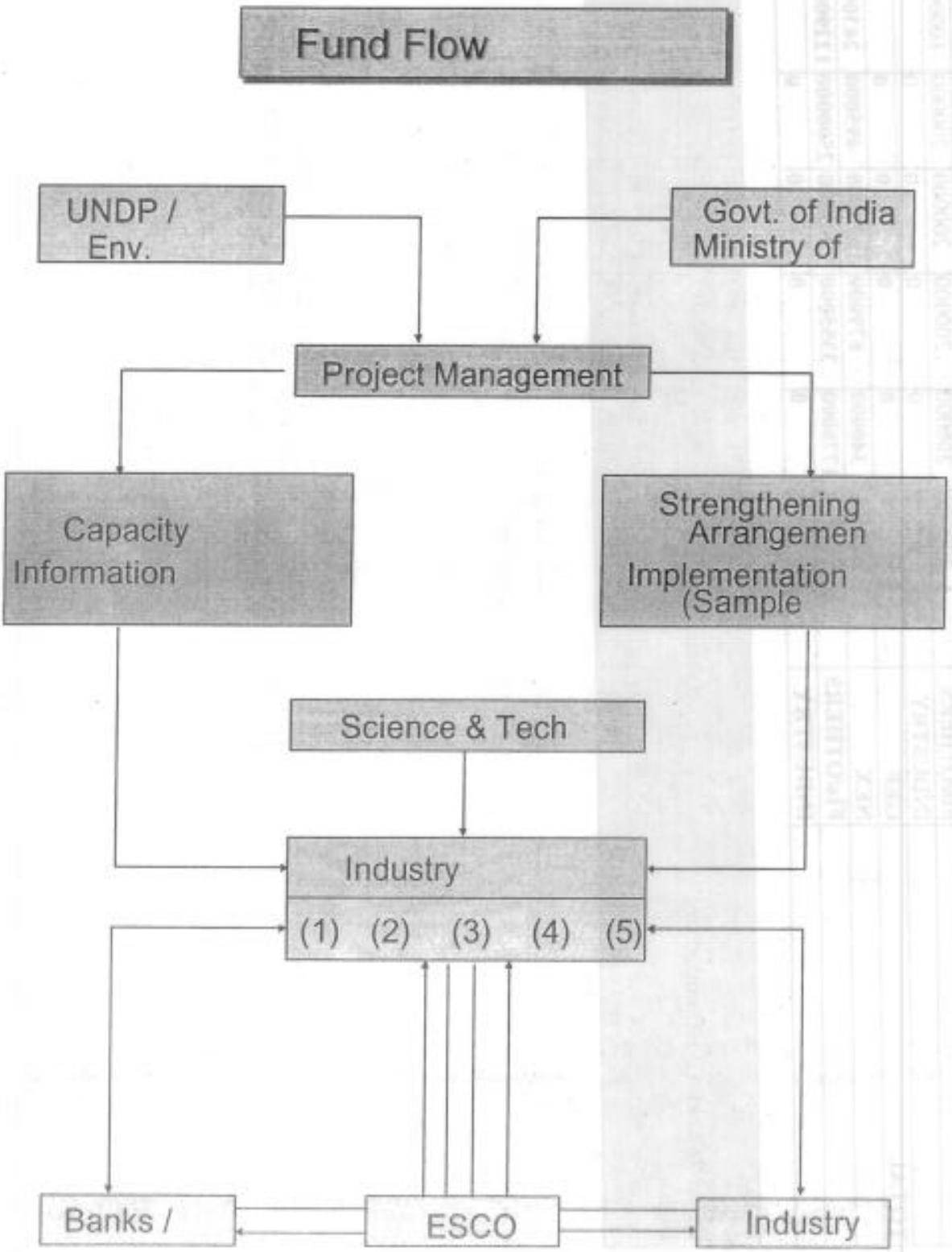
Annex B2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Annexure C
STAP Roster
Technical Review and Response to STAP Review

Summary and General Review

The steel rerolling mill (SSRM) sector is unique to India, especially due its widespread application, and large number of small mills (1200). The proposal provides a comprehensive approach to deal with the multitude of barriers commonly found in industry and small and medium-sized enterprises (SMEs). A five-year program is proposed to develop, demonstrate, market and disseminate commercially proven energy-efficient technologies in the SRRM sector. The program also tries to build an infrastructure for market transformation through the organization of the industry, capacity building, and the formation of financing mechanisms (ESCO, bank). The proposed approach seems appropriate to reduce or remove some of the barriers found in this industry for energy-efficiency improvement.

However, specific elements of the proposal and program need additional attention to demonstrate the likelihood of success and improve the long-term sustainability of the approach. Below we discuss these aspects in detail. The most important elements that need improvement are:

- More information on the economic and technical characteristics (including distribution) of SRRM-sector is needed to devise an effective and efficient communication strategy.
- Development of a more plausible forecast of the long-term development within the sector, and the impact on program design.
- Improved assessment of the direct and indirect impacts of the proposed program on energy use, GHG emission reduction, local air pollution and air quality, as well as economic performance of the industry.
- Training of SRRM operators and managers needs to be clearly included as an integrated activity to achieve additional savings, and improve effectiveness of the program.
- Embedding of the program and organization into existing international standards (ISO), protocols (for evaluation) and existing experience in working with innovative SMEs.
- Embedding of the program in existing organizational structures of the SRRM-industry on a regional or local basis (if existent).
- Design of an effective and efficient communication and dissemination approach tailored to the specific needs of the SRRM-sector.
- Development of ways and means to ensure the sustainability of the market transformation effort through cost-reduction (after 5 years of establishing the program), partnering, market development and direction of the program efforts (e.g. market segment of the SRRM-industry).

Based on my understanding it will be possible for the proposers to adapt and improve the proposal taking into account my suggestions in the review report. This would strengthen the proposal considerably.

Scientific and Technical Soundness

The large number of SRRMs is a unique characteristic of the steel industry in India. Many of these plants have an extremely small capacity, especially when compared to the international iron and steel industry. Given this unique character, it is advisable that the proposal, or appendices, contain more detail on the sector and its future. The current proposal provides average data, based on an extensive survey in the five clusters of SRRMs. The survey is extremely valuable. However, the proposal does not contain any data on economic, environmental and product quality issues of the SRRM-sector. This is not only important to evaluate the co-benefits of the proposed technology packages, but also to evaluate the most successful direction and implementation of the proposed program (see also below under sustainability and stakeholder involvement).

Given that 75% of the 1200 plants are small-scale plants, there may be serious limitations to the product quality and the consistency of product quality of products of these small-scale plants. The scale of the plants is extremely small. For comparison electric furnaces in the SRRM sector have a heat size of a few tons, while modern electric arc furnaces have heat sizes of over 100 tons. Many of the rolling mills (not composite plants) have an even smaller production capacity. It would be good to provide a distribution of the sizes of the plants to get a better understanding of the industry and be able to better pinpoint the target group of the proposed program within the wider SRRM-industry (see also below under sustainability).

The program proposes the development of efficiency standard and benchmarks. While the standards can help to 'weed out' the inefficient and polluting smallest plants, the use and legal basis for the standards is unclear in the proposal (see also below under sustainability). Also, the use of benchmarks for the technical packages is unclear. This part of the proposal needs to be further developed and the expected use of standards and benchmarks needs to be clarified, and whether these are used with respect to *processes* or *technical packages*.

The program aims at the introduction of *technical packages*, but does not address process and energy management issues. Given the lack of specialized personnel within SMEs, training in 'best practice' management strategies and practices would be an important item to add to the program. Training should not be provided as a single event, but should be provided in the form of continuous learning. Providing a program of continuous training will also help to build an active network of plant operators and managers, contributing to the success of the overall program. It is advised that the proposed center (TIRFAC) would develop and provide the training material, and 'train the trainers'. The trainers need to be based and active within each of the clusters, making communication routes shorter and more effective

The assumed growth scenario (until 2022) seems unlikely, given an increasing demand for higher quality products, and increasing economies of scale to compete on a national

and global steel market.[10] Also, the current capacity utilization of the SRRMs seems very low (60% on average), underlining that future growth can for a large part be met by available capacity. It is unclear from the proposal how much new construction of SRRMs is expected, and how the project will influence the energy-efficiency of the new plants. The current proposal aims at existing SRRMs. However, SRRMs to be constructed (if the scenario in the proposal were correct) provide a low-cost opportunity and new capacity will actually be constructed. The assumed growth scenario is also important for estimating the expected savings (directly and indirectly) due to the program.

To sustain the results of the project it is advisable to focus on the segment of SRRMs that will survive long-term (see also below). This can be strengthened by emphasizing the use of international standards in the selection of mills for the demonstration projects. For example, companies that have an ISO 9000 certification, or will receive one, would be eligible for participation in the program. Furthermore, the project can work with participating SRRMs to foster the use of ISO 14000 and energy management systems.

Although the quantitative basis for the assumptions in the proposal look reasonable, the proposers do often not clearly define the terms used in the proposal, which makes it hard to interpret the technical basis of the proposal:

- Generally, secondary steel production means the production of steel from secondary resources (= scrap). However, the authors seem to use the term to reflect both secondary steel production and SRRMs. However, only part of the SRRMs do melt steel in furnaces, while others may use ingots or billets. These ingots and billets may come from primary and secondary mills. Hence, SRRMs (without the composite mills) are a third segment of the market, and not necessarily part of the secondary steel market.
- The proposers claim that 75% of the 1200 units are 'small scale' the definition of small scale is never given. Is this less then 10,000 tonnes/year or more?
- The proposers use the terms ecotech and alltech, without proper definition of the terms. The International Iron and Steel Institute introduced the terms in the 1998 report "Energy Use in the Steel Industry".[11] In the IISI report ecotech represents a process that makes use of all proven energy saving technologies that are commercially attractive. The alltech process represents a process in which all proven energy saving technologies have been included. However, the proposers use it to define a set of energy-efficiency measures. From correspondence with the proposers it is clear that they used different economic criteria to select

[10] For example, many small inefficient and polluting plants that produced low-quality iron and steel also characterized the Chinese steel industry. In the past decade many, if not all, have been closed, and iron and steel plants have production capacities comparable to international facilities (even though the capacity of individual process (e.g. blast furnace, electric arc furnace, BOF converter) are still relatively small).

[11] International Iron and Steel Institute, Committee on Technology. *Energy Use in the Steel Industry*. IISI, Brussels. Belgium, September 1998.

"ecotech" energy-efficiency improvement technologies (e.g. selecting all cost-effective measures using a 30% discount rate).[12]

- The proposers give average fuel use for the different clusters/regions by fuel in kg of coal and liters of oil, without specifying the energy contents of the fuels used. Using common international energy contents for coal (29.3 MJ/kg) would give an extremely high energy consumption of 7.5 GJ/tonne or rolled steel (compared to 5.06 GJ/tonne in Table 2). Given, the variation in coal quality in India it is recommended to provide energy consumption figures in accepted SI energy units.
- Does the electricity use provided in Table 1 include induction and electric arc furnaces? I assume not, and that solely the electricity in the rolling operations is included.

Hence, the proposers need to develop a clear set of definitions to provide a clearer basis for the assessments included in the proposal.

In this context it is unclear what the purpose is of the comparisons in Table 2. The Ecotech and Alltech (Europe) cases in Table 2 are assessments of best practices around the world (based on the 1998 report of IISI, see above), and not actual average energy consumption in section mills in Europe. The energy consumption figures for Japan seem to be for a hot strip mill, and not for section, bar or wire mills. Furthermore, the plants in Europe and Japan are typically large-scale facilities, and incomparable in size to the SRRMs.

A central element of the proposal is the establishment of a research and information center specifically for the secondary steel industry (TIRFAC) in India. International data collection: this is a sector specific for India, as steel plants in the rest of the world are typically of much larger scale, and even stand alone rolling mills are of much higher capacity. Only a few developing countries would face similar issues. Hence, technology available elsewhere in the world would need to be 'downscaled' for use in the small-scale SRRMs. How will TIRFAC collect international data, select and evaluate technologies specific enough for the SRRM situation? This justifies the research and testing facility to be housed in the center. Also, the institute should be housed in an appropriate organization and location, so that it can easily be integrated in existing networks of SRRMs throughout the five regional clusters.

Global Environmental Benefits (and Drawbacks)

The proposal does not provide an understandable estimate of the overall direct energy savings from the proposed program and estimates of the indirect savings due to dissemination and replication throughout the SRRM sector. In the current proposal a footnote estimates savings at 21 PJ over 20 years. This seems low, as the total potential (30% savings, 100% penetration at current production volume) would be equal to 17.6 PJ

[12] From the technical appendix it can be deducted that the selected combustion measures all have a CCE (or payback period) far below the criteria set for selection. Only the packages developed for coal-fired furnaces come close to the criteria. This suggests that there may be more cost-effective opportunities available in the furnace.

annually. Furthermore, the basis for a project cycle of 20 years is unclear. Burners and motors last shorter than 20 years, as will many other parts of the furnace (lining) and rollers of the section mill. The estimate given in a footnote is impossible to understand without further information, e.g. expected degree of implementation by furnace-type and package (directly and indirectly). The same holds true for reductions in CO_2 emissions, which are currently not estimated in the proposal.

Other Environmental Benefits

The proposal does not estimate other environmental benefits of the improvements in energy-efficiency. This is unfortunate, as these savings will be very important for local air pollution (e.g. SOx, NOx, PM) reduction. Although the GEF Operational Strategy focuses on climate change, these improvements in local and regional air quality are very important for local support of the program. Furthermore, improvements in working conditions and employee health are important co-benefits.

GEF Priorities

The project fits with the GEF priorities as defined in the Operational Strategy for Climate Change and the Operational Program for removal of barriers to energy efficiency and energy conservation. The proposed program will remove and reduce barriers to energy-efficiency improvement in an industry that traditionally is hard to reach with energy policy (SMEs). The proposed technical packages do meet economic criteria, and would lead to "win-win" solutions.

Evaluation

There is a clear need for improved methods of quantitative evaluation of the program results. While it is hard to quantitatively evaluate program elements such as dissemination and stakeholder participation, it is important to measure those elements that can be quantified, e.g. achieved energy savings at the 30 plants, sales of the technical packages and technologies, etc. For this purposes the proposers should develop a clear protocol, possibly following the International Monitoring and Verification Protocol (IPMVP). Furthermore, it is advised to have the evaluation done by an independent organization to ensure unbiased results.

While it is essential to have a representative Project Steering (PSC) and Project Advisory Committee (PAC), these should not be too large to reduce overhead, to reduce delays and complex decision making structures. Furthermore, it seems strange to have large steel plants participate in the PAC for a project aimed at technology improvement in the SRRMs (a competitor). Participation of individuals from the steel industry with expertise essential for the project should be welcomed.

Replicability

The program initially will work with 30 of 1200 SRRMs in India, but a dissemination approach is developed to reach out to the other mills (see also below). The size of the industry would provide ample potential within the sector. Further replication outside of India will be limited, as SRRMs are a development typical for India. However, some of the concepts developed, and especially the combination of a number of approaches for

barrier removal may be replicable in other sectors dominated by SMEs in India and other developing countries.

Sustainability

The sustainability of the proposed program will depend on the establishment of networks and an organizational structure that can survive without additional international funding after 5 years. The likelihood will depend on the effectiveness and efficiency of the program in reaching out to the SRRMs, achieving cost reductions for SRRMs, while demonstrating the overall gains for the Indian economy and (global) environment.

There are three elements in the proposal that need attention in evaluating the long-term sustainability of the program. First of all, the sustainability of the SRRM-sector is an important factor. As discussed above, it seems unlikely to me that the 900 small SRRMs can survive the next decades. I think that the Indian steel industry will follow similar development patterns as elsewhere in the developing world, and ultimately will focus on large integrated mills, and medium-scale flexible plants using scrap, DRI (direct reduced iron)[13] and smelt-reduction as inputs. The larger SRRMs may survive and develop into flexible secondary steel mills. Hence, for the sustainability of the program it is advisable to focus on the plants that are likely to survive in the developing Indian steel market.

Secondly, the sustainability of the ESCO market for industry in India is an uncertainty factor. Outside of India ESCO-activity in industry has been limited, and experience relatively recent. It is unclear from the proposal what the ESCO-experience is in Indian industry, especially with SMEs. This may need more research at the beginning of the project, to identify the most effective and successful ways to improve collaboration between ESCOs and SRRMs. As a backup strategy, the proposal includes working with banks. It may be attractive to actively identify ways to develop appropriate ways of financing energy-efficiency projects in the SRRM-industry by commercial banks.

Thirdly, the overall effectiveness and efficiency of the program has to improve to sustain the program. Because of high transaction costs, any energy-efficiency program with SMEs is likely to have higher costs than other industrial energy-efficiency programs. The specific costs of the program (based on estimated energy savings and submitted financing request), are $1.3/GJ-saved (excluding cost-share industry), which are high. Part of the high costs is due to the actual cost of energy-efficiency demonstration projects (cost-shared with industry), and the start-up costs of an information and research center. Still, the program should search for effective ways to reduce the overall costs for future sustainability and replication.

Finally, it is important provide a sustained regulatory and policy framework for the program. The program may help to develop approaches that can successfully be adapted

[13] India is already one of the larger producers of DRI in the world, using mainly coal-based processes. DRI is used as a high quality iron-input in the electric arc furnace to produce high-quality steel. However, total DRI-production is limited to about 4% of total pig iron production.

to policies, such as the development of minimum efficiency standards for SRRMs and specific product categories. Also, the approach in the project may help to develop similar approaches for other industrial sectors dominated by SMEs. However, for this to happen the government needs to actively support the program with policy initiatives. The embedding of the program in a policymaking framework needs to be clarified and further developed.

Stakeholder Involvement

From the program proposal it is not possible to get a clear picture of the current level of organization within the industry on the regional and local level. To design the most effective and efficient communication and dissemination strategy it is important to use existing channels, as well as appropriate new networks. There are 4-5 clusters of SRRMs in different regions in India, and within each cluster mills seem to have comparable characteristics. What kinds of networks exist within the clusters? Are their networks of SRRMs and are there links to financing, consultants, or other technology and service suppliers? Similarly, how is the Ministry of Steel connected to the SRRMs, and what are the best ways to ensure collaboration between them (which historically has been very limited due to an emphasis on the large integrated producers)? In short, what is the best way to communicate with the SRRMs, as this is unclear in the proposal; it just mentions generic communication methods and provides no evaluation of the relative effectiveness and efficiency. The proposal states that a stakeholder participation of 75 at an earlier workshop was "overwhelming", although it is unclear how many of the participants were from 1200 SRRMs. Hence, I believe it is key for the success of the program to develop the most efficient and effective communication tools that fit the characteristics of the sector (SME, regional clustering, limited organization), and not to develop a separate or competing structure or organization. This needs a strong emphasis in the project and proposal.

Other important elements of stakeholder involvement are the involvement of ESCOs (and to communicate the program and successes throughout this industry) and of other (international) programs in India focusing on SMEs. For example, the UN Cleaner Production Program aims specifically at the introduction of innovative practices and technologies for cleaner production in SMEs. In India, the National Center for Cleaner Production is based in New Delhi, and collaborates with four other institutes throughout the country. Tapping into their experiences is essential to provide increased changes for success for working with SRRMs.

Capacity Building

The proposal is strong on the element of capacity building. The proposed program contributes to capacity building in the SRRM-industry, but very importantly, also in sectors of potential providers of services and technology to the SRRM-industry (ESCOs, banks, and technology suppliers). The establishment of the research and information center for secondary steelmakers can be an efficient way to establish indigenous technology assessment and development capacity. However, to be successful in transforming the SRRM-sector it needs to be clearly embedded in the industry and in a communication and dissemination strategy. There is no need for an additional research

institute that has no connection to or impact on the industry. Hence, it should be carried by the industry. The proposal foresees future sustainability of the center through contribution of the SRRMs. It is very difficult to evaluate the likelihood of such a financing option without further information on the organizational structure of the sector. The potential for SRRMs to contribute to the center is also unclear, given the lack on financial information on the SRRM-industry in the proposal. Hence, this needs clear attention in the program and proposal.

Innovativeness

The project does not contain any new or innovative technical or policy approaches. However, the combination of the approaches in a single sector dominated by SMEs can be qualified as innovative. Some of the elements seem riskier (e.g. the use of ESCOs for SMEs in India) than others, and a comprehensive approach as proposed may reduce these risks.

RESPONSE TO TECHNICAL REVIEW

Responses to the STAP review are provided below in Italics. Where possible, the Project Brief has been strengthened to reflect the guidance provided by STAP.

Summary and General Review

The steel rerolling mill (SSRM) sector is unique to India, especially due its widespread application, and large number of small mills (1200). The proposal provides a comprehensive approach to deal with the multitude of barriers commonly found in industry and small and medium-sized enterprises (SMEs). A five-year program is proposed to develop, demonstrate, market and disseminate commercially proven energy-efficient technologies in the SRRM sector. The program also tries to build an infrastructure for market transformation through the organization of the industry, capacity building, and the formation of financing mechanisms (ESCO, bank). The proposed approach seems appropriate to reduce or remove some of the barriers found in this industry for energy-efficiency improvement.

However, specific elements of the proposal and program need additional attention to demonstrate the likelihood of success and improve the long-term sustainability of the approach. Below we discuss these aspects in detail. The most important elements that need improvement are:

- More information on the economic and technical characteristics (including distribution) of SRRM-sector is needed to devise an effective and efficient communication strategy.

  The economic and technical characteristics of the SRRM sector have been investigated and analyzed prior to the project's design, and detailed reports have been prepared as part of the PDFB phase. A comprehensive evaluation of the mills was conducted on all key aspects --- technical, financial, infrastructural, social and concerns for pollution. Further, the distribution of mills by size, product, region, volume, etc. is now provided (see Appendix -1 for the additional information requested).

- Development of a more plausible forecast of the long-term development within the sector, and the impact on program design.

  The share of the SRRM has been continuously growing. Currently, the SRRM meets 70% of the total long products requirement in the country. Section – 1.2 of the Project Brief now highlights the growth rate of this sector.

- Improved assessment of the direct and indirect impacts of the proposed program on energy use, GHG emission reduction, local air pollution and air quality, as well as economic performance of the industry.

  An assessment of the direct and indirect impacts of the Programme was carried out, as described in. Section 8.4 and Table 7 of the Brief.

- Training of SRRM operators and managers needs to be clearly included as an integrated activity to achieve additional savings, and improve effectiveness of the program.

Section 5.1.4, dealing with capacity building of different stakeholders, specifically includes training of SRRM operators and managers as part of the development of in-house industry capacity.

- Embedding of the program and organization into existing international standards (ISO), protocols (for evaluation) and existing experience in working with innovative SMEs.

  The project will strive to achieve international standards and protocol as part of the long-term strategy for technology upgrades in the SRRM sector, and the project will specifically introduce the concepts of existing international standards to the sector. Based on the experience of implementation of technical packages in the select mills, the standards will be implemented in a phased manner.

- Embedding of the program in existing organizational structures of the SRRM-industry on a regional or local basis (if existent).

  The project recognizes the importance of an effective model for accelerated adoption of technical packages by the industry. A five-step integrated model for embedding the programme in the existing industrial clusters has been proposed, and will be included at the Project Document stage:

  Step 1: To redefine five geographical clusters with model units as centers of excellence. Each zone has been studied with regard to the number of units in various categories, technologies employed, aggregate energy use and pattern, scope of energy conservation, institutional settings, and awareness and competence levels. The data is used to develop investment portfolios by clustering of the units in each zone.

  Step 2: To strengthen legal, policy, and administrative support to energy efficiency initiatives and secure commitment at local, state and central levels.

  Step 3: To develop zone level leadership and energy and technology management skills as a two-pronged strategy; first within the zone and secondly through proposed TIRFAC under the project. A competent group of entrepreneurs (core group) would be developed which aims at cooperative procurement of services for hedging the transaction costs, post-installation assistance and after-sales-services. TIRFAC provides an organizational base to the private sector units and acts as a focal point for dissemination of information, documentation of activities in the zone, monitoring of energy consumption profile/patterns, assimilation and absorption of technologies and measuring development through progress indicators. In addition, it acts as a technology resource center. The center develops energy managers who provide leadership in development of energy efficiency projects and programs in the zones.

  Step 4: To develop a culture of willingness among local FIs/banks to finance, through demonstrating cost recovery of EE projects and facilitating mainstream financial support, including from those having links to foreign and multilateral development banks.

Step 5: To develop strategic energy plans and targets for the zones linked to the national strategy for energy efficiency improvement and mitigation of local, regional, national and global environmental impacts.

- Design of an effective and efficient communication and dissemination approach tailored to the specific needs of the SRRM-sector.

  Dissemination of best practices, lessons learned from implementation of technical packages and facilitating replication is integral to the proposed communication strategy. In particular, the differences among the clusters and within the clusters are recognized. The revised document includes an activity to focus on effective designing of the communication strategy to meet specific needs of the SRRM sector.

- Development of ways and means to ensure the sustainability of the market transformation effort through cost-reduction (after 5 years of establishing the program), partnering, market development and direction of the program efforts (e.g. market segment of the SRRM-industry).

  The Government of India has already given highest priority to the energy efficiency improvements of all sectors including the small and medium scale and steel sectors. The programme has been conceived and developed taking into account the significance of the sector in the long term and had proposed integrated measures instead of the piecemeal approaches of the past.

  Based on my understanding it will be possible for the proposers to adapt and improve the proposal taking into account my suggestions in the review report. This would strengthen the proposal considerably.

Scientific and Technical Soundness

The large number of SRRMs is a unique characteristic of the steel industry in India. Many of these plants have an extremely small capacity, especially when compared to the international iron and steel industry. Given this unique character, it is advisable that the proposal, or appendices, contain more detail on the sector and its future. The current proposal provides average data, based on an extensive survey in the five clusters of SRRMs. The survey is extremely valuable. However, the proposal does not contain any data on economic, environmental and product quality issues of the SRRM-sector. This is not only important to evaluate the co-benefits of the proposed technology packages, but also to evaluate the most successful direction and implementation of the proposed program (see also below under sustainability and stakeholder involvement).

Appendix 1 to this Annex provides additional details as suggested.

Given that 75% of the 1200 plants are small-scale plants, there may be serious limitations to the product quality and the consistency of product quality of products of these small-scale plants. The scale of the plants is extremely small. For comparison electric furnaces in the SRRM sector have a heat size of a few tons, while modern electric arc furnaces have heat sizes of over 100 tons. Many of the rolling mills (not composite plants) have an even smaller production capacity. It would be good to provide a distribution of the sizes of the plants to get a better understanding of the industry and be able to better pinpoint the

target group of the proposed program within the wider SRRM-industry (see also below under sustainability).

> *The SRRM sector comprises 1200 working mills, however this sector produces steel products that meet national BIS standards. Product quality is largely driven by the market rather than by the scale of operations. The SRRM's long products are more than 70% of the automobile component market (both OEM and replacement), whereas SRRM construction steel also supplies nearly 85% of the rural and semi-urban market where there is a demand for "cheap" steel rather than quality. On quality front, the SRRM sector is continuously diversifying into higher end products such as import substitution steels, production of special and engineering steels for export, steels required for metro and other infrastructure projects, TMT steels, and coated rebars for construction. Since quality has a premium in the market, therefore, product innovation is more visible in the sector than the energy innovation. The present induction based composite mills are now using 70 to 90% of sponge iron in their charge mix to produce international quality of steel. The project is further reinforcing the concept of quality and productivity improvement through implementation of the technology packages. Appendix 1 provides information on the breakdown of mills by size.*

The program proposes the development of efficiency standard and benchmarks. While the standards can help to 'weed out' the inefficient and polluting smallest plants, the use and legal basis for the standards is unclear in the proposal (see also below under sustainability). Also, the use of benchmarks for the technical packages is unclear. This part of the proposal needs to be further developed and the expected use of standards and benchmarks needs to be clarified, and whether these are used with respect to *processes* or *technical packages*.

> *Technical packages have been designed after carrying out energy and process audits and therefore include processes as well. However, the process of standardization aims to strengthen the industrial base rather than weeding out inefficient mills. The standard for these packages will evolve in partnership with BEE, regulatory agencies such as pollution boards, and other stakeholders.*

The program aims at the introduction of *technical packages*, but does not address process and energy management issues. Given the lack of specialized personnel within SMEs, training in 'best practice' management strategies and practices would be an important item to add to the program. Training should not be provided as a single event, but should be provided in the form of continuous learning. Providing a program of continuous training will also help to build an active network of plant operators and managers, contributing to the success of the overall program. It is advised that the proposed center (TIRFAC) would develop and provide the training material, and 'train the trainers'. The trainers need to be based and active within each of the clusters, making communication routes shorter and more effective.

> *The technical packages have evolved as integrated packages that combine process and energy management issues. The Programme would therefore not only demonstrate the best practices but also activities to sustain these practices through continuous training at all levels. TIRFAC would play an important role by effective partnering with other key and potential stakeholders.*

The assumed growth scenario (until 2022) seems unlikely, given an increasing demand for higher quality products, and increasing economies of scale to compete on a national and global steel market.[14] Also, the current capacity utilization of the SRRMs seems very low (60% on average), underlining that future growth can for a large part be met by available capacity. It is unclear from the proposal how much new construction of SRRMs is expected, and how the project will influence the energy-efficiency of the new plants. The current proposal aims at existing SRRMs. However, SRRMs to be constructed (if the scenario in the proposal were correct) provide a low-cost opportunity and new capacity will actually be constructed. The assumed growth scenario is also important for estimating the expected savings (directly and indirectly) due to the program.

The growth rate projected has factored in the cyclic nature of the steel industry's demand patterns. While some mills are operating at lower capacities, new mills are also being set up and the existing mills have diversified their product towards higher value steel.

To sustain the results of the project it is advisable to focus on the segment of SRRMs that will survive long-term (see also below). This can be strengthened by emphasizing the use of international standards in the selection of mills for the demonstration projects. For example, companies that have an ISO 9000 certification, or will receive one, would be eligible for participation in the program. Furthermore, the project can work with participating SRRMs to foster the use of ISO 14000 and energy management systems.

The proposal has been designed around the mills that would survive in the long–run and are already adapting to changing conditions of the market.

Although the quantitative basis for the assumptions in the proposal look reasonable, the proposers do often not clearly define the terms used in the proposal, which makes it hard to interpret the technical basis of the proposal:

- Generally, secondary steel production means the production of steel from secondary resources (= scrap). However, the authors seem to use the term to reflect both secondary steel production and SRRMs. However, only part of the SRRMs do melt steel in furnaces, while others may use ingots or billets. These ingots and billets may come from primary and secondary mills. Hence, SRRMs (without the composite mills) are a third segment of the market, and not necessarily part of the secondary steel market.

  Appendix 2 to this Annex provides a glossary of important technical terms used in the context of steel rerolling mills.

[14] For example, many small inefficient and polluting plants that produced low-quality iron and steel also characterized the Chinese steel industry. In the past decade many, if not all, have been closed, and iron and steel plants have production capacities comparable to international facilities (even though the capacity of individual process (e.g. blast furnace, electric arc furnace, BOF converter) are still relatively small).

- The proposers claim that 75% of the 1200 units are 'small scale' the definition of small scale is never given. Is this less then 10,000 tonnes/year or more?

  This information is provided in Appendix 1 to this Annex.

- The proposers use the terms ecotech and alltech, without proper definition of the terms. The International Iron and Steel Institute introduced the terms in the 1998 report "Energy Use in the Steel Industry".[15] In the IISI report ecotech represents a process that makes use of all proven energy saving technologies that are commercially attractive. The alltech process represents a process in which all proven energy saving technologies have been included. However, the proposers use it to define a set of energy-efficiency measures. From correspondence with the proposers it is clear that they used different economic criteria to select "ecotech" energy-efficiency improvement technologies (e.g. selecting all cost-effective measures using a 30% discount rate).[16]

  Definitions have been provided in the Project Brief and in the Glossary in Appendix 2.

- The proposers give average fuel use for the different clusters/regions by fuel in kg of coal and liters of oil, without specifying the energy contents of the fuels used. Using common international energy contents for coal (29.3 MJ/kg) would give an extremely high energy consumption of 7.5 GJ/tonne or rolled steel (compared to 5.06 GJ/tonne in Table 2). Given, the variation in coal quality in India it is recommended to provide energy consumption figures in accepted SI energy units.

  The actual conversions are provided below:
  1 kg of oil = 41 MJ
  1 normal cu.m.= 34.5 MJ
  1 kg Coal = 27.8 MJ
  1 kWh = 12 MJ

  Table 2 in the Project Brief gives the total energy use (which includes power, and fuel) in the SRRM based on 6.92 GJ/tonne and 5.06 GJ/tonne only refers to the fuel use.

- Does the electricity use provided in Table 1 include induction and electric arc furnaces? I assume not, and that solely the electricity in the rolling operations is included.

  Table 1 does not take into account induction and electric arc furnaces.

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[15] International Iron and Steel Institute, Committee on Technology. *Energy Use in the Steel Industry*. IISI, Brussels. Belgium, September 1998.

[16] From the technical appendix it can be deducted that the selected combustion measures all have a CCE (or payback period) far below the criteria set for selection. Only the packages developed for coal-fired furnaces come close to the criteria. This suggests that there may be more cost-effective opportunities available in the furnace.

Hence, the proposers need to develop a clear set of definitions to provide a clearer basis for the assessments included in the proposal.

Definitions have been provided within the Project Brief and in the Appendices.

In this context it is unclear what the purpose is of the comparisons in Table 2. The Ecotech and Alltech (Europe) cases in Table 2 are assessments of best practices around the world (based on the 1998 report of IISI, see above), and not actual average energy consumption in section mills in Europe. The energy consumption figures for Japan seem to be for a hot strip mill, and not for section, bar or wire mills. Furthermore, the plants in Europe and Japan are typically large-scale facilities, and incomparable in size to the SRRMs.

Table 2 intends to show a comparison given that this industry must compete on products and not on processes. The reference made is not to a hot strip mill but rather a KYOEI plant.

A central element of the proposal is the establishment of a research and information center specifically for the secondary steel industry (TIRFAC) in India. International data collection: this is a sector specific for India, as steel plants in the rest of the world are typically of much larger scale, and even stand alone rolling mills are of much higher capacity. Only a few developing countries would face similar issues. Hence, technology available elsewhere in the world would need to be 'downscaled' for use in the small-scale SRRMs. How will TIRFAC collect international data, select and evaluate technologies specific enough for the SRRM situation? This justifies the research and testing facility to be housed in the center. Also, the institute should be housed in an appropriate organization and location, so that it can easily be integrated in existing networks of SRRMs throughout the five regional clusters.

The project proposes to set up the facilities along the lines suggested and details will be provided at the Project Document stage.

Global Environmental Benefits (and Drawbacks)

The proposal does not provide an understandable estimate of the overall direct energy savings from the proposed program and estimates of the indirect savings due to dissemination and replication throughout the SRRM sector. In the current proposal a footnote estimates savings at 21 PJ over 20 years. This seems low, as the total potential (30% savings, 100% penetration at current production volume) would be equal to 17.6 PJ *annually*. Furthermore, the basis for a project cycle of 20 years is unclear. Burners and motors last shorter than 20 years, as will many other parts of the furnace (lining) and rollers of the section mill. The estimate given in a footnote is impossible to understand without further information, e.g. expected degree of implementation by furnace-type and package (directly and indirectly). The same holds true for reductions in CO_2 emissions, which are currently not estimated in the proposal.

Revised Annex A provides the required information on incremental cost.

Other Environmental Benefits

The proposal does not estimate other environmental benefits of the improvements in energy-efficiency. This is unfortunate, as these savings will be very important for local air pollution (e.g. SOx, NOx, PM) reduction. Although the GEF Operational Strategy focuses on climate change, these improvements in

local and regional air quality are very important for local support of the program. Furthermore, improvements in working conditions and employee health are important co-benefits.

Section 8.4 of the revised project brief and Annex A on incremental cost covers the stated benefits.

GEF Priorities

The project fits with the GEF priorities as defined in the Operational Strategy for Climate Change and the Operational Program for removal of barriers to energy efficiency and energy conservation. The proposed program will remove and reduce barriers to energy-efficiency improvement in an industry that traditionally is hard to reach with energy policy (SMEs). The proposed technical packages do meet economic criteria, and would lead to "win-win" solutions.

Evaluation

There is a clear need for improved methods of quantitative evaluation of the program results. While it is hard to quantitatively evaluate program elements such as dissemination and stakeholder participation, it is important to measure those elements that can be quantified, e.g. achieved energy savings at the 30 plants, sales of the technical packages and technologies, etc. For this purposes the proposers should develop a clear protocol, possibly following the International Monitoring and Verification Protocol (IPMVP). Furthermore, it is advised to have the evaluation done by an independent organization to ensure unbiased results.

The Monitoring Plan will be developed for the Project Document, and will include a methodology for evaluation of the project's results. In addition, all UNDP projects are subjected to mid term evaluation and evaluation by independent team of experts.

While it is essential to have a representative Project Steering (PSC) and Project Advisory Committee (PAC), these should not be too large to reduce overhead, to reduce delays and complex decision making structures. Furthermore, it seems strange to have large steel plants participate in the PAC for a project aimed at technology improvement in the SRRMs (a competitor). Participation of individuals from the steel industry with expertise essential for the project should be welcomed.

The reviewer's suggestion will be taken into account when finalizing the project's management and oversight structures.

Replicability

The program initially will work with 30 of 1200 SRRMs in India, but a dissemination approach is developed to reach out to the other mills (see also below). The size of the industry would provide ample potential within the sector. Further replication outside of India will be limited, as SRRMs are a development typical for India. However, some of the concepts developed, and especially the combination of a number of approaches for barrier removal may be replicable in other sectors dominated by SMEs in India and other developing countries.

Sustainability

The sustainability of the proposed program will depend on the establishment of networks and an organizational structure that can survive without additional international funding after 5 years. The

likelihood will depend on the effectiveness and efficiency of the program in reaching out to the SRRMs, achieving cost reductions for SRRMs, while demonstrating the overall gains for the Indian economy and (global) environment.

Appendix 3 to this Annex provides an analysis of the sustainability of the Programme.

There are three elements in the proposal that need attention in evaluating the long-term sustainability of the program. First of all, the sustainability of the SRRM-sector is an important factor. As discussed above, it seems unlikely to me that the 900 small SRRMs can survive the next decades. I think that the Indian steel industry will follow similar development patterns as elsewhere in the developing world, and ultimately will focus on large integrated mills, and medium-scale flexible plants using scrap, DRI (direct reduced iron)[17] and smelt-reduction as inputs. The larger SRRMs may survive and develop into flexible secondary steel mills. Hence, for the sustainability of the program it is advisable to focus on the plants that are likely to survive in the developing Indian steel market.

Secondly, the sustainability of the ESCO market for industry in India is an uncertainty factor. Outside of India ESCO-activity in industry has been limited, and experience relatively recent. It is unclear from the proposal what the ESCO-experience is in Indian industry, especially with SMEs. This may need more research at the beginning of the project, to identify the most effective and successful ways to improve collaboration between ESCOs and SRRMs. As a backup strategy, the proposal includes working with banks. It may be attractive to actively identify ways to develop appropriate ways of financing energy-efficiency projects in the SRRM-industry by commercial banks.

The ESCO related activities are considered to be an innovative component of the project. To date, ESCOs have been operating in larger sectors. Several ESCOs have already shown interest in participating in this Programme.

Thirdly, the overall effectiveness and efficiency of the program has to improve to sustain the program. Because of high transaction costs, any energy-efficiency program with SMEs is likely to have higher costs than other industrial energy-efficiency programs. The specific costs of the program (based on estimated energy savings and submitted financing request), are $1.3/GJ-saved (excluding cost-share industry), which are high. Part of the high costs is due to the actual cost of energy-efficiency demonstration projects (cost-shared with industry), and the start-up costs of an information and research center. Still, the program should search for effective ways to reduce the overall costs for future sustainability and replication.

Appendix 3 to this Annex provides additional information.

Finally, it is important provide a sustained regulatory and policy framework for the program. The program may help to develop approaches that can successfully be adapted to policies, such as the development of minimum efficiency standards for SRRMs and specific product categories. Also, the approach in the project may help to develop similar approaches for other industrial sectors dominated by

[17] India is already one of the larger producers of DRI in the world, using mainly coal-based processes. DRI is used as a high quality iron-input in the electric arc furnace to produce high-quality steel. However, total DRI-production is limited to about 4% of total pig iron production.

SMEs. However, for this to happen the government needs to actively support the program with policy initiatives. The embedding of the program in a policymaking framework needs to be clarified and further developed.

The Ministry of Steel and Bureau of Energy Efficiency would be actively involved in influencing the appropriate policies.

Stakeholder Involvement

From the program proposal it is not possible to get a clear picture of the current level of organization within the industry on the regional and local level. To design the most effective and efficient communication and dissemination strategy it is important to use existing channels, as well as appropriate new networks. There are 4-5 clusters of SRRMs in different regions in India, and within each cluster mills seem to have comparable characteristics. What kinds of networks exist within the clusters? Are their networks of SRRMs and are there links to financing, consultants, or other technology and service suppliers? Similarly, how is the Ministry of Steel connected to the SRRMs, and what are the best ways to ensure collaboration between them (which historically has been very limited due to an emphasis on the large integrated producers)? In short, what is the best way to communicate with the SRRMs, as this is unclear in the proposal; it just mentions generic communication methods and provides no evaluation of the relative effectiveness and efficiency. The proposal states that a stakeholder participation of 75 at an earlier workshop was "overwhelming", although it is unclear how many of the participants were from 1200 SRRMs. Hence, I believe it is key for the success of the program to develop the most efficient and effective communication tools that fit the characteristics of the sector (SME, regional clustering, limited organization), and not to develop a separate or competing structure or organization. This needs a strong emphasis in the project and proposal.

The project aims to network with existing institutions and especially industry associations.

Other important elements of stakeholder involvement are the involvement of ESCOs (and to communicate the program and successes throughout this industry) and of other (international) programs in India focusing on SMEs. For example, the UN Cleaner Production Program aims specifically at the introduction of innovative practices and technologies for cleaner production in SMEs. In India, the National Center for Cleaner Production is based in New Delhi, and collaborates with four other institutes throughout the country. Tapping into their experiences is essential to provide increased changes for success for working with SRRMs.

Capacity Building

The proposal is strong on the element of capacity building. The proposed program contributes to capacity building in the SRRM-industry, but very importantly, also in sectors of potential providers of services and technology to the SRRM-industry (ESCOs, banks, and technology suppliers). The establishment of the research and information center for secondary steelmakers can be an efficient way to establish indigenous technology assessment and development capacity. However, to be successful in transforming the SRRM-sector it needs to be clearly embedded in the industry and in a communication and dissemination strategy. There is no need for an additional research institute that has no connection to or impact on the industry. Hence, it should be carried by the industry. The proposal foresees future sustainability of the center through contribution of the SRRMs. It is very difficult to evaluate the likelihood of such a financing option without further information on the organizational structure of the

sector. The potential for SRRMs to contribute to the center is also unclear, given the lack on financial information on the SRRM-industry in the proposal. Hence, this needs clear attention in the program and proposal.

Innovativeness

The project does not contain any new or innovative technical or policy approaches. However, the combination of the approaches in a single sector dominated by SMEs can be qualified as innovative. Some of the elements seem riskier (e.g. the use of ESCOs for SMEs in India) than others, and a comprehensive approach as proposed may reduce these risks.

The project's innovation primarily lies in the introduction of technologies and best practices that are being applied for the first time in the SRRM sector in India with close partnership with the Government of India and utilizing innovative institutional mechanisms.

ANNEX A: INCREMENTAL COST ANALYSIS (IN USD)

Components	Baseline	Alternative	Increment
Global Environmental Benefits	Marginal decline in GHGs due to marginal improvements in energy efficiency gains. GHG emissions per tonne of production reduce by 2.91% by the year 2008. Cumulative CO_2 emissions will be 111 million tons over 20 years.	GHG emission in sample units will decline by an average of 32%. The overall impact on the sector would be a decline of GHG reduction per tonne of production by about 33% over a period of 20 years. Cumulative emissions will be 73.94 million tons.	Cumulative saving of CO_2 reduction will be 36.76 million tons over a period of 20 years.
Domestic Benefits	The adoption of low cost low risk technological options without major changes in process will result in marginal energy efficiency improvements. Also associated emissions will reduce with conservation of iron resource.	Introduction of technology options resulting in energy efficiency improvements of 31.5% in 30 sample mills. Over 70% of units expected to adopt these technologies over 20 years. Institutional mechanism bridges information gaps laying foundation for continual improvements in energy efficiency, as new technologies are commercialized/replicated.	Energy efficiency improvements of the order of 31.5% are expected. Creation of infrastructure and capacity for continual technological upgrades. Creation of models that could be replicated in other small and medium enterprises.
Program Component – Costs of removal of barriers to energy efficiency improvement in the steel rerolling sector (funded by the GEF and Govt. Counterparts)			
1. Benchmarking for EcoTech options and technical packages established and validated.	There is no provision for Benchmarking EE norms and standards for equipment /devices manufactured in the country. Sale of equipment or technology is governed primarily by cost factor. *Cost: 0*	Developing energy and environment labels, standards, and benchmarks including investment norms (techno-economic and cost recovery) of EE options and technology packages. Designing standard methods and tools for design engineering and implementation of EcoTech solutions. Developing information modules for financing institutions, government and policy makers, and industry partners. **Cost: USD 0.85 million**	Benchmarking and development of standards would lead to establishment of minimum energy performance standards (MEPS). Design and operational manuals will be prepared and disseminated to industry for wide spread adoption of advanced technologies. *Cost: USD 0.85 million* *GEF: USD 0.70 million* *SDF: USD 0.15 million*
2. Strengthened Institutional Arrangements	Lack of institutional capabilities to provide support to advance of EE technologies, appropriate funding products and mechanisms from domestic financial institution, connectivity at the institutional level for joint developments and technology transfer etc. The industry associations lack technology	Developing networks of association of private and public institutions and companies (domestic and international), bilateral/ multilateral organizations, banks and financial institutions to provide technical, financial and market inputs to the sector and securing policy and administrative support. Establishing self-financed business networks through self-financed association of multi-	In the absence of institutional arrangements and business support network, the entire activity is incremental in nature. This would facilitate development of research, design and technology development alliance, joint ventures and cooperation for technology transfer, as well as establishment of long term institutional framework and connectivity.

Components	Baseline	Alternative	Increment
	orientation and have no relation with institutional agencies that could support market transformation leading to adoption of EE technologies. **Cost: 0**	disciplinary experts, including successful entrepreneurs aimed at dissemination of experience and providing support. Developing internationally linked institutional capacity (joint ventures, technical cooperation, etc) aimed at facilitating technology transfer. **Cost: USD 1.10 million**	*Cost: USD 1.10 million* *GEF: USD 0.95 million* *SDF: USD 0.15 million*
3. Effective Information Dissemination Program Developed.	There is no formal mechanism for collating, evaluating and disseminating information on resource personnel/experts, institutions, technologies, markets and financing products. SRRM industry in SME segment has no source of information for techno-economic parameters, operating experience and risks associated with adoption of new technologies. Technology and service providers often provide incomplete information without SOPs/SMPs and performance norms. **Cost: 0**	Establishing worldwide database on EE technologies (sources of supply and investment costs, expert analysis, projects, markets, opportunities, and related stakeholders). Disseminating information through newsletters, technical bulletins, website and expert presentations, including regular briefs to industry on markets, new funding schemes and new technological developments. **Cost: USD 0.50 million**	An information system with communication facilities to collect, store, retrieve and disseminate information to all stakeholders is an incremental activity for the sector. *Cost: USD 0.50 million* *GEF: USD 0.40 million* *SDF: USD 0.10 million*
4. Enhanced Stakeholders' Capacity	The industry and various stakeholders utilize informal channels for building capacity. Slow build up of capacity in normal process adversely affects technology adoption and absorption. The operating personnel in industry lack experience and expertise to operate high-end technologies. Banks and FIs lack appreciation, expertise to appraise, finance and monitor EE projects. Local administration/Government agencies experience are unable provide the requisite support to EE project due to lack of appreciation an exposure to needs of SME segment. **Cost: 0**	Assessment of capacity needs of stakeholders to implement and absorb advanced EE technologies followed by time-bound action plan. Conducting training programs / workshops in EE technologies and technology management including cooperative procurement of EE technologies in clusters, engineering and implementation. Developing Standard Operating Practices (SOP) and Standard Maintenance Practices (SMP). Facilitating absorption and assimilation of "Best Practices". Training of trainers program for developing industrial and institutional in-house capacity such as development of Energy-cum-Investment managers. Training local, state and central level banks, state financial institutions, manufacturers and suppliers of services, and local/regional consultant through special pilot programs. Institutional collaboration / tie-ups with clusters to facilitate new EE projects. **Cost: USD 3.0 million**	Dedicated capacity building programs covering training workshops, development and implementation of SOPs/SMPs and dissemination of "Best Practices" will strengthen capacity and capability of the SRRM sector to undertake EE projects. Since no structured arrangements for capacity building exist, all activities proposed are incremental in nature. *Cost: USD 3.0 million* *GEF: USD 1.55 million* *SDF: USD 1.45 million*

Components	Baseline	Alternative	Increment
5 Technical and financial feasibility of EcoTech options and technical packages established.	Under the existing circumstance the industry is likely to adopt energy efficiency measures implemented by a few industry leaders and would be financed through own resources. These attempts will be in piecemeal manner and restricted to low-investment, low-risk options. *Cost USD 0 million*	Developing financial linkages and guidelines to support pilot testing of packages in sample mills. Verifying techno-economic viability of the packages including cost recovery, performance and the impacts. Documenting implementation experience for developing model implementation practice. Disseminating the lessons learned to wide range of stakeholders. Developing pipeline investment projects. ***COST: USD 2.20 MILLION***	Exposure of the industry to EETs is entirely new and therefore incremental in nature. The activity undertaken in this component will reduce the risk perception with respect to these technologies and help in restructuring the sector close to the international boundaries with regard to energy and environmental efficiency norms. This would lead to expanded investments in EE. **Cost: USD 2.20 million** *GEF: USD 0.95 million* *Industry: USD 1.25 million*
6. Innovative institutional mechanisms established	No ESCOs in operation. Since the technologies adopted are low costs and from local sources, ESCOs do not find opportunities in this sector. Lack of familiarity on both sides also restricts its possibility. *Cost: 0*	Developing mechanisms of performance contracting involving identified ESCOs and technology providers. Strengthening capacity of the ESCOs for implementing identified technical packages for the mills. Developing institutional linkages among existing ESCOs, technology providers and industry. Evaluating the market potential through demonstrating ESCO concept. **Cost: USD 1.15 million**	ESCO operation demonstrated and information disseminated in the sector will result in development of a new funding mechanism with least risk for SRRM sector. *Cost: USD 1.15 million* *GEF: USD 0.85 million* *SDF: USD 0.30 million*
7. Technology Information Resource and Facilitation Center Established.	The implementation of Energy Efficiency Bill and other economic measures for EE improvement do not have specific focus on SRRM sector. No dedicated institution caters to SRRM sector for evaluation of technology, RD&D, unbiased information resource on technology integration and techno-economic feasibility. Information on technology and its economic viability is available from vendors or other users only. *Cost: 0*	***Setting up project management and coordination unit for implementing project activities. Developing a comprehensive work-cum-implementation and monitoring plan for activities in the TA component. Establishing Technology Information and Facilitation Center.***	***Since the institutional arrangements and business support network is totally missing for the sector, the entire activity proposed to be established in alternate scenario will be incremental in nature for the SRRM sector.*** *Cost: USD 2.10 million*
SUB TOTAL (Program Component)	***USD 0 million***	***Cost: USD 10.90 million***	***Cost: USD 10.90 million*** ***GEF: USD 6.75 million*** ***SDF: USD 2.90 million*** ***Industry: USD 1.25 million***

Components	Baseline	Alternative	Increment
Investment Component – Costs of feasibility of EcoTech options, establishment of Technology Information Resource Facilitation Centre (TIRFAC) and strengthening manufacturing base of domestic energy efficiency equipment suppliers (Funded by non–GEF resources)			
1. Feasibility of EcoTech options	The sector has a strong willingness to pay if the EE investments have paybacks within two to three years. However, there is reluctance to meet the high up front and start-up costs. Market size for EE technologies and EcoTech will remain limited due to high perceived technical and financial risks by industry. Industry is likely to adopt energy efficiency measures in a piecemeal manner and restricted to low investment-low risk options. **Cost: USD 64.41**	Implementing 5 technology packages in 30 sample mills 23 on one-to-one basis and 7 through ESCOs. *Cost : USD 81.42 million*	Demonstrating the viability of technical packages including cost recovery to improve confidence, facilitate removal of barriers associated with limited commercial model experience in the minds of the stakeholders, lower risk perception. *Cost USD 17.01 million* *GEF: USD 0.00 million* *SDF: USD 2.43 million* *Industry: USD 3.29 million* *FIs/DST: USD 11.29 million*
2. Establishment of Technology Information Resource Facilitation Centre	No dedicated institution caters to SRRM sector for evaluation of technology, RD&D, unbiased information resource on technology integration and techno-economic feasibility. Information on technology and its economic viability is available from vendors or other users only. **Cost: USD 0**	***Establishment of Technology Information and Facilitation Centre with most modern hardware, prototype and software facilities specific to the needs of the steel rerolling sector.*** **Cost: USD 1.95 million**	The centre is the first in the country to facilitate SMEs in the sector in technology transfer / absorption, design development / implementation, development of customized EE solutions and providing R&D and Innovation support *Cost: USD 1.95 million* *GEF: USD 0.00 million* *SDF: USD 1.95 million*

Components	Baseline	Alternative	Increment
3. Strengthening manufacturing base of domestic energy equipment suppliers	***EE investments have behaved in an 'incoherent' manner with a serious gap in capacity of DEMs to provide well designed standard EE equipment / services to the industry. DEMs do not have facilities to provide well engineered, designed and customized EE solutions at the user-centered interfaces. The situation has created an abundance of low-cost energy intensive alternatives in the market*** *Cost : 0*	In addition to institutional support from TIRFAC, the activities comprise strengthening of manufacturing base for energy efficient furnaces, mill equipment and accessories and electrics through import of design software, institutional and / or collaboration tie-ups. *Cost: USD 2.00 million*	Since strengthening of manufacturing base of DEMs, specific to the needs of the SMEs in the sector is totally new in the country, therefore considered as incremental in nature. *Cost: USD 2.00 million* *GEF: USD 0.00 million* *SDF: USD 0.00 million* *FIs: USD 1.00 million* *Industry: USD 1.00 million*
SUB-TOTAL (Investment Component)	***Cost: USD 64.41 million***	***Cost: USD 85.37 million***	***Cost: USD 20.96 million*** ***GEF: USD 0.00 million*** ***SDF: USD 4.38 million*** ***FIs/DST: USD 12.29 million*** ***Industry: USD 4.29 million***
GRAND TOTAL (Program Component + Investment Component)	***Cost: USD 64.41 million***	***Cost: USD 96.27 million***	***Cost: USD 31.86 million*** ***GEF: USD 6.75 million*** ***SDF: USD 7.28 million*** ***FIs/DST: USD 12.29 million*** ***Industry: USD 5.54 million***

ANNEX B: PROJECT LOGICAL FRAMEWORK

STRATEGY	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Overall Project Goal (Impact)			
To reduce GHG emissions in the steel rerolling mill (SRRM) sector in India.	• Compliance with established energy & environment efficiency norms of EcoTech options & technology packages adopted. • 'Progress Ratio' measurement study after every 2 years. • Beginning first year EcoTech coverage increases to 25% by end of fifth year.	• Annual statistical progress report of Ministry of Steel (Office of the DCI&S). • 'Green' Balance Sheets of SRRM Units (by TIRFAC) • Baseline & EcoTech study reports (by TIRFAC) • Bi-annual cluster reports and Annual country reports	Ministry of Steel (EA) sets up an internationally linked self-financing institutional capacity and maintains the required human and financial resources.
Project's Goal (Outcome)			
To improve energy efficiency in the SRRM Sector by expanding private sector investments in 'win-win' nature of low GHG emitting technologies (EcoTechs).	Share of EcoTech increased to 25% (3 million tons) by end of the project period resulting in cumulative energy saving of 9 PJ and 0.88 million tonnes of reduction in CO_2 emissions.	• Bi-annual and annual study reports of TIRFAC based on regular field studies. • Collection of data from secondary sources	• Market demand, Policy and regulatory framework sustained. • Adequate availability of semis (raw material used for rerolling) • Required equity / credit is available.
Outputs / Components			
1. Benchmarks for EcoTech options and technical packages established and validated			
• Industry compliance to energy-cum-environment performance benchmarks or 'best-practice' norms. • Energy and environment labels, standards, and benchmarks including investment norms of EE options and technology packages developed by end of third year. • Standardized methods and tools for design, engineering and implementation of EcoTech solutions designed. • Information modules for FIs, govt, policy makers, and industry developed.	• Actual performance of sample units validated after one year of their stabilization • Techno-economic viability including cost recovery (CCE, IRR, Payback, BEP, etc.) is established. • Standard design and implementation manuals prepared and distributed • Information modules (1c) developed and disseminated by the end of 18 months of the start of the project. • Feedback from FIs, government and policy planners and industry.	• Evaluation report of 'Best-practice' norms • Report on verification standards by experts' panel. • Results documented for sample units • Performance report on continuous working of the technology packages in the sample mills. • Field visits and monitoring and evaluation reports • National standard evolved.	• Technology sources are available. • Sources are keen to build up the market by tailoring technologies to match size and configuration the mills • Local expertise for implementation is available. (This risk will be mitigated through capacity building)

STRATEGY	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
2. Institutional Arrangements Strengthened			
• Networks of association of private and public institutions and companies, bilateral and multilateral organizations, financial institutions providing technical, financial and market inputs to the sector within the legal framework of the nation are developed. • Business networks established through self-financed association of multi-disciplinary experts including successful entrepreneurs. • Institutional capacity to facilitate technology transfer developed.	• Contract completed by specialist agency / organization for establishment of business support networks and development of internationally linked institutional capacity successfully by the end of 3rd year. • 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.	• Annual project implementation report by PMC.	• Means of communications available • Willingness to participate and collaborate remains high
3. Effective Information Dissemination Program Developed.			
• Establishing worldwide database on current and emerging EE technologies including sources of supply and investment costs, expert analysis, projects, markets, opportunities, and related stakeholders. • Disseminating information through newsletters, technical bulletins, website and expert presentation.	• Report identifying information needs, information sources, dissemination channels and MIS finalized by end of 1st year. • System design, data collection, alliances and mechanism established by end of 2nd year. • Information dissemination channels & access procedures operationalized by end of 3rd year.	• Stakeholders survey of project impacts • Publications/case studies	• Competent task-specific expertise is locally available.
4. Stakeholders capacity enhanced			
• Carrying out capacity building need assessment of the major stakeholders to implement and absorb advanced EE technologies in the sector. • Identifying specific capacity building needs for preparation and implementation of a time -bound action plan for capacity building of the major stakeholders. • Conducting training programs/workshops in EE Technologies and Technology Management including cooperative	• Technology, resource and capacity building needs of each cluster mapped with time bound action plan in first year. • Master plan for capacity building activities is finalized and documented by 13th month. • 5 cluster workshops for units / DEMs / consultants on 'new' technologies and technology management each year • 10 Workshops for unit owners / managers on cooperative management practices and procurement processes in each of 5 clusters over 5 years. • Standard Operating Practices (SOP) and Standard Maintenance Practices (SMP) developed in third and	• Annual Project Implementation Reports and Reviews (Short, Mid & Long-term). • Formal participants' satisfaction survey conducted at conclusion of each capacity building activity (Level I) • Formal participants' skill evaluation at conclusion of every capacity building activity (Level II) • Independent Peer Reviews	• Policy and administrative support at all levels due to involvement of ministry of steel. • Competitive training/ capacity building resources including modern software facilities are available

STRATEGY	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
procurement of EE technologies in clusters, engineering and implementation support. • Developing Standard Operating Practices (SOP) and Standard Maintenance Practices (SMP) • Facilitating absorption and assimilation of 'Best Practices'. • Training of trainers' programme for developing industrial and institutional in-house capacity such as development of Energy-cum-Investment managers. • Training local, state and central level banks, state financial institutions, manufacturers, and suppliers of services and local/regional consultant. • Institutional collaboration/tie-ups with clusters to facilitate new EE projects.	fourth year • 'Best Practices' program developed in second year and workshops conducted in third and fourth year. • Three exposure visits to developed countries for DEMs / local consultants. • 5 interaction and policy-oriented workshops for central / state govt. institutions on complex SME issues and constraints. • 3-week training program and curriculum developed by the end of first year for developing Energy-cum-Investment Managers. 5 programs, one in each cluster, conducted in 2nd, 3rd, and 4th year. • Pilot programs for local govt., administrators, and planners focusing on energy efficiency and greening of environment conducted in each cluster beginning second year. • Workshops on evaluating of EE technologies and projects for financing / banking sector.	(IPRs) for capacity building efforts. • Action Taken Reports (ATRs) for capacity building activity plan.	
5. Technical and financial feasibility of EcoTech options and technical packages established			
• Developing financial linkages and guidelines for support to pilot testing. • Implementing 5 technology packages in 30 sample mills – 23 on one-to-one basis and 7 through ESCOs. • Verifying techno-economic viability of the packages including cost recovery, performance and the impacts. • Documenting implementation experience for developing model implementation practice. • Disseminating the lessons learned to wide range of stakeholders.	• EcoTech Packages implemented and operationalised in 30 units: 3 units in 1st year, 4 in 2nd year, 9 in 3rd year, 8 in 4th year and 6 in 5th year. • Documentation of lessons learned in successive years as above. • Multiplication strategy package wise developed and recommended in successive years in accordance with successful implementation of packages as above.	• Progress report on implementation of demonstration units. • 'Best Practice' reports prepared by a Group of national and international experts based on demo units' operation.	• Acceptance of the project by major stakeholders. • Executing agency ensures implementation at minimum cost.
6. Innovative institutional mechanisms established			
• Developing mechanisms of performance contracting involving identified ESCOs (Thermax EPS, INTESCO ASEA, ELPRO ENERGY CENTER, SEETECH INDIA, DCM.	• ESCOs identified. Performance capability of ESCOs specific to the needs of rerolling mills enhanced by the end of 2nd year • Market transformation strategy developed and implemented at end of the 2nd year.	• Project completion reports by ESCOs as per agreement. • Annual Market Survey Reports.	• Availability of national & international ESCOs and their willingness to participate.

STRATEGY	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
and 3EC) and technology providers • Strengthening capacity of the ESCOs for implementing identified technical packages for the mills • Developing institutional linkages among existing ESCOs, technology providers and industry • Evaluating the market potential through demonstrating ESCO concept	• 5 ESCOs operationalised from third year. • Demonstration of EcoTech packages in 7 units through ESCO route between 3rd and 5th year. • A minimum of 90 % of EE solutions (EcoTech options/tech. Packages proposed under the project) become locally available at conclusion of the project.		
7. Technology Information Resource and Facilitation Centre Established			
• Setting up of a project management and coordination unit for implementing project activities • Developing a comprehensive work-cum-implementation and monitoring plan for activities in the TA component • Reporting to funding agencies as per the pre-determined progress indicators for various activities in the project. • Documenting lessons learned for all project activities and their objective vis-à-vis outputs. • Establishing technology information and Facilitation Centre.	• PMC set up in 10 weeks after project approval by GEF Council. • Annual Work plan approved by PSC and job order issued which coincides with 'zero' date of the project. • Master plan for project activities is finalized and documented in first 10 weeks. • Monitoring and Evaluation Plan along with reporting procedures finalized and PMC staff appointed at the end of 6th month. • Monthly / quarterly / annual performance review formats prepared for adoption by all project constituents at the end of 6 months. • Software and hardware centers of TIRFAC set up at the end of 2nd and 3rd year respectively.	• Job Order issued • Project Progress & Completion reports (PPR & PCR) plus mid-term Review and Action Taken Reports by Project Advisory Committee. • Annual Disbursement and Audit Reports	• Competent task-specific expertise is locally available. • Policy and administrative support available. • Financial resources (GEF and non-GEF) are available in time. • EA exercises financial discipline to ensure implementation of project at minimum cost.