short-term experts

<Chinese side> PD: Project director, PM: Project manager, CP: Counterpart, AS: Administrative staff

*1: Japanese fiscal year starts in April and ends in March.

*2: APO can be changed according to the achievement of the Project.

ANNEX7 Tentative list of machine and equipment

Use of equipment	Name of Machine and equipment		Remarks	Quantity	Priority
Equipment for combustion experiment	Equipment for multi-functional combustion experiment furnace	Furnace body		1 set	A
		Equipment for extracting heat		1 set	A
		Equipment for cooling water		1 set	C
		Equipment for supplying fuel		1 set	C
		Equipment for supplying combustion air		1 set	C
		Equipment for exhaust gas		1 set	C
		Valves		1 set	A
		Regenerative burner for combusting light oil		1 set	A
		Regenerative burner for combusting gas		1 set	A
		Regenerative burner for combusting low-caloric gas		1 set	B
		Low NOX burner		1 set	A
		Various regenerative medium		1 set	A
		Equipment for electrical & instrumentation		1 set	A
		Measurement instrument for temperature, heat flow, pressure, flow rate, exhaust gas analyzer for controlling and so on	A part of equipment is also used for plant diagnosis.	1 set	A
		Accompanying equipment for electrical & instrumentation		1 set	C
		Data handling equipment	Also used for plant diagnosis and including notebook PC.	1 set	A
		Spare parts		1 set	A
Equipment for measurement and analysis		Automatic gas analyzer	Purpose: gas analysis, type : mass spectrometer, component : including nunumam gas sampling device	1 set	A
		ICP atomic emission spectrometer	Purpose : analyzing solid component etc in exhaust gas, type : ICP	1 set	A
		Hardware for computational fluid dynamics (CFD)	Purpose : numerical analysis of combustion and heat transfer	1 set	A
		Software for computational fluid dynamics (CFD)	Purpose : numerical analysis of combustion and heat transfer	1 set	A
		Laser diffraction based particle analyzer	Purpose : analyzing particle distribution	1 set	B
Equipment for plant diagnosis	Exhaust gas analyzer etc	Exhaust gas analyzer	Analyzed component : O2,CO,CO2,SOx,NOx、component : including gas sampling device	1 set	B
		Portable exhaust gas analyzer	Analyzed component : O2,CO,CO2,Nox	1	A
	Various thermometer etc	Thermography	Purpose : thermal imaging	1	A
		Radiation thermometer		1	A
		Heat flow meter		1	B
	Furnace tracker for measuring temperature etc	Furnace tracker for measuring temperature	Purpose : equipment for measuring temperature of high-temperature moving material	1	B
		Thermocouples & spare parts for furnace tracker		1 set	B
	Various anemometer & flow meter	Pitot static tubes flow meter		1	C
		Thermal anemometer		1	C
		Ultrasonic flow meter		1	B
	Various measuring instrument for environment	Smoke density meter		1	A
		Sound level meter		1	A
	Equipment for electric supply etc	Electric supply unit		1	C
		Equipment for on-site electric supply (voltage stablizer, transformer)		1 set	C
		Equipment for on-site electric supply (cables etc)		1 set	C
		Data handling equipment	Including datalogger & notebook PC	1 set	B
		Transceiver		1	C
	Vehicle	Vehicle for transporting equipment for plant diagnosis		1	B
		Station wagon		1	C
	Others	Notebook PC		1	B
		Software for CAD	3D	1	B
		Plotter	for CAD,,A0,color	1	B
		Digital video camera		1	B
		Projector for PC	weight less than 1.3-1.5kg	1	B

A: top priority

B: next priority

C: purchased by Chinese side with own cost

( ): alternative

ANNEX 8 List of Chinese counterparts in the first year

No.	Name	Sex	Qualification	Specialty	Business in charge
1	Liu Liu	Male	Chief Engineer, Doctor, Professor, Senior engineer	Metallurgy	Director of the center
2	Li Xiangyang	Male	Senior engineer, Doctor	Materials Science and Engineering	Deputy director of the center
3	Bu Huancun	Female	Senior engineer	Equipment for Metallurgy	Deputy director of the center
4	Gao Zhonglong	Male	Professor	Thermal technology for metallurgy	Researcher
5	Liang Yan	Male	Senior engineer	Industrial furnace for metallurgy	Researcher
6	An Qiushun	Male	Professor, Senior engineer	Automatic control	Researcher & Japanese translator
7	Xu Lijun	Male	Senior engineer	Equipment for Metallurgy	Researcher
8	Mi Guming	Male	Senior engineer	Automation	Researcher
9	Li Qing	Male	Senior engineer	Industrial furnace for metallurgy	Researcher
10	Bi Geping	Male	Senior engineer	Measurement and analysis	Researcher
11	Shen Xueqing	Female	Doctor, Senior engineer	Measurement and analysis	Researcher
12	Gao Feng	Male	Senior engineer	Metallurgy	Operation and maintenance of facilities
13	Ding Yongliang	Male	Senior engineer	Metallurgy	Operation and maintenance of facilities
14	Liu Guangzhi	Male	Engineer	Mechanical maintenance	Operation and maintenance of facilities
15	Li Changqing	Male	Engineer	Mechanical maintenance	Operation and maintenance of facilities
16	Zhang Boting	Male	Professor, Senior engineer	Equipment for Metallurgy	Japanese translator

Secretary: Wang Chuan, Yan Jingping and Lin Xin

ANNEX 9 Budget appropriated by CISRI

Unit: ten thousands yuan

Fiscal Year	Items							Total
	Equipment transport /installment	Machine procurement Constructio-n	Academic Activities	Scientific Research*	Personnel expenses	Administrativ-e cost (Office rental, utilities)	Travel cost	
1st	200	200	10	90	100	60	40	700
2nd	100	50	10	40	100	60	40	400
3rd	0	0	5	45	150	90	60	350
4th	0	0	5	45	150	90	60	350
5th	0	0	5	45	150	90	60	350
Sub total	300	250	35	265	650	390	260	2150

*Including materials, fuels, and expenses for facility maintenance.

ANNEX 10 Joint Coordinating Committee (JCC)

1. Functions

The Joint Coordinating Committee will be held at least once a year and whenever necessity arises. Its functions are as follows:

(1) To formulate, review and approve the Annual Work Plan of the Project under the framework of the Record of Discussions,

(2) To review the overall progress of the Technical Cooperation Program as well as the achievement of the Annual Work Plan

(3) To exchange views on major issues arising from or in connection with the Technical Cooperation Program

2. Composition

(1) Chairman

Vice president of CISRI (International Cooperation)

(2) Committee Members

(Chinese side)

a. Representative(s), from SSTC

b. Representative(s), from SETC

c. Representative(s), from CISA

d. Representative(s), from CISRI

e. Representative(s), from the Center

f. Other personnel concerned with the Project decided by the Chinese side

(Japanese side)

a. Chief Advisor

b. Coordinator

c. Japanese Expert(s) designated by the Chief Advisor

d. Representative(s) of the JICA China Office

e. Other personnel concerned to be decided and dispatched by JICA, if necessary

Note: The Official(s) of Embassy of Japan in China may attend the Joint Coordinating Committee as observer(s).