SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING

VOLUME 10 | ISSUE 1 | MARCH 2019

# SAMEEEKSHA NEWSLETTER

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## Inside...



Promoting Energy Efficiency in SMEs

SAMEEEKSHA

### VISION

SAMEEEKSHA envisages a robust and competitive SME sector built on strong foundations of knowledge and capabilities in the development, application, and promotion of energy-efficient and environment-friendly technologies.

Bureau of Energy Efficiency | Swiss Agency for Development and Cooperation SDC | SHAKTI SUSTAINABLE ENERGY FOUNDATION | teri The Energy and Resources Institute

A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

## IN THIS ISSUE...

This issue has, as its focus, the GEF-funded project titled 'Market Transformation and Removal of Barriers for Effective Implementation of the State-Level Climate Change Action Plans' being implemented by UNDP in the state of Jharkhand, in partnership with Ministry of Environment, Forests and Climate Change (MoEFCC). The aim of the project is to reduce greenhouse gas (GHG) emissions in various sectors at the state level as identified in the Jharkhand Action Plan for Climate Change (JAPCC).

The theme article captures the approach, activities and achievements of the project. Following a study that helped assess the potential for introducing energy efficiency (EE) and renewable energy (RE) measures in the state's MSME sector, energy audits were conducted in a number of energy intensive sub-sectors to identify possible energy conservation options and estimate the energy savings and $CO_2$ reductions that would result from their adoption. Currently, the project is paving the way for widespread and sustained adoption of EE and RE measures through conducting a large number of detailed energy audits, preparing bankable detailed project reports, strengthening the supply chain network, and capacity building of staff from the state nodal agencies.

One of the sub-sectors studied by the project is cold storage, which is of particular importance to Jharkhand considering the state's predominantly agricultural-based economy and the need to reduce post-harvest losses of fruit and vegetable produce. The results of energy audits on cold storage units are presented in a separate article. The project has also set up and demonstrated the benefits of a stand-alone solar-powered micro cold storage unit, in partnership with Jharkhand Renewable Energy Development Agency (JREDA) and Aragaro Vegetable and Fruit Producer Company Ltd (AVFPC), a local farmer producer company (FPC). An account of this pioneering implementation is presented in a brief case study. The issue also carries a summary of the discussions during the 15th Platform Meeting held at Coimbatore in January 2019.

*SAMEEEKSHA Secretariat*

# BOOSTING MSME BUSINESS IN JHARKHAND BY PROMOTING ENERGY EFFICIENCY AND GREEN ENERGY GENERATION: A UNDP–GEF PROJECT

## Backdrop

India, as the world's fourth largest consumer of electricity, is committed towards actions to combat climate change through strategies outlined in the National Action Plan on Climate Change (NAPCC), 2008: namely, 'achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gas emissions', and 'devising efficient and cost-effective strategies for end-use demand-side management'.

There is need for greater synergy between the national priorities and the state-specific strategies to achieve the NAPCC goals, as it requires actions in several sectors that are state subjects and have to be implemented by the states. For instance, state governments are responsible for developing state-specific action programs for the power, transport, industry, buildings and municipal energy efficiency, and forestry sectors in line with the NAPCC.

In this context, UNDP, in partnership with Ministry of Environment, Forests and Climate Change (MoEFCC) and with support from Global Environment Facility (GEF), is implementing a project titled 'Market Transformation and Removal of Barriers for Effective Implementation of the State-Level Climate Change Action Plans'. The project is being implemented in Jharkhand. The overall goal of the project is to reduce greenhouse gas (GHG) emissions in various sectors at the state level as identified in the respective State Action Plans for Climate Change (SAPCC). This article outlines the approach, activities and achievements of the project in Jharkhand.

## JAPCC

The Jharkhand Action Plan on Climate Change (JAPCC) envisions 'achieving economic growth and poverty alleviation objectives and enhancing livelihood opportunities while ensuring environmental sustainability'. JAPCC outlines a number of strategies to reduce the energy intensity and climate change impacts of the state, through adaption and mitigation measures in eight sectors: agriculture, forestry, health, industry, mining, power, urban & transportation, and water. Energy efficiency (EE) and renewable energy (EE) solutions form key elements of the JAPCC strategies and proposed activities.

## Approach

The project commissioned a study by TERI to assess the potential for introducing EE and RE measures among key energy consuming sectors in the state, including the barriers that have to be overcome in promoting the adoption of such measures. The study highlighted the need and potential for introducing EE/RE-based technologies in Jharkhand's MSME sector, where most MSME units continue to use obsolete, low-efficiency equipment and production practices. The key barriers identified by the study included the following:

- Limited knowledge and interest among entrepreneurs regarding the potential for energy conservation, or the options available for technology improvement
- Inability of MSMEs to access finance through formal channels, due to limited awareness on the available financing schemes, as well as lack of the capacities required to develop sound credit proposals
- Lack of local service providers (LSPs) to support entrepreneurs in conceptualizing, developing and implementing EE/RE initiatives
- Lack of EE technologies adapted to meet the needs of particular MSMEs sub-sectors, and that can be readily adopted (in 'plug & play' manner)
- Lack of initiatives that would help finance de-risking instruments for EE measures.

The project evolved a strategy and plan of action designed to address and overcome these barriers, through engagements with key stakeholders including government agencies (departments of MSME, industry, and industrial development); Jharkhand Renewable Energy Development Agency (JREDA); financial institutions; MSME entrepreneurs; and industry associations (Jharkhand Small Industry Association, Adityapur Small Industry Association).

## Activities

Consultations were held with policy makers on how to address the potential barriers against the adoption of EE measures across the state; and on how the project could be mainstreamed and integrated within their operational planning, so as to ensure their involvement and facilitate large scale replication

of the EE measures. Consultations were also held with banks/ financial institutions to understand their specific requirements (both process and statutory aspects) for the dedicated financing of EE and technology upgradation measures. The chart below depicts the project approach and activities.

Walk-through audits have been conducted by TERI and two other agencies (TUV SUD and PGS Energy) in some sample MSME units in three energy intensive industrial sub-sectors: ceramic/ refractory, iron & steel, and automobile/engineering. Frequent interactions have been held with industry associations to boost the MSME entrepreneurs' confidence in adoption of the identified EE/RE technology measures. Table 1 summarizes the potential for energy savings and $CO_2$ reductions in the three sub-sectors.

**Table 1**. Potential for energy savings and $CO_2$ reductions in three energy intensive MSME sub-sectors

| Industry | Units (no.) | Annual energy saving potential* (kWh/annum) | Annual $CO_2$ reduction potential (t $CO_2$/annum) |
|---|---|---|---|
| Ceramic/ Refractory | 35 | 5424 | 615 |
| Iron & steel based | 50 | 2263 | 1933 |
| Automobile/ Engineering | 35 | 6349 | 5841 |
| Total | 120 | 14036 | 8389 |

*electrical + thermal

The current and future activities of the project are directed along the following broad lines:

- Conducting detailed energy audits (DEAs) in 120 interested MSME units; identifying EE measures and/or technology upgradation options aimed at waste minimization and resource use efficiency; and preparing bankable Detailed Project Reports (DPRs) for the units
- Developing a sectorial technology compendium and handbook for financing of the various technological options
- Policy de-risking—endorsing and integrating the sectorial technology compendium within the action plan of the state's Industry Department to facilitate its wider adoption
- Demonstrating the impact of energy productivity enhancement/reduction of energy cost along with increased profitability and improved working environment, through PPP mode
- Supporting financial inclusion (debt and equity) of the units for which DPRs have been prepared through the project interventions
- Strengthening the supply chain network (standardization of tailor-made products, strengthening of local service providers, etc.) towards minimizing the transaction cost and ensuring ease of O&M
- Handholding units in adoption of technology measures (based on DPR recommendations)
- Capacity building of staff from the nodal agencies (JREDA and MSME Department), on the identification of EE/improved technology options and on financing of initiatives.
- Implementing a customized, strong monitoring and reporting framework, and integrating it as a part of reportage on Sustainable Development Goals (SDG) and Nationally Determined Contributions (NDC)

**Energy audits in progress**

*Contributed by the United Nations Development Programme (UNDP), New Delhi, India. Please contact UNDP for further information.*

# ENERGY CONSERVATION AND RENEWABLE ENERGY OPPORTUNITIES IN COLD STORAGE UNITS IN JHARKHAND

## Backdrop

The UNDP–GEF–MoEFCC project titled 'Market Transformation and Removal of Barriers for Effective Implementation of the State Level Climate Change Action Plans' aims at achieving reductions in GHG emissions in the state of Jharkhand through the implementation of energy efficiency (EE) and renewable energy (RE) solutions in select sectors, as identified in the Jharkhand Action Plan on Climate Change (JAPCC). Cold storage has been identified by the JAPCC as an important sector for the state's development that also offers high potential for reducing GHG emissions through the introduction of EE/RE technologies.

*Cold storage facilities allow producers of vegetables, fruit and other perishable commodities to store their produce for long periods of time without risking loss in quality. The produce can then be sold when market demand is high and prices are attractive.*

In order to assess the potential for improving the profitability of the existing sold storage units as well as the new units that are coming up, UNDP commissioned a study by TERI of the cold storage sector in Jharkhand. The broad objectives of the study were to obtain an understanding of the technologies in use and the patterns of energy consumption among the operating cold storage units; identify technologies and process areas offering high potential for energy savings; and outline energy conservation measures (ECMs) that could be adopted by the cold storage units, along with quantification of their benefits in terms of energy and cost savings as well as reductions in GHG emissions.

## Intervention

As of March 2017, Jharkhand had 58 cold storage units with a total installed capacity of about 236,680 tonnes. As a first step, TERI prepared a detailed district-wise inventory of the cold storage units. The inventory included energy-related data (annual electricity consumption, back-up power systems if available), as well as information on installed and operating capacities, commodities stored, months of operation, estimated turnover, storage fees/rent, and so on. This exercise involved close interactions and discussions with the unit owners, associations and other stakeholders, and enabled the identification of 11 cold storage units that showed interest in exploring, in greater depth, the possibility of adopting EE/RE solutions. Detailed field assessment studies were conducted in these 11 units, covering the following key elements:

- Assessment of the electricity consumption vis-à-vis storage load
- Process/step-wise analysis (pre-cooling and storage) of energy consumption and energy balance
- Layout and floor plans of cold storage areas, as well as details on critical storage conditions such as temperature, relative humidity, $CO_2$, air circulation, lighting, etc. for each area
- Inventory and specifications of the existing electrical systems
- Assessments and benchmarking of operating efficiency of the refrigeration system, including compressor, evaporators, pumps, condensers, fan, coil units, cooling tower and lighting
- Study of insulation systems including leak detection
- Thermal audit of the cold storage building, chiller room and electrical panels

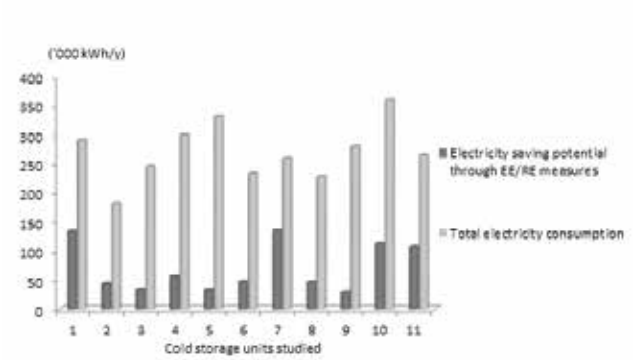
## Results

Based on the field studies, the project team identified, for each of the 11 units, a number of EE and RE solutions that could be adopted to reduce electricity consumption and improve profitability. The total potential for electricity savings through adoption of these EE/RE options is about 775,000 kWh annually, which is equivalent to a monetary

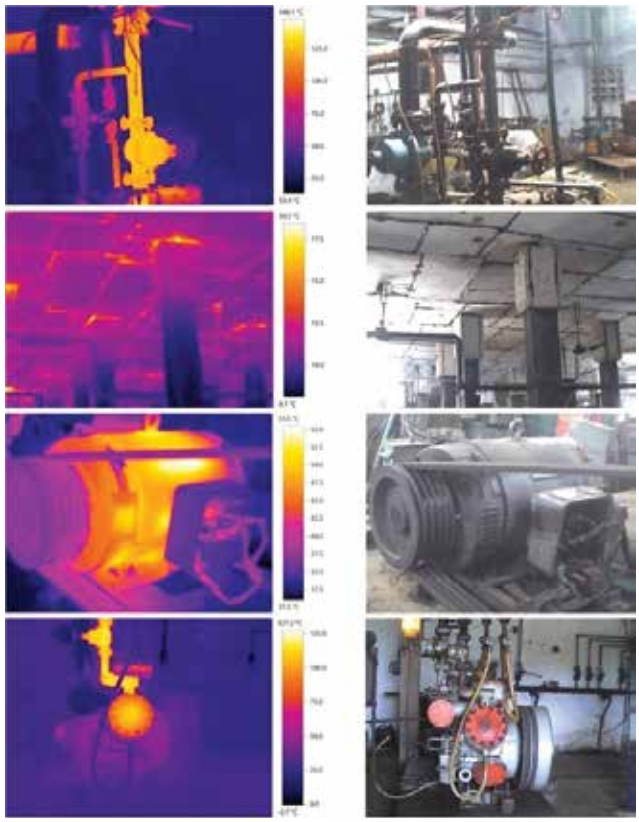
saving of 53.6 lakh rupees. The total investment required is 138.6 lakh rupees, with an overall simple payback of 2.6 years. The simple payback periods on investments range from 0.5 years to just over 5 years (Table 1).

**Table 1**. Recommended EE/RE options, with average simple payback periods

| EE/RE option | Potential no. of units | Average simple payback (y) |
|---|---|---|
| Replace existing lighting with EE lighting | 11 | 0.5 |
| Improve billing power factor by installing PF controller | 4 | 0.6 |
| Install air curtains in doors | 1 | 0.6 |
| Replace cooling tower pump with EE, VFD-enabled pump | 2 | 0.7 |
| Overhaul NH3 compressor | 2 | 0.7 |
| Replace fans with BLDC fans | 11 | 1.3 |
| Replace old compressor with EE compressor | 1 | 1.8 |
| Replace old motors with IE3 motors | 9 | 2.2 |
| Replace old chamber doors with hermetically sealed doors | 5 | 3.3 |
| Install rooftop solar PV system | 2 | 5.6 |




**Unit-wise electricity savings potential through adoption of EE/RE measures ('000 kWh/y)**



**Energy audits - thermography images**

# SOLAR-POWERED MICRO COLD STORAGE PLANT DEMONSTRATED IN JHARKHAND

## Background

Jharkhand is an agrarian state with over 32 lakh hectares of land under cultivation producing more than 110 lakh tonnes of grains and horticulture. While the State has a 30%–35% horticulture surplus, it has been reported that Jharkhand loses about 37% of its perishable fruit and vegetable production. One of the key contributing factors for such high loss levels is the lack of adequate cold storage infrastructure, such as storage facilities, inappropriate logistic arrangements, and poor market linkages. According to a study by Yes Bank, the current gap for cold storage infrastructure in Jharkhand is around 579,000 tonnes.

Jharkhand has recognized horticulture as one of the focus areas for economic growth and has been striving to bring the sector into the mainstream of the state's economy. The Jharkhand Food Processing Industry Policy, 2015 aims to establish the State as the leading state in food processing in India. To achieve this vision, one of the strategic areas of intervention proposed under the Policy is development of suitable infrastructure facilities including cold storages. Along with the policy recognition for the sector, there are institutions that have been set up in the state at the grassroots level to support the vision. Farmer Producer Organizations (FPOs) have been set up and some of them have been adopting latest technologies and infrastructure facilities to improve business sustainability. However, the adoption of these interventions needs to be promoted among a larger set of FPOs. For this purpose, support is required on various fronts including development of forward linkages, credit and market linkages for off-take of the additional produce and so on.

In light of the above, the scope for expansion of cold storages in Jharkhand is immense. Cold storage facilities with alternate electricity supply options such as solar can meet the storage requirements effectively and efficiently.

## Potential for solar-based cold storage

Cold storages require reliable power supply to maintain the desired temperature required for the storage of produce. However, the electricity supply situation in Jharkhand is irregular and insufficient. The farmers get grid electricity for not more than 6 to 7 hours a day and there is no supply during the critical hours of the day: 6 pm to 10 pm. In this scenario, cold storage facilities based on alternate power solutions, such as solar, could prove to be very useful for the farmers. While diesel generator sets are an option, they are expensive and environmentally damaging. On the other hand, solar powered cold storages offer a possible solution as they are economical compared to diesel, as well as environmentally benign. Jharkhand is well endowed with solar energy. As per the National Renewable Energy Laboratory (NREL) satellite data, Jharkhand has solar insolation between 5.0 and 5.5 kWh/m$^2$/day; and with 300 sunny days yearly, it is a good location to harness solar energy.

## Intervention

Recognizing the above aspects, and in order to demonstrate the feasibility of solar cold rooms in addressing the existing challenges pertaining to wastage of horticulture produce and the resulting losses to farmers, United Nations Development Programme (UNDP) implemented a solar-powered standalone micro cold storage in Sardarodih village of Koderma district, in partnership with Jharkhand Renewable Energy Development Agency (JREDA) and Aragaro Vegetable and Fruit Producer Company Ltd (AVFPC), a local FPO (now converted into a farmer producer company or FPC). The implementation took place under the ongoing GEF-supported project titled 'Market transformation and removal of barriers for effective implementation of state level climate change action plan'.

### *Key features of unit*

The micro cold storage unit has a capacity of 5000 kg, and is powered by a 4 kWp solar photovoltaic (PV) system that operates the refrigeration system (battery-less compressor operation) during the day. During the non-sunny hours, power is drawn from innovative thermal storage facilities that can provide 24–30 hours of backup with closed doors. The unit is designed to maintain temperature in

the range of 2–10° C and relative humidity in the range of 80–95%. Intelligent control architecture is integrated in the system for temperature and humidity management, based on the quantity and type of fruit and/or vegetables stored during that period. In addition, a remote monitoring system has been provided as a protective maintenance option to avoid down time. The unit is designed to be hybridized with grid (single and three-phase) and generator as required.

### *Operation and management*

AVFPC is responsible for operating and managing the unit, as well as for scaling up of interventions. The FPC charges each farmer for storage based on type of produce, quantity, and period of storage. The revenue collected is being used or maintenance and scaling up.

## Benefits

The unit is helping to enhance the income of the small and marginal farmers from the FPC, by facilitating the safe storage of their vegetables and fruits till such time when they can negotiate better prices for their produce. It showcases the effectiveness of solar-powered cold storage technology, and also demonstrates a successful, replicable business model that integrates participatory management (by farmers of the FPC) with scientific and sustainable post-harvest storage practices, thereby providing an opportunity to strengthen and sustain the economic well-being of marginal farmers.

## Way forward

The project is currently engaged in the following activities to pave the way for replications of the solar-based cold storage technology and the FPO/FPC-driven business model:

- Project site visits, awareness generation and handholding initiatives for other FPCs and FPOs
- Leveraging support from horticulture and agriculture department for similar interventions at each horticultural cluster, with self-help groups (SHGs), FPO, FPC, and mandis (wholesalers)
- Leveraging support from financial institutions for financing farmers' micro cold storage units. Engaging with NABARD for mainstreaming the adoption of solar-based micro cold storage among the FPOs/FPCs promoted by NABARD in Jharkhand.

**Profile of demo unit**

| Feature | Summary |
|---|---|
| Geographical location | Village – Sardarodih; Aragaro panchayat; Chandwara Block; |
| | Koderma District, Jharkhand |
| Produce stored | Vegetables: tomato, onion, cauliflower, cabbage, potato, carrot, beet, brinjal, capsicum, French beans |
| | Fruit: papaya |
| Beneficiaries | Currently 283 farmers, to be escalated to 500 members |
| System particulars | Dimensions—20 ft. × 8 ft. × 8ft. |
| | Capacity – 5000 kg |
| | Solar power – 4 kWp |
| System cost | INR 1,460,000 |
| Sustainable benefit | 5.7 t $CO_2$/annum, estimated based on 4 kWp of solar power supply 18% PLF |

*Contributed by the United Nations Development Programme (UNDP), New Delhi, India. Please contact UNDP for further information.*

# 15TH MEETING OF SAMEEEKSHA

The 15th Coordination Committee Meeting of SAMEEEKSHA was held in Coimbatore on 12th January 2019. The participants included representatives from Ministry of MSME, BEE, MSME Development Institutes (MSME-DIs), and associations of various industry sub-sectors from the southern region of the country. Mr. Girish Sethi, Senior Director, TERI highlighted TERI's long association with the Coimbatore cluster, which started with the successful introduction of the divided blast cupola (DBC) technology among foundry units in the cluster. Mr. Abhay Bakre, Director General (DG), BEE explained that BEE follows a policy of learning from the 'demand side', i.e. by addressing needs and requirements as voiced by MSMEs, rather than coming out with program/policies from the 'supply side'. Mr Sudhir Garg, Joint Secretary (JS), Ministry of MSME, urged the participants to follow lean manufacturing (LM) techniques, and spoke on the tool rooms and Common Facility Centres (CFC) established by Ministry of MSME. Mr Raj Pal, Economic Advisor, Ministry of Power, advised the participants to utilize the electrical testing facilities at Central Power Research Institute (CPRI).

Mr Sachin Kumar, Secretary, SAMEEEKSHA and Senior Fellow, TERI, provided an update on the SAMEEEKSHA Platform and also presented an overview of key energy intensive MSME clusters in Tamil Nadu, including estimates of energy saving potential. The following presentations were made to guide the discussions that followed:

- Energy efficiency programs for MSME clusters—Mr Milind Deore, BEE
- Promoting energy efficiency and renewable energy in selected MSME clusters in India—Mr Suresh Kumar, UNIDO
- TERI'S intervention among MSMEs in southern region—Mr Prosanto Pal, TERI

The salient points from the presentations and discussions are summarized below.

- Mr Jayakumar Ramdass, highlighted the following needs of the cluster:
  - » Support for the development and use of energy efficient IE3 and IE4 motors
  - » Financial assistance for technology up-gradation—especially among the small units (specifically, foundries)
  - » Support for establishing a skill development center
- Mr. V Krishnakumar, SIEMA, underlined the need to incentivize the manufacturing of EE pumps.
- Mr R Ramamurthy, CODISSIA, highlighted the need for setting up a design centre in the cluster to upgrade the designs of existing pumps. He also briefed participants on the 'Smart Pump' project being undertaken in the cluster with support from the Ministry of Heavy Industries, Government of India.
- Mr Ramesh, President, CII chapter, spoke on the need for adopting small but effective measures like switching off compressors and other equipment before a holiday, preventing leakages during transportation of diesel, etc. He also spoke on the EE refractory-lined 'tower furnace' that can replace the existing low-efficiency aluminium melting furnace.
- Mr M Raveendran, COSIA, mentioned the need to establish testing facilities for compressors in the cluster.
- Mr Muthuraman, SITRA noted that at present there is only one testing centre in the state of Tamil Nadu (at Chennai) for undertaking energy auditor/energy manager examination, and requested BEE to consider establishing another center in Coimbatore. SITRA would be happy to provide its own infrastructure for this endeavour.

## ABOUT SAMEEEKSHA

SAMEEEKSHA is a collaborative platform aimed at pooling the knowledge and synergizing the efforts of various organizations and institutions—Indian and international, public and private—that are working towards the common goal of facilitating the development of the Small and Medium Enterprise (SME) sector in India, through the promotion and adoption of clean, energy-efficient technologies and practices.

SAMEEEKSHA provides a unique forum where industry may interface with funding agencies, research and development (R&D) institutions, technology development specialists, government bodies, training institutes, and academia to facilitate this process.

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