Government of India

and

United Nations Development Programme

Global Environment Facility

PROJECT DOCUMENT

Removal of Barriers to Energy Efficiency Improvement in the Steel Rerolling Mill Sector in India

February 2004

NEW DELHI

GOVERNMENT OF INDIA
UNITED NATIONS DEVELOPMENT PROGRAMME
GLOBAL ENVIRONMENT FACILITY
PROJECT DOCUMENT

PIMS No.	1515
Project Number:	IND/03/G31
Project Title:	Removal of Barriers to Energy Efficiency Improvement in the Steel Rerolling Mill Sector in India
Project Short Title:	Steel Rerolling
Estimated Start Date:	March 2004
Estimated End Date:	February 2009
Executing Agency:	Ministry of Steel (MOS), Government of India
Implementing Agency:	Ministry of Steel (MOS), Government of India
Project Site:	Haryana, Rajasthan, Uttar Pradesh, Punjab, Jammu & Kashmir, Gujarat, Maharashtra, Chhattisgarh, West Bengal, Tamil Nadu, Andhra Pradesh, Kerala and Karnataka

UNDP and cost-sharing (in US$)	
UNDP/GEF:	
Project	6,750,000
PDF B	280,000
Co-financing	**7,030,000**
Government of India (Steel Development Fund)	7,280,000
Government of India (PDF B)	60,000
TA Project for cluster financing of SMEs	1,000,000
Private Sector	5,540,000
Leveraged Financing	
Government Agencies: IREDA, PATSER, Technology Development Board (Dept. of Science & Tech.)	5,520,000
Financial Institutions: SIDBI, ECO FUND (ICICI) and Commercial Banks	5,770,000
Sub-total Co-financing and Leveraged	**25,170,000**
Total Project (Including PDF B)	**32,200,000**

Brief Description. This project seeks to reduce greenhouse gas (GHG) emissions by providing technical assistance to the small and medium-sized steel-rerolling mills in India to enable them to adopt more energy efficient and environmentally friendly technologies. To date, these cleaner and more efficient practices have not been widely adopted in India due to information and knowledge barriers, combined with inertia and uncertainty on the part of a conservative, but competitive business sector. The project strategy seeks to involve the initial penetration of "low-risk", high efficiency technology packaged in selected small and medium-scale mills. It will thereby allow industry's confidence in and access to these technologies to grow. As a result, not only will information and assistance in adopting the identified packages be provided, but the industry will be driven to adopt these new packages through the need to maintain competitive edge. The Ministry of Steel will establish a centre for providing training, information and capacity strengthening on a sustained basis. It will develop institutional linkages with energy-service companies for providing off-the-shelf technologies from international equipment vendors. These actions, together with investment support provided by the Banking Sector are expected to result in an innovating, transforming, and efficient steel re-rolling sector.

On behalf of:	**Signature**	**Date**	**Name/Title**
Government of India		25/3/04	Saurabh Garg Dy. Secretary (FB) Department of Economic Affairs Ministry of Finance, Government of India
Executing Agency & Implementing Agency		25/3/04	J. P. Singh Joint Secretary Ministry of Steel, Government of India
UNDP		12/4/04	Maxine Olson UN Resident Coordinator & UNDP Resident Representative, India

United Nations official rate of exchange on the date of signature of Project: US$ 1 = Rs. 45.00

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A. COUNTRY PROGRAMME CONTEXT

I Background

With an average growth rate in the gross domestic product of 5.8 per cent during the first decade of reforms (1992-2001), India is among the 10 fastest growing economies in the world. Primary commercial energy demand grew almost three - fold at an annual rate of 6 per cent between 1981 and 2001, to reach 314.7 million tonnes of oil equivalent (MTOE). The Tenth Five-year Plan proposes a shift in the focus of planning from merely resources to the policy, and institutional changes. India, accounting for 3.5 per cent of world commercial energy demand in 2001, has projected gross domestic product (GDP) growth of 8 per cent for the Tenth Five Year Plan. This is expected to fuel the energy demand, which is expected to grow at 5.2 per cent annually.

During the Ninth Five Year Plan, a need was felt to have Energy conservation Act and to establish an apex institution to effectively implement a programme of energy conservation. Energy efficiency and energy conservation is a multi - faceted activity and involve four major sectors of the economy - industry, transport, agriculture and domestic sectors. The Energy Conservation Act, 2001 was passed which mandates the setting up of a Bureau of Energy Efficiency (BEE). Although significant efforts have been made, but much desires to be fulfilled with regard to small and medium scale sectors and unorganized sectors that create millions of livelihoods. The Ministry of steel, through the proposed project would bring about energy efficient improvements in about 1200 operating steel re-rolling mills (SRRMs) in India – establish yet again the need for private–public partnership in critical areas of development.

II Country Programme and Thematic Focus of UNDP

The energy linkages to environment are widely known through the global warming and associated impacts of Climate Change. The vulnerability of specific regions and developing countries in particular poses different threats and corresponding challenges to adaptation. The protection and regeneration of the environment is vital for Sustainable Human Development. UNDP addresses this challenge by focusing on local priorities as well as global environmental issues. UNDP in India works closely with the Government in implementing its national agenda. The Ministry of Environment and Forests (MoEF) act as UNDP, India's technical focal point of the Global environment Facility. UNDP-supported programmes focus, in an integrated way, on different aspects of the environment: natural resources management, multi-level capacity building for decision-making, mainstreaming global environment issues into the development process, and information dissemination and advocacy.

UNDP assists the Government through a range of technical assistance programmes to provide inputs to national policies and strategies for promoting environmentally sustainable solutions. These programmes include clean technology demonstration, supporting the development of national strategies and action plans, and the strengthening of national and regional institutions. UNDP's environment strategy targets three types of interventions: biodiversity conservation, natural resources management (e.g. water, forests), and clean energy technology promotion.

UNDP is the lead-implementing agency for the Global Environment Facility (GEF) in India. India is the fifth largest recipient of GEF funding. Biodiversity and Climate Change are the key

focal areas for UNDP-GEF with emphasis mainly on technical assistance and capacity building. Apart from global environmental considerations, GEF projects strongly reflect national priorities, and are implemented in close collaboration with the Government. The present project reflects commitment of UNDP to the national direction and ownership. Partnership with government agencies and civil society partners initiated under the first Country Cooperation Framework (CCF- I, 1997-2002) will be vigorously pursued and strengthened through linkages with the new Country Programme.

B. PROJECT BACKGROUND

I Development Context

1.1 Review of Energy Efficiency in Industrial Sector of India

India is currently world's seventh-largest consumer of energy, sixth-largest source of greenhouse gas (GHG) emissions and second-fastest growing source of GHG emissions. The emissions are expected to grow at a rate of 5% between 1990 and 2010. However, per capita energy consumption and emissions have remained relatively low. The low per capita emissions (0.3 tonnes of carbon per person) are due to the large population. The industrial sector accounts for over 50% of the total emissions, which is likely to grow five fold by 2020[1].

Out of the total energy consumption in industrial sector of India, approximately 65% is attributed to the most energy intensive industries, namely, fertilizer, iron and steel, aluminum, cement, paper and pulp. The end-use energy efficiency levels in these industrial sectors again are comparatively low[2]. Consequently, with the growing energy demand, rising shortages and spiraling upward costs of energy, the energy efficiency improvement in the industrial sector gained national priority. Since 1980s, the government has introduced various policies and institutional measures with active participation of the industry. The Approach Paper to the Tenth Five-year Plan[3] stresses the need for efficient use of energy resources to achieve sustainable development. Some of the major efforts in the past are summarized below:

- Inter-Ministerial Working Group (IMWG) on Energy Conservation constituted for directing national energy efficiency efforts.
- Petroleum Conservation Research Association (PCRA) funded by the Oil Industry Development Board set up for ensuring efficient use of petroleum products.
- Energy Management Center (EMC) was established for planning and developing energy efficiency programs; it is now replaced by the Bureau of Energy Efficiency (BEE).
- Institutions set up for promoting energy efficiency services. These include industry associations such as Confederation of Indian Industry (CII), financial institutions (IREDA, IDBI, ICICI), the National Productivity Council (NPC), TERI.

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[1] India consumed 13.2 EJ of energy in 1998 (coal, 55%; petroleum fuels, 38%; and natural gas, 7%) and released 926 million tons of CO_2 (coal, 67.75%; petroleum fuels, 26.75%; and natural gas, 5.5%).

[2] The consumption of energy in industrial sector increased from 1.91 EJ in FY 1984 to 4.93 EJ in FY 1996 at a compound annual growth rate of over 8%. The intensity of energy use in steel, cement, and paper and pulp industries in India are relatively high (Source: World Energy Assessment-Energy and the Challenge of Sustainability, 2000):

a) Steel: 39.7 GJ/Te as compared to 17.5 in Japan, 25.4 in US and 27.5 –35.0 in China.

b) Cement: 8.4 GJ/Te as compared to 4 in US, 5 in Japan and 5.9 in China.

c) Pulp and paper: 46.6 GJ/Te as compared to 40.6 in US and 31.6 in Sweden.

[3] Five Year Plan Document of Planning Commission, 2001-02.

- Regulatory reforms initiated for rationale pricing, which have brought average retail energy prices to levels that are at par or above the cost of supply. Coal and petroleum prices have been largely deregulated and average electricity prices paid by the end-users now approximate long-run marginal costs[4].
- The Energy Conservation Act, 2000 enacted (on August 18, 2001) for using energy efficiently, energy conservation and for related matters. The Act mandates setting up of the Bureau of Energy Efficiency (BEE). It has the broad objectives to provide policy framework and direction to EE efforts, and coordinate energy conservation policies and programs amongst various stakeholders. BEE would further establish systems and procedures to monitor and verify EE results in key sectors of the industry, leverage multilateral and bilateral donors, support private sector, and administer the delivery of energy services to both private and public sectors.

The above efforts have contributed to end-use efficiency in the industry. The measure of gross energy intensity of economy, as the energy elasticity of GDP had declined from 1.26 in 1980 to 1.06 in the 1990s. In addition to the national efforts, a large number of programs are supported by multilateral, bilateral and international organizations. The World Bank, USAID and the Asian Development Bank have established credit lines with the financial institutions (IREDA, ICICI, IDBI and SIDBI). However, these efforts have been limited to large and organized sectors, including steel. The interventions by the Ministry of Steel were limited to the large-scale integrated steel plants. The secondary steel production, however, constitutes approximately 57% of the total steel production in India, which is mainly in the small and medium scale sector. The reform processes have neglected the SME sectors, which are seen to be major consumers of energy and contributors to GHGs

1.2 Energy and Environment Concerns of the Small and Medium Scale Steel Rerolling Mills (SRRMs)

As noted above, the steel rerolling mills (SRRMs) in the small and medium sector has not been actively supported. However, this sector constitutes an unavoidable link in the overall supply chain of steel in the country. It largely consists of small and medium enterprises (SMEs) with 75% of units in the small scale. The mills grew haphazardly with outdated, low-investment high-cost technologies and practices largely financed with their own funds. According to the "Comprehensive Survey of Steel Rerolling Industry"[5] the sector comprises 1200 (working) SRRM units of various sizes. Some mills are composite (with electric arc furnace and/or induction furnaces to produce ingots for rolling). The cumulative average annual growth rate of the SRRM sector from 1966 to 1996 was approximately 4.7%. Correspondingly, the capacity grew from 4.7 million tons up to 19.4 million tons during that time frame. In spite of global and domestic recession in the steel industry, the sector has recorded an annual average growth of about 6% during 1997 to 2002.[6] Also, during the same period, the share of secondary steel producers has increased to about 57%. With no major steel plant contemplated in the future, the present share of secondary steel would be expected to continue or likely to grow in future. The sector thus has a large aggregate capacity and enjoys a competitive edge over the major

[4] Economic Survey, 2001.

[5] DCI&S Survey Report, 1997, Ministry of Steel.

[6] Overall growth of steel was 3.8%.

producers due to their flexibility in production for meeting low tonnage requirements in various grades, shapes and sizes to serve niche markets. The direct energy-use in this sector includes heating fuels (furnace oil, natural gas, and coal), and electrical energy. Indirect energy use is accounted by the use of energy intensive raw materials. The energy losses would thus comprise direct losses and indirect losses through scale loss and low yields. The direct energy cost in the SRRMs is estimated at 25 – 30% of overall production cost.

The steel-rerolling sector is further characterized by the following:

- Outdated technologies and practices.
- Low information and awareness levels.
- Inappropriateness of generic energy efficiency technologies developed.
- Lack of incentives to cater to small scale energy efficiency projects.
- Lack of experience in accessing external funds.
- High investment costs of energy efficiency technologies.
- Low research and engineering base and other institutional linkages.

Tables 1 and 2 detail the high energy-use patterns and the scope for reducing energy consumption in the secondary SRRMs.

Table 1. Energy Use Pattern in the SRRM Sector in India

Region	Furnace oil/Natural Gas			Coal	Total	Specific Energy Use		
	Batch	Continuous				F.Oil	Coa	Electricity
		Stand Alone	Composite			(L)	(kg)	(kWh)
North								
'000 tonnes	890	5960	1000	1250	9100	56	226	165
No of mills	67	211	15	167	460			
South								
'000 tonnes	140	2496	400	930	3966	66	269	192
No of mills	15	85	6	124	230			
East								
'000 tonnes	95	1936	350	960	3341	60	264	190
No of mills	7	37	5	128	177			
West								
'000 tonnes	250	3458	550	1025	5283	65	264	186
No of mills	28	160	8	137	333			
Total (All India)								
'000 tonnes	1375	13850	2300	4165	21690	61	253	180
No of mills	117	493	34	556	1200			
Distribution								
Tonnes (%)	6.3	64.0	10.5	19.2	100			
Mills (%)	10.0	41.0	3.0	46.0	100			

Table 2. Energy Use in SRRMs: India vs. Europe and Japan

Energy Emission Factors	India		Europe				Japan	
	All Sections		Medium Sections		Light Sections		Hot Charge	Cold Charge
	Obsolete Technologies		Eco Tech	All Tech	Eco Tech	All Tech		
	F.Oil	Coal	Mixed Gas		Mixed Gas		Fuel oil	
Fuel, MJ/tonne	2440	5060	1500	1310	1600	1350	540	1040
Power, J/tonne	1518	1860	736	598	966	782	828	874
kWh/tonne	165	202	80	65	105	85	90	95
Energy, MJ/tonne	3958	6920	2236	1908	2566	2178	1368	1914
CO_2, Kg/tonne	515	900	270	230	310	260	180	250
Yield,% *	90	90	97.5	97.5	96	96	94-95	94-95

(Source: DCI&S Survey Report, 1997)

* Best yields obtained elsewhere in the world: Sections-97.5%, Wire rod-98.5%, and Bar-97.3%. Energy consumption in the SRRMs in India is 1.8 times in the case of fuel oil based mills and 3.0 times in the case of coal based mills, when compared to energy consumption in similar mills abroad.

A study of 90 units, selected from 5 geographical clusters during the PDF-B phase, revealed that the sector has tremendous potential for energy efficiency improvement. The sector primarily caters to the growing niche markets, and meets customized low volume requirements in various steel grades and shapes. Since the markets for these products are likely to grow further, there is a potential opportunity for improving energy efficiency levels.

1.3 Energy Efficient Technology Packages for Steel Rerolling Mills

A comprehensive survey of was carried out to identify "EcoTech options" available for the SRRM sector. EcoTech refers to a set of technologies that are energy efficient, and economically viable under local conditions. In all 13 EcoTech options were considered in the area of combustion and 19 in the area of rolling mill and electrics. A detailed energy, environment and technology audit of the 20 front-rank SRRMs undertaken during the PDF phase has established a clear opportunity to reduce unit energy consumption levels in the sector, and thereby achieve national and global environmental benefits[7]. This study has quantified the gap between the investment opportunities in energy efficiency improvement and the actual practice. The PDF phase also examined various investments; technology interface issues and developed energy supply curves (cost of conserved energy - CCE) at 30% discount factor. The technology packages have been evolved from a basket of EcoTech options available to the SRRM sector. The five technology packages (according to mill size, configuration and type of fuel used) and two customized packages integrate EcoTech options in the areas of combustion, rolling mill and electrics. In addition, customized packages that are common to all the packages and 'pre-

[7] With an average EE production of 12.9 million tons in 20 years' project cycle, the following energy and environment benefits would be expected to accrue:

- Energy Conservation Benefits: Energy Saving = 21.1 PJ Valued at US $ 118.7 million, equivalent to $ 9.2/ton or 35% of the energy bill paid by mill owners at an average investment cost of $ 9.2/ton.
- National Environment Benefits: Annual average $ 18.0 million measured directly as a function of reduced soiling, increase in urban estate values, increased tree and crop growth and reduced water pollution resulting from low level of particulate emissions, low PM-10 and PM-2.5 emissions, low SOx and NOx emissions.

requisites' to their adoption were evolved. Four technology packages, which are low-cost integrated types, fall under the oil/NG fuel category and one in the coal category. The latter is in two parts, (a) and (b). The adoption of the technical packages is expected to result in about 30% saving in the primary energy use with nearly same amount of CO_2 reduction. Summary of the packages with details of EcoTech options, energy saving potential cost of conserved energy (CCE), and paybacks periods for investments are placed at **Appendix 1**.

The energy saving potential and economic indicators of the "EcoTech" options and the packages has taken into consideration the priorities of industry and other stakeholders. These include parameters such as profitability and willingness to invest, reflected as the internal hurdle rate or the discount factor, benefits in non-energy applications and other competitive aspects. Some options have relatively low energy saving potential but have high negative values of CCE and high IRR indicating high cost recovery. Also, in some options energy saving potential is high, but there is a relatively low negative CCE, low IRR and low cost recovery. Each package is optimally designed with a suitable combination of range of options so that industry has sufficient willingness to pay and at the same time it serves global and national objectives. There is a significant market potential of the technical packages, which has been estimated along with EE options at US$ 120 million. However, in order to realize this potential, the identified barriers have to be removed.

II Issues to be Addressed

2.1 Target Sector

The target sector for this project is exclusively the small and medium enterprises (SMEs) engaged in steel rerolling. This sector has more than 1200 units in operation across the country with concentration in some pockets. The sector has been divided in to 5 geographical clusters for effective dissemination of project benefits.

2.2 Barriers to Accelerated Development

In general, the deployment of energy efficient technologies in the sector has been slow. The difficulties faced are due to small capacities, limited resources including information, large variation in inputs and product-mix with near absence of institutional support services. Based on studies of the sector during PDF-B phase and extensive consultations with all stakeholders, the following specific barriers to implementation of EE technologies in the sector have been identified.

Lack of Need-based Financing Approaches and Mechanisms

Financing of technology projects in the SME sectors is still underdeveloped in India. The leading banks and financial institutions (FIs) are reluctant to lend for individual EE projects due to lack of understanding of technical and financial aspects of new technologies and at times, due to lack of investment portfolio. There is a lack of domestic venture capital instruments to finance new technologies. Other funds, namely, Science and Technology funds, technology fund of ICICI, bilateral and multilateral funds are not easily accessible to the sector due to different lending norms, and lengthy and cumbersome procedures. The small and medium mills, which usually have a low equity base or little exposure to equity and credit financing, lack capability to prepare application forms, credit documents and business plans to comply with standard procedures and

lending norms of FIs and other lending agencies. In general, internal funds (surplus funds) are invested in backward integration, setting up new units or diversifying into other businesses.

Absence of Effective Market Transformation Strategies Specific to the SME Sector

While some state-of-the-art technologies have been introduced in the SRRM sector, they have not been widely distributed and penetration has remained low. The reasons identified are lack of institutional capabilities to provide design and demonstration support, lack of capacities to manufacture standard EE equipment/facilities suitable for the smaller mills, and lack of experience and expertise to operate high-end technologies. Production of energy-efficient equipment, based on technologies developed in other countries has just begun in India. But, due to a lack of in-house engineering and technical manpower, design, and engineering skills, research and development support, absorption of EE technologies within the sector has remained low. The barrier external to this sector such as poor infrastructure and lack of institutional channels/capacity for technology transfer further limits the commercialization potential of new technologies. The factors that have accentuated the present situation include low availability of energy services (design and development, technology application at user-centered interface, implementation, etc.), low market size, low scales of operation, and non-availability of standard designs and EE solutions. Although there is a potential for ESCOs in the small and medium scale sectors, these barriers have to be addressed independently.

Lack of Information

Due to lack of information and institutional mechanisms for ensuring information flow, there has been a virtual absence of technology databases. The information on EE technologies, configurations, techno-economic parameters, operating experience and type of risks associated, is marginal in nature and highly asymmetric. The suppliers of technologies have generally ignored the need for customizing information packages to suit mill-specific design and operating practices, interface and managerial issues and performance norms. Technologies supplied in a situation like this have under-performed when compared with their performance elsewhere.

Limited Institutional and Industrial Capacity

There is insufficient capacity of stakeholders at all levels, operating institutions and lack of business support network at national, regional and local levels to implement energy efficiency projects. Due to weak human resources and institutional capabilities (design, engineering and implementation support), the perceived technical and financial risks are high. Further, the cyclic nature of steel industry has forced the SMEs in the sector to look for short-term objectives rather than long-term EE solutions.

Low Priority and Bounded Rationality

The share of direct energy costs is in the range of 15 to 25% of the total operating costs in the SRRM sector. Since the sector experiences acute shortage of energy intense raw materials used as feed stock known as semis (ingot/billets) for rerolling from time to time, EE investments tend to be a low priority[8]. Individual entrepreneurs manage the steel mills in the unorganized sector. Due to limitations of time and ability to analyze information, they have neglected EE

[8] The SRRM sector is using all kinds of semis viz. Induction furnace ingots, billets, rerollable scrap, blooms and slabs from main producers etc The price difference varies between Rs.2000 – 3000. If industry reduces the average price by Rs.700-800, this works out to more than the energy savings expected after making considerable amount of investment.

investments/projects. Inertia is another dimension of the problem, where industry tends to be committed to the status quo.

High Transaction and Hidden Costs

Due to the SME nature of the sector, energy efficiency potential of the sector can only be achieved through implementation of a large number of small projects. Advanced technologies carry high transaction costs. The proportion of this cost to the basic investment costs of technology is high in SMEs as compared to large enterprises. The market has continued to remain biased against smaller EE projects, especially in cases when it takes more than two years to recover initial investments on annualized basis. Technology providers have very often ignored additional costs invariably associated with the implementation of new technologies at the operating plants. These costs include re-engineering, replacement or modification of existing plant and facilities, shifting of location, loss of production, 'add-on' fuel and power consumption, etc. The uncertainties in the 'projected' and 'actual' costs act a barrier in the development of the EE market.

Limited Commercial Experience

The commercial viability of EcoTech options and energy efficient technical packages is yet to be tried and proved in the sector on a visible scale to improve the confidence level of investors. This is a 'critical' factor in widespread adoption of EE technologies especially when some technologies proposed under the project are new to the investor in the sector or first time in the country. This has resulted in the low confidence level of the small-scale investors.

III Indicators of National Priority

The proposed project is consistent with the national programs, policies and priorities, as well as with nationally and internationally agreed-upon programs for sustainable development. The Central Government has considerable emphasis on improving energy efficiency, as is evident from enactment of Energy Conservation Act and formation of Bureau of Energy Efficiency (BEE). The goals and objectives of the project are in conformity with the mandate of BEE.

India has ratified the UN Framework Convention on Climate Change (UNFCCC) in 1993 and the Kyoto Protocol in 2002. It is currently in the process of preparing the national communication to the UNFCCC in accordance with the Convention. The proposed project would lead to reduction of GHG emissions and thereby contribute to the Climate Change mission, while simultaneously protecting the interests of small business and associated employment potential by enhancing the capacity and economic viability of SMEs through better energy efficiency, leading to reduction in CO_2 emissions.

The Ministry of Steel, as well as Technical and Political GEF focal points have endorsed the project brief of the proposed project that has been prepared in accordance with UNDP/GEF guidelines and approved by the GEF Council in May 2003.

IV Lessons Learnt from Previous Programs

In the past there has not been a comprehensive effort for EE improvement for steel re-rolling mill (SRRM) industry in the SME segment. The efforts of PCRA in the past were limited to only the reheating furnaces operating with furnace oil. The industry did have marginal gains but the agency did not address to totality of issues because their objective was limited to conservation of petroleum products only.

The government has now initiated the program to address the viability of energy efficiency improvement with emphasis on removal of barriers for long-term sustainability of project outcome. This project will demonstrate the necessity for integrated management of infrastructure, financing mechanisms, local as well as administrative machinery of government for EE improvements in the sector.

Detailed stakeholder consultations have already been undertaken during PDF-B stage and sponsors and promoters have been fully consulted during project design. The project clearly focuses on industry needs and institutional business models and aims to reduce the transaction costs and remove barriers.

V Reasons for UNDP Cooperation

UNDP has been supporting energy-environment projects in India and has a large experience of working with governmental and non-governmental agencies. The proposed project contributes towards the environmental goal of reducing GHG emissions. The project design is consistent with the strategic areas of support identified in the policy framework, and global conventions and funding. The project supports a major intended outcome of global concerns and commitments addressed at the national level through mainstream national development planning machinery. The thematic area of Vulnerability Reduction and Environment Sustainability of the new UNDP Country Programme for India (2003-2007) envisages support to meet the goals of global conventions and mobilize resources from diverse sources, including the Indian private sector. This will address national/regional concerns such as the management of globally significant area of climate change and demonstrate technologies, including innovative approaches, to address linkages between global environment issues and national developmental challenges.

This project is consistent with priorities of UNDP to support sustainable energy use and build capacity to achieve global environmental and developmental goals. The project proposes to demonstrate best practices and innovative approaches. As a GEF implementing agency, UNDP facilitates the Government of India's commitment to promote sustainable technological interventions such as those proposed under this project. Capacity building for enhanced investments in EE projects, sustainability of small enterprises, improvement in work environment for workmen and improvement in quality of life would be achieved through the project. The project activities thus contribute to promotion of all these goals of UNDP.

Finally, the objectives of the proposed project are consistent with the objectives of the GEF Operational Programme No. 5 on "Removing Barriers to Energy Efficiency and Energy Conservation".

C. THE PROJECT

I Project Objectives

The global development objective of the project is to increase end - use energy efficiency of SRRM sector and to reduce associated emissions of greenhouse gases (GHG). The immediate objective of the project is to accelerate the penetration of environmentally sustainable energy efficient technologies through removal of barriers, which would ultimately lead to large - scale commercialization of EE technologies in the sector.

II Project Strategy

Major thrust of the project is on promotion of sustainable and viable energy efficient technologies in a market - driven manner. This would be achieved through reduction of transaction cost of EE technologies, opening up innovative channels for financing of EE Projects, development of human resources at local, regional and national level, facilitating communication among institutions and assistance to SMEs in the sector to develop market - based bankable energy efficiency projects. The five-fold strategy aimed at SMEs in the sector will cover:

- Technology Demonstration - Economic and technological characteristics of SRRM industry along with its distribution pattern in the country has been thoroughly investigated and understood prior to designing the GEF program. A report has been prepared on available EcoTech options during PDF-B phase. Each option has been individually analysed to study its suitability for interfacing with brown field industry along with required investment, returns in terms of paybacks, CCE etc. these have been further clubbed to maximize EE gains by developing a package that is considered 'pre-requisite' for all and 5 - specific technology packages that suit requirement of units with varying capacities and current level of technology. While four packages are for oil or gas based units, one package is for the very small units that use coal for the purpose of reheating steel. The later has further 2- options- a) burning lump coal on grate and b) pulverized coal combustion.

  The technology packages would be demonstrated in 30 sample units spread across 5- geographical clusters to demonstrate techno economic viability.
- Cluster Approach - This would involve development of business and commercial networks (business support system), encouraging cooperative procurement of technologies and services, installation of central facility for providing clean coal/gas through adoption of state-of-art technologies like 'caldron process' or similar other 'clean coal technologies'.
- Institutional Support - Strengthening of institutional arrangements for long-term sustainability of the project objectives has been built in to the project design and a self-sustained technology information resource and facilitation center (TIRFAC) would be set up that would continue to provide various technical assistance (TA) services to the SMEs in post project period.

- Financial Support - Innovative financing mechanism such as ESCOs would be introduced for the first time in the industry that has a high risk-perception. Development of 'investment portfolios' with the banks/FIs, introduction of risk-guarantee on a limited scale etc has been envisaged.
- Market Development - Capacity building of all stakeholders including financial and technical support to domestic equipment manufacturers (DEMs).

These strategies would be translated into action programs by availing technical assistance (TA) support earmarked for removal of barriers. This would be achieved through two distinct components - Program Component and Investment Component.

- The Program component shall comprise of following activities:
  - Benchmarking EcoTech options and technology packages.
  - Strengthening institutional arrangements.
  - Effective information dissemination.
  - Capacity building of stakeholders.
  - Establishing technical and financial feasibility of EcoTech options and technology packages.
  - Introduction of ESCO and third party financing mechanism.
  - Establishing technology information resource and facilitation center (TIRFAC).
- The investment component would involve development of sample units as model for demonstration of technology packages and EcoTech options developed during the PDF - B phase. The investment for this component would come mainly through industry's own resources supported by finance from Commercial Banks and FIs and other funding agencies.

Representative SRRM units have been selected based on scientifically designed criteria and in proportion to the distribution pattern of the industry in five geographical clusters. These units represent "critical mass" of the SRRM sector, which would be provided TA support for implementation of identified technology packages.

This would provide a platform for validation of technology packages and assumptions made in context of investments, returns and paybacks. It would facilitate establishment of techno-economic feasibility of the packages and EcoTech options. These select units would also assist PMC in the process of benchmarking and capacity building through development of 'best practices', SOPs, SMPs; field training of energy managers, etc.

This component would also include strengthening the manufacturing base for EE devices through financial and technical support to domestic equipment manufactures (DEMs).

III Replication

The steel re-rolling mill (SRRM) sector in India has maintained a growth level of 5.5 to 6.0 percent in the past. This pattern of growth is expected to continue in the next two decades. The production from the sector, therefore, would rise from the level of 10.0 million tonnes per year (mtpy) in 2002 to 16.5 mtpy by 2012 and to 29.0 mtpy by 2022. The EcoTech options and technology packages identified and developed during the PDF - B phase match with energy

efficiency needs of industry and have attractive techno - economic indicators. The vast spread of selected sample units in different geographical clusters, representing large variations in reheating furnace design/fuel used, mill configurations, input stock and product - mix, etc. shall provide vast exposure to the industry. The successful demonstration and achievement of results by these units along with effective dissemination and capacity building measures are expected to enhance replication potential. This process would be accelerated through adoption of 5-step replication strategy as follows:

Step 1 The entire industry in the country would be divided into five geographical clusters, wherein the sample units would act as centres of excellence. Expert consultancy agencies shall be engaged in each of the clusters to undertake detailed survey/mapping of SRRM units, level of current technologies and potential for improvement in both technology and operating practices.

Step 2 Strengthening of institutional arrangements particularly with the banking sector through development of investment portfolios for the SRRM sector in each cluster/zone. Securing commitment of local and state level administrators, policy makers to support Energy and Eco - efficiency initiatives.

Step 3 A system would be developed for sharing information within the zone, development of local leadership for promoting technology management skills, collective sourcing of technical support services, technologies, spares and other inputs. This would be further strengthened with intervention of TIRFAC at the national level. A competent core group of entrepreneurs would be developed for cooperative procurement of services for hedging the transaction costs, post - installation assistance and after - sales services.

Step 4 The documentation and dissemination of 'best practices', monitoring of energy consumption patterns/profile and development of progress indicators for assimilation and absorption of technologies together with training and deployment of energy managers in each zone would lead to large scale development of energy efficiency projects in the zone.

Step 5 The case studies of financial returns on investment and demonstration of cost recovery of EE projects would lead to development of a culture of 'willingness to finance' amongst local banks/state financial institutions.

The capacity building activity for all stakeholders at state/zone/national level and various other technical support services through the TIRFAC would facilitate fast replication of EcoTech options and technology packages. The replication potential for the SRRM sector has been studied in depth taking into consideration the present dynamics influenced by fiscal policies of the Government of India and expected impact of the project activities. This is projected in the following table.

Table 3. Estimated Replication Potential in Post-Project Period (2008 – 2012)

Description	Unit	2008	2009	2010	2011	2012	Cumulative
Replication Parameters							
Sector Production	Mill. Tons	13.2	14.0	14.8	15.6	16.5	74.1
Sector Prod. Replicated	Mill. Tons	4.5	5.9	7.2	8.6	9.9	36.1
Energy Saving							
Energy Saved	PJ	6.5	8.6	10.6	12.7	14.7	53.1
Fuels, Power & Material saved							
Furnace Oil	Kt	58.8	77.0	95.5	114.1	132.7	478.1
Thermal Coal	Kt	103.9	137.8	171.0	204.0	237.0	853.7
Power Coal	Kt	65.9	86.9	108.2	129.6	151.0	541.6
Material	Kt	59.0	77.3	95.6	114.0	132.4	478.3
Emissions Avoided							
CO_2	Kt	634	830	1025	1219	1413	5121
N_2O	Tons	12.6	16.5	20.5	24.5	28.5	102.6
SO_2	Tons	7036	9234	11439	13662	15885	57256
TSP	Tons	888.6	1177.4	1463.9	1750.8	2037.7	7318.4
PM-10	Tons	284.4	376.8	468.4	560.2	652.1	2341.9

A consulting agency shall be contracted for each cluster to undertake detailed mapping of the region for technology and operating efficiency status of SRRM industry. It would also identify banks/FIs in the region with large exposure to the sector and shall facilitate development of 'investment portfolio' in association with PMC. A system would be developed for sharing information within the zone. These activities will form part of capacity building measures under the project.

III Project Results

3.1 Development Goals

The project would contribute to reduction in GHG emissions through increased energy efficiency of the steel re-rolling mills. This would be achieved by strengthening institutional arrangements, information dissemination and capacity building of stakeholders for enhanced private sector investments and removal of various technical, financial, institutional and market barriers, as identified during PDF - B phase. The GEF capacity and replicated capacity created over a period of 20 years including project period of 5 years is expected to give a cumulative production of 257 million tons as projected in **Appendix 2.**

Indicators

The cumulative reduction of CO_2 emissions is projected at the level of 36 million tonnes over a period of 20 years. Expected reduction of all emissions from GEF and replicated capacity is projected in **Appendix 3**.This would be monitored periodically for individual sample units, and different clusters, taking into account the reduction in specific energy consumption including indirect savings resulting from reduced burning loss, increased mill availability through reduction in breakdowns and unscheduled mill stoppages and improved overall yield of rolled product.

3.2 Technical Assistance (TA) Component

Outcome I: Benchmarks for EcoTech Options & Packages Established

Output 1.01 Review report on techno - economic and commercial status of Energy Efficient clean technologies relevant to SRRM sector utilizing maximum bandwidth for future application and development of investment norms for all EE options and technology packages.

Activity 1.01 Benchmarking is the most cost-effective method developed over the years to identify best practices and establish corresponding process parameters. In case of SRRM sector, there are vast variances in equipment design, operating process parameters, input materials and the product mix. As such, it is the first necessity to establish benchmarks for energy use in the steel re-rolling process to achieve energy efficiency improvement in the sector.

This task would be assigned to a consultancy agency with facilities for energy and process audit and would be conducted in two stages. (a) Establishment of process parameters like specific thermal energy consumption, electrical power, burning loss (%), yield (%), roll consumption norms (tonnes/mm) for common rolled long products such as rounds, flats, light structurals, etc. These would be established with reference to the input stock and mill configuration (b) Benchmarking for technology packages based on audits/studies in 'sample units' and the operating results.

Output 1.02 Development of energy and environment labels, standards, and benchmarks for equipment and devices used in steel re-rolling industry.

Development of standard methods and tools for design engineering and implementation of EcoTech solutions in SRRM sector.

Information modules for financing institutions, government and policy makers, and industry partners.

Activity1.02 Eco labels and energy consumption standards shall be developed for various equipment and devices used in the SRRM sector. These include combustion equipment such as burners, blowers; recuperator, gearbox, rolls, etc. The norms so developed would provide an opportunity to assess capabilities of domestic equipment manufactures (DEMs) vis-à-vis international standards and would facilitate development of prescriptive standards, minimum energy performance standards (MEPS) and average standards for all equipment and devices.

The outcome of benchmarking activities at 3.01 would be used to develop information modules for dissemination to financing institution, government and policy makers and industry at large. As follow up of standard designs and re-engineering of plant facilities, manuals would be developed for technology packages and EcoTech options. These would be disseminated to the DEMs for strengthening the local manufacturing base and subsequent application in the industry.

The steps involved are development of scope of work and TORs for the consultants/experts, selection of agency and their appointment. The outputs shall be reviewed periodically and the data generated shall be stored with Documentation and Information Cell for further reference and dissemination.

Monitoring indicators for these activities would be -i) finalisation of TORs, ii) selection and appointment of team of experts, iii) Issue of contract to the lead agency/institution, iv) periodic progress reports on development of benchmarks, v) performance evaluation reports for validation of benchmarks for technology packages and vi) publication of information modules and manuals.

Indicators of Outcome I

- Industry complies with energy-cum-environment performance norms bench marked against 'best-practice' norms achieved in respect of similar technologies in India or abroad and validated through actual performance of EMUs after one year of their stabilization.
- Techno-economic viability including cost recovery (CCE, IRR, paybacks, BEP, etc.) is established.
- Energy labels and standards developed by end of third year.
- Information module developed and disseminated by the end of 18 months of the start of the project.

Expected Impact of Outcome I on Barriers

The activities in this component will primarily address the absence of EE market transformation strategy and partly the lack of need based financing approvals and mechanisms related barriers.

Outcome II: Strengthened Institutional Arrangements

Output 2.01 Network of associations of all stakeholders to provide technical, financial and market inputs to SRRM sector and for securing policy and administrative support.

Activity 2.01 Association of "lead" industrial SRRM units participating in the project along with technology providers, financial institutions/banks, design and engineering firms/institutions and independent experts/consultants would be developed to provide technical, financial and market inputs.

This forum would be developed as an independent association of industry that would function in a professional manner with management support from PMC/TIRFAC in the initial stage. Subsequently, the association would develop as spokesperson of industry to secure policy and administrative support within legal framework of the country and would act as major force in promoting replication of EE projects.

This task would be assigned to a management consultant. Successful functioning of regional groups would act as a nucleus for the development of activity at the national level.

Output 2.02 Network of multi - disciplinary national and international experts and successful innovative SRRM units for experience dissemination, problem diagnosis and development of solutions designs at local costs.

Activity 2.02 A self - financed business network of multi - disciplinary experts, both domestic and international, including successful entrepreneurs would be established with the objective of dissemination of experience. Services of this expert forum would help problem diagnosis and development of solution designs at low costs that are affordable to the industry in the SME segment. This forum would also provide consultancy services for development of "Bankable" EE projects including design, engineering, installation, environment and safety validation services.

This activity would adopt the functional model of USAID and NMCP (Netherlands Management Cooperation Programme) in developing association of industry experts and mechanism for their deployment in SMEs for specific assignments. This activity would also avail guidance and support from the Department of Science and Technology (DST) of GOI for development of consultants. Capacity building workshops for consultants would strengthen this activity during the project.

Output 2.03 Internationally linked institutional arrangement aimed at establishing global relations for two-way communication on current developments in technology and to facilitate technology transfer.

Activity 2.03 Development of internationally linked institutional capacity is needed for technical co - operation and technology transfers. This mechanism would ensure continuous upgradation and implementation of new technologies in the industry. This would also help in development of research and technology alliances, joint ventures, etc. both in India and abroad.

The monitoring indicators for these activities would include - i) Finalisation of framework of associations, ii) Appointment of a lead agency/expert to initiate the forums, iii) Issue of contract to the lead agency/institution, iv) Reports on activities of the institutions.

Indicators of Outcome II

- Job contracted to specialist agency/organization, preferably, international with sufficient experience in the line. Completed successfully by the end of 3rd year. Job as includes establishment of business support networks and development of internationally linked institutional capacity.
- Hardware facilities namely prototype development, technology testing and calibration along with software facilities put in operation by the end of 3rd year.
- Design, standards and implementation manuals put in practice during the same period.

Expected Impact of Outcome II on Barriers

The activities in the component will establish a long-term institutional framework, improve utilization of exiting institutions, facilities and resource personnel, build institutional capacity/expertise to provide energy services at local costs and provide improved connectivity within and outside to mitigate technical and financial risks.

Outcome III: Effective Information Dissemination Programme

Output 3.01 Establishment of worldwide database on current and new developments in technology, their sources and investment requirements, projects in progress, market trends, resource personnel etc.

Development of communication channels including web based EE -Net for information dissemination on technology markets, funding schemes, etc.

Activity 3.01 Comprehensive database on current and emerging EE technologies including sources of supply, investments, expert analysis, case studies on implementation, etc. would be established with an efficient system for retrieval, updating, analysis and dissemination. A national information centre would be established in the Software Centre of TIRFAC in New Delhi. This activity would involve system design, development of software and report formats. The system would also maintain data on operating performance of sector, standards, benchmarks and baselines.

This would function as a part of TIRFAC for storage and retrieval of variety of data and information related to steel re-rolling sector. Software and MIS experts would be assigned the task for development of an integrated data management and information system.

Information dissemination channels would be established in the form of web based EE - Net and regular publications/bulletins/newsletters covering information on technical, financial and related developmental issues.

The design of web based EE - Net would be developed and installed through an expert contractor. This would be subsequently, maintained by the Documentation and Information Cell. The publication activity would also managed by the same cell as part of TIRFAC.

Indicators of Outcome III

- Report identifying information needs, information sources, dissemination channels and MIS finalized by end of 1st year.
- System design, alliances and mechanism established by end of 2nd year.
- Information dissemination channels & access procedures operational by end of 3rd year.

Expected Impact of Outcome III on Barriers

The establishment of an effective information system and communication channels will help to remove the barriers pertaining to lack of information and information asymmetry which has limited the growth of the technology market.

Outcome IV: Enhanced Stakeholders Capacity

Output 4.01 Report on assessment of capacity building needs of major stakeholders to facilitate implementation and absorption of advanced EE technologies in the SRRM sector and Mapping of clusters.

Activity 4.01 A considerable groundwork on general assessment of capacity building needs has been carried out during interaction with stakeholders in the PDF - B phase. Workshops and consultative meetings with stakeholders in different regions would be arranged with involvement of all affected and interested parties including the wide range of relevant governmental ministries and agencies. Involvement of stakeholders at this stage is to ensure identification of all issues, which might get overlooked in normal course, but may have significant importance for certain stakeholders.

Output 4.02 Network Strategy for Capacity Building

Activity 4.02 Based on initial assessment of capacity building needs, a holistic approach would be adopted to address to various dimensions or levels of capacity, which include the individual, the institutional and the systemic. All these three levels are closely interlinked and require coordination and complementary efforts. This activity would have project approach with milestones, targets for coverage, specific start and end dates and a very specific goal for each of the activity, which shall be critically, reviewed for continuous improvement in subsequent annual activity plans. Design of training programmes/workshops on EE technologies, technology management and co - operative procurement/implementation will be promoted through this activity.

The suppliers, Banks, Consultants, Authorities and host of other stakeholders that form part of the SRRM industry business circle need to be strengthened in a way so that their capacity building ultimately contributes to the strength of industry. This is the network approach of the project activity.

Training of officials from local administration, state and central govt. institutions and departments/agencies will be associated with special pilot programs of demonstration projects.

Special pilot programs would center on 'sample units' that would demonstrate successful implementation of EcoTech options and technology packages. Select group of officials from local administration and government departments/agencies dealing with SRRM industry would be identified for this programme in all clusters. The programme would commence with orientation of officials with regards to project objectives, methodology and role of 'sample units'. The group would meet periodically to review the operating performance in terms of energy parameters and emission level of 'sample units' as well visit respective units in the cluster. The positive results of the 'sample units' would facilitate better understanding of the officials with regard to the role of technology in improving energy efficiency and resultant reduction in pollution levels.

Output 4.03 Methodologies and Tools of Energy Management Developed

Activity 4.03 Development of standard operating practices (SOPs), standard maintenance practices (SMPs), and development of "Best Practice" program form major outputs that promote EE improvement in the industry.

Standardization of operating practices and maintenance practices has direct bearing on energy efficiency improvement through reduction of delays. A good number of SRRM units are acquiring ISO 9000, mainly to improve brand image of their product and increased market acceptance. As a short and mid - term strategy, the project would build upon from this stage as a nucleus approach to introduce SOPs and SMPs. In the long term strategy, the concept of ISO 14000 with stress on environment management system (EMS) would be introduced in select units with a view to develop a model process for "greening" of the mills. The following action plan is envisaged - Introductory workshops shall be conducted in each cluster to familiarise industry on advantages of standardization with specific reference to ISO 9000, SOPs and SMPs. This would also cover introduction to main features of ISO 14000 and benefits of voluntary compliance in the long run.

Appointment of a consulting agency to prepare a document on international experience of implementing Energy Management System (EMS)/ISO 14000 in SMEs particularly in the East and Southeast Asian Countries, with a view to promote Life Cycle Assessment, Eco-Labeling, etc. Linkages shall be developed with NGOs like ECOLOGIA & Ecoline taking advantage of the work carried out under ISO/TC 207 for sharing experience.

Development of at least two steel re-rolling units in the SME segment as 'Green Mills' for demonstration of ISO 14000/EMS implementation concept. The experience gained shall be shared with both national and international experts through a workshop for developing a model for SME units in India.

This assignment would also cover compilation of case studies on "Best Practice" concept application in different areas in India and abroad to develop an action plan for implementation of "Best Practice" program in SRRM sector.

Implementation of "Best Practices" program in 2-units will be followed by impact assessment on quarterly basis. The outcome would be documented and disseminated to industry through training workshop. A manual on "Best Practices" program implementation with specific reference to steel re-rolling sector would be prepared and disseminated to industry.

Trainers' workshop to impart training to local consultants and development of Energy - cum - Investment managers will be another management tool that will create awareness of regular audit and action for implementation of recommendations.

In the BAU scenario, very few consultants are available for the SRRM sector. The consultants operating for small-scale sector are mostly individuals without adequate information resource and support staff. Capacity building activity for these consultants would cover exposure to - a) new technological developments, b) standard energy audit practice, c) problem diagnosis and search of solution