IMPLEMENTATION OF ENERGY EFFICIENCY IN SME CLUSTERS

ENERGY CONSERVATION AND COMMERCIALIZATION (ECO-III) PROJECT

February 2009






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ENERGY IS LIFE
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ACRONYMS

ADB	Asian Development Bank
AMCs	Annual Maintenance Contract
ATIRA	Ahmedabad Textile Industry Research Association
BEE	Bureau of Energy Efficiency
3CEE	Three Country Energy Efficiency
CDM	Clean Development Mechanism
CEI	Chief Electrical Inspector
CFL	Compact fluorescent lamp
CNG	Compressed Natural Gas
DPR	Detailed Project Report
DSM	Demand-side management
DSCLES	DCM Shriram Consolidated Limited Energy Services
EC	Energy Conservation
ECMs	Energy Conservation measures
EE	Energy Efficiency
EET	Energy Efficient Technologies
ECO	Energy Conservation and Commercialization
ES	Electrical Systems
ESCO	Energy Service Company
FBC	Fluidized Bed Boilers
FO	Furnace Oil
GDP	Gross Development Product
GEDA	Gujarat Energy Development Agency
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GoG	Government of Gujarat
GOI	Government of India
GSECSL	Green Environment Services Cooperative Society Limited
GTZ	Gesellschaft für Technische Zusammenarbeit
INR	Indian Rupee
IREDA	Indian Renewable Energy Development Agency

ISTSL	India SME Technology Services Ltd.
JICA	Japan International Cooperation Agency
JPC	Joint Plant Committee
kL	Kilo Liter
Kms	Kilometers
kWh	Kilowatt hour
L	Liter
M&V	Monitoring and Verification
MOU	Memorandum of Understanding
MT	Metric Ton
NGO	Non Government Organization
NPC	National Productivity Council
NISST	National Institute for Secondary Steel Technology
NITRA	Northern India Textile Research Association
PCRA	Petroleum Conservation Research Association
PEDA	Punjab Energy Development Agency
REEC	Regional Energy Efficiency Center
RF	Reheating Furnace
RM	Re-rolling Mill
SBI	State Bank of India
SCM	Standard Cubic Meters
SDA	State-Designated Agency
SIDA	Swedish Development Cooperation Agency
SIDBI	Small Industries Development Bank of India
SME	Small and Medium Enterprise
SOP	Standard Operating Practices
SPV	Special Purpose Vehicle
TPA	Tons per Annum
TUF	Textile Up gradation Fund Scheme
VFD	Variable Frequency Drives
UNDP-GEF	United Nations Development Fund- Global Environmental Facilities
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development

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21 February 2009

EXECUTIVE SUMMARY

This report provides lessons learned from implementing Energy Efficiency (EE) in small and medium enterprises (SMEs) in India. Divided into four sections, it begins with a review of India's past activities and the gap areas. The report then goes on to present the pilot studies carried out under the project. The report highlights the energy efficiency implementation opportunities in the pre-selected clusters/units and perceived barriers impeding their adoption. The report concludes with a set of recommendations to enhance energy efficiency in the sector for the benefit of the implementing agencies.

It is well known that, besides contributing to a significantly lower environmental impact in Indian SMEs, energy efficiency improves the basic competitive edge. Therefore, in accordance with the ECO-III project objectives, it was decided to strengthen selected state-designated agencies (SDAs) to pursue energy efficiency programs in SMEs, taking some clues from the Three-Country Energy Efficiency Project (3CEE) recently completed under World Bank auspices and which remains the most authoritative publication in this field. ECO-III's SME activities focused on medium sized companies, especially those likely to be covered under the Energy Conservation (EC) Act, 2001.

From the onset, a key barrier to designing effective and targeted programs to reduce energy consumption in these enterprises was the lack of a definition and criteria for identifying SMEs, particularly their size – in relation to revenue, production or sales. To address this problem, The Government of India took a major step towards encouraging and strengthening the SMEs by enacting the Small and Medium Enterprise Development Act in June 2006. Prior to this, medium-sized enterprises were not defined either technically or legally, which made it difficult – if not impossible – to target them with specific programs, e.g., incentives to promote EE. Today, medium-sized enterprises are clearly defined as units whose investment in plant and machinery (original cost) does not exceed INR100 million. The corresponding limit for medium–sized service enterprises is INR50 million.

Interactive discussions between the Bureau for Energy Efficiency (BEE), state-designated agencies, and ECO-III, as well as studies conducted in the past, reveal that:

a) Developing trust and relationships amongst stakeholders is the key to success of any energy efficiency program.

b) Additional policy research is needed for circumventing the attitudinal and financial barriers, which are critical to project implementation.

c) Technology push (top-down) and market pull (bottom-up with the ultimate user interacting on their perceived needs) need calibrated work on the energy efficiency front.

d) Vendors and service providers can play a major role in addressing the cultural and financial barriers, but bringing them together in a competitive environment presents a massive challenge.

e) Institutional finance and credit-related concerns are rarely addressed, and internal funds are generally used for implementing low-cost energy conservation measures. Often, capital-intensive measures are not pursued by users because entrepreneurs are reluctant to spend capital on projects other than those directly improving production and sales. Therefore, financing EE is seldom mentioned as a key concern and as a result, little data about it exists.

The project selected four partners/sub-contractors to work in the two short-listed states (Punjab and Gujarat), and in four SME Clusters. These clusters were selected after a preliminary round of pre-investigative work. It was also decided the possibility of propagating cross cutting technologies will be pursued in one Cluster. Accordingly, clusters – Mandi Govindgarh (steel), Ludhiana (textile

processing), and Ahmedabad (textile processing), and Ahmedabad (Vatva, Naroda and Narol for cross-cutting energy efficient technologies) were chosen, keeping in mind:

a) Past work done by the National Institute for Secondary Steel Technology in the Cluster, including the ongoing UNDP-GEF Project for the Steel Re-Oiling Mill sector from 2002 onwards.

b) Some SME units under the textile sector, especially textile processing, are likely to be listed as designated consumers as per the EC Act. They would need extensive capacity building efforts in order to cater to the mandatory provisions of the EC Act.

It was initially thought that a total of 20 units in these four clusters would be an appropriate number to provide valuable insights into the process of developing energy efficiency solutions relevant to the SME sector as a whole. After an initial energy audit, key activities were to include pre-feasibility studies, which would hopefully lead to actual case studies of EE financing and project implementation (four or more). The exercise also involved an in-depth effort to understand and tackle key barriers impeding energy efficiency in SME sectors via a number of activities, such as:

1) Seeding and nurturing the energy efficiency concepts
2) Establishing a business dialogue between the SMEs and vendors of energy efficient products
3) Organizing a series of meetings/workshops at the Cluster level
4) Facilitating interactions with the banks to understand the concerns related to credit worthiness and follow-up for loan applications
5) Establishing a policy dialogue with State-Designated Agencies, Bureau of Energy Efficiency, and other key players – financial institutions, industry associations, other donor projects, and other agencies active in energy efficiency finance – through an interactive Workshop on Accelerating Implementation of Energy Efficiency Projects in SMEs, given by the Project on June 11, 2008.

Midway through the project, it was felt that the pre-feasibility studies would be most useful if substantial efforts were made to overcome the inertia of the units with a reasonable level of post-study activities. Similarly, for the intervention involving cross cutting energy efficient technologies and after taking up two pre-feasibility studies, it was felt that there was no need to undertake additional ones. Accordingly, the ECO-III management decided to limit the number of pre-feasibility studies to 11 (three per cluster each for Mandi Govindgarh (steel re-rolling), Ludhiana (textile processing), Ahmedabad (textile processing), and two for cross-cutting technologies Ahmedabad (Vatva, Naroda and Narol). Detailed Project Reports were prepared for three textile units (two at Ludhiana and one at Ahmedabad) and one for cross cutting technologies articulating the business plan of the proposed model. These studies concluded that EE solution development for EE finance projects should involve:

a) The right mix of short-term and long-term options
b) Persuasive skills to convince the users on the benefits (energy savings and others – product quality, productivity, materials, reduced emissions, and better work environment)
c) A good understanding of the capability and capacity of stakeholders to invest
d) Educating users on the risks, if any, of the energy conservation measures (ECMs)
e) Tenacity and risk absorption capacity by the participating stakeholders

SMEs are a heterogeneous lot – there are a variety of liquidity and business credibility concerns. SMEs are not transparent in sharing information on their outputs, cost, and financial performance. Both banks and SME units are aligned based on personal rapports. The Project also experienced difficulties with beneficiary units tendering loan applications after completion of the pre-feasibility studies and Investment Grade Proposals despite massive follow-up facilitation efforts. This is also related to timing of the activities and adverse market conditions. Innovative Energy financing or

Energy Service Company (ESCO)-financed SME projects pose difficulties both in conception and execution. Pre-requisites of an ESCO project are bankable proposals, which provide win-win situation to the key stakeholders, followed by smart negotiations and simplified contracts. In the area of financing, the Project foresees:

a) An increased role of for equipment suppliers/vendors (their participation as ESCOs, innovative financing or Performance Guarantees would be useful)
b) An increased role for large companies in promoting energy efficiency solutions for their ancillary SME suppliers
c) The establishment of consortia (synergic relationships between energy auditors, academic institutions, and general management specialists) to develop solutions and share costs, risks, and benefits in a business-like manner appears as a promising new approach

For example, work at Vatva Industrial Estate (Ahmedabad) is an attempt to develop a Road Map for wider application of energy efficiency solutions. Key to the proposed format is the Energy Champion – Green Environment Services Cooperative Society Limited (GSECSL) and interest shown by a few equipment suppliers. Based on the experiences under the Project at Vatva Industrial Estate, there is a strong case for soft support for inducing the stakeholders from the industry to invest in energy efficient technologies in addition to further technical assistance for energy solution development leading to energy efficiency financing.

USAID/ECO-III studies in the four clusters were undertaken with somewhat similar objectives to those of the BEE initiative in 25 clusters, that was undertaken with the support of Ministry of Micro, Small and Medium Enterprises, the Small Industries Development Bank of India (SIDBI), and the World Bank. SME schemes often need to be reviewed during the implementation phase. BEE is also thinking of introducing an innovative scheme like the "White Certificates" used in Europe to incentivize the stakeholders – user industry, solution developers, banks, and other stakeholders. ECO-III also suggests that BEE develop a website or knowledge base to concentrate all the information pertinent to the SME/EE issues and activities to avoid duplication of efforts and accelerate the development of sustainable business solutions. Organizations such as India SME Technology Services Ltd. (ISTSL) may be involved in playing a role in developing innovative energy financing solutions by close networking relations with the Indian Banks.

At the technology level, the Project also identified "Industrial Furnaces" as a major area of improvement as part of its goal to support the establishment of Regional Energy Efficiency Centers (REEC) – the one at Nagpur- will be devoted to propagating energy efficiency and fuel switching in industrial furnaces. The World Bank is planning to support steel forging steel clusters in Kolapur and Pune. This is likely to entail application of energy efficient small furnaces and capacity building of different stakeholders. The REEC at Nagpur can work together with the World Bank and other donors in addition to BEE and local counterparts to propagate energy efficient solutions for furnaces. This could also lead to a large programmatic Clean Development Mechanisms (CDM) activity with additional financial benefits to the new users.

Finally, it is our understanding that the World Bank will soon enter into a partnership with SIDBI for an omnibus fund. A part of this fund can go towards financing/supporting cluster-level activities under ECO-III as highlighted above.

All the above-mentioned activities are likely to provide an unprecedented impetus to increasing energy efficiency in Indian SMEs. We believe that the ECO-III contribution has been very valuable given the limited budget that was allocated to this activity and if requested, we stand ready to continue providing support in this important area.

1. SME SECTOR PERSPECTIVE

1.1. RELEVANCE OF THE SMEs

Growth of all segments of manufacturing and services enterprises – be they micro, small, medium or large – is critical for economic development and creation of jobs. India has nearly three million small and medium enterprises, which constitute more than 80 percent of the total number of industrial enterprises in the country. They contribute nearly 35 percent in direct export and 45 percent in the overall export from the country. SMEs are one of the biggest employment-providing sectors (over 30 million jobs).

The concept of cluster development emerged about 15 years ago and offers a new insight into the potential role of SMEs in enhancing their access to new technology. A cluster is a geographic concentration of firms and their various service providers and is defined by: (a) a product/product range, and (b) a place (name of a city, town, village) with forward linkages (selling agents, direct customers) and backward linkages (raw materials, suppliers, machinery suppliers) linked to production activities. It is estimated that there are 600 modern SME clusters and 2,000 rural and artisan-based clusters in India. To make their products globally competitive, Indian SMEs need to upgrade their technology.

The problems faced by the SMEs, particularly in accessing technology and maintaining competitiveness, are formidable. In recent years, the Government of India (GOI) has launched a number of initiatives to help small industries. Many of the SMEs are reeling under the current phase of economic slowdown, which is threatening their survival. In fact, many of these units are looking towards innovative and out-of-the-box ways to improvise their operations.

1.2. SCOPE OF ENERGY CONSERVATION

Numerous sector-specific studies have confirmed that energy intensity in industry can be reduced with the widespread adoption of commercially available technologies to improve energy efficiency, producing significant aggregate impacts and global benefits from reduced emissions of greenhouse gases. It is consistent with several GOI sector priorities and national plans – specifically, the National Mission for Enhanced Energy Efficiency in Industry under the National Action Plan for Climate Change released by GOI on June 30, 2008 has emphasized the need for improving energy efficiency in the manufacturing sector.

Despite recent Indian reductions in overall energy intensity, the SME sector has fallen behind larger Indian industry benchmarks in terms of productivity, technology upgrading, and energy efficiency. In this context, the Bureau of Energy Efficiency is laying adequate emphasis on the SME sector as presented in the Working Group on Power for 11th Five-Year Plan (2007-2012)-Sub-Group 5. SMEs are facing high – and rising – energy costs, unlike certain other sectors of the economy such as agriculture, that benefit from subsidized energy prices. As SMEs are also exposed to global competition, price and cost pressures are areas of high and increasing importance. SMEs, especially those for whom energy costs represent a large portion of total production costs, can reap especially high direct economic benefits from improving efficiency of energy conversion and reduction of energy losses, yet numerous barriers and market failures have prevented widespread adoption. Key impediments include the following:

- Lack of awareness and capacity on the part of SMEs to take up energy conservation and to perceive effective programs.

- Lack of scientific approach, measured data on the energy performance status. This is also related to the skill of key personnel employed by them and reticence to improve the reporting system due to the tax-oriented approach followed by the SMEs.
- Low credibility of the service providers such as energy auditors/ESCOs, and dearth of champions and strategic partners.
- Limited access to affordable financing/incentives to induce SMEs to come on board.
- Low priority – energy efficiency is one of several priorities and usually ranks low in sectors where incidence of energy cost is less than 10 percent of the manufacturing cost.
- Lack of coordination among the Government and private sector agencies involved in energy efficiency related activities.

1.3. PAST INTERVENTIONS

Energy efficiency in SMEs is not a new program in India. In the past, several government-induced interventions have addressed this area. Often these programs have not succeeded in achieving large-scale replication. A few bilateral/multilateral programs under the aegis of United Nations Industrial Development Organization (UNIDO), Swedish Development Cooperation Agency (SIDA), Indo-German Energy Program, and USAID were seeded during the past few years. Several national agencies like the National Productivity Council (NPC), The Energy Research Institute, Petroleum Conservation Research Association (PCRA), National Small Scale Industries Corporation, Winrock International, National Institute for Secondary Steel Technologies, etc. have been working at the grassroots level. A recently completed World Bank Global Technical Assistance Project, "Developing Financial Intermediation Mechanisms in China, India and Brazil" (the 3 CEE Project) led to the launching of five pilot lending schemes for energy efficiency at SMEs by Indian banks. Financing institutions/banks such as the State Bank of India (SIA), Small Industries Bank of India, Indian Renewable Energy Development Agency, and the ICICI Bank, among others, have been funding and supporting energy efficiency projects in SME units. The Ministry of Micro, Small, and Medium Enterprises, Government of India, has to count on BEE, PCRA and SIDBI for massive efforts needed in this area.

1.4. GAP AREAS

Implementation of energy conservation measures in SMEs has been at a far slower rate than expected despite substantive efforts in the past 20 years. Imperfect information about energy efficiency among small and medium enterprises still persists, preventing increased adoption of efficient technologies.

A central barrier, which will be the primary target area of the proposed project, is the current gap in understanding between the energy auditors/EE practitioners who prepare technical proposals for the SME clients and the local banks who evaluate loan proposals, not technical studies. This is mainly due to lack of facilitation efforts in connecting reliable energy audits to loan applications. Several clusters do not have access to the local service providers. Often there is doubt about their credentials. Thus, the 3CEE Report has pointed out that end-users and bankers often find that certain claims of energy savings are overstated. The technical credibility gap is an area to be addressed by energy professionals and supporting organizations such as BEE and PCRA.

There also appears to be a need to systematically support development of a large number of EE investment proposals under a programmatic approach to aggregate demand for EE investment in SME industrial clusters and to create a sustainable mechanism for identifying, preparing, and financing these proposals at the local level. ESCOs/energy service providers would perhaps be more readily accepted by end-users if they were able to finance the energy efficiency projects and realize their contribution related to the energy savings. So far, the issue of financing ESCOs has not

been taken seriously even by major stakeholders like the State Bank of India, who have been in the business of energy efficiency financing for the past 7-8 years.

Quoting from the proceedings of the ECO-III sponsored Workshop "Accelerating Implementation of Energy Efficiency Projects in SMEs" held on June 11, 2008, Project Management Cell, UNDP-GEF Project for Steel Re-rolling Mills Sector, traced the tardy progress in respect to the energy efficiency scheme operating from 2001 to June 2007 for their massive program with US$14 million budget equally shared between GOI (through the Ministry of Steel) and Global Environmental Facilities (GEF). The Program has several features, such as the removal of barriers to energy efficiency financing through capacity building, implementing ESCO projects and monitoring and evaluation programs in the Steel re-rolling sector. The industry showed lukewarm interest in implementing capital intensive measures, such as the replacement of inefficient re-rolling mill furnaces. The reasons cited were mismatches between the solutions attempted and the user industry specificities. In fact, several programs fail to trigger market response and active participation due to lack of foresight about current attitudes regarding solutions to EE. Often, the role to be played by the energy solution provider for developing trust among the key actors is not given adequate attention at the program design stage. Energy efficiency programs also need substantive efforts for periodic review and midterm corrections to ensure results. Often frequent changes in the Program implementing agencies also adversely affect the outcome.

In many instances, the Banks have announced special schemes to finance energy efficiency in SMEs but they generally suffered from inadequate preparedness to market and facilitate SME customer's interest and involvement. For that reason, nationalized banks – Union Bank of India, Canara Bank, Bank of India, and Bank of Baroda – had launched schemes similar to the State Bank of India's initiative. These schemes did not evoke enough response as per the 3 CEE Project Report. This can be attributed to the lack of adequate preparedness of these banks to ensure a good response from users. According to the 3CEE Report, the following impediments are often faced by the banks and SMEs while implementing energy efficiency projects:

1) Lack of available capital, especially for smaller enterprises
2) Inadequate information on appropriate equipment and technology
3) Under-emphasis on EE investment financing by domestic financial institutions

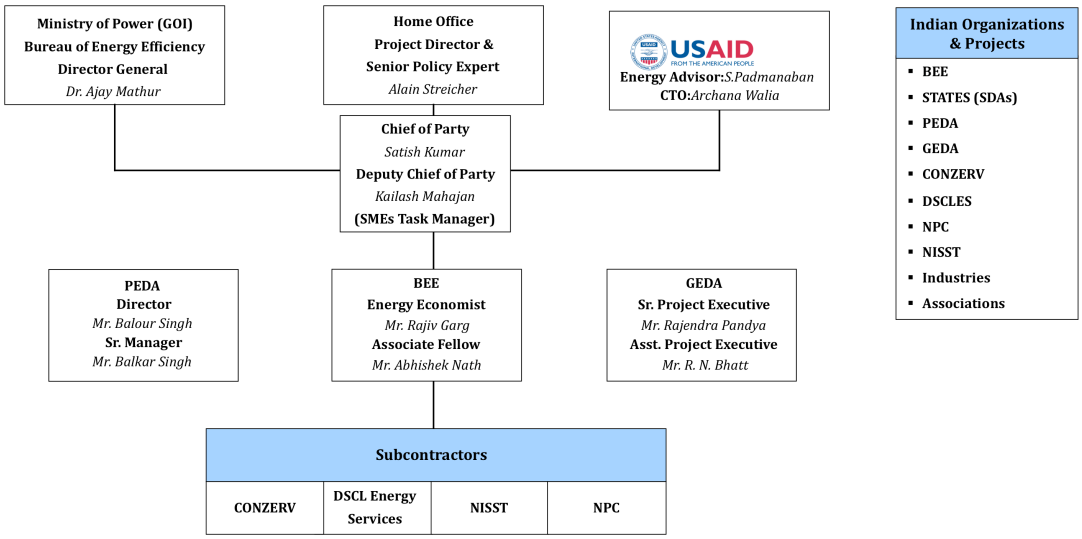
2. PROGRAM DESIGN

2.1. LINKAGE TO ECO OBJECTIVES

The SME component is linked to the ECO objectives of promoting access and utilization of clean, energy efficient technologies and continuity of the implementation of the Energy Conservation Act by building on earlier phases of the ECO project.

The main focus is to closely associate with BEE and SDAs (in Punjab and Gujarat, ECO-III focused states) in the SME tasks especially for resolving the perceived bottlenecks for accelerating the implementation of energy efficiency measures. Fig 1 below shows the organization chart depicting the key actors in this intervention.

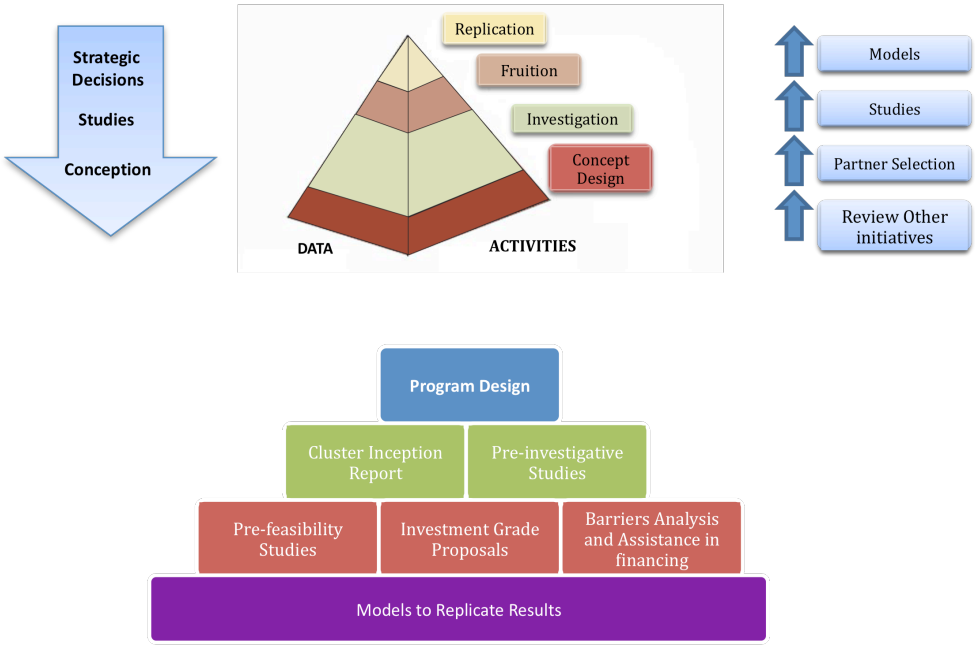
Figure 1. Organization Chart for EE Interventions in SMEs



2.2. APPROACH

The goal of this program is to accelerate the rapid penetration of the untapped market of the already known technologies/techniques with external abatements. It is generally believed that there is a large potential market for already tried and demonstrated energy efficient technological measures that can be implemented successfully by Indian SMEs. The project is aiming at viable projects in the SME sector which can be implemented not only in the chosen clusters but have substantial potential for replication in other locations. Figure 2 below depicts the broad steps involved in the approach being adopted by the Project.

Figure 2. Steps involved for SME Programs



- Identify barriers and develop a road map for implementing energy efficiency projects
- Identify a few SME clusters and cross-cutting technologies for concerted attention for energy efficiency financing
- Undertake a few pilot projects to conceptualize energy efficiency projects in SMEs
- Understand EE financing practices and address the institutional and credit-related concerns

2.3. CLUSTER SELECTION- INCEPTION REPORT

There is very little energy data available on SME clusters. The project characterized clusters based on the number of units in the clusters and annual turnover as per UNIDO. The table below summarizes data in respect of short-listed clusters.

A few other clusters – e.g., diamonds (Surat and other locations in Gujarat), ceramic tiles (Morbi, Gujarat), induction furnaces (Mandi Govindgarh, Punjab), and rice mills (Amritsar and other places, Punjab) – were considered. They were dropped for lack of adequate motivation among the actors.

Table 1: Information from Short-listed Clusters

Cluster/ location	Strengths	Weaknesses	Merits
Ludhiana (Punjab) Dyeing units	Energy cost: +30% of value added cost, competitive sector, large population of units and turnover	Research association also unable to dent dearth of local service providers and program facilitators	Enlarge the EE market in textile sector being targeted under EC Act, Use soft funding under Technology Up gradation Fund (TUF) scheme, Develop capacity of EE service providers
Mandi-Govindgarh (Punjab) Steel Re-rolling mills	Energy cost: +30% of value added cost, competitive sector, large population of units and turnover, UNDP– GEF project, an active Local service provider (NISST)	ECO-III relies on market pulls - very few takers without subsidies, wide fluctuations in the cost of inputs –coal, fuel oil and business volume.	Tap opportunities in units outside the ambit of UNDP-GEF subsidy scheme

Ahmedabad (Gujarat) - Textile Process houses	Energy cost: +30% of value added cost, competitive sector, large population of units and turnover, presence of research association and service providers	Low profile of EE activities, association not active on EE front, EE activities from research associations activities are on a decline-inertia of the industry is a handicap	Enlarge the EE market in Textile sector being targeted under EC Act, Use soft funding under TUF Scheme, Develop capacity of EE service providers
Ahmedabad (Gujarat) Mixed – dyes, pharmacy, light engineering, machine tools, etc	Strong association – common effluent plant, large population of units and turn over, synergy among public private actors	Past energy efficiency initiatives did not succeed in the recent years, actionable data not forthcoming from SMEs	Implementing cross-cutting EE technologies with vendor and other stakeholders

2.4. PRE-INVESTIGATIVE STUDIES

Pre-investigative studies provide a sector review of relevant opportunities that aid in conceiving a package of energy efficiency measures based upon the information garnered during the studies, and experiences of the ECO-III organizations and service providers/vendors. Studies capture the reasons for selecting clusters or cross cutting technologies.

Pre-investigative studies generally get sold on the merits of the substantial possible energy cost reduction and the quick paybacks to the beneficiary units. In one of the clusters (mixed cluster at Ahmedabad at Vatva), the focus of the studies is to market implementation of clean and widespread "proven" energy efficient technologies such as efficient lighting, soft starters, and variable speed drives, which cut across several sectors. On the other hand, the other three clusters are capturing a variety of technologies relevant to the clusters – textile dyeing/processing and steel re-rolling, etc.

Table 2: Key strategies: Pre-investigative studies

Cluster	Strategies	Significance
Vatva – Naroda-Narol (Ahmedabad)	Review of past NPC studies and one-to-one interactions with users and other stakeholders.	Grasp of the issues by feel of situation to take up capacity building activities
Ahmedabad	Interactions with Chief Electrical Inspector and banks, partnership with Ahmedabad Textile Industry Research Association (ATIRA)	Pre-marketing interventions,
Ludhiana	Interactive meets /workshop with industry associations, Northern India Textile Research Association (NITRA), State Bank of India and Punjab Energy Development Agency (PEDA)	Exchange of ideas and sustenance of interest in ECO-III program
Mandi Govindgarh	Interactive meets /workshop with industry associations and PEDA, review of the past studies by National Institute for secondary Steel Technology (NISST)	Exchange of ideas especially on energy efficient technologies and strategies such as fuel switching and material savings relevant to the sector

2.5. PRE-FEASIBILITY STUDIES

Pre-feasibility Studies are designed to provide a diagnostic as well as pre-marketing of energy efficiency measures by performing technical evaluation and cost-benefit analysis. The purpose of the pre-feasibility studies report is to prepare the ground for appropriate consultancy support by

service providers to the SMEs, which are need-based, transparent, and can trigger the implementation process.

Pre-feasibility studies deploy diagnostic tools for performing technical evaluation and cost-benefit analysis similar to energy audits. A questionnaire is being compiled from the units on their Present Energy Profile along with other relevant information. The units are selected based on their energy-saving potential as well as the financial health and preparedness of units to invest.

The short-listed units are providing a commitment in writing to support the studies and implement the viable energy-saving measures emanating from the studies. The project also devoted some efforts to overcoming the inertia of the units. The short-listed units for the Ahmedabad textile cluster agreed to make a token contribution towards meeting the cost of Process Specialists from ATIRA to work with the team. For steel re-rolling mills, studies capture material savings as well as energy cost savings.

2.6. INVESTMENT GRADE PROPOSALS

Investment Grade Studies are expected to lead to bankable proposals. This is the outcome of the pre-feasibility studies undertaken under the project. The Investment Grade EE Proposal is intended to firm up bankable propositions by obtaining competitive offers from the equipment suppliers by reviewing with the user industry various options to mobilize project finance. There is a wide range of investment packages in energy efficiency projects in SMEs. Low and medium investment projects having payback of less than one year are usually implemented from internal accruals. Medium to large investment projects are normally implemented as part of a modernization or expansion program for which debt financing is sought.

2.7. CROSS CUTTING TECHNOLOGIES

In one cluster (mixed cluster at Ahmedabad covering the industrial estate at Vatva), the identification of a champion who has the trust of the member units in the cluster and promotes multi-stakeholders for propagation of clean and widespread "proven" energy efficient technologies, which cut across several sub-sectors, has been very successful. It has opened doors for several interventions involving key actors – vendors, banks, energy auditors, service providers with active roles in the industry association. This has garnered support of the Gujarat Energy Development Agency (GEDA) and local service providers, including BEE, accredited energy auditors, and equipment suppliers.

2.8. FACILITATION

These activities also include facilitation services to track project development, assistance, and backstopping of the project until financial closure. Often energy consulting is construed as a merely technical advisory activity unrelated to business/financial decision making processes. Implementation of ECMs requires substantial pre-marketing and post-studies interventions, which are usually ignored by technical consultants/energy auditors. The Project has emphasized these activities as a part of the ECO-III interventions. Table 3 highlights the interactive sub-activities under the project.

Table 3: Interactive Sub-activities in SME Clusters

Gujarat

	Activities	Year 2007										Year 2008									Expected Outcomes
		Q2			Q3			Q4				Q1			Q2			Q3			
		3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	
	1.0 Program Design and Monitoring																				
1.1	Meetings with GEDA and partners (NPC, DSCLES, GCPC) in pursuit of sector research																				Grasping the issues
1.2	Presentations at IRGSSA's IREDA Workshops (Surat, Rajkot, Ankleshwar) and interactions with SME stake holders																				Discussions with stake holders
1.3	SME sessions at GEDA workshop – Raising the profile of Energy Efficiency in Gujarat																				Dissemination
1.4	Interim meetings with GEDA, NPC , DSCLES, beneficiaries /champions																				Interim reviews
1.5	Meetings with BEE, GEDA on interim results																				Feed back
1.6	Partners Review Workshop																				Exchange of ideas and mid term corrections
1.7	SMEs Workshop																				Exchange of experiences
1.7	Consolidation and next steps																				
	2.0 Field Studies (Cross Cutting Technolgies)																				
2.1	Pre-proposal studies and interactions																				
2.2	Proposal and Inception Report																				Firming up the clusters
2.3	Pre- Investigative Report																				Sector overview
2.4	Pre-feasibility studies																				studies to fix Technolgies
2.5	Feasiblity - model formulation																				Business model
	3.0 Field Studies (Ahmedabad Textile Cluster)																				
3.1	Pre-proposal studies and interactions																				A meaningful work plan
3.2	Proposal and Inception Report																				Interactions with associations
3.3	Pre- Investigative Study																				Sector analysis
3.4	Pre-feasibility studies																				3 studies to fix ECMs
3.5	Investment Grade & Concluding																				Bankable proposal
	4.0 GEDA: Major Inputs																				
4.1	Interactions with ECO-III Team																				Familarization
4.2	ECO-III Workshops																				About ECO-III approach for SME studies
4.3	Workshop with Energy auditors																				Stake holders Workshop

Punjab

	Activites	Year 2007										Year 2008									Expected Outcomes
		Q2			Q3			Q4				Q1			Q2			Q3			
		3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	
	1.0 Program Design and Monitoring																				
1.1	Meetings with UNDP Steel, NPC, Conzerv																				Grasping the issues
1.2	Background parper and meetings with patners																				Discussions on terms of reference
1.3	Inviting Prposals and finalization of Pos																				Sub-contract
1.4	Distiling information on Clusters and Stake holders																				
1.5	Meetings with BEE, PEDA on interim results																				
1.6	Partners Review Workshop																				Feed back
1.7	SMEs Workshop																				
1.7	Consolidation and next steps																				Exchange of experiences
	2.0 Field Studies (LudhianaCluster)																				
2.1	Kick off meetings- PEDA Industry Associations (Ludhiana)																				Firming up the clusters
2.2	Inception Report																				Sector overview
2.3	Pre- Investigative Report																				Workshop, short listing units
2.4	Pre-feasibility Studies (3)																				3 studies to fix ECMs
2.5	Investment Grade Reports (2 units)																				Bankable proposals
2.6	Consolidation and Suggestions for replication of results																				Next steps
	3.0 Field Studies (Mandi Govindgarh Cluster)																				
3.1	Pre-Preposal Discussions, Inviting Proposals from NISST and finalization																				A meaningful work plan
3.2	Inception Report																				Interactions with associations
3.3	Pre- Investigative Study																				Workshop, Unit survey, short listing
3.4	Pre-feasibility Studies (3)																				3 studies to validate ECMs
	4.0 PEDA: Major Inputs																				
4.1	Visit to Mandi Govindgarh with ECO-III team																				Familarization visit
4.2	Interactions with Conzerv and ECO-III team																				About ECO-III approach for SME studies
4.3	Participating in workshop Ludhiana (Conzerv)																				Stake holders Workshop
4.4	Participating in workshop Ludhiana (Conzerv)																				WB- IREDA Workshop (IRGSSA)
4.5	Participating in workshop Mandi Govindgarh (NISST)																				Stake holders Workshop
4.6	Review visit (Mandi Govindgarh and Ludhiana)																				Interim findings
4.7	Review visit (Ludhiana)																				Feedback on the ECMs
4.8	Participating in SMEs workshop (ECO-III) Delhi																				Exchange of experiences
4.9	Review visit (Mandi Govindgarh and Ludhiana)																				Stock taking
4.1	Pre-Closure discussions with ECO-III																				Next steps

3. STUDIES FINDINGS

3.1. TEXTILE SECTOR

Profile of energy consumption, energy conservation measures and energy conservation potential in the six textile processing units is depicted in Tables 4(A), 4(B), and 4(C) below:

Table 4(A): Energy Consumption Profile: textile processing units

Unit	Fuel used	Electricity/ Aggregate Energy (%)	Aggregate Energy (TOE) /year
A. Punjab	Rice husk	8.0	2175
B. Punjab	Rice husk	7.9	1730
C. Punjab	Rice husk	11.0	1220
A. Gujarat	Lignite	6.3	3400
B. Gujarat	Lignite	9.3	1220
C. Gujarat	Lignite	6.2	5980

Table 4 (B): Typical Energy Conservation Measures: textile processing units

Cluster: Punjab	Cluster: Gujarat
• Reduce excess air in Thermo-pack and boilers • Install variable frequency to IDF and in steam boiler • Replace conventional fluorescent lamps with T-5 lamps • Install capacitors to avail maximum power factor rebate • Install variable frequency drive (VFD) on boiler forced draft fan • Waste heat recovery (Flue gas heat: heaters) • Install variable frequency drive on compressor • Install variable frequency drive on pump (Dyeing machine)	• Advanced Fluidized Bed Combustion Boilers (FBC) Thermo-pack • Thermo-pack: Reduce heat losses and heat recovery • Installing co-generation • Caustic recovery from mercerizers • Replace jiggers by cold pad dyeing process • Waste heat recovery – jet dyeing, kiers • Install energy efficient compressor • Improving drying efficiency in stenters • Voltage reduction in the lighting circuit • Install energy efficient pumps

Table 4 (C): Annual Energy savings and costs estimated in textile processing units

Units	Energy Savings (TOE)	Value of Energy Savings (INR million)	Investment (INR million)	Simple Pay Back Period (Months)
A. Punjab	99	2.2	3.8	20
B. Punjab	159	2.6	4.2	19
C. Punjab	54	1.5	3.0	24
A. Gujarat	723	5.9	8.2	17
B. Gujarat	345	3.4	4.2	16
C. Gujarat	163	13.3	4.9	4.5

3.2. STEEL RE-ROLLING MILL SECTOR

Profile of energy consumption, energy conservation measures and energy conservation potential in the three steel re-rolling units is depicted in the table 5 (A), 4(B) and 4 (C) below:

Table 5 (A): Energy Consumption Profile: steel re-rolling units

Units	Aggregate Energy (TOE) /year	Electricity /Aggregate Energy (%)	Thermal Energy Source
A. Re-rolling	820	26	Coal + oil
B. Re-rolling	290	25	Oil
C. Re-rolling	450	19	Coal

Table 5 (B): Typical Energy Conservation Measures: steel re-rolling units

Typical Energy Conservation Measures: steel re-rolling units
• Redesign of furnace and switch to producer gas. • Optimization of operational performance and installing VFDs application on blower. • Increasing the width of existing furnace. • Installation of new energy efficient recuperators • Replacing existing bearing with anti-friction roller bearing • Replacing existing coupling with universal spindle • Adoption of Flat belts in place of existing V-belts • Installation of Y-type lifting table and wall tilter/roller table on roughing stand • Improvement in the power factor • Reducing down time and reducing idle running of motor • Replacement of old and rewound motors of fans, pumps and blowers with new energy efficient motor

Table 5 (C): Energy savings estimated Redesigning of Furnace using pulverized Coal

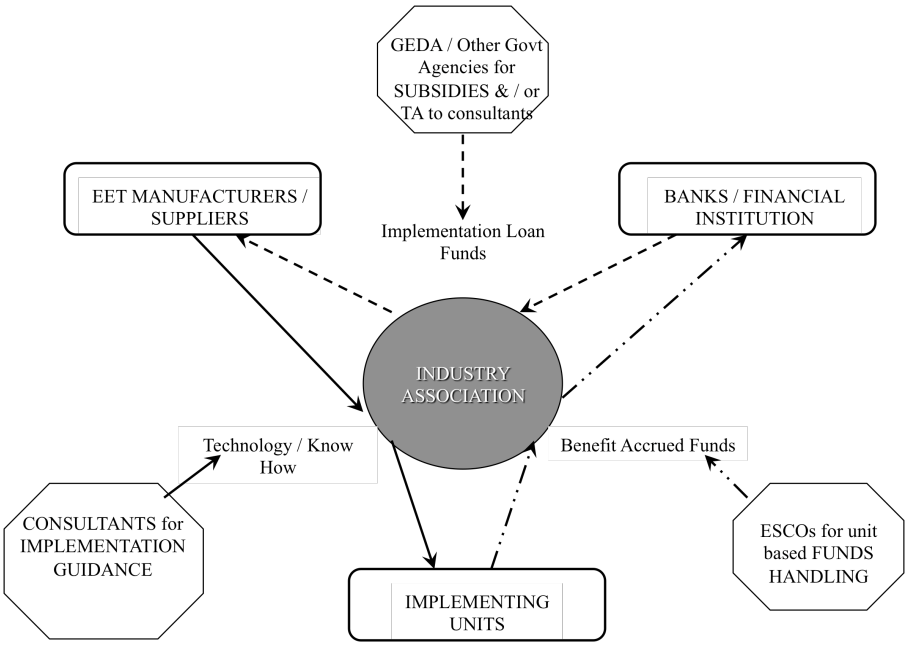
Units	Energy Savings (TOE/year)	Energy Savings (INR Million/year)	Material Savings (INR Million/year)	Energy plus Material Savings (INR Million/year)	Investment (INR million)	Simple Pay Back Period (Months)
A. Punjab	80	1.64	8.35	10.0	19.1	23
B. Punjab	66	1.54	1.38	2.92	2.9	12
C. Punjab	79	2.28	5.52	7.8	4.1	6

3.3. CROSS-CUTTING TECHNOLOGIES

The project decided to chase a prescriptive model driven by an Ahmedabad-based energy champion for the members of clusters successfully running a common effluent plant. It should be noted that previous efforts to provide additional energy efficiency measures did not create the desired impact.

- Two pilot studies were taken up in the cluster to grasp the prevailing situation and gather facts at the cluster level.
- The model as conceived for propagation of energy efficiency technologies is depicted in Figure 3. The premise of this model is to redesign the package to market cross cutting energy efficiency technologies, such as efficient lighting, soft starters, VFDs, etc., which cut across several sectors. It is seeking a flexible intervention involving key actors – e.g., vendors, banks, service providers backed by young engineering college students, promotional agencies such as GEDA.
- The business model was developed through further participative discussions in July 2008. GEDA is supportive and we expect a few equipment suppliers to be in the loop. It is expected to be ready for launch at the end of the ECO-III Project.
- The model envisaged a pivotal role of the association which already exists, with positive outlook and years of experience in managing common effluent treatment plant to take on energy efficiency initiatives with the involvement of the stakeholders – energy efficient technology (EET) vendors, EE Consultants, Financial Institutions. The direct players/ beneficiaries in the SME EE Market would be better placed to deal with a single entity (Industry Association) rather than a dispersed/ discrete lot of Small and Medium Entrepreneurs especially through exchange of actionable data. The cluster has about 600 units.
- SME units would be the primary beneficiary of this approach, as their energy cost would be reduced after implementation of the options. Since it would be a cooperative approach, member units would also gain on discounts that vendors may be willing to share. Vendors would benefit by selling their products in a large number. A market would be created for Consultants /Energy Auditors/ESCOs in the SME sector which provides opportunities for development.
- GEDA, GIDC and other participating Government Agencies would draw new benefits from the close relationships built up among the stakeholders and visibility of the efforts in energy conservation activities. Banks and FIs would be interested in giving sizable loan for Energy Conservation activities. Since the approach is a win – win for all stakeholders, it would also ensure sustainability in the long term and it makes sense to replicate other SME clusters. Interestingly, GEDA has a target to service 4000 SME units by 2012, terminal year of the eleventh five year plan through walk through energy audits which will bring out relevant data on cross cutting technologies relevant to the units triggering a wide scale implementation in the SME clusters.

Figure 3. Model for Propagation of EE Technologies



4. OPPORTUNITIES AND CHALLENGES

4.1. ENERGY CONSERVATION POTENTIAL

Business model for cross cutting technologies at Vatva Industrial Estate is expected to generate investment of the order INR30 million leading to energy savings of nearly INR 15 million on annual basis with about 25% annual growth in business volume.

The aggregate energy saving potential in 9 units the Textile (Ludhiana and Ahmedabad) and Re-rolling mills (Mandi Govindgarh) clusters can be summed up in Table 6 as below:

Table 6: Aggregation of Energy Conservation potential

Nature of EC measures	Investment (INR Lacs)	Energy savings (INR Lacs/year)	Other comments
Low-cost/no-cost measures with Simple payback below 12 months	31	47	Creamy ideas
Other minor retrofits	41	22	Several measures with paybacks of 1-3 years in 6 units (textile)
Major Capital Projects	439	370.9	Common ideas - table below
Cogeneration (2 units)	560	153	Disinterest by units due to likelihood of shortage of lignite and its high prices. This is a case worth re-investigation in other situations.
Aggregate	1071	592.9	

** There is ample scope of the vendors of energy efficient equipment capitalizing on ECO-III outcomes and creating a market in the cluster beyond these three units. Even banks may be interested in supporting this. Another idea is to look for other supporting agencies at the State /Central Government level.

Of these, major capital investment is listed in Table 7 below:

Table 7: Capital Intensive Projects (Investment above INR 10 Lacs)

Unit	ECM	Investment	Expected savings/year	Other comments
Adinath (Ludhiana)	VFD application – pump & fan	22	7.4	Common to three Ludhiana units
Ekta (Ludhiana)	VFD application - pump	15	5.7	Common to three Ludhiana units
Ekta (Ludhiana)	Compressor with VFD	10	3.4	
Devinder Sandhu (Ludhiana)	VFD application – pump	15	5.6	Common to three Ludhiana units
Sameer (Ahmedabad)	Existing Thermo pack to be changed to FBC design	26	18	Common to three Ahmedabad units

Sameer (Ahmedabad)	Replace jiggers by cold padding	20	8.2	
Srikrishna (Ahmedabad)	Existing Thermo pack be changed to FBC design	30	10.7	Common to three Ahmedabad units
Chetan (Ahmedabad)	Existing Thermo pack to be changed to FBC design	40	100	Common to three Ahmedabad units
Thakur Steel (Mandi Govindgarh)	Recuperators, Furnace revamps VFDs fans, capacitors etc.	29	29	Common to the re-rolling mill units
R.K. Plates (Mandi Govindgarh)	Recuperators, Furnace revamps, Rolling mill, electrical, etc	41	78	Common to the re-rolling mill units
Bhusan Steel (Mandi Govindgarh)	Recuperators, Furnace revamps, Rolling mill, electrical, etc	191	104.9	Common to the re-rolling mill units

4.2. IMPACTS

4.2.1. TEXTILE PROCESSING UNITS:

Impact made in respect of the studies in 6 textile processing units in both Ahmedabad and Ludhiana units is insignificant as most units have not made substantial progress in respect of measures involving substantial capital investments (0.2 – 5 million INR) having paybacks of 1-3 years. They do not buy capital intensive measures like co-generation due to tight monetary conditions besides other risks associated with these projects such as high cost of lignite, etc.

Interestingly one unit (Sameer Textiles, Ahmedabad) has invested INR 2.5 million from internal resources to implement some of the measures. They have made a separate application for loan of INR 40 (L) from Punjab National Bank to implement these two projects on Waste Heat Recovery from process Jet Dyeing Machines and Caustic Recovery from Mercerizers. The loan application, as given to understand, is under process.

Shri Krishna Processors is keen to invest from internal resources one million Indian rupees for short and medium term measures to be implemented within next 3-6 months and looking for financial assistance such as soft loan or performance contracting for replacement of existing manually fired thermo pack by FBC technology based one which involves investment of two million rupees.

Units at Ludhiana cluster have chased low cost measures and done very little to utilize the investment grade proposals to seek loans from the Banks who are keen to extend loan to them considering their overall financial position and track record. This is somewhat related to prevailing investment climate in the sector as well as the general apathy to energy efficiency.

Two of the units (Sameer Textiles and Chetan, both at Ahmedabad) are likely to be notified as designated consumers by BEE. It is likely that the experience under the Project will be handy for devising strategies for intensifying implementation in such units especially the program "Perform, Achieve and Trade" which will provide some inducements in the form of incentives/penalties for units not achieving the targeted specific energy consumption targets. This obviously will call for fixing benchmarks for energy consumption figures.

4.2.2. STEEL RE-ROLLING MILLS:

Two units (Bhusan Steel and Thakur Steel) have implemented some of the suggested measures (a) Furnace modifications in Bhusan steel by investing .0.35 million with benefits of 0.49 million INR,

(b) Installing VFD on blowers, augmenting capacitor bank , reducing mill stoppages , etc by investing about INR 0.1 million leading to annual savings of INR 0.65 million. Most of other measures in all 3 units are under planning stage and will be taken up once the market bounces back. The units are under tremendous pressure due to severe stress due to drop in business volume, realization far below cost of production, very high cost of inputs including fuel, etc. The sector is also reviewing the fuel switching options- in the present context some units are re- looking into the decision to switch back from coal/producer gas to furnace oil – ideally bi-fuel option is quite relevant in the present context.

On the whole, impact of the Project activities on the prevailing situation is limited, though the stakeholders including PEDA got convinced on the need to take the legacy of the project to its logical conclusion by continuing the campaign beyond the project period in this sector.

4.2.3. CROSS CUTTING TECHNOLOGIES:

It is too early to expect the model to fructify relationships between the stakeholders to implementation of energy efficiency measures. The Project has focused a major attention to the pilot activities in the Vatva Industrial cluster for propagating energy efficient technologies through the cooperative efforts of the stakeholders led by the Industry Association (cooperative venture of about 680 SMEs) as a prescriptive solution. Detailed discussions with SMEs units, SMEs associations, energy efficient technologies (EET) vendors, Banks and GEDA led to a good deal of understanding or consensus among the stakeholders about the proposed approach. Key initiatives undertaken during the recent period include:

- ✓ Meeting of the member units was held in presence of GEDA officials (Government Agency) to appraise and inform the member units about the benefits of this large-scale cooperative energy efficiency initiative.
- ✓ Meeting of EET vendors organized at GEDA where they were apprised of the benefits of this approach and they subsequently accepted this model. Green cooperatives were also represented, along with a few members of association member units.
- ✓ The vendors were very appreciative of the initiatives and promised whole-hearted involvement in sustaining the approach. They were of opinion that they stood to benefit through the cooperative methodology.
- ✓ The association, at its initiative, organized meetings of vendors with the association member units.
- ✓ The association convinced two of the vendors to demonstrate the performance of EETs, namely T5 and Spray Drier. (Spray drier was initially taken by the association and demo units were installed at one of the member unit's facility.)
- ✓ A meeting has been proposed of the association with a few other government agencies, such as the Ministry of Micro, Small, and Medium Enterprises, national small industries corporation, industry commissions, etc. who, in preliminary discussions, showed interest in supporting this approach.
- ✓ GEDA (Government agency) has finalized a large-scale walk-through energy audit for SMEs to document energy usage in SMEs and potential for conservation.
- ✓ An initiative by the industry association has led to an MOU between the association and NIRMA University for providing manpower for the EET survey.

4.3. BARRIER ANALYSIS

For barrier analysis, the project did a review of the past studies including the recent 3CEE Report, and utilized the past exposure in the recent cluster-related training programs under the aegis of World Bank-Indian Renewable Energy Development Agency (IREDA) and SBI Uptech scheme, as well as several workshop meetings under ECO-III Project.

A specific Workshop was organized by ECO-III for the exchange of the experiences among stakeholders from the pilot studies in the four SME Clusters under the Project on June 11, 2008 in New Delhi. The Workshop also disseminated the highlights of experiences of a few other similar programs in the recent years. Participants deliberated on the key policy and barriers – particularly relating to financing – impeding investment in energy efficiency projects for overcoming the same. This Workshop provided a forum for a meaningful exchange of ideas among agencies and champions for energy efficiency in SMEs in India.

A summary of the barriers impeding implementation/energy efficiency financing and a likely road map for addressing them are shown in the table below:

Table 8: Barriers to Implementing Energy Efficiency in SMEs

Sr. No	Barriers	Likely Solutions	Remarks
1	There is massive gap on actionable data and effective and well publicized/ dissemination of demonstration projects.	Cluster level workshops, site visits, awards for successful case studies, films, etc.	Critical is access to information within and outside the cluster.
2	Effective coordination with stake-holders – understanding and trust of unit owners needed to get the process going.	Stress on participative activities and joint reviews, energy audits to be re-packaged with emphasis on facilitation till fruition of energy savings.	Communication gaps and multiplicity of agencies have to be mitigated.
3	Limited access to affordable financing and incentives to induce SMEs on board.	Innovative financing and subsidy schemes, recognizing energy efficiency achievements for additional tangible benefits.	Administration of the scheme and its periodic review needs substantive efforts
4	Low Credibility of the service providers such as energy auditors/ESCOs with professionally trained staff active in SMEs, dearth of "champions" and "strategic partnerships".	Calculative developmental efforts needed including capacity building and professional support, tutoring by experienced persons during formative period. Successful case studies	Human resources development issues can no longer be brushed aside in pursuit of energy efficiency business ethics
5	Non transparent cash transactions do not go well with verification of results (Monitoring & Verification).	Innovative non-intrusive M&V approaches will have to be developed to capture most of the potential for investments.	Cash transactions are the rule in most SMEs and that this situation is likely to remain for years to come.
6	Innovative financing applications for EE pose a challenge and not tried so far seriously.	More pilots stressing verifiable energy savings especially on guaranteed energy savings model needed.	Incentives to ESCOs for successful projects executed will provide the impetus.

4.4. REGIONAL ENERGY EFFICIENCY CENTERS (ENERGY EFFICIENT FURNACES) AND TECHNOLOGY PROMOTION

The Project also identified "Industrial Furnaces" as a major area of improvement as a part of its goal to support the establishment of three Regional Energy Efficiency Centers. One center at Nagpur is devoted to propagating energy efficiency and fuel switching in industrial furnaces. It is

also proposed to develop capability of energy firms, ESCOs, equipment suppliers, and user industry to develop viable solutions for engineering furnaces through the ECO-III-supported REEC at Nagpur. The World Bank is planning to support the steel forging cluster in Kolapur and Pune. This is likely to entail application of energy efficient small furnaces and capacity building of different stakeholders. The REEC at Nagpur can play that role if ECO-III and World Bank/SIDBI work together for developing innovative finance solutions.

5. OBSERVATIONS

USAID ECO-III studies in the four clusters were taken up with somewhat similar objectives to those of the current BEE initiative in 25 clusters with the support of the Ministry of Micro, Small, and Medium Enterprises, SIDBI, and the World Bank.

Prima facie, the impact of ECO-III activities to the SME units covered is quite limited. This is related to the small size of the Project as well as lower degree of acceptance of the suggestions made by the ECO-III team by the beneficiary units due to prevailing business environment. The stakeholders – users, service providers, and other agencies associated in these efforts do not look to these studies beyond the need for an incentive scheme, soft support for the cost of studies, installation of EETs.

From the field studies taken up under the Project, it is observed that EE financing of projects requires more due diligence for packaging the right mix of short- and long-term measures depending upon the paybacks and investment levels. Often, the users are tempted by low-/no-cost measures and look for more outside help for deeper understanding on the energy conservation measures by the operating staff. The Consultants engaged in SME EE tasks need persuasive skills to convince the users about the benefits (energy savings and others – product quality, productivity, materials, reduced emissions, and better work environment) and tenacity to work in the sector.

SMEs are a heterogeneous lot – there are liquidity and business credibility concerns. SMEs are not transparent in sharing information on their outputs, cost, and financial performance. It is also relevant to have a good understanding of the capability and capacity of stakeholders to invest. While ECO-III strived for a letter of commitment or memorandum of understanding from the pre-selected units, it is felt that more foresight into the prevailing financial situation is also useful, at the stage of pre-selection of the units for studies focused on EE financing.

The users are not often educated on the risks associated with the ECMs. Studies are usually expected to raise the confidence level of users for implementing EE measures. This also calls for assistance for selecting the vendors. Quite crucial for the success of the energy efficiency campaign is the risk absorption capacity by the participating stakeholders.

These studies established that both banks and SME units are aligned based on personal rapports. The Project also experienced hassles in beneficiary units tendering loan applications after completion of the Pre-feasibility studies and Investment Grade Proposal despite massive follow up facilitation efforts. This is also related to timing of the activities and adverse market conditions. Thus in one unit at Ahmedabad, efforts to seek loans under TUF scheme from a leading private bank was rejected because of lack of trust and relationship with the SME entrepreneur.

Innovative Energy financing or ESCO-financed SME projects are difficult both in conception and execution. These are often not pursued because of lack of adequate pre-marketing and confidence building measures involving the users and Consultant. The stakeholders are shying away from innovative models such as energy performance contracting or performance guarantee. Perhaps the market is too nascent at the moment. Sustenance of the program needs substantive support for technical assistance or fiscal incentives to the beneficiary unit /stakeholders to cover the perceived risks. The incentives may be in the form of reduced interest on loans and providing grants for associated costs of verification and certification of energy savings and efforts for energy efficiency solutions.

Indian Banks so far have not moved in the direction of cash flow lending for SME activities. This is also related to banking practices for other projects. Most energy efficiency proposals are included with modernization and expansion projects. High transaction cost for EE proposals is a deterrent.

In the area of financing, the Project foresees an increased role for equipment suppliers/vendors (their participation as ESCOs, innovative financing or Performance Guarantees would be useful). In fact, in the Vatva Industrial estate, they have taken a good deal of interest in promoting their products and services by participating in the interactive meetings and exhibitions.

Consortia (synergic relationships between energy auditors, academic institutions, and general management specialists) established to develop solutions and share costs, risks, and benefits in a business-like manner appear as a promising new approach. For example, work at Vatva Industrial Estate (Ahmedabad) is an attempt to develop a road map for wider application of energy efficiency solutions. Key to the proposed format is the concept of an "Energy Champion" leading the industry association – GSECL – and the interest shown by a few equipment suppliers.

Large companies may promote energy efficiency solutions for their ancillary SME suppliers. This may be relevant for ancillary units connecting with major automobile or machinery manufacturers for technical and financial support for improving their competitiveness.

At the technology level, the Regional Energy Efficiency Center at Nagpur is expected to work with the steel industry to promote EE by providing a clear understanding of the tools and techniques of energy efficiency in Industrial Furnaces.

6. CONCLUSIONS

The team's conclusions are presented below:

There is a national need for developing momentum for implementing energy efficiency in SMEs by focusing on handholding efforts, pre-marketing, and post-studies activities. Ideally, the local service providers have to take up these activities with the support of more experienced agencies for overall guidance and problem solving.

Acceptability of these ideas needs calculative efforts for development of energy efficiency solutions. Energy auditing, EE Financing, Energy Project Conservation, and risk financing are not the drivers for getting quick results.

Major success in the project is seeding a participative process involving stakeholders at Vatva Industrial Estate. This appears to be a useful model worth emulating in other industrial estates. It is poised to be accepted by the SMEs and others interested in energy efficient technologies. There is a need for more synergy between buyers and sellers of energy efficiency ideas. Government agencies and donor programs may continue to support technical assistance programs and bring in refinements/additional ideas that are in tune with the local efforts.

REECs under the Project would be useful for developing energy efficiency solutions. This could be done directly by entrepreneurs or the promoters such as major firms as part of their supply chain or other entities such as banks. REECs will be pursued under the USAID ECO-III Project.

The ESCO model, which is too nascent at the moment for SMEs, needs substantive support for technical assistance or fiscal incentives to the beneficiary unit/stakeholders to cover the perceived risks. World Bank, Japan International Cooperation Agency (JICA), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), USAID, and BEE may consider the possibility of providing a fiscal incentive or some form of additional guarantee for the energy service companies, equipment suppliers, special purpose vehicle, or industry association implementing bundled energy efficiency projects in SME clusters.

ESCO proposals need substantial support from promotional agencies such as India SME Technology Services Ltd., for developing innovative energy financing solutions by close networking relations with the Indian Banks and encouraging cash flow financing instead of asset based financing.

It is the understanding of the ECO-III Project that the World Bank will soon enter into a partnership with SIDBI for an omnibus fund. A part of this fund can go towards financing/supporting cluster level activities developed under ECO-III as highlighted above. All the above-mentioned activities are likely to provide an unprecedented impetus to increasing energy efficiency in Indian SMEs.

The ECO-III Project contribution has been very valuable given the limited budget that was allocated to this activity and if requested, ECO-III stands ready to provide continued support to BEE and the various stakeholders in this area.

7. LIMITATIONS

On the basis of the analyses carried out during the past two years under the Project, we have identified the following limitations to a rapid and broad acceptance of energy efficiency improvement in Indian SMEs:

Inadequacy of actionable data for the diverse SME sub-sectors:

This is mainly because of the inherent difficulties in capturing accurate data because of prevailing practices of record-keeping and tax-oriented reporting (reluctance of business owners to cooperate in this area).

Absence of a good model which can provide good learning worth emulating within the time and budgetary constraint:

There is a very wide variation in the production patterns, scale of activities, technological and managerial practices, and business models justifying case by case work in different SME clusters.

Gaps in the perception of users and other stakeholders due to style of functioning within the SMEs:

A longer timeframe – five years – is needed to comprehend and develop workable solutions.

Massive facilitation efforts needed for assisting implementation:

Energy efficiency interfaces with SME business functions and requires a good deal of networking support for developing business-like solutions. Implementation also needs a good deal of capacity building support at the enterprise level as well as joint follow-up with stakeholders such as vendors of equipment, banks, etc.

Meager budget for the SME component was a handicap:

The relatively low budget associated with this activity was a handicap in attracting interest in the project.

8. RECOMMENDATIONS

Based on our two years of study, experiments, and intensive discussions with over 100 stakeholders, we have the following recommendations:

1) Realization of the latent potential for higher energy efficiency in the SMEs needs **time frame of several years** – at least five – for maturity of results.
2) Of the various initiatives undertaken by the Project, the most promising one appears to be propagating energy efficient technologies at Vatva via the **Industry Association**. All key stakeholders have to pursue the legacy of these activities to a logical conclusion. Some efforts are also needed to garner additional technical assistance for sustaining the drive. Donor programs may encourage more participative activities aimed at improvement of program facilitation tasks, which are aimed at participative work and better synergy between the stakeholders.
3) **The REEC activities for SMEs at Nagpur** for industrial furnaces need complementary support from BEE and donors like the World Bank to allow developing suitable projects in neighboring clusters such as Pune and Kolapur.
4) GEDA and PEDA should pursue stocktaking **of SME activities** on a periodic basis, for instance, once every six months, based on a review of the prevailing environment. Lessons from the major ongoing programs need to be considered while designing future programs.
5) Dovetailing EE financing for medium textile sector units designated under the EC Act to the BEE's new scheme **"Perform, Achieve and Trade"** may provide a useful motivation of the key actors – consumers – energy managers, energy auditors, ESCOs, and financial institutions to tap existing schemes such as TUF Scheme for overcoming technological obsolescence and enhance energy efficiency.
6) The Project also suggests the need for **BEE to develop a website or knowledge base** to concentrate all the information pertinent to the SME/EE issues and activities to avoid duplication of efforts and accelerate the development of sustainable business solutions.
7) The project also supports the idea of BEE to introduce a novel scheme for "Perform, Achieve and Trade" (PAT) for SMEs. To start with, a few SMEs in the textile sector may be the candidates under the PAT Scheme.

ANNEXURE- A

PROMOTING CROSS CUTTING ENERGY EFFICIENT TECHNOLOGIES AT VATVA INDUSTRIAL ESTATE

1. PROJECT BACKGROUND

IRG under USAID ECO-III Project has sought the professional services of National Productivity Council (NPC), Regional Professional Management Group (RPMG), Gandhinagar, under the ECO - III project, for Energy Efficiency Studies in Small and Medium enterprises (SMEs) in the Gujarat State.

2. INTRODUCTION

At present there are around 3 lac units in the small and medium sector in Gujarat. As per United Nations Industrial Development Organization (UNIDO) estimates, there exist around 350 Small and Medium Enterprises (SMEs) clusters in India, of which Gujarat commands a large share (49 clusters). Some of the important SME clusters in Gujarat include Readymade Garments, Drugs & Pharmaceuticals, Dyes & Intermediates at Ahmedabad; Ship breaking at Along; Re-rolling Mills at Bhavnagar/ Shior; Plastic Industry at Dhoraji; Brass Parts at Jamnagar; Wall Clocks at Morbi; Chemicals at Nandesari, Vapi & Ankleshwar; Diesel Engines, Electric motors, Ferrous Castings, Gold & Silver Ornaments, Machine Tools, Wrist Watch & Components at Rajkot; Power looms, Diamonds, Gems & Jewellery, Jari at Surat; Pottery & Ceramics at Surendranagar (Than) & Wankaner; Ceramic Products at Thangadh and Petrochemicals at Vadodara.

With rapid globalization SMEs are facing business risks where cost of manufacturing is going up every day and competition is bringing down the selling price of their products. This would require focused approach for improving productivity & efficiency, adoption of newer technology, capacity building of human resources, innovative financing options, and cluster based projects on Research & Development etc. One of the primary input costs for SMEs is Energy; therefore conservation of Energy demands utmost importance for SMEs to remain competitive on a global scale. But due to various barriers as enumerated in succeeding section drive for Energy Conservation in SMEs has lagged estimates. Successive studies in SME sector to bring Energy Conservation to the forefront have been unsuccessful due to one or many of following barriers;

- The units are small and individualistic in nature.
- Limited Technology Awareness & know-how.
- Limited Human Resources Capability.
- Costs involved are sometimes huge for small SMEs.
- Financing is not pursued due to negative mindset on borrowing.
- Space constraints and lack of proper layout.
- Lack of Preventive or Predictive Maintenance culture.
- OEM / Suppliers not interested in selling to, many small units.
- Lack of training among operators for proper upkeep of EETs
- AMC services not prevalent for most of the EETs.

Taking into account these barriers, the project team has developed a novel approach for Mass Scale Replication of EETs in a bundle of SMEs, which has been detailed in this report.

3. PRE-INVESTIGATIVE STUDIES

3.1 MODUS OPERANDI

Based upon pre designed evaluation criteria, 2 units were selected for Pre – Investigative Studies by the team, namely Akash Dyes & Intermediaries and Shiv Ceramics in Naroda Industrial Area of Ahmedabad. Detailed studies were undertaken for these units for generating base lines and EE options. Preliminary cost – benefit analysis was also carried out. Tailor made solutions for these units were recommended which amounted to saving of INR 0.2 million & INR 0.5 million in respective units. The simple payback periods for options were 5 & 12 months and applicable GHG reduction amounted to 77 & 18 TPA respectively.

In the case of M/s Shiv Ceramics based upon the team recommendations length of biscuit Kiln was increased resulting saving of CNG to the tune of 24771 SCM and mitigated the tile breakage, which was as high as 20%.

3.2 RATIONALE FOR PRESCRIPTIVE SOLUTIONS

The EE implementation in SME sector, based on the team's rich experience in this sector, was felt to be a challenging task. The challenges are in the form of awareness, acceptability, and comfort level to use EETs. Biggest challenge is to achieve and replicate energy savings across several other units by sustaining the drive. Hence it was felt that the proper and telling way to implement and realize EE in SMEs was to identify prescriptive EETs that are already matured for ready implementation. Usage of prescriptive solutions has following advantages over tailor made solutions;

- Mass scale replication potential,
- Many units may be bundled together for cooperative benefits
- Technology awareness and know how may be centralized
- Discount may be negotiated from OEM / Suppliers based on mass order.
- With a large quantum, financing may become a viable option.

3.3 CROSS CUTTING EE TECHNOLOGIES IDENTIFIED

There are presently many Energy Efficient Technologies in the market, which may be implemented across the board in the SME sector. Common EETs that may be implemented are Efficient Lighting T5, Lighting Energy Saving Module, Capacitors, Soft Starter Energy Savers, Variable Frequency Drives, Waste Heat Recovery systems (in dryers, Boilers & furnaces), Efficient Condensate Recovery & Steam Trapping, Efficient Insulation (in Steam Pipe Lines, furnaces etc.), Efficient Combustion systems, Efficient Compressed Air Systems, Efficient Refrigeration & Air Conditioning Systems, Efficient Pumps & Vacuum Systems, Efficient Boilers, Efficient Furnace Design, fuel switching options, etc.

Based upon the team's experience in the field and pre– investigative study under ECO-III project, EETs were further short listed mainly on following points;

- Mass Prescriptive applicability.
- Proven benefits that they accrue,
- Already established market, and,
- Many EET Vendors ensuring Competitive market.

The following EETs that met the above criteria were identified for Mass Scale Replication;

- Efficient Lighting – T 5s,
- Lighting Energy Savers,
- Soft starters,
- Capacitors, and,
- Variable Frequency Drives.

The above mentioned EETs have a mass replication potential, have already established market and are prescriptive in nature. Still, their usage in SME sector is very limited due to many barriers that have been listed in earlier sections. So it is felt that a "*push"* strategy through the aegis of the Champion (Green Cooperative may be required for their wider implementation.

This led to development of the approach of Green cooperative networking among the stake holders for inducing and sustaining a participative implementation drive for EETs in SME sector which has been detailed in subsequent section.

4. APPROACH FOR WIDER APPLICATION OF EETs

4.1 APPROACH

The approach suggested based on the ECO-III foresight, envisages a pivotal and Facilitators role of the association (Green Cooperative). It will serve as a focal point for the major stakeholders for implementation of EETs amongst the dispersed SME units who generally are less inclined to take on Energy Efficiency initiatives. The stakeholders, namely the EET vendors, EE Consultants, Financial Institutions, being the direct players/ beneficiaries in the SME EE Market would be better placed to deal with a single entity - Green Cooperative rather than a dispersed/ discrete lot of Small and Medium Entrepreneurs.

Presently the approach is being advocated for Vatva Industrial Area of Ahmedabad with GESCSL[1] taking on the Anchor Role of Association of SME units. The model is pictographically depicted in figure 3 under section 3.3 (Page13)

4.2 CROSS LINKAGES BETWEEN VARIOUS STAKEHOLDERS

The Industry Association (Green Cooperative) would act as a *CORE LINK* between various stakeholders such as EET Vendors, Consultants, Government Institutions, Banks and beneficiary units. Roles and responsibilities of the major stakeholders are delineated at Annex-IA. The working of the model would have following steps;

1. **Data Gathering / Pilot Studies**

   Consultants / Auditors would be involved in this exercise for gathering data from beneficiary units. This data gathering and pilot studies would be carried out for the purpose of identifying newer EETs with mass scale replication potential. These pilot studies may be either funded by the Association or Government Agencies such as GEDA2, GIDC3 or IC4. The pilot studies may be carried out in select units representing the cluster. Data gathering exercise may be carried out for all beneficiary units. This may be done on a pre-engineered data collection sheet where possible EET options may be compiled.

2. **Demonstration Studies**

   Demo Projects especially in context of EE propagation in SME sector have been more successful than other approaches. One of the common barriers for EE in SME is that the beneficiary units generally are not willing to take initiative but they want to copy success stories. To overcome this barrier demonstration exercise may be carried out in select unit. The demo projects may come up as simple low cost - low saving EETs to high cost - high saving EETs.

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[1] Green Environment Services Co-Op society Limited, a cooperative initiative of 680 SME units for running of Common Effluent Treatment Plant in Vatva Industrial Area of Ahmedabad.

[2] Gujarat Energy Development Agency – State Designated agency for implementation of EC Act, 2001 in the State.

[3] Gujarat Industrial Development Corporation

[4] Industry Commissionerate

Typically an inefficient system that is prevalent commonly in several similar units (e.g. Chemical, dyes, Pharmacy etc.) may be targeted for improvement. One of these units may be chosen from willing units, who are willing to take the initiative for bearing a portion of implementation cost and initial risk of failure. The demo project may be collectively funded by the EET Manufacturer, Beneficiary Demo unit and Government Agencies (GEDA, IC, and GIDC etc.) The percentage of sharing may vary from project to project basis. For e.g. for small investments with small payback period EET Vendor and beneficiary unit may themselves fund the project and for large investments with larger pay back period funding from Government agencies / Multilateral Donor Organizations may be sought.

In all the above cases the voluntary demo unit enjoys the First Bird Advantages and the initial exclusive benefits where as the other units have the advantages of proven technology to copy with benefits to see.

The benefits that are accrued to demo unit may be circulated to all interested member units for sustainability of the model. A third party evaluation of benefits accrued may also be carried out.

3. Bundling of units

After ratified success of demo, and based upon data gathered, units may be bundled together for applicability of EETs identified. This bundling would help in negotiating with suppliers for best possible purchase rate, banks for necessary financing options, ESCOs for possible financing etc. External Consultants may be involved for preparation of Purchase orders.

Depending upon the applicability and need, some of the bundled EETs could be offered through ESCO Model of sharing – of – benefits route. Alternatively the implementation of such schemes could possibly be engineered through involvement of electric distribution companies under their DSM mandate and the investments of the ESCO could be collected through electricity bills of beneficiary units. This may be possible only for Electrical energy related EETs.

A third option could be to employ the leverage available through CDM / White Certificate Route.

White Certificates that have gathered considerable response in European countries are certificates issued by independent certifying bodies confirming the claims of market actors for savings of energy, as a consequence of energy end- use efficiency measures (From Directive of European Parliament 2006/32/CE)

The basic philosophy is that Obligation Bound (OB) Agents (In Indian Context Designated consumers) must comply with White Certificate Targets set for them. They need not necessarily do energy conservation in their own premises (and thereby earn certificates) but may buy certificates from others who are doing energy conservation (but are not obliged to do that – In Indian Context SMEs). These White Certificates are tradable commodity in European Market in the same way as Carbon Credits.

To put it differently in Indian Context, Designated Consumers may be provided with Energy Conservation targets. They may do that in their own premises, but if it not possible, they may help out SMEs in achieving equivalent Energy Conservation. Thereby expertise of Energy Management Teams in Big industries may be utilized to do Energy Conservation in SME units who lack technical expertise to do that on their own.

This would also mean that Energy Conservation is done at least cost. A small saving for Designated Consumers may cost a very high amount, but same amount of saving in a bundle of SMEs would cost less to implement.

4. **Installation/ Implementation of EET options**

EET Manufacturers may be asked to provide guidance and training for proper use of EETs. Vendors may also be roped in to provide AMCs for implemented EETs.

5. **Technical Committee**

It is suggested to have an unbiased third party technical committee to oversee implementation of model and to suggest any mid term corrections in the implementation of the model. This committee would also be responsible for sustainability of the model and its replication in more and more GIDC, cluster, and regions in the State. This committee may comprise of eminent persons including retired IAS, Electricity Generating & Distribution Companies, GEDA, and CEI, etc.

Same cycle of activities would be repeated and more and more EETs would be identified to make the model Self – sustainable.

5. NETWORKING BETWEEN STAKEHOLDERS

5.1 STEPS INITIATED

For this approach to succeed the CORE i.e. Green Environment Services Cooperative Society Limited (GESCSL) is an all important entity. GESCSL is one such co-operative of around 800 SME units located at Vatva Industrial Area of Ahmedabad. This cooperative has been formed to run Common Effluent Treatment Facility for these units. Users pay monthly charges to this entity for disposing off their waste in an environment friendly manner. Lately, GESCSL has also initiated "Energy Associate Program" from its premises for conducting Energy Audits for willing units of the association by utilizing services of Under-Graduate Students of Local Engineering College. Funding for audits carried out is provided by the association and implementation of options generated is guided by the willingness of individual units.

NPC had a few rounds of interaction with GESCSL about benefits of the proposed approach and modus operandi for implementation of the EETs. GESCSL was very much willing to undertake the implementation exercise, based upon which further steps and events were initiated. Further, the same was discussed with GEDA, being the State Designated Agency for implementation of EC Act, 2001 in the State of Gujarat.

5.2 EVENTS ORGANIZED

Subsequent to positive response from GESCSL about implementation of the approach, NPC initiated meetings with beneficiary units of Vatva and meeting with EET Manufacturers and Vendors at GEDA, Gandhinagar.

Based on positive response from both beneficiary units and EET Vendors, an exhibition of working models was organized at Vatva Green premises on 14th of August 2008. This was followed by interaction between Vendors and units and presentations by the EET Vendors. GEDA was also involved in all the interactions, so that the experience may be utilized for policy level interventions.

5.3 PERCEPTION OF VARIOUS STAKEHOLDERS

During the events organized Stakeholders gave varied comments, which have been listed below;
Meeting with Beneficiary units on 09th July, 2008 at Vatva Green Premises.

- Members were enthusiastic about the Model and its mechanism of operation.
- They generally welcomed the prospect of professional consultants to undertake EE Assessments in their units and identify prospective EETs on a continual basis.
- They were desirous of having meetings with the vendors, to not only know about EETs but also to discuss about modalities.
- Some of the members who had already initiated implementation of Energy Efficiency in small scale in their units explained to the others about the benefits that were accruing to them.
- Many of the members wanted to know more about the modalities the EET vendors follow while selling their products.

Meeting with EET Manufacturers on 17th July 2008 at GEDA, Gandhinagar

- Vendors were enthusiastic about the Model and its mechanism of operation.

- Vendors recounted some of their experiences with SME sector in respect of barriers, enablers and success stories. Some vendors informed that the SME clients wanted EETs with simple payback of less than 1.5 years.
- All vendors were prepared to contribute to facilitating a pre scoping study for evaluating applicability and market size for various EETs.
- The gathering was of the opinion that On – Field Demonstration of EETs was desired by the SMEs and Vendors were willing to comply wherever feasible.
- Some of the vendors were ready to provide EETs through ESCO route and most of them were willing to consider payment on installments.
- One of the proposals that was discussed and agreed upon was to organize an EET Exhibition of working models at GESCSL Vatva premises, tentatively planned for the last week of July followed by presentations by individual EET vendors.
- At the suggestion of the EET vendors to post their details on GEDA website, GEDA was of the opinion that this could be done provided they form an association of EET Manufacturers / Vendors / Dealers in Gujarat.
- The EET association, everyone felt, would be a very useful and positive initiative in furthering the theme of large scale energy efficiency in the SME sector especially as they could collectively discuss issues, plan strategies and get together for further useful initiatives.
- EETs wanted to meet beneficiary units at the first opportunity which was agreed upon

6. FUTURE PLAN OF ACTION

6.1 MODUS OPERANDI

At present the approach is being advocated for Vatva Industrial Area with limited number of EETs. The same model after success at Vatva may be replicated in other industrial associations. Industry Commissionerate may be involved in the exercise to give it more credibility and GIDCs may be involved for better facilitation in their areas of operation.

Next step may be to form a Technical Committee as summarized in section 4.2 (e) of this report. Then consultants / Auditors would have to be involved to generate more and more EETs for implementation. Coincidently GEDA is presently implementing a scheme of Walk-through Energy Audits (WEA) in SMEs. This scheme may be linked with this model for reliable and faster data gathering exercise.

6.2 CROSS LINKAGE BETWEEN GEDA – WEA AND GREEN COOPERATIVE

GEDA being the nodal agency in the State for Energy Conservation activities has developed a scheme for conducting WEAs in a span of 3 years. These audits are proposed to be carried out through BEE certified Energy Auditors and Managers. This scheme may be interlinked with NPC model for faster & reliable data generation for applicability of EETs. This initiative would then be capable of kick starting a focused Energy Conservation Drive in SMEs of Gujarat. It would provide a database of energy consumption profile and sustained and affordable Energy Consultancy market for SMEs in particular.

Consultants / Auditors while carrying out WEA at SME premises would also collect data on pre designed data collection sheet for applicable EETs in that unit. Data for units would be then bundled together for its reference by the Green cooperative for implementing EETs, identifying Demo projects and other schemes for networking the stake holders. In due course of inception of EET application activities, Green cooperative will also independently take up their own carry out data gathering exercise for possible applicability of newer EETs.

6.3 MARKET SIZE

Approximate market sizes based upon some assumptions, for Green Cooperative Member Units, total 680 in numbers, are given in following table. There would be many more EETs that may be applicable to these units. Samples of these EETs have been chosen for initiation of activities based upon criteria mentioned in section 3.3 of this report.

Table 1: Market Size For EETs In Green Cooperative (680 Member Units)

S No.	Name of the EET	No. of Possible Units where EET is applicable	No. of EETs per Unit	Absolute Savings	Units	Savings (Million INR / Annum)	Investments Required (Million INR)	Simple Payback Period (Months)
1.	T 5	680	12	7,93,152	kWh / annum	3.97	4.49	14
2.	Lighting Energy Savers	680	1	2,97,432	KWh / annum	1.49	1.52	13
3.	Capacitors	680	1	42,721	KWh / annum	0.21	0.51	28
4.	Soft Starters	350	4	37,80,000	KWh / annum	18.90	1.82	2
5.	Variable Frequency Drives	680	2	91,80,000	KWh / annum	45.90	63.75	16
6.	Waste Heat Recovery in Tray Dryers	250	2	22,500	kl FO / annum	810.00	350.00	6
7.	Waste Heat Recovery in Spray Dryer	100	1	2,400	kl FO / annum	864.00	70.00	1
TOTAL						1744.47	492.08	4

Assumptions:

- Average 300 days of working /annum and 12 hours of working per day.
- Cost of T 5: INR 500/-, Lighting Energy Saver INR 2,200 /- per kVA, Capacitors: INR 750/-, Soft Starters: INR 1,200/-, VFD: INR 5,000/- per kVA, Waste Heat Recovery: INR 0.7 Million per Dryer, Cost of Power: INR 5/- per unit, Cost of FO: INR 36/- per Liter.
- Hours of operation – Tray Dryers: 6 hours per day, Spray dryers: 4 hours per day, others: 12 hours per day.

7. ADVANTAGES OF THIS APPROACH

7.1 SUSTAINABILITY OF THE APPROACH

The model is envisaged to enhance Energy Efficiency market in SMEs of the State. This model would be a win – win situation for all stakeholders. SME units would be the primary beneficiaries of this approach as their energy cost would be reduced after implementation of the options. Since it would be a cooperative approach, they would also gain on discounts that vendors may be willing to share.

Vendors would benefit by selling their products in a large number. A market would be created for Consultants / Auditors in the SME sector which provides lots of opportunities development. GEDA, GIDC and other participating Government Agencies would benefit from mass scale visible increase in energy conservation activities.

Banks and FIs would be interested in giving sizable loan for Energy Conservation activities. Since the approach is a win – win for all stakeholders, it would also ensure sustainability in the long term and replication in other SME clusters.

7.2 EASE OF REPLICATION IN OTHER SME CLUSTERS

Gujarat is a land where co-operative culture has flourished for a long time. Success of Gujarat in Dairy production is testimony to the same. Secondly, SME industries in Gujarat are cluster based as discussed in section 2.of this Annex. Therefore same type of EETs would be applicable through out the cluster thus ensuring success of this model.

8. CONCLUSION & WAY AHEAD

At this stage the implementation process is commencing with GEDA supported Audit survey (Walk – Through – Energy Audit: WEA), which is designed to identify cross cutting EETs applicable amongst the cluster of units and also to gather energy use baselines. NPC at its own initiative is developing a standard template report for the above audit survey (WEA), which would bring out findings that are easy to consolidate and assess for implementation in a large scale. In addition NPC will help GEDA in consolidating the survey findings to market EETs and facilitate large scale implementation.

Some future activities that need a push in right direction are mentioned below;

1. Considering the vital role of EET's Manufacturers and ESCOs, in propagating the market for EETs in a large way, it is important to forge an initiative that would facilitate and help these stakeholders in this direction. This Facilitators role may be initiated in the form of assistance on;
    - Legal framework for ESCO operations,
    - Market Framework that would govern the financials,
    - Legal agreements / MoUs for smooth implementation,
    - It must be said that the EETs and a few EE-ESCOs are eager to get involved in the large scale implementation of EETs, but do-not have the necessary inputs on some of the above issues, which would be key to the success of a long term, sustained activity.
2. On the issue of financing EE projects, involvement of banks and financial institutions, would be appropriate, but they too would need to fully briefed and brought in on the framework and mechanisms of financing these projects through EETs / EE-ESCOs and recovery of money.
3. Financing issues for Demo projects could be an area, which would require more assistance both from the point of view of managing the Demo projects and percolation of benefits, as well as identifying additional sources for funding.
4. The Association (Nodal catalyst) also could do with specialized Technical Assistance on management of the Large scale EE implementation – issues like sustaining EET identification, analysis, market scoping, EET vendor identification / development / analysis / qualification, EET Technical Specs assurance, EET implementation in SME units, Finance & Accounting and Monitoring & Verification of results.
5. It probably would be a good idea to bring in Technical Assistance on carbon credit assessment, bundling through SPV etc to leverage sustainable benefits.

To sustain and continue this activity the core stakeholders (Association/ Vendors/ Member units) cannot be expected to be left to themselves to see the movement through to its logical conclusion. It is felt essential that they would require hand holding (especially for issues relating to Technical Assistance, planning for continual future steps, planning and networking for funds, interaction with Government bodies, interactions with ESCOs/ EET Vendors) by some external entity for instance National Productivity Council (NPC) to ensure that the model in its right perspective gets implemented and this hand holding exercise would be required to be continued for a year of two till such time that the process gets stabilized and is capable of functioning independently – like an NGO for instance. To ensure unbiased operations and management of the process it is felt necessary to introduce a committee comprising of 4 – 5 members who have no individual stake in the process.

All said and done, at present, the movement though slow, has begun in the right direction and efforts towards generating EETs, utilizing ESCOs/ EET Vendor ESCOs, Small Demo cases are being undertaken. However, external specialized and expert assistance would definitely add momentum to the drive.

ANNEXURE- A I

ROLES & RESPONSIBILITIES OF KEY STAKEHOLDERS

1. GREEN ENVIRONMENT COOPERATIVE SOCIETY LIMITED

- Industry associations would be the most important stakeholders for successful implementation of Model on a mass scale. Their Roles and Responsibilities would include;
- Awareness creation for EE Technologies available, their usage, possible improvements, and costs involved for implementation, funds availability and mode of implementation.
- Bundling of industries based upon possible technological interventions, based upon suggestions from independent consultants, approved by the association.
- Negotiating with different EET manufacturers & suppliers for buying on a mass scale negotiating with manufacturers for providing warranty / guarantee, on site erection / commissioning and maintenance contracts. Independent consultants may be involved based upon individual expertise, to provide technical support to the association.
- Tap various Government Agencies, including GEDA, for any subsidies that may be available, by espousing cause of energy conservation on a mass scale in SMEs. Preparation of DPR so as to quantify Energy conservation potential and their payback periods.
- Negotiate terms and conditions with banks / financial institutions for providing loans for initial implementation. Negotiate interest rates and payback methodology & periods.
- Generate Base lines for energy usage by third party involvement, preferably accredited Energy Auditors.
- Negotiate with ESCOs for possible implementation through that route.
- Coordinate with all stakeholders for effective implementation of model. This pre assumes that the associations will have a core group to address these requirements.
- Take up complimentary work for certification of energy savings in SMEs such as white certificates in association with BEE and other agencies.

2. ENERGY EFFICIENT TECHNOLOGY MANUFACTURERS / SUPPLIERS

- Awareness creation to develop clientele for EETs that are identified for implementation in the industry cluster.
- They would also conduct awareness campaigns for New Technologies that have emerged in the market.
- Advice on possible alternatives available, payback periods and possible funding avenues, based upon their experience with other associations / industries. Manufacturers may also examine possibility of giving EETs through ESCO route.
- Capacity building within the cluster to ensure proper usage and maintenance of installed EETs.
- Deliver, install and maintain the technologies within industry premises.
-

3. TECHNOLOGY CONSULTANTS (Local Accredited Energy Auditors)

- Advise individual units on possible alternatives available and educate on EC opportunities.

- Provide technical input to individual units during selection, installation, commissioning and maintenance of technology.
- Provide unit – wise base line figures of energy usage in the cluster.
- Verify claims made by manufacturers / suppliers about individual products.
- Advice associations for bundling of industries based upon usage of appropriate technologies.
- Provide help to Industry association in calculating energy conservation potential and payback periods & in evaluating performance of EETs from Suppliers.
- On behalf of industry associations prepare DPR and present to Government Agencies for getting grants / subsidies.

4. IMPLEMENTING / BENEFICIARY UNITS

- Work with other units so as to effectively replicate the model in a cooperative fashion.
- Provide access to data to third party consultant for ascertaining base line figures.
- Operate technologies in best possible manner as suggested by manufacturers manual.
- Contribute to the association to develop a common core group of technicians for service required by the fraternity.

5. ESCOs

- Provide individual units / association with possible alternatives for financing & implementation of EETs.
- Enter into understanding (MoU) with association directly for financing of technologies.
- Collect base line figures and cross verify them for smooth implementation of model.

6. FINANCIAL INSTITUTIONS / BANKS

- Conduct assessment study on the size of EET market in the cluster.
- Develop package schemes, based on bundle size on terms of financing (period, security, interest rate, etc.)
- Examine the potential for bundling the EET benefits to access CDM credits.
- Work with the Association to further their mandate of promoting EE.
- SIDBI and SBI are some financial institutions who may be inclined to be involved in such effort.

7. GEDA / INDUSTRY DEPARTMENT & OTHER GOVERNMENT AGENCIES

- To facilitate implementation of pilot studies, that may serve as Demo for showcasing possible improvements.
- In line with GEDA's role as Facilitator for EC activities in the state, it could develop schemes to fund the TA component, the demo projects & schemes for assessing CDM potential.
- Entrust the approved EE consultants for enhancing EET implementation and EC opportunity identification.

ANNEXURE- B

EXPERIENCES FROM SME STUDIES IN RE-ROLLING MILLS CLUSTERS AT MANDI GOVINDGARH PUNJAB

1. PROJECT BACKGROUND

As a part of the ECO-III initiative in the state of Punjab, USAID ECO-III decided to work together with National Institute of Secondary Steel Technology (NISST) as a part of ECO III team for promoting energy efficiency in Steel Re-rolling Sector, one of the most energy intensive sectors. Punjab Energy Development Agency (PEDA) a SDA is a strategic partner in the energy efficiency project is deeply involved in this exercise from the beginning.

NISST being its own kind of institution established by Ministry of Steel, Gov. of India agreed to participate in the Project to help the steel rolling sector for implementing Energy Efficient Technologies in steel re-rolling sector (SMEs) in Mandi Gobindgarh Cluster of Punjab.

2. SECTOR PROFILE

Steel Re-rolling sector is one of the key segments of steel industry in India. It has come a long way as a supplementary sector to main steel plants. This sector accounts for about 70% of the national production of bars, rods and structural. The steel re-rolling sector mainly comprises small and medium enterprises (SMEs) with 75% units in the small scale sector. There are about 1500 re-rolling mills working in the country.

The sector produces approximately one third of the total steel produced in India (by direct and indirect sources). Due to the versatility of this sector in producing any section/size and any odd tonnage of rolled products, it has created its niche in steel sector of the country. The sector has witnessed a fast growth during last three decades. A comprehensive Survey of re-rolling mills carried out by the organization of Development Commissioner for Iron & Steel in 2004 revealed that Punjab is having largest number of rolling mills in the country having approximately 450 working mills installed in a radius of just 8 to 10 kms. It is having 23% of re-rolling mills in the country. It produces approximately 20% of the total steel production of the country from re-rolling sector.

The state of art of technology of re-rolling sector in India is poor as compared to standards of developed countries. There is a tremendous need for this industry to modernize/upgrade its technology and adopt energy efficient technologies. Also opening up of economy exerts pressure on the re-rolling industry for cost reduction. This factor also exerts a driving force on this sector to come forward for adopting Energy Efficient and Environmentally sustainable technologies. The Indian re-rolling mills is an unorganized sector with low engineering, limited technology innovation and poor R&D base as well as low level of human resource on knowledge of technology, operational skill etc. The sector also faces deficiencies such as the lack of access to technology and technology sharing and the inadequacies of strong organizational structure, professional attitude etc. The dominance of financial risk in the mind of decision makers is also associated as barrier for the growth of this sector.

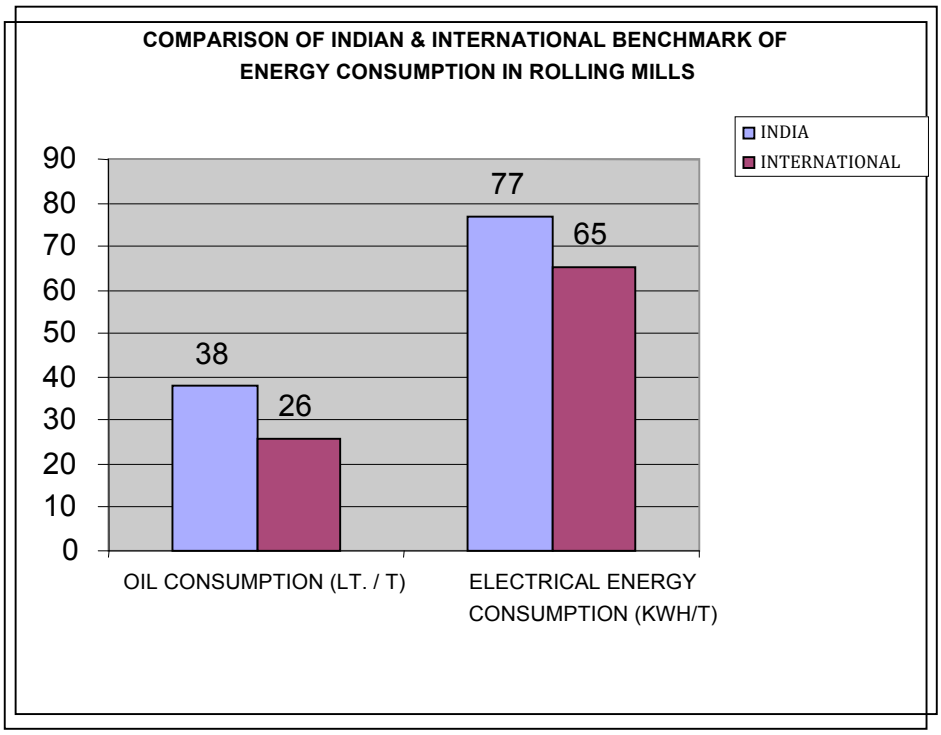
*JPC survey report 2004

3. ENERGY CONSUMPTION TRENDS

Energy is the major requirement of re-rolling operation. Critical analysis of re-rolling process in a Bar and Rod Mill shows that energy cost accounts for approximately 40-50% of the total cost incurred on re-rolling operation.

The specific energy consumption in re-rolling sector in India is appreciably higher than that of developed countries. In India, about 38- 50 liters of oil and about 80 - 200 KWH electrical power is required with cold charging of material in a re-rolling mill compared to 26 liters and 60-85 KWH of electricity for production of one tonne of finished product in developed countries. The comparison of Indian & International Benchmark of Energy consumption in Rolling Mills is depicted in chart given below:-

Figure 1: Comparison of Indian & International Benchmark of Energy Consumption in Rolling Mills



The values in terms of MJ/T for oil consumption are 1509 MJ/T for Indian Benchmark and 1040 MJ/T for International Benchmark. Similarly, for electrical energy consumption in rolling mills, the values for Indian Benchmark is 277 MJ/T while for international Benchmark, it is 234 MJ/T. For total energy consumption, the international benchmark is 1274 MJ/T while Indian Benchmark is 1786 MJ/T. It has been found that the usage of energy (in term of consumption of power/electricity/coal and furnace oil), the product yield and productivity varied considerably from one category of mill to other depending upon the technology employed.

Cost of up gradation of technology in the steel sector is generally high and it has not been possible for the plants to invest funds in these areas. This has resulted in technological obsolescence leading to higher consumption of inputs, higher energy consumption, lower environment friendliness, lower productivity and higher cost of production. This is particularly relevant for the small and medium sector steel plants.

4. MANDI GOBINDGARH CLUSTER STUDY

Mandi Gobindgarh is biggest cluster of rolling mills in the country having approximately 350 to 400 working mills installed in a radius of just 8 to 10 kms. The Mandi Gobindgarh cluster includes the industry in Mandi Gobindgarh, nearby areas of Khanna, Amloh and Sirhind. The first steel rolling mill in Mandi Gobindgarh was started in 1940 and the first steel trade house was also established in the same year. Now this cluster has created its niche in the re-rolling sector of India due to it's versatility in rolling almost all sizes and shapes of rolled products. About 20% of total production from re-rolling sector comes from this cluster.

After seeing a recession of nearly ten years up to 2002 -2003, the industry is growing with faster rate due to increased demand because of growth in infrastructural projects. Several new industries are coming up in this cluster and the existing one is enhancing their capacities. However the industry in this sector is still running with old/conventional technologies. There is massive scope for improvement in operational efficiency including energy efficiency.

4.1 STUDY OBJECTIVES

USAID ECO-III has taken up the pilot studies in two SME clusters in Punjab in consultation with PEDA to provide a road map for intensive implementation of Energy Conservation activities. The Objectives of these studies are:

- Identify SME cluster with high EE potential
- Disseminate information on benefits of EE measures
- Evolve strategies to implement energy saving technology with high replication potential after pre feasibility study and detailed Energy Improvement Program

It was decided to focus on steel re-rolling mills (Mandi Gobindgarh) in the Punjab state considering very large untapped energy conservation potential and general interest of the units and other stake holders in propagation of cross cutting energy efficient technologies which are marketable. The services of National Institute for secondary Steel Technology (NISST) have been taken up utilizing their skills and expertise to package the Energy Efficiency measures experiences in dealing with SMEs especially in the Iron and Steel sector due to their core competency.

The pilot studies will identify, promote the feasible ideas and create market pulls looking into the barriers impeding application of these technologies. The studies will contribute to public private partnerships for need based application oriented research and hopefully lead to a win-win situation for the stakeholders – SMEs, equipment suppliers and energy efficiency promotional agencies in the same coin.

4.2 PROJECT INCEPTION WORKSHOP AND PRE-INVESTIGATIVE STUDIES

Three agencies -NISST, USAID-IRG, and Industry/Industry associations closely interacted for seeding the pilot studies at the Mandi Gobindgarh cluster. It was decided that the industry associations will furnish the names of 40-50 industries that are likely candidates for the ECO-III project. Individual industries willing to participate also were open to NISST directly.

A meeting was held with All India Steel Re-rollers Association & Small scale Steel Re-rollers Association on 19-12-07 to brief the industry associations about the ECO III project on energy efficiency in re-rolling mills to be undertaken in Mandi Gobindgarh cluster by USAID-IRG in

association with NISST. Based on the mutual discussions, Scope of ECO -III activities was decided taking up the following tasks.

- Pre- investigative studies
- Pre- feasibility studies

  It was decided to have an inception workshop on 21-01-08 to appraise the industry about the launch of this project and to enlist the members who are willing to participate in this project. The key focus of the workshop was also to highlight a few useful technologies such as:

  - Replacement /Modernization of existing furnace for efficiency improvement.
  - Installation of Producer Gas Systems
  - Complete change of furnace lining and use of ceramic fiber veneering
  - Use of technologies such as:
    - Energy efficient recuperators
    - Variable frequency drives
    - Semi automation in the mill/furnace

About 45 persons participated in the Workshop. Besides awareness on energy efficiency measures relevant to the sector, the modalities of the USAID ECO-III Project were explained to the audience.

The workshop brought home the need the intensify implementation of energy efficient technologies by the units. Donor programs like UNDP or PCRA undoubtedly are useful; some how cost reduction in the manufacturing process amply justify the need for implementation of the feasible measures especially the ones which are well understood and tried out straight away rather than waiting for the outcome of demo projects.

In this regard, as presented in the Workshop meeting, it is useful to focus on the following technologies:

- Switching from Oil/PF coal fired to Producer Gas firing considering the substantial reduction in both material loss and energy cost reduction possibilities besides providing better environment. (NISST has already acquired sufficient experience in this field).
- Use of technologies such as Variable Speed Drives, M D controller, Automatic Power Factor Control System, use of Energy Efficient Motors etc.
- Use of technologies such as Energy Efficient Recuperators, Crop Length Optimization, Universal Spindles, Anti Friction Roller Bearings, Semi Automation, etc. Selection and application engineering need to be pursued with due diligence.
- Change of Furnace Lining and use of Ceramic Veneering.

The workshop brought home the need to intensify implementation of energy efficient technologies by the units and some of which are also captured by other donor programs like UNDP or PCRA.

NISST circulated a format to the industry and received response from 10 units based on which three units were short listed units with 2 back up units in consultation with the Project. The short listed units were the candidates for ECO-III interventions – pre-feasibility studies. Energy conservation measures are summarized in the table 2 below:

Table 2: Gist of the energy conservation measures

S.No.	Energy Conservation Measure	Details
1.	Furnace Design Modification (Furnace oil using furnaces)	In case the furnace is not properly designed and the fuel consumption and scale loss/burning loss are more, design of the furnace is required to be modified. The local quality of burners shall be replaced with more energy efficient burners. The appropriate size of blower should be installed. The furnace lining should be configured for less heat losses. • Investment (10 Mt/hr furnace INR 50,00,000) • Pay back period 12 to 18 months
2.	Furnace Design Modification (Pulverized coal fired furnaces)	In case the furnace is not properly designed and the fuel consumption and scale loss/burning loss are more, design of the furnace is required to be modified. The furnace shall be modified with proper aerodynamics and proper air fuel ratio controller should be installed. • Investment (8 Mt/hr furnace INR 50,00,000) • Pay back period 12 to 18 months
3.	Switch over to Producer Gas	Switching over from furnace oil/pulverized coal combustion technology producer gas technology is low energy efficient technology. Due to gaseous nature of fuel, its combustion is very good. Compared to operational cost and material loss (scale loss/ burning loss) it is more economical than furnace oil or Pulverized coal. (10-15 Mt/hr furnace (Oil) • Investment: INR 100 lacs • Pay back period 12 to 15 months 8 -10 Mt/hr furnace (Pulverized coal) • Investment: INR 90 lacs • Pay back period 24 to 30 months
4.	Furnace Design Modification (Furnace oil using furnaces)	In case the furnace is not properly designed and the fuel consumption and scale loss/burning loss are more, design of the furnace is required to be modified. The local quality of burners shall be replaced with more energy efficient burners. The appropriate size of blower should be installed. The furnace lining should be configured for less heat losses. For 10 Mt/hr furnace: • Investment INR 50 lacs • Pay back period: 12 to 18 months
5.	Furnace Design Modification (Pulverized coal fired furnaces)	In case the furnace is not properly designed and the fuel consumption and scale loss/burning loss are more, design of the furnace has to be modified with proper aerodynamics and proper air fuel ratio controller should be installed. For 8 Mt/hr furnace • Investment INR 50 Lacs • Pay back period 12 to 18 months
6.	Switch over to Producer Gas	Switching over from furnace oil/pulverized coal combustion technology producer gas technology is low energy efficient technology. Due to gaseous nature of fuel, its combustion is very good. Compared to operational cost and material loss (scale loss/ burning loss) it is more economical than furnace oil or Pulverized coal. 10-15 Mt/hr furnace (Oil) • Investment's INR 100 lacs • Pay back period 12 to 15 months 8 -10 Mt/hr furnace (Pulverized coal) • Investment: INR 90 lacs • Pay back period 24 to 30 months

7.	Variable Voltage Variable Frequency drive	In case to maintain the proper air fuel ratio, also to decrease the energy consumption the VFD is the best solution for maintaining proper air pressure and proper quantity of air (oxygen). For a 10 Mt/hr furnace (Oil) • Investment INR: 1- 1.5 lacs • Pay back period 12 to 15 months
8.	Reduction in Power Transmission Losses Universal Spindles & Couplings	Used for transmitting the gearbox to the mill stand rolls and the inter-connecting mill stands. Most re-rollers are using wobbler type 3-fluted or 4 fluted wobbler spindles and couplings. Mill down time is reduced and mill Utilization increases by around 0.25% approximately. • Investment INR 7- 8 lacs • Pay back period 2 – 2.5 years
9.	Anti-friction Roller Roll Neck Bearings	Smooth movement of rolls in the chocks. Roller bearings are grease packed and there is practically no friction Fabric bearing although cheap gets worn off, burnt and working only at 40 to 50% efficiency, causing lot of mill down time and resulting in loss of production. The mill down time is reduced and mill utilization goes up by around 0.5%. • Investment INR 5-6 lacs • Pay back period 1 – 1.5 years
10.	Crop Length Optimization	In re-rolling mills the front and back end cutting of the bar is more than 300-500 mm. Thus lot of wastage is there. With crop shear automation the front and back end loss is greatly reduced. Yield improvement may be expected to the tune of 0.25%. • Investment INR 3-4 lacs • Pay back period 0.9 – 1.0 years
11.	Installation of Y-roller Table in 3-hi Mill Stands of Rolling Mills	Installation of Y-roller table towards the entry side of middle / top rolls ensures constant temperature of the metal. Elimination of the dependence on the manual skilled labors and maintenance free operation (as compared to the case of tilting table) are other advantages It is expected to result in 0.25% increase in mill utilization. • Investment INR 5- 6 lacs • Pay back period 1.5 – 2.0 years
12.	Oval/Square Repeaters (Bar & Rod Rolling Roller Entry & Delivery Guides (Bar & Rod Rolling)	In some of cross country type mills, feeding of the rolled stock from one stand to another is still done manually. To avoid this manual feeding, adoption of repeaters is a must. The mill utilization increase is approximately 0.25%. The increase in yield approximately 0.25%. There are combinations of two or four rollers at the front of the guide box. This helps in holding the stock firmly and proper feeding into the roller groove. Mill availability increases by 0.25%.

4.3 POST WORKSHOP ACTIVITIES

It was also felt useful to institute a questionnaire survey for short-listing the potential candidates. For the purpose of technical data collection, a Survey Form was designed by experts of NISST in consultation with USAID-IRG. Survey Form sought details related to specific energy consumption figures, technology status, financial condition, operational details and assessment of willingness of the plant to go for ECO-III technologies for re-Rolling Mills. Base data was collected through questionnaire through personal visits by NISST engineers to the short listed units. The different critical parameters such as specific fuel consumption, specific power consumption; yield percentage, capacity utilization, etc. were be compiled and then evaluated based on the past exposure of NISST to this sector. This was followed up by a walk though exercise involving Survey of the units and evaluation on the basis of SWOT rating matrix of technical parameters and financial strength (such as specific fuel consumption, specific power consumption; technical up-gradation carried out earlier, pollution control device installed, etc.) followed by personal interaction with management of the unit to assess their technical capability & capacity to absorb energy efficient technologies. Three units were selected from pre-investigative studies for the pre-feasibility studies.

5. SELECTION OF UNITS

Intensive meeting were scheduled with all the 10 units respondents to ECO-III studies.

The following considerations were kept in view for selection of the units

- Comfort to share the experience and their data
- Past experience to upgrade their unit especially during the past five years.
- Involvement of their top management (Director/Partner) in new technologies
- Attitude and interest of their operatives
- Seriousness of the plans to invest in energy efficiency measures

The profile of the 10 units was prepared by NISST (table below) and on the basis of criteria mentioned above, 3 units were short-listed. NISST obtained in writing consent for the proposed studies from the respective managements.

Table 3: Profile of 10 units at Mandi Gobindgarh Cluster

Name of the Unit	Technology Opted	Remarks
The Modi Oil and General Mill	Producer Gas	*This unit is in the heart of the city (i.e. in residential area) and unit is interested for Producer Gas System. *Due to hazardous nature of gas it is difficult to get NOC from Pollution Board. *Implementation may get affected.
Bhatia Steel Industries	VFD, Furnace Modification (Pulverized Coal)	*The owner is partner in two units (Bhatia Rolling Mills and Thakur steel & Agro industries). *He is very active and has more or less all type of instruments for data recording and monitoring. *One of the units i.e. Thakur steel & Agro Industries is selected, as it is a bit bigger in size and production.
The Punjab Steel Rolling Mills	Producer Gas Recuperator VFD	*The owner of the unit is not much interested for immediate investment, as there is space problem and have already selected and purchased another site for shifting.
H S Steels (P) Ltd	Furnace Modification	*There is wide variation in the actual data and the data provided by them. *The unit is also not interested to provide the actual data.
K C Soni & Son Steels (P) Ltd.,	Producer Gas Recuperator	* It is a totally new unit and its owner sites in Delhi office. It was very difficult to discuss with him on and off. Also being a new unit he was not in a position to invest more.
Modi Wire Products,	Producer Gas	*The owner has two units in same campus. (The Modi Oil & General Mill and Modi Wire Products). *This unit is in the heart of the city (i.e. in residential area) and unit is interested for Producer Gas System. *Due to hazardous nature of gas it is difficult to get NOC from Pollution Control Board. *Implementation may get affected.
Rajdhani Steel Rolling Mills	Furnace Modification	*Not in a position to invest more as the unit has procured a unit in Raipur.
Bhushan Steel Industries	Recuperator	*This is a medium size unit. It is using furnace oil as well as Pulverized coal both simultaneously. *They wanted to use only pulverized coal in first phase and then

		on producer gas. *One of the partners is dynamic and is ready to share the data and experience. Unit selected.
Thakur Steel & Agro Industries,	VFD, Furnace Modification Anti-Friction bearing	*This is a small size mill. *Owner/Partner is very active and have All type of instruments for data Recording and monitoring. Unit selected
R K Plate & re-Rolling Mills,	Furnace Modification	*This is a medium size unit. It is using pulverized coal. *The owner is dynamic and is ready to share the data and experience. Unit selected

THE SELECTED UNITS

1. **Bhushan Steel Industries:**

   This unit is under partnership and is manufacturing Patra for conduit pipes. G I pipes, hinges and cycle parts. This unit is having 18" mill with annual capacity of about 15,000 – 20,000 MT capacity of production and is consuming above 2500, 000 units electricity yearly costing above one crore of rupees. A part from this, they are consuming about 388,000 MT of Coal and about 373,200 MT of furnace oil. They are very much interested in installing producer gas system along with an energy efficient recuperator. It is believed that most of the units producing tar, bar, rounds and TMT have shifted on producer gas system and are working satisfactorily, but Patra rolling units have still not well convinced about such system as they feel that due to more energy requirement for Patra whether this could be successful or not and most of these people are waiting for some results in such type of systems. If this becomes successful then there is market for replication of such systems in many units.

2. **R. K. Plate & Re-rolling Mill:**

   This unit is manufacturing bars, rounds and angles etc. as a construction material. This unit is having 9" mill with annual capacity of about 15,000 MT. The electric energy consumption of unit is around 1000 MWH. Fuel consumption of the plant is about 900,000 MT of coal/ annum. The unit evinced interest in installing an energy efficient furnace, recuperator and automation of mill. It has been observed that unit is a progressive one. They have done modification of their furnace in 2005-2006 to improve their productivity and also added little instruments to their furnace. Also they installed conveyor system from roughing to finishing mill as a part of their automation plans.

3. **Thakur steel & Agro Industries:**

   This unit is manufacturing bars, rounds, angles, squares and thin flats etc. as a construction material. The unit is having 8" mill with annual capacity of about 9,000 MT. The electric energy consumption of unit is around 900 MWH. Fuel consumption of the plant is about 540000 MT of Coal per annum. The unit showed keen interest in modification/ modernization of their furnace for energy efficiency improvement and installation of an energy efficient recuperator. It has also shown it's willingness in installation of energy efficient transmission systems in its mill - roller bearings etc. The unit has been found to be very much willing to participate in this programme.

6. PRE-FEASIBILITY STUDIES

The studies were taken up in the 3 units which are willing to participate in ECO-III Projects with their own funding. A process audit was conducted by the project team in the chosen units to find out the status of technology - energy consumption level in different section of the mill, scope of improvement etc. After the completion of field study a detailed report of each unit was prepared with justification of the cross cutting technological options expected to be taken up.

6.1 PRE-FEASIBILITY FINDING – SUMMARY

The study conducted by the team, number of suggestions for debugging have been given to the unit for performance enhancement, also lists the description / specifications of suggested measures. Net annual EE savings and productivity benefits exclusively to EE measures taking into account the expansion is given in Table 4 below.

Table 4: Annual Energy Efficiency/material loss Savings (INR Lakhs)

Project	On a/c of EE Measures (INR in lacs)	On a/c of material saving due to EE Measures (INR in lacs)	On a/c of productivity improvement due to EE Measures (INR in lacs)	On a/c of reduction in penalty (INR in lacs)	Total (INR in lacs)	Energy Saving (TOE)
THAKUR STEEL & AGRO INDUSTRIES						
	3.60 (RF) + 10.20 (RM) + 1.55 (ES) =15.35	6.40 (RF) + 6.40 (RM) = 12.80	1.00	29.15	52.20	15.35
BHUSHAN STEEL INDUSTRIES						
	3.6 (RF) + 8.0 (RM) + 4.8 (ES) = 16.4	120 (RF) + 3.0 (RM) = 123	5.0 (RM)	0.50	149.9	82
R K PLATE RE-ROLLING MILLS						
	5.4 (RF) + 15.84 (RM) + 1.56 (ES) =22.8	24 (RF) + 31.2 (RM) = 55.2	78	73.3	22.8	55.2

Project	Investment (INR In Lacks)	Savings (INR in Lacks)	Simple Payback Period (Yrs)
THAKUR STEEL & AGRO INDUSTRIES			
	17.00 (RF) + 8.00 (RM) + 3.10 (ES)+ 1.00 (Others)=29.10	29.15	1.0 year
BHUSHAN STEEL INDUSTRIES			
	165 (RF) + 21 (RM) + 4.0 (ES)+ 1.00 (Others)= 191	144.9	1.5 year
R K PLATE RE-ROLLING MILLS			
	22 (RF) + 15 (RM) + 2.65 (ES) + 1.0 (Others) =40.65	78	0.5 years

RF: Reheating Furnace, **RM**: Rolling Mill, **ES**: Electrical system

Costs-Benefit Analysis of Energy Efficiency and Investments

The summarized indicators for various Cost Benefit Analysis of energy Efficiency & Investment are given above.

Table 5: Summary Table for three units covered under Pre Feasibility Studies

	Re heating Furnace	Rolling Mill	Electrical System	Others
THAKUR STEEL & AGRO INDUSTRIES				
Current Practice	Nil	Nil	INR: 40,000	-----
Project Cost	INR: 17 Lacks	INR: 8.0 Lac	INR: 3.10 Lac	INR: 1.0 Lac
	*Increasing the width of existing furnace. *Installing VFD *Installation of new Energy Efficient recuperator (which can take give hot air up-to 3500C)	*Replacing existing bearing with anti-friction roller bearing *Replacing existing coupling with universal spindle * Adoption of Flat belts in place of existing V-belts *Replacement/synchronization of gear box and automation of lubricating system.	*Improvement in the power factor *Improving MD *Reducing down time and reducing idle running of motor *Replacement of old and rewound motors of fans, pumps and blowers with new energy efficient motor	*Adopting SOP
BHUSHAN STEEL INDUSTRIES				
Current Practice	3.5 lacks	Nil	Nil	-----
Project Cost	INR: 165 Lac	INR: 21 Lac	INR: 4.0 Lac	INR: 1.0 Lac
	*Installation of producer gas system + modification of existing re-heating furnace *Installing VFD *Installation of new Energy Efficient recuperator (which can take give hot air up-to 3500C)	*Replacing existing bearing with anti-friction roller bearing in 2 finishing stands *Replacing existing coupling with universal spindle in 5 stands * Adoption of Flat belts in place of existing V-belts * Installation of Y-type lifting table and wall tilter/roller table on roughing stand	*Improvement in the power factor *Improving MD *Reducing down time and reducing idle running of motor *Replacement of old and rewound motors of fans, pumps and blowers with new energy efficient motor	*Adopting SOP
R K PLATE RE-ROLLING MILLS				
Current Practice	Nil	Nil	Nil	-----
Project Cost	INR: 22 Lac	INR: 15.0 Lac	INR: 2.65 Lac	INR: 1.0 Lac
	*Increasing the width of existing furnace. *Installing VFD *Installation of new Energy Efficient recuperator (which can take give hot air up-to 3500C)	*Replacing existing bearing with anti-friction roller bearing *Replacing existing coupling with universal spindle * Adoption of Flat belts in place of existing V-belts * Installation of Y-type lifting table and wall tilter/roller table on roughing stand.	*Improvement in the power factor *Improving MD *Reducing down time and reducing idle running of motor *Replacement of old and rewound motors of fans, pumps and blowers with new energy efficient motor *Improvement in lighting system	*Adopting SOP

7. STATUS OF IMPLEMENTATION

Two units (Bhusan Steel and Thakur Steel) have implemented some of the suggested measures (a) Furnace modifications in Bhusan steel by investing INR 0.35 million with benefits of INR 0.49 million, (b) Installing VFD on blowers , augmenting capacitor bank , reducing mill stoppages, etc by investing about INR 0.1 million leading to annual savings of INR 0.65 million. Most of other measures in all 3 units are under planning stage and will be taken up once the market bounces back. The units are under tremendous pressure due to severe stress due to drop in business volume, realization far below cost of production, very high cost of inputs including fuel, etc. The sector is also reviewing the fuel switching options- in the present context some units are re- looking into the decision to switch back from coal/producer gas to furnace oil – ideally bi-fuel option is quite relevant in the present context.

Savings in Bhusan Steel are:

- Improvement in scale loss by 0.25 %
- Saving in material 7MT*8hr*250 days= 14000 Mt*0.25%=35 Mt
- INR 40,000*35MT = INR 14, 00,000 annually
- Saving in heating cost by INR 200 to 250 per Mt.
- 14000 Mt x INR 250 = INR 35, 00,000 annually
- Savings (Materials plus Energy): INR 49 lacs

Savings in Thakur Steel are:

- Saving in material loss: 3MT*8hr*250 days*INR 40,000/MT = INR 6,00,000 annually
- Saving in power by 5.0 unit/hr: 5*10 hrs*250 days* INR 4.0 = 50,000 annually
- Savings (materials plus energy): INR 6.5 lacs

On the whole, impact of the Project activities on the prevailing situation is limited, though the stakeholders including PEDA got convinced on the need to take the legacy of the project to its logical conclusion by continuing the campaign beyond the project period in this sector.

FACTORS IMPEDING IMPLEMENTATION

1. Normally 30-40% of the units respond to the on –going initiatives by NISST and other complementary programs such as UNDP-GEF Project which provide substantive subsides. The barriers to implementation include:

   - Line Supervisors (Foreman) not well educated/motivated
   - Lack of awareness of the efficient practices
   - No measurement
   - Un skilled/trained manpower
   - Contract practices for production unrelated to energy

2. In the recent period – past 6-8 months, the units are reeling under tremendous pressure. This is mainly due to wide variations in the demand, cost of inputs – raw materials, fuel – coal and oil as well as finished products to the tune of 10-40% over the base figures. This has led to fluctuations in business and shift in priority on the type of product mix, etc. In fact, techno-economics of ECMs presents a different picture. For example, the coal gasifiers does not appear to be relevant to some entrepreneurs in the present context while some of them are even contemplating switch over to furnace oil instead of coal due to climb down of the crude oil . In this context, implementing ECMs is on the back- burner. This has affected the pace of implementation of the measures, though units are realizing the relevance of these measures.

3. Merely 10% of 300 units in Mandi Gobindgarh and adjoining areas keep a track of different technologies and also take interest how to reduce avoidable losses and the cost of production. Replication of these measures among the industry across the board in the cluster is also passing through the rough weather due to constraints - technical, managerial resource and financial. Inadequacy of an incentive scheme to propagate implementation is a major concern of the user industry. It is learnt that the Association of Industries is in dialogue touch with other donor programs – UNDP and the World Bank for providing soft support for implementing ECMs.

8. NEXT STEPS

1. The units covered under the Project have a phased plan for implementing the recommendations from the pre-feasibility studies. The studies have brought out that material cost reduction benefits account for 50- 75% of the cost reduction potential and are of significant interest to the re-rolling units.
2. For development of the energy efficiency culture in the steel re-rolling mill clusters, the following measures (as established and accepted by the units in the pilot studies) have substantial untapped potential :
    a. Furnace modification and revamps
    b. Fuel switching
    c. Semi automation in furnace.
    d. Use of VFD
    e. Use of Roller bearing, universal spindle.
    f. Use of energy efficient motors.
    g. Power factor improvement & MD controller
3. Local Service Provider (NISST) and other organizations such as equipment suppliers and agencies such as PCRA may work together to work together with the user industries in intensifying the drive.

9. CONCLUSIONS

PEDA /BEE and NISST should continue the legacy of these efforts by taking up the following tasks:

- Awareness programs on energy efficient technologies which promise substantial cost reduction opportunities
- Some more units could be taken for studies to create more attraction in units for modification towards more efficient technologies
- NISST could act as information dissemination center.
- Some subsidy could be given to motivate the industry to adopt these technologies.

ANNEXURE- C

EXPERIENCES FROM SME STUDIES IN SME CLUSTERS IN TEXTILE PROCESSING UNITS – LUDHIANA

1. PROJECT BACKGROUND

The main objective of the SME Component of Energy Conservation and Commercialization – Phase III (ECO3) project is identifying barriers to financing energy efficiency projects for SMEs and providing technical assistance to conceptualize and execute a model scheme for energy efficiency projects in SMEs which can be replicated in other locations by BEE and SDAs. The project engaged Conzerv Systems Pvt. Ltd the task of implementing Energy Efficiency (EE) in one SME Cluster in Punjab. The team identified Ludhiana Textile cluster for EE intervention and disseminated information to SMEs in the cluster on benefits of EE measures. Through an interactive meeting on Nov 13, 2007 at Ludhiana & also through IRGSSA-World Bank program on EE Capacity building on Dec 14&15 at Ludhiana. Conzerv successfully completed Pre-feasibility energy studies for 3 units & detailed investment grade audit of 2 units in the textile sector at Ludhiana.

The project selected Ludhiana textile cluster for implementation of EE measures under the project due to the following factors:

- Textile sector is listed as a *Designated Consumer* by BEE with good energy saving potential
- Location advantages of Ludhiana being Punjab's industrial hub
- Ludhiana has 300 dyeing units and about 1000 knitwear & spinning units
- Supportive role played by associations, and progressive members with positive outlook
- NITRA's technical involvement in cluster
- Healthy and viable units interested in technological up-gradation
- SBI's active interest in promoting EE in the cluster through Project Uptech at Ludhiana and the active role played by the Hosiery Specialized Branch.
- This project offered an opportunity for Conzerv to share previous project experience in South Indian Textile SMEs.

2. SUMMARY OF ACCOMPLISHMENTS

The team effectively liaised with Banks, Industries Associations and NITRA with the following objectives:

- Identify SME cluster with large untapped energy saving potential and scope for applying cross cutting technology for a focused technical assistance initiative under ECO-III project, and make a SWOT analysis of the cluster.
- Disseminate information to SMEs in the cluster on benefits of EE measures.
- Implement energy saving technology, which has a high replication potential, among select SME units.

A. Networking with Banks and Industries Associations:

- **Meetings with Banks:** Conzerv team met SBI's Branch Manager and Chief Manager, Project Uptech and apprised them the objectives of the project. SBI suggested the names of 6 units banking with them for energy improvement programme.
- **Tie-up with Local Technical Expertise:** Conzerv team has worked out an arrangement with NITRA Power loom Centre, Ludhiana, to assist Conzerv in conducting a survey of textile units in Ludhiana to identify of suitable units for energy studies.
- **Interaction with the potential SMEs/ Major Associations:** Conzerv team had interactions with local SMEs and their associations. These included Mr. Vinod Thapar, President, and Mr. DD Sharma, Secretary of Knitwear Club (apex body for various Textile Mills / Industry-related associations), and Mr. Raja Sood, Hon. Secretary, Association of Dyeing Units. These discussions helped in further in short-listing the units for the Survey.

B. Awareness creation in the cluster

- **Interactive Meeting held on November 13, 2007:** An interactive meeting on financing EE in textile cluster under the above programme was organized on 13.11.2007 in the premises of SBI, Ludhiana. The objective of the meeting was to acquaint the SME units with the features of the above project and the activities proposed under USAID ECO-III and how it will be beneficial to them. Twelve SMEs attended the meeting apart from office bearers of industries associations, NITRA, PEDA and USAID-ECO-III Project team.

- **IRGSSA-World Bank programme on Energy Efficiency capacity building**: This was organized by Conzerv on 14-15 Dec 2007 at Ludhiana. About 50 industrial units attended the seminar on the first day and 30 units on the second day. The technical sessions were well received and there was a good involvement of participants in the deliberations.

3. PRE-FEASIBILITY STUDIES

Based on the findings of pre-investigative studies, Conzerv conducted 3 pre-feasibility pilot studies of the following units:

1. M/s Ekta Dyeing & Finishing House — March 13 to March 15, 2008
2. M/s Devinder Sandhu Impex Ltd — March 17 to March 19, 2008
3. M/s Adhinath Dyeing &Finishing Mills — March 26 to March 28, 2008

The units were selected on the following basis:

- Their investment in plant and machinery is below INR 10 crore i.e., they are SMEs.
- Their annual sales turnover is above INR 7crore.
- Their financials, payment track record and conduct of accounts with the bank are good.
- Their monthly energy bill (fuel + electricity) is above INR 15 lacs.
- The cost of fuel and electricity constitutes about 20% to 25% of their total cost of production and hence good scope for EE measures.
- These units have given letters of consent for energy studies and implementation of recommendations, if found feasible.
- The projects will have potential for replication in the cluster and elsewhere in the country.

Following objectives were kept in focus while undertaking pre feasibility studies:

- Identify candidate projects in Textile Sector, which can be implemented not only in chosen cluster but have substantial potential in other locations.
- Identify the application and deployment of energy efficient technology that has been reliably tested and developed in the past years but have not been extensively applied by the Textile Sector.
- Based on the merits, take this pre-feasibility study further for investment grade study and prepare bankable proposal, which can be tied to on-going schemes of the financial institutions (e.g. SBI/ SIDBI).

4. HIGHLIGHTS OF THE STUDY

1. **M/s Adhinath Dyeing &Finishing Mills:**

Total savings, INR	22.09 Lacs
Total investments, INR	38.1 Lacs

- Impact of Proposed Energy Conservation Measures

Energy reduction	
Electricity, kWh	339073
Rice Husk, MT	264
Percentage of Reduction in Energy	
Electricity, %	13.83
Rice Husk, %	3.32
Percentage in Cost Reduction, %	6.1

2. **M/s Devinder Sandhu Impex Ltd**

Total savings, INR	15.17 Lacs
Total investments, INR	30 Lacs

- Impact of Proposed Energy Conservation Measures

Energy reduction	
Electricity, kWh	284956
Rice Husk, MT	115
Percentage of Reduction in Energy	
Electricity, %	17.22
Rice Husk, %	2.96
Percentage in Cost Reduction, %	8.24

3. **M/s Ekta Dyeing &Finishing House**

Total savings, INR	26.42 Lacs
Total investments, INR	41.77 Lacs

- Impact of Proposed Energy Conservation Measures

Energy reduction

Electricity, kWh	315503
Rice Husk, MT	482
Percentage of Reduction in Energy	
Electricity, %	16.85
Rice Husk, %	8.03
Percentage in Cost Reduction, %	9.55

- An interactive meeting to share the above findings of Pre-feasibility studies was held at Knitwear club on 8th April, 2008 with the above 3 units. The units expressed their satisfaction and appreciation over the prospects of Energy Savings and agreed to implement the recommendations in the report.
- A visit to each one of the above three units was made on 16th May, 2008 and item-wise discussions on the recommendations on energy conservation measures were held. The units submitted their acceptance/observations on the report by a letter.
- Investment Grade Audit Report- Two units were selected for investment grade audit with bankable proposals on paid-from-savings model. The units were Adhinath Dyeing & Finishing Mills and Devinder Sandhu Impex Ltd.

The criteria for selection of these two units were:

- Their financials, profits, payment track record and conduct of accounts with the bank are good.
- They have good order book and expansion plans.
- The units are willing to raise external borrowings for implementation of the project
- The projects have potential for replication in the cluster and else where in the country.

Accomplishments

1) Compilation of investment grade audit report furnishing:
   a) The basis of energy savings including assumptions made & impact of proposed energy saving measures.
   b) Detailed evaluation of energy saving options of selected units, technology involved, energy accounting and balancing
   c) Critical analysis of their financial position &ability to repay loan in terms of cash flow projections, debt service coverage and bank ability of the project.
   d) Measurement and Verification protocol for energy savings
2) A visit to each one of the above two units was made on 16th July, 2008 and item-wise discussions on the implementation of recommendations on energy conservation measures were held. The units submitted their concurrence by a letter.
3) Discussions with SBI and SIDBI, Ludhiana were held on bank ability after submitting to them a copy of Investment Grade Audit Report and their concurrence to finance the energy saving project obtained.
4) Both the units have qualified personnel or Chartered Accountants working in the Company and they will not have any problem in submitting the data to Bank for sanction of Term Loan. They have also availed of term loans from Bank earlier and have experience in complying with Banks formalities for availing a term loan. The units are awaiting finalization or audited financial statements for the year ended 31 Sep 2008 and they will be approaching their Bankers soon. The team forwarded the checklist for availing Bank loan to them and they expressed that they may not need further hand-holding support in complying with the formalities for availing term loan for the EE Project

5. SUMMARY OF THE STUDY

Table 6: Summary Table for three units covered under Pre Feasibility Studies

Savings, INR in lacs

	UNIT A	UNIT B	UNIT C
Total Savings	INR 22.09	INR 15.17	INR 26.42
Total Investment	INR 41.10	INR 30.00	INR 41.77
Pay Back Period	24.7 months	24 months	19 months
Reduction in Electricity	13.83%	17.22%	16.85%
Reduction in rice husk	3.32%	2.96%	8.03%
Reduction in cost	6.10%	8.24%	9.55%

Table 7: Summary of common energy conservation / Efficiency measures

S. No	Energy conservation/ Efficiency measures
1	Reduce Excess Air to Reduce Flue Gas Losses in Thermo Pac
2	Reduce Ingress of Air through Ash Collector and Install Variable Frequency to ID Fan in Steam Boiler
3	Replace Conventional Existing Fluorescent Lamps with T-5 type Lamps
4	Improve Power Factor to Avail Maximum Power Factor Rebate
5	Eliminate Throttling and Install Variable Frequency Drive to Forced Draft Fan of Thermo Pac/Boiler
6	Recover Flue Gas Heat of Thermo Pac to Preheat Combustion Air / Water
7	Install Variable Frequency Drive to Atlas Copco Compressor
8	Recover Heat of Flue Gas of DG Set
9	Eliminate Throttling of Spray Pump of Soft Flow Dyeing Machine and Install Variable Frequency Drive

6. LEARNINGS

- The marketing of EE concept to SMEs poses several challenges. There is a resistance to undertake energy audit despite availability of incentives because of the mindset of SME entrepreneurs. The cost of energy audits is perceived to be high by many SMEs.
- Even where walk through audits have been completed and energy saving potential identified, EE is not on the list of priorities for entrepreneurs. Lot of persuasive follow up is required for implementation of energy saving measures.
- SMEs are quick to implement low cost measures with their own funds. However they need time to do major changes which include plant and equipment modification / revamping by availing bank finance
- While initially there is a resistance, once a few no-cost suggestions were successfully implemented, full co-operation from management was received.
- Wherever EE schemes have been implemented, they are a definite value addition for SMEs.
- Energy audits and cluster-level energy studies have identified good energy saving potential and investment opportunities with short payback period of 1 to 2 years.
- SMEs need handholding support for equipment selection integration into their plants and to provide training to their plant operators to sustain energy saving measures.
- SMEs do not want to discuss or reveal their own operating costs and energy cost reduction potential to other upstream units or competitor. They feel that there would be pressure on them to reduce their margins (and profits), if costs and savings potential of specific units are discussed in a common forum as case studies and replicable models. Nevertheless they are interested in generic case studies and analysis, provided their own costs are kept out of purview.

Additional facilitation, for units covered under studies:

Both the units have qualified personnel/ Chartered Accountants working in the company and they will not have any problem in submitting the data to bank for sanction of term loan. They have also availed of term loans from bank earlier and have experience in complying with banks formalities for availing a term loan. Conzerv forwarded the checklist for availing bank loan to them and they expressed that they may not need further hand-holding support in complying with the formalities for availing term loan for the EE project. The units are not keen to seek loan from the units and favor deploying internal funds for the same. One unit (Devinder Sandhu) indicated that they will do after they see a reference site or demo's of all the recommendations.

7. ROAD MAP FOR IMPLEMENTATION

Action Plan for PEDA

- PEDA is expected to play a greater role in promoting EE projects and financing models in the states, especially among SME clusters by creating much greater awareness on EC Act (2001) and its implications for SMEs through seminars, workshops and interactive meetings.
- There is lack of information on EE equipment, supply options as well as information on availability and credibility of ESCOs and EE consultants, which this project could address to a limited extent for those units which were directly involved in the project. There is a great need for wider discussion and dissemination of successful EE projects and case studies, as well as need to provide information on available expertise at the local or regional level. PEDA may bridge the information gap through interactive meetings.
- Demonstration projects or pilots have a significant impact on convincing industries especially SMEs. Two units each from four or five clusters may be selected for detailed energy audits and investment grade report so that the successful models can be developed and replicated by other SMEs in the cluster.

Action plan for Banks

- Banks may organize seminars for creation of energy efficiency awareness among SME borrowers at various industrial estates or SME clusters, as well as follow-up meets on workshops already organized
- Wherever energy consumption of SMEs exceeds 10% of cost of production, banks may advise units to undertake energy improvement program while issuing loan sanction letters
- Banks may empanel BEE-accredited energy auditors to undertake energy studies for SMEs in all regions, and advise SME borrowers of names and services/expertise available
- Sensitize bank officers on EE financing schemes and on identifying potential beneficiaries
- Banks may finance or share cost of one energy audit in each industrial estate/ cluster for demonstrative purposes

Action Plan for SME Associations

- Preparation of action plan for promoting EE in the SME cluster in consultation with banks, SMEs and EE & Technical experts
- Facilitating one-to-one meetings with SME units, energy auditors & consultants
- Planning more technical workshops for SMEs with banks and EE consultants

Framework for monitoring the results of implementation of EE measures.

PEDA may retain the services of an official or engage a consultant to extend handholding support to the two units studied for selection of equipments, installation and for training their workers on EE implementation. The consultant can help the 2 units in monitoring energy saved by implementing the recommendations for a period of 3 months.

ANNEXURE- D

EXPERIENCES FROM SME STUDIES IN SME CLUSTERS IN TEXTILE PROCESSING UNITS – AHMEDABAD

1. PROJECT BACKGROUND

As a part of USAID ECO-III project, a textile cluster in the Gujarat was short listed for the SME interventions. The goal of the exercise is to provide technical assistance to conceptualize and execute a model scheme for energy efficiency projects in SMEs, which can be replicated in other locations by BEE and SDAs. The Project banked on the ECO-III partner DSCLES for executing these activities.

2. CLUSTER SELECTION

The team opted to take up SME task in the Ahmedabad Textile cluster after a review of the untapped potential and macro perspectives. Key reasons behind choosing the Textile cluster of Ahmedabad are:

- Textile industry in particular had contributed in a big way to the industrialization of the State. In fact, development of many industries likes, Dyestuff, Chemicals, Engineering and Cotton farming is solely dependent on this sector. The State is well known for development of Hybrid Cotton, Ginning, power looms, composite mills, spinning units and independent processing Houses. Gujarat contributes 33% of woven fabric of organized sector and 25% of decentralized power-loom sector of the country.16% of the cultivated land area of the state is for cotton. Gujarat is the largest cotton producing State in the country. Over 23% of GSDP comes out of textiles alone. Gujarat share over 21% of the total textile exports of the country.
- Largest number of medium and large fabric process houses concentrates in the State, mainly in Ahmedabad (250 Nos.) and Surat (350 Nos.), besides 1500 hand printing units at Jetpur alone The textile cluster at and around Ahmedabad units is found suitable for the study objectives. SME textile cluster located in Ahmedabad comprising over 250 process houses and 94 power operated textile units in and around Narol (Dist. Ahmedabad).
- There is absence of serious efforts to evolve an energy efficiency program by SMEs in textile cluster at Ahmedabad in the recent period despite presence of process experts, energy managers and auditors and suppliers of energy efficient equipment.

In a large composite textile mill, the cost of energy as percentage of the manufacturing cost varies between 12 – 15%, which includes electrical and thermal energy. Wet processes require high amounts of thermal energy, inducing a higher share of energy costs. The energy cost is next to the raw material cost and comparable to labor cost. Hence, energy conservation in a textile mill plays significant importance and is a priority area for maximizing profits. The scope for energy conservation in the textile sector is normally around 20-25%. Processing is the weakest link in the supply chain of textile industry. It has developed low-end technology with little investment initiatives and technology up-gradation.

As most of the process houses are in the gamut of SMEs, it was decided to concentrate on the Wet Processing under the ECO-III Project.

Ahmedabad Textile Industries Research Association (ATIRA) – an autonomous R & D laboratory linked to the Ministry of Textile, GoI, has been identified as a local service provider. Playing a pivotal role as an R & D laboratory, specifically in textiles, for over 45 years, they are also one of the authorized Energy Auditors empanelled by the Office of the Chief Electrical Inspector, GoG. ATIRA has expressed strong interest to work jointly with DSCLES. ATIRA's involvement in the Project will provide valuable additional input, specifically in the areas of process optimization in textile sector. Accordingly, a broad framework of overall terms of reference for working together between DSCLES and ATIRA was executed in the early stage of the cluster level activities.

The team collated information from Electrical inspectorate from the Energy audit studies to take stock of energy audits being taken up by them. Very little use is made from these reports for analysis and selection of EE technological measures.

3. SELECTION OF THE UNITS

The team approached several units in the cluster through personal meetings and mails besides analysis of preliminary data on power consumption - water pumping and lighting, and likely energy savings and zeroed in three units, namely a) Sameer Synthetics, Odhav, Ahmedabad b) Shri Krishna Processors, Ahmedabad c) Paradip Overseas (Chetan), Vasana, Ahmedabad. The units also committed *in-kind contribution* for both pre-feasibility as well as IGA, if taken forward. This in-kind contribution is sought to test the possibility of making such an EE activity market driven (ii) to have sincere commitment of the beneficiary unit towards implementation of ECM's, which may get evolved, and (iii) to partly take care of expenses towards ATIRA's logistics/fees.

Pre-feasibility studies adequately focused on low hanging or easy fetching energy savings opportunities immediately thereby building-up the confidence as well as establish the worthiness of such an exercise. Energy savings projects, which are either high capital intensive and/or technically complex in nature only, have been considered for IGA and development of a bankable project. Among the key energy conservation measures in the pre-feasibility studies suggested include:

- Advanced FBC Thermo-pack
- Thermo-pack: Reduce heat losses and heat recovery
- Installing Cogeneration*
- Caustic recovery from mercerizers
- Replace jiggers by cold pad dyeing process
- Waste heat recovery - jet dyeing, kiers
- Install energy efficient Compressor
- Improving drying efficiency in stenters
- Voltage reduction in the lighting circuit
- Install energy efficient Pumps
- Improve electrical distribution within the plant
- Interim discussions on ECM on small cogeneration in Sameer and Chetan as a follow up of the pre-feasibility studies reveal that the proposition encounters a risk of high cost and availability of lignite. Therefore these barriers have to be addressed while preparing detailed project report.

Table below at a glance provides gist of energy consumption and energy conservation measures identified under the Project

Out of the 3 units, IGA was carried out at Sameer Synthetic Mills, who had expressed intention to implement energy saving projects with commercial financing. Sameer have indicated interest in implementing other capital intensive and/or technically complex energy efficiency projects for implementation and have requested for an investment grade energy audit to be done together with the evaluation of opportunities for financing these under the Textile Up gradation Fund (TUF) Scheme. Sameer will carry out the performance measurement and verification (PMV) independently. Shri Krishna Processors is looking for financial assistance such as soft loan or performance contracting for replacement of existing manually fired thermo pack by FBC technology based one.

Table 8: Summary Table for three units covered under Pre Feasibility Studies

Unit	Aggregate Energy (TOE) /year	Annual energy bill (INR Lakh)	Electricity /Aggregate Energy (%)	Fuel used	Expected Investments (INR Lakh)	Expected Benefits (INR Lakh)
Sameer	3400	350	6.3	Lignite	286	125.4
Srikrishna	1220	148	9.3	Lignite	49	34
Paradip Overseas (Chetan)	5980	731	6.2	Lignite	409	220

4. SUMMARY OF IGA FINDINGS

Sameer would take the lead in obtaining financing for the entire investment. It is proposed to seek the financial assistance to the extent of INR 188 Lacs. The projects represent a typical case study of a SME textile mill and can be replicated in similar facilities.

Table 9: Summary of Energy Saving Projects for Implementation

Sr. No.	Energy Saving Measures	Expected investment	Expected savings	Observations
1	Waste Heat Recovery from process Jet Dyeing Machines	2 Lac	3.5 Lac	Being considered under TUF Scheme (Loan application to PNB likely soon)
2	Thermo-pack Replacement	26 Lac	18 Lac	Implemented 0.35 million INR with own funds. Also switched over from lignite to agro fuels. 5-7% savings
3	Caustic Recovery from Mercerizing Machines	29 Lac	25.4 Lac	Being considered under TUF Scheme (Loan application to PNB likely soon
4	Process water pumping improvements	1.8 Lac	0.9 Lac	Space Constraint
5	Cogeneration	200 Lac	66 Lac	Space Constraint
6	Replacement of existing jigger dyeing with cold dyeing machine	20 Lac	8.5 Lac	Implemented with overdraft from their Bank

The project financials (Table 2) clearly demonstrate viability of implementing the projects.

Table 10: Summary of Project Financials

Project Financial Parameters Value

1	**Project cost, INR lacs**	338
2	**Term Loan Assistance sought INR lacs**	188
3	**Energy savings, INR lacs/year**	122
4	**Project internal rate of return**	14%
5	**Average RoCE**	27%

Tangible benefits include annual saving of around INR 122 Lacs to Sameer. Intangible benefits include improvement in product quality and reduction in greenhouse gas emissions by 16840 tons of CO_2 annually .The project represents a typical case study of a textile mill and can be replicated in other similar units.

On completion of the Investment Grade Energy Study in Sameer Synthetic Mills, joint Efforts were made by DSCLES and Sameer to obtain financing for implementing the Projects. Since Sameer had expressed interest in availing benefits under the TUF Scheme, ICICI Bank and the existing bankers – Punjab National Bank (PNB) was approached for financing the projects.

ICICI Bank declined the request due to non-eligibility of partnership firms to avail Financing under the programme managed by them. Sameer had an existing line of credit from PNB for purchase of new machinery and Expansion. On completion of the DSCLES study, a) The details of new projects to be undertaken to utilize this credit was finalized and efforts are being made to secure this under the TUF Scheme. Meanwhile the unit has ploughed its own funds for replacement of jigger dyeing with cold dyeing machine.

5. KEY LEARNINGS

1. Financing of energy efficiency projects

- There is a wide range of investment scale in energy efficiency projects in SMEs.
- Low & medium investment projects, having payback of less than 1 year are normally implemented from internal accruals.
- Medium to large investment projects are normally implemented as part of modernization or expansion program for which debt financing is sought.
- There are several existing sector specific credit lines – sector oriented (viz. TUFS) or SME oriented (viz. CGFTSI); list of similar is enclosed as Annex-4.
- Information on such schemes is known at cluster level since they are operated through a network of nationalized banks. A few of these schemes have a tacit requirement for employment of energy efficient technology as part of expansion and modernization.
- Varying relevance of prevalence of previously observed traits such as:
    - Asymmetry associated with reporting production and hence energy usage Preference and comfort in relationship with existing banks (working capital lenders)
    - Decision for obtaining debt financing is based on the scale of investment and importance to main production operations. In industries where maximizing production is the priority, focus on cost reduction is not very high. Energy cost reduction is on the back- burner. From the point of view of financing a project, merits and financial returns of the project are not a consideration for the lending.
    - Loan review and servicing process are not consistent and scale able (different types of EE projects in different industries – makes parameterization of appraisal process difficult)

2. Cluster Operations

- Role of Industry Associations: In India clusters homogenous and heterogeneous clusters co-exist. Individual units tend to associate with either or both regional associations or domain centric associations. The degree of involvement of these associations varies. In clusters where such organizations are pro-active, the availability of information on cleaner production practices, energy efficient technologies; developments such as CDM are well known and leveraged. In others, information on these aspects remains a barrier.
- There are many energy efficient technologies (cross-cutting sectors); information regarding which are not readily available in clusters. Confidence level to adopt such technologies would be higher if there was a medium (such as the BEE or energymanagertraining.com website or local center of excellence or testing centre or any other more effective method) through which updated case studies and cost information can be made available.
- There is an unmet demand for service on industry intelligence (in the specific study for Gujarat this was related to cleaner production technologies; common business operations for procurement of imported coal, raw material for process and services such as CDM).

6. RECOMMENDED STRATEGIES

While confirming the rationale that SMEs across the board are constrained by technical, Managerial, resource and financial constraints, several efforts have been/ are being made to help overcome these. The Bureau of Energy Efficiency's National Agenda for Energy Efficiency in SMEs aims to accelerate adoption of energy efficient technology and practices in SME clusters is A welcome move to overcome a few of these constraints. A few recommendations include:

- There is a need for high level of awareness on possible areas and potential for energy cost reduction, but the skills required for conceptualizing and implementing such projects vary.
- Clusters reflect a contradiction of closely networked operations and cut throat competition bordering on turf protection. The desired results of replication can be achieved by an effective cluster champion. Energy efficiency is an important activity of interest to many users and other interests.
- Products customized to the client and to the industry; products are built around existing ones used for SMEs. There is a need to dovetail energy efficiency financing with existing financing schemes, which have a better reach to the clusters.

ANNEXURE- E

SME WORKSHOP:

ACCELERATING IMPLEMENTATION OF ENERGY EFFICIENCY PROJECTS IN SMEs

1. BACKGROUND

The project organized a SME Workshop 'Accelerating Implementation of Energy efficiency Projects' on June 11, 2008 in New Delhi, at which more than 50 stakeholders participated. The Workshop had the following objectives:

- To provide a forum for a meaningful exchange of ideas among agencies and champions for energy efficiency in SMEs in India.
- To exchange experiences among stakeholders from the pilot studies in the four SME Clusters under the aegis of USAID ECO-III Project along with a few related programs carried out in recent years.
- To discuss key policy and barriers – particularly relating to financing – impeding investment in energy efficiency projects for overcoming the same.

RECOMMENDATIONS

The recommendations evolved during the Workshop are given below:

- Three Countries (3C) Report under the aegis of the WB. UNEP and UN organizations have deliberated on energy efficiency programs in SMEs by exchange of experiences from India, China, and Brazil. ECO-III has taken note of the documentation under the 3C report, which may serve as a useful reference for directions for EE financing issues.
- While there are several organizations engaged in energy efficiency in SMEs, more intense efforts are needed for a road map to be developed. BEE efforts in the next 3-4 years are a small step in this direction, needing pooling of substantive efforts by several other organizations including donor programs.
- ECO-III will consolidate its findings in Phase I (2006-08) and take on a few additional efforts in this area in the future.
- Energy champion-driven model in Vatva Industrial Estate with active participation by stakeholders and flexibility to modify its contour and business ethics with inputs /contributions from all important members appears to be a workable approach for spreading cross cutting energy efficient technologies. This model needs to be nurtured for fruition and replicated wherever feasible.
- ECO-III equally values other models being pursued by other donor programs and national agencies such as PCRA, PTC (India), etc. ECO-III will continue to do more research on this model and support their advocacy by the Indian stakeholders in SME sector.
- ECO-III feels that EE Financing is crucial but not a critical factor affecting the pace of implementation in SMEs at this juncture. Banks will continue to follow their traditional approach in funding EE projects for improving the bottom line of their clients in sectors of deep interest to them.
- Considering the large amount of funding support needed by intensifying these activities in the future, banks such as the State Bank of India, and others such as the Bank of India, Punjab National Bank, and SIDBI, has to keep playing their role and expand their outreach by developing a capacity building program for their officials. IREDA and private banks can contribute their resources by diversifying into this area.
- Financial protocols being followed by Indian Project developers; service providers need to be re-examined in view of addressing the institutional barriers impeding the expansion of EE finance portfolio, which is likely to pick up in the near future.

- A number of new business models and ideas were very well received by the participants, especially, with some adaptation, the European "White Certificates" scheme, which ECO-3 will explore further in the next few months.
- While there is dearth of actionable data for perceiving and program design for SMEs, MMSE and BEE can take up joint activities to address this huge area with due diligence.

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