Steel Task Force

Action Plan

Original Draft: Approved by the PIC in October 2006

The 1st Update: November 2008

Contents

Introduction

The six countries of the Asia-Pacific Partnership on Clean Development and Climate—Australia, China, India, Japan, the Republic of Korea, and the United States of America—are cooperating to meet both their increased energy needs and associated challenges, including those related to air pollution, energy security, and greenhouse gas intensities.

The Partnership has established public-private Task Forces in eight key sectors: (1) cleaner fossil energy; (2) renewable energy and distributed generation; (3) power generation and transmission; (4) steel; (5) aluminium; (6) cement; (7) coal mining; and (8) buildings and appliances. The Task Forces are designed to meet Partnership goals through international cooperation to facilitate the development, diffusion, deployment, and transfer of existing, emerging and longer term cost-effective, cleaner, more efficient technologies and practices among the Partners through concrete and substantial cooperation so as to achieve practical results.

As a product of its first stage of collaboration, each Task Force has created an Action Plan which has been endorsed by the Policy and Implementation Committee. The Action Plans contain an initial set of priority activities for implementation. Some projects contained within the Action Plans may need to be refined or elaborated. Financial resources are needed for the implementation of the Action Plans. Some initial funding from some government and industry sources has already been identified for the implementation of projects. Partner countries will continue to work to mobilize further funding from both public and private sectors in order to bring about full implementation of the practical projects identified in the Action Plans and will continually develop new projects and add them to this set of activities.

Sector Review

The Role of Steel

Steel plays an essential role in meeting the challenges of sustainable development for the world in the 21st century. Steel is used in every aspect of our lives, and is found in buildings, bridges, automobiles and trucks, food containers and medical devices, to name a few. Steel provides substantial direct employment in the Asia-Pacific Partnership on Clean Development and Climate's Partner countries, and a significant direct contribution to the Partner countries' economies. Countless additional jobs and economic benefits are provided in supply and support activities including mining, capital equipment supply, utilities and many community industries.

The aggregate amount of carbon dioxide (CO_2) emitted from the global steel industry has reached roughly two billion tons annually, accounting for approximately 5% of global man-made CO_2 emissions. Countries in the Partnership account for more than 57% of global steel production. The Steel Task Force therefore has significant potential to address CO_2 emissions and conserve energy by sharing information on clean technologies and by cooperating to implement such technologies. To enable these efforts, the Partnership will emphasize public–private cooperation to reduce or remove barriers to technology implementation.

The production process for steel is energy-intensive and requires a large amount of natural resources. Energy constitutes a significant portion of the cost of steel production, up to 40%

in some countries. The majority of emissions generated by steel production are due to coal use and other energy resources as a key process input, which means that increasing energy efficiency is the most cost-effective way to improve environmental performance.

To address these problems, there has been massive investment in new products, plants, technologies and operating practices. The result has been a dramatic improvement in the performance of steel products, and a related reduction in the energy and consumption of raw materials in their manufacture. Recent developments have enabled the steel industry's customers to improve their products through better corrosion resistance, reduced weight and improved energy performance. This improvement is seen through a wide range of products including passenger cars, packaging and construction materials.

Figure 1 World Steel Production

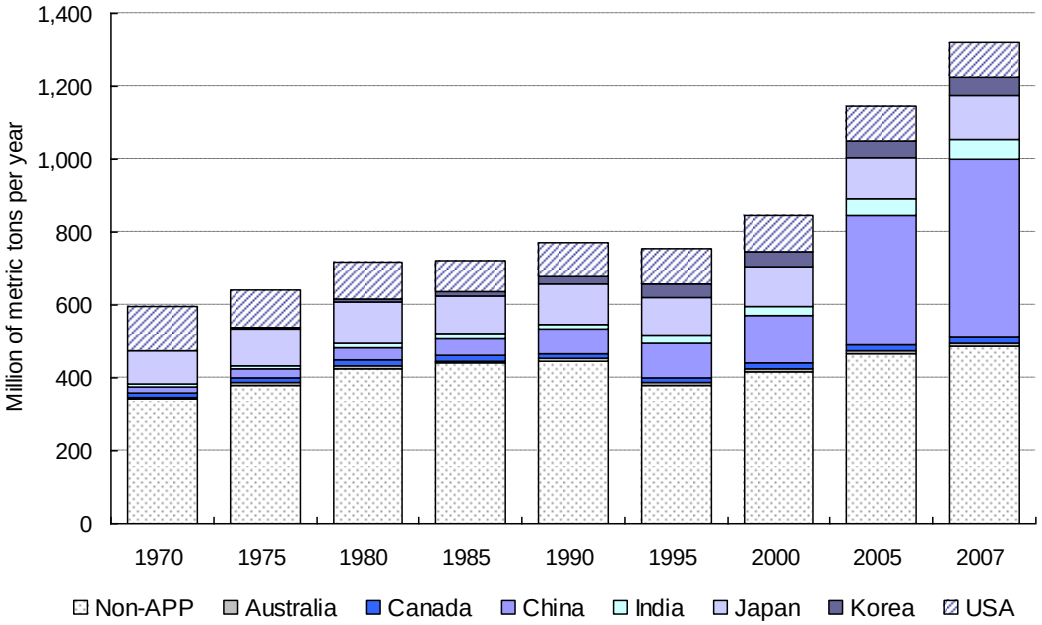
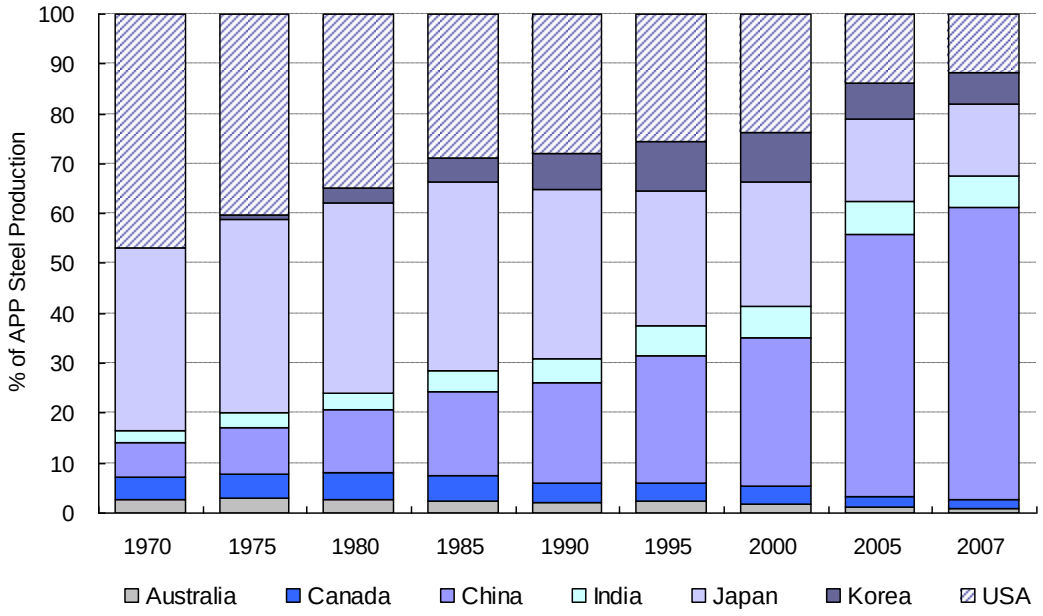


Figure 2 APP Steel Production Share



Opportunities in Steel

The nature of the steel industry provides the sector with attractive options to reduce emissions and increase energy efficiency. For one, steel is fully recyclable. At the end of their useful life, products containing steel can be converted back into 'new' steel, ready for other applications. Furthermore, the steel production process can utilize wastes and by-products as alternative reductants and raw materials, which reduces air pollution and the use of fossil fuels.

In 2005, almost 43% of global crude steel production came from recycled steel. However, recycling rates vary significantly between products and countries. Mature economies have established recycling processes and availability of scrap steel that may not exist in other countries. Steel production also generates large quantities of solid and gaseous waste. There are significant opportunities to increase the uptake of this waste (in particular, steel slags) by other industries, as well as the steel industry, through the introduction of enhanced processing technology and the development of cross-sectoral linkages. For example, slags are processed into building materials, such as cement and aggregates, providing a major contribution to the environment by reducing CO_2 emissions and the need for virgin raw materials.

The primary areas to reduce emissions and/or conserve energy are:

- Process and raw materials enhancement.
- Energy and materials recycling and reuse.
- Waste and emissions reductions.

Sharing technical and performance data among Partner countries will enable the Partnership to establish appropriate metrics, which will be used to measure the progress of Partners as they 1) identify key opportunities, 2) break down barriers, and 3) implement state-of-the-art and cost-effective clean technologies.

Barriers and Achievements

Addressing barriers to the implementation of clean technologies will enable Partners to address greenhouse gas emissions more effectively, recognizing that differing national circumstances may influence the potential for energy conservation in domestic steel industries. This work will also contribute to the reduction of other emissions and effluents, which is essential to the Partnership's effort to meet our increased energy needs and associated environmental challenges.

Partner countries have identified various issues as barriers to achieving the maximum potential for improving the energy efficiency and environmental performance of the steel sector. These barriers relate to capital availability/costs, intellectual property, regulatory regimes, access to specialized skills and R & D, and raw materials quality.

Australia

Primary barriers include economic constraints to implementing effective technologies, e.g. competition for capital.

Successes include the development of technologies such as HIsmelt (a direct smelting technology which can utilize lower grade iron ore) and AUSMELT (bath smelting iron production), as well as clean development initiatives such as efficient wastewater re-use.

Canada

The Canadian iron and steel sector has voluntarily reduced its energy intensity (per tonne shipped) by 27 % between 1990 and 2007. This is equivalent to a reduction of carbon dioxide intensity (per tonne shipped) by 32%, or 21% absolute CO2 reduction.

These energy intensity improvements were achieved by:

- the utilization of by-product fuels to replace purchased fuels,
- implementation of best available technologies economically achievable (BATEA), and
- application of best energy efficiency/conservation practices.

Examples of such technologies include achievement of 100% continuous casting, and Canada's first direct strip production mill.

While economic and technical barriers limit the penetration of certain existing technologies in Canadian steel mills, breakthrough technologies will be required in order to make additional, significant reductions in energy consumption and associated greenhouse gas emissions in the long-term. Such technologies will require investments and support for research and development.

China

Barriers:

The Barriers in China iron and steel industry include: It should be gradually build the mutually beneficial and win-win strategic partnership, then to secure the stable supply of raw materials and be free of worries in this regard.

Technological advancement fell behind the development of added capacity. The R&D investment is not enough, low rate of high tech and high value added products. So it need to invest more in technical renovation then take energy saving and consumption reduction and environmental protection improvement as the prerequisite for the enterprise to survive and seek further development.

Achievements:

The rapid development of the China iron and steel industry supported the rapid growth of economic development. Remarkable progress achieved in plant equipment modernization.

New progress made in energy and resource saving and environmental protection.

Aggregated energy consumption per ton of steel was down by 20.3% from0.93ton standard coal in 2000 to 0.74 ton standard coal in 2005.

In 2004, exhaust water per ton of steel in CISA members was down by 14.3% over 2000. Continuous casting ratio for CISA members rose to 96.41% in 2005 from87.3%in 2000.

great significance made in independently developed new grading technology on low grade Hematite, produced high quality iron ore concentrate with an iron content over 68% and SiO2 ＜4%.

India

Barriers include the quality of raw materials (iron ore and coal); the large number of unorganized secondary steel producers (1,500 small to medium entrepreneurs produce about 40% of the total steel production); the high cost of capital; the availability of trained, skilled manpower; the availability of 'space' for the introduction of new technologies in old plants; and the high cost of ferrous scrap for recycling.

Achievements include the introduction of coke dry quenching technology; the introduction of top recovery turbine; COREX process implemented at Jindal Steel (PVT); the introduction of continuous casting technology in about 70% of integrated plant capacities; the improvement of blast furnace productivity from 1.5 T/m3 to 2.0 T/m3; and the improvement in energy efficiency from 8.5 GCal/tcc to 7.25 GCal/tcc.

Japan

Equipment and facilities related to iron and steel industry in general require substantial capital investment and have a relatively long life. Because of the problems related to economic barriers and also the production line stoppage required during construction and equipment installation, it is often difficult to introduce a new technology for energy conservation to the existing production line. The integrated decision should be made with thinking about timings for renewal of facilities, for establishment of new technologies, and for line stoppage, etc.

The voluntary action plan established by the Japan Iron and Steel Federation was formally put into action in 1996, and has demonstrated its effectiveness after approximately ten years of reiterating the Plan-Do-Check-Action business cycle.

The contribution of the voluntary action plan is not limited to the area of energy conservation in the production process at steel mills, but also includes how it benefits society. Such contribution examples are through highly functional steel products to provide energy and resources savings for other industries, through steel-making by-products such as blast furnace slag cement, as well as through utilization of waste materials generated from other industries and households including waste plastics and used car tires. These contributions in the area of cross sector approaches achieved comparable levels of CO_2 reduction.

As one of the focuses of such initiatives, the Japanese iron and steel industry has also been making an effort to reduce CO_2 emissions on a global basis by transferring various energy-saving technologies overseas.

Korea

The high level of energy efficiency and pollutant control adoption makes it hard to find easy improvement opportunities. Additional opportunities will be uncovered as a result of the development of long-term breakthrough technologies.

Key achievements include FINEX, an innovative, environment-friendly iron-making process, as well as strip casting, which provides significant energy savings for the casting process.

United States

The U.S. iron and steel sector has voluntarily improved energy efficiency by 28% and lowered carbon equivalent emissions by 37.5% since 1990.

Environmental rules and regulations are strictly enforced. This regulatory climate does, however, sometimes produce conflicting regulatory schemes where energy efficiency is sacrificed in favor of reduced emissions. Transfer of technology to other countries is often hindered by concerns over the following issues: 1) trade barriers and economic conditions such as currency manipulation affecting value; 2) regulatory differences that may not create a need for a specific technology; and 3) lack of intellectual property protections that adequately protect the patent holders.

Conclusion

Partner countries are taking a leadership role in addressing the global challenges of clean development and climate change in a way that is complementary to and builds on existing steel industry initiatives. Partner countries have recognized the significant potential that exists to reduce greenhouse gas emissions and conserve energy in their steel sectors by sharing information on clean technologies and by cooperating further to implement such technologies. The Partnership provides a unique forum for public–private dialogue and cooperation, which will contribute to the development of a viable long-term clean development strategy, addressing energy security, climate change, and other environmental challenges.

Objectives

- Develop sector-relevant benchmark and performance indicators.
- Facilitate the development and transfer of best practice steel technologies.
- Increase collaboration between government agencies, research bodies and industry institutions between relevant Partner countries.
- Develop processes to reduce energy usage, air pollution and CO_2 emission from steel production.
- Increase recycling across the Partnership.

Projects and Milestones

We will facilitate recycling within Partner countries and access to state-of-the-art clean technology and environment control systems. This Task Force will promote emissions reduction of gases such as CO_2 through the development, introduction, and implementation of existing and emerging cost-effective, cleaner technologies and practices, as well as the transfer of expertise. The initial emphasis will be on operations in China and India. Our portfolio of projects and timeline has been carefully crafted to achieve maximum impact by focusing on the establishment of a baseline, which will be used for carefully targeted action.

First, we will identify effective technologies and equipments for this purpose. We will then review the current status of equipment deployment rates, energy efficiency indices, environment-related indices such as SO_x density and recycling rate of by-products in each

country. After these preparations, we will set milestones to achieve the objectives, conduct research and diagnosis of facilities for energy saving and environmental protection to identify barriers, demonstrate potentials of CO_2 emission reduction, etc., and discuss solutions.

Table 1: Action Plan Milestones and Near-Term Goals

	2006	2007	2008	2009	2010 and thereafter
1. APP Workshop	September 27-29 in Tokyo	March 14-16 in India October 23-26 in Australia	April 14-17 in Korea Tentatively Autumn in China	Tentatively Spring in U.S.A Tentatively Autumn in Canada	To be decided
2. Review **2.1 Equipment Implementation Analysis** ・Energy Saving ・Environment Protection ・Recycle **2.2 Identification of Barriers** **2.3 Comparison of energy and CO2 intensity**	By end of June (Survey sheets) First Survey Completed in September Additional Survey to be conducted by October Began study Began study Authorized common boundary	 Results reported in India Results reported in India Rough survey results reported in India	Reviewed at Korea Survey Results to be assessed by the third party Survey Results to be assessed by the third party	**<u>Combine Project 2 and 3 to One Project</u>** Follow up of Implementation Analysis	 Follow up of Implementation Analysis Accumulate Actual Results of Equipment Implementation
3. Performance Indicators (include boundary)	Began study	First Survey Results Reported in India. Further Research began from June	EG and DH to analyse data for review and for assessment. Improve data quality and quantity Survey Results to be assessed by the third party	Target Setting of Each Country by January Workshop to be held by the third party and Report to be Completed	Follow up of Actual Results of Each Country
4. Performance Diagnosis	Under Discussion	First trial completed by March in China and India	First trial completed by March in China and India Visit more sites for diagnosis. Model project to be implemented as an Actual Project	Continue site diagnosis. Follow-up site visit to be made at the technology implemented sites.	Continue follow up and site visits
Flagship Project 5 State-of-the-Art Clean Technologies (SOTACT) Handbook	Completed the first edition Next revision due December	SOACT is posted on website by 11, January	To be revised as necessary	To be revised as necessary	To be revised as necessary
Flagship Project **6 Technology Deployment**	Candidate projects identified	Discussion on design of Technology Deployment framework – continued in successive Task Force meeting	"Guidelines for Technology Deployment and Cooperation under the APP Steel Task Force." is to be drafted in mid-2008. Project starts from midyear following Task Force agreement on Guideline To be revised as necessary	Implementation of model projects	Implementation of model projects

Appendix A: Individual Project Plans

STF-06-1: APP Steel Workshop

Project

Exchanging information and sharing experience between Partner countries on annual basis.

Objectives

To promote mutual understanding of, and collect related policy and technological information on, energy saving, environmental protection and recycling.

To identify barriers and solutions through dialogue between governments and private sectors of Partner countries.

To promote the exchange of information on production management and environmental protection through on-site visits and dispatch of experts by steel makers of the host country.

Milestones

Japan hosts the first workshop in September 2006 in Japan. On-site visits will also be held together with these events.

Thereafter, each participating country will host such workshops annually on a rotational basis.

Location

The first workshop in Japan.

Thereafter, in each Partner country annually on a rotational basis.

Participation

Management: Host country

Participation: Six Steel Task Force Partner countries. Also, members of other Task Forces are welcome and we will encourage all the Partner countries' participants to join us, as well as appropriate third party experts from Partner countries.

Resources

Necessary human resources and expenses are borne by host Partner country, in principle.

Host Partner country to cover costs of organizing and managing workshop.

Other Partner countries to cover their respective participation costs.

STF-06-2: Status Review of Steel Industry Related Indicators for Energy Saving, etc.

Project

Reviewing the current status of related issues such as equipment diffusion rates of energy-saving facilities in plants as described below, after identifying effective technologies and equipments for energy saving, environment protection and recycling.

Energy Saving

Examination of diffusion rates of energy-saving equipments in iron and steel industries' plants.

Examination of data for possible comparison of energy and emission intensity of CO_2 will be conducted after making common definitions and the problem of boundaries.

Environment Protection

Examination of equipment diffusion rates of cleaner technologies to lessen the burden on the environment and quantitative measurement of NO_x, SO_x, and soot and cinder, etc (i.e. emission intensity).

Recycling

Examination of recycling rates in iron and steel by-products use such as slag, dust and sludge.

Barriers

Identification of barriers that prevent diffusion of effective technologies/facilities, and discuss solutions. These barriers may include, but are not restricted to:

- Intellectual property issues.
- Trade practices and policies.
- Legal and regulatory issues.
- Lack of capital and financing.
- Lack of incentives.
- Tax policies.
- Resource constraints.
- Lack of knowledge/awareness.

Objectives

To calculate potentials for CO_2, NO_x, and SO_x emissions reduction in Partner countries.

To identify positive ways to improve the situation regarding environmental protection and recycling.

To utilize shared data and experiences of participating Partner countries, share views and finally use these data to improve situations as necessary.

Milestones

Initial survey was completed at the end of September in 2006, except for intensity related items.

To review data for possible comparison of energy and emission intensity of CO_2, NO_x, and SO_x by mid 2007 after solving the problem of boundaries.

Continue this exercise annually if agreed at the second Steel Task Force meeting.

Location

To be decided.

Participation

Management: Japan

Participation: Six Partner countries Steel Task Force members.

Resources

Each country will bear the cost of project planning, research, data collection, analysis, review and validation, which will include contractor fees travel fees, research expenses and others, as needed.

STF-06-3: Performance Indicators Setting

Project

Identify concrete quantitative indicators related to energy efficiency and environmental improvement.

Each Partner country to set milestones of performance indices by taking into account each country's situation and background etc., after demonstrating potentials of CO_2 emission reduction, etc., based on the result of the status review (Project Two).

Objectives

To identify potentials for CO_2, SO_2 and other emissions reductions.

To establish calculation method of performance indicators for energy efficiency and environmental protection with regard to gaseous emissions such as CO_2 and SO_x, and recycling rates of by-products such as slag, taking into account circumstances of each Partner country.

To set ambitious but realistic milestones to guide participating Partners' projects for CO_2, SO_2 and other emissions reduction, etc.

Milestones

Set milestones by around mid 2007.

Location

To be decided.

Participation

Management: Korea (Co-Chairs: Japan and the United States).

Participation: Six Partner country Steel Task Force members.

Resources

Funding from outside resources could be requested.

STF-06-4: Performance Diagnosis

Project

Partner countries, especially China and India, welcome energy saving and environment protection experts of Partner countries to iron and steel plants to assist with the introduction, diffusion and development of related technologies and operating practices. After these diagnoses of energy consumption and environmental protection opportunities, appropriate improvement strategies will be advised.

Objectives

To offer voluntary advice on appropriate improvement plans to steel companies in participating Partner countries, based on energy saving and environmental protection diagnosis. These plans may include identification of flagship projects and aim to achieve diffusion of appropriate technologies and operating practices.

To identify and explore areas of collaboration in R&D of energy efficiency and environmental protection technology between Partner countries.

Milestones

Starting from 2007, experts are dispatched to iron and steel plants in appropriate Partner countries.

Location

Appropriate Partner countries.

Participation

Management: China and India.

Participation: Appropriate Partner countries.

Resources

To be decided on a project-by-project basis.

STF-06-5: State-of-the-Art Clean Technology (SOTACT) Handbook

Project

The SOTACT Handbook is a potential flagship project. It is a logical extension to the baseline performance data compiled in STF-06-2.

The goal is to develop and compile a comprehensive information document containing best available energy saving technologies and practices and environment protection in the iron and steel industry.

The document will include an upfront list and an abstract of all presented technologies.

After completion, the document will be web based and regularly updated by each Partner country.

Objectives

To share knowledge across Partner countries by compiling a comprehensive information document containing best available technologies and practice for energy saving and environment protection.

To provide steel decision makers with access to accurate description of technology options to support capital improvement projects.

To create a 'live' clearinghouse matching technology suppliers and end users.

To create a 'living' record of improvement of 'best available technology' over time.

Milestones

Initially, Japan presented at Berkeley a preliminary version containing information about Japanese energy saving and environmental protection policies and technologies in the iron and steel industry. This document to be circulated to other Partner countries to add similar information relating to each country.

The United States requested and gathered information from all other Partner countries to develop a revised Part I edition (excluding casting technologies).

The first revised Part I edition was distributed at the Tokyo Task Force meeting on September 27, 2006.

The second revised Part I edition will be distributed to Partners by December 1st 2006.

The final Part I report will be presented at the March 2007 meeting in India.

Location

Not specific: handbook to be discussed at each Task Force meeting.

Participation

Management: United States (Co-Chair: Japan).

Participation: Six Partner country Steel Task Force members.

Resources

Partner countries' staff time.

U.S./Japan industry support.

Consulting/technical writing resources

Website development & web content management

STF-06-6 Technology Deployment

Project

Develop detailed practical projects to deploy State-of-the-Art Clean Technologies. An initial list of candidate projects is attached.

Objectives

To improve energy, greenhouse gas and environment protection performance of the iron and steel industries in Partner countries by implementing cost-effective technologies.

Milestones

Provide outline of project requirements.

Prioritize projects and obtain commitment for candidate projects.

Commence studies toward setting up candidate projects from April 2007. Projects are expected to start from January 2008.

Plant visit by experts if required.

Undertake negotiations between host sites, donor Partner countries and capital providers.

Develop detailed project plans and establish project implementation arrangements for individual projects.

Post-implementation analysis and reporting.

Location

Appropriate Partner countries.

Participation

Management: Australia

Participation: Appropriate Partner countries.

Resources

Participating Partner countries' public and/or private funds.

Attachment: Project Candidates Proposed by India

India proposed fifteen project candidates listed below. By the next Task Force meeting, India is to further elaborate these candidates and the Task Force will examine the possibility of establishing them as field test projects.

1. Heat recovery from Sinter Cooler and other energy optimizing schemes in Sinter Plant

2. Hot charging of semi-finished steel (Blooms/Slabs)

3. Heat recovery from hot BF stoves' exhaust/flues

4. Sensible heat recovery from LD/BOF gas.

5. Application of regenerative burners in iron and steel making process

6. Recovery of energy from BF top gas pressure

7. Secondary emission control in SMS (BOF and EAFs)

8. Improving design and operation of coke oven effluent (BOD) plant

9. Recycling of steel plant dust and sludge using rotary hearth furnace

10. Recovery of iron ore from slime / tailing of iron ore washeries

11. Treatment and disposal of used PCB based transformer oil.

12. Technology know-how of new design ESP to control particulate matter emission from stack to 20–30 mg/Nm3 (for Sinter Plant)

13. Energy consumption and emission control in sponge iron plants (SIP) (air pollution)—SOTACT

14. Integration of SIP and induction furnace (IF) technologies (SOTACT)

15. Involvement of R & D engineers in pilot / commercial plant operation of SCOPE—21 coke-making processes