





# Promoting Energy Efficiency and Renewable Energy In selected MSME Clusters In India

A Joint Initiative of GEF, UNIDO and BEE



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National Technology Coordinator, UNIDO 17<sup>th</sup> SAMEEEKSHA Workshop, New Delhi 08 January, 2020



















#### About the Project

- Objective: Introduce energy efficiency and enhance use of renewable energy technologies in process applications in the 12 selected energyintensive MSME clusters in India
- Project Value: GEF Grant 7.17 million US\$ / Co-financing 26.2 million US\$
- Project Partners:











Cluster Partners:













































Coimbatore

Belgaum

Ahmedabad

Howrah

Indore, Ujjain, Pitampura



**CERAMIC** 

Khurja

Thangadh

Morbi

Himmatnagar & Naroda



**DAIRY** 

Gujarat

Kerala

Tamil Nadu

AP & Telangana

Odisha

Maharashtra

Punjab

Haryana

Madya Pradesh

Sikkim



Jalandhar

Nagaur



Jamnagar

**Existing Clusters** 

**New Clusters** 

Mixed Clusters











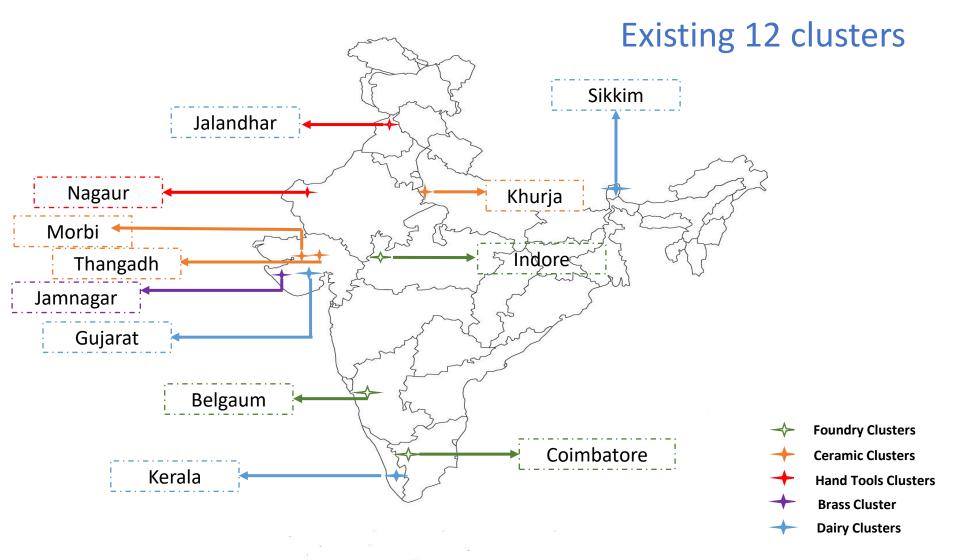


















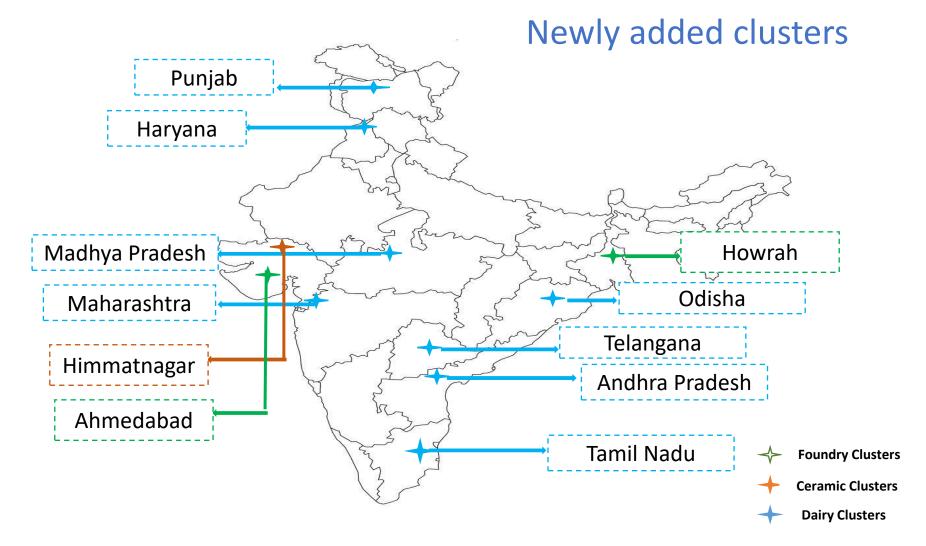






















Project Components

Component 4





#### **Component 1**

Increased capacity of Owners, Managers and Operators Suppliers of EE & RE products Service providers Finance providers Increasing the level of end-use Strengthening demand and policy, institutional implementation and decisionof EE and RE making technologies and frameworks practices by **MSMEs** Scaling up of the project to national level















Component 2







A dedicated experienced resource

person was appointed as a cluster

leader in each cluster on full-time

for implementation of all these

basis. He will be majorly responsible

activities with the help of consultants,

association, BEE and UNIDO teams.

Carry out detailed energy audits on a sample basis in each cluster from 10 to 20 MSME units to identify possible energy saving opportunities

Based on energy audit findings, potential EE and RE technologies are being identified in consultation with vendors, technology consultants, OEMs and MSMEs.

#### Capacity Building

Organize capacity building workshops/training programs for entrepreneurs, managers, shop floor workers to disseminate: Possible EE & RE technologies; **Best Operating Practices** 

#### Implementation Assistance

Help industries on selection of technology, vendors and oversee the implementation process. Partial financial assistance will be give for few innovative EE & RE projects

#### Vendor Training

Cluster level vendor data base was developed and organized capacity building workshops for local service providers on identification of EE & RE measures. Also facilitated B2B meeting with vendors and MSME entrepreneurs.

Technology **Energy Audits** 

Identification

Capacity Building

Large Scale

Deployment

12

11

3

Assistance

 $D_{em_{and}}$ 

Aggregation

mplementation

Holistic

**Approach** 

Vendor Training 5 Demonstration

provide assistance to MSME units on implementation of EE & RE measures

#### Results Documentation

Demonstration

With the support from

Vendor/LSPs, Cluster leader

With the help of Energy Management Cells set-up by the project, cluster leaders are continuously monitoring results of EE & RE measures implemented

#### Dissemination Workshop

Regularly, dissemination workshops were organized to share the achievements to encourage the other MSME's in the cluster on EE & RE

#### Large Scale Deployment

Interest among MSMEs has increased with the help of price reduction, success stories and dissemination workshops.

#### Price Reduction

10

Because of demand aggregation, price reduction was possible in few EE measures

#### Demand Aggregation

6

Results

documentation

Dissemination

Workshop

FOllow-UP with more

MSMES

Depending on type of EE & RE measure, type of the cluster and existing demand, CL will pool the requirements of different industries. With the help of association, CL will invite the quotations from different vendors for procurement of collected demand.

#### Follow-up with more **MSMEs**

A rigorous follow-up with potential MSME units will be done by cluster leader to take up the similar initiatives.























(TOE/Year)



























### EE and RE projects Implementation

Cluster Name	Small Scale Projects	Energy Savings (TOE/year)	CO₂ Reduction (Tonnes/year)	Monetary Savings (Lakh ₹ /year)	Investment (Lakh ₹)	Average Investment in Each Project (Lakh ₹/year)
Jalandhar	58	247	1892	179	119	2.05
Coimbatore	69	255	2408	293	252	3.65
Nagaur	57	30	295	32	15	0.26
Jamnagar	38	113	667	137	270	7.11
Khurja	9	383	1495	75	28	3.11
Indore	20	130	821	71	52	2.60
Gujarat	121	5900	33144	3022	4852	40.10
Belgaum	90	393	3576	305	452	5.02
Thangadh	90	1967	10414	1046	1547	17.19
Morbi	14	564	1739	71	49	3.50
Kerala	8	112	250	35	57	7.13
Total	574	10094	56701	5266	7693	13.40

115 technologies have been identified and some of them replicated multiple times



















### **Success Stories**



















### Roof Top Solar Photovoltaic Project

- Till date, 23 industries have installed grid connected roof-top solar photovoltaic systems
- The capacity of the system is varying from 11 kWp to 99 kWp
- Commutatively, 1.1 MWp solar rooftop PV system was installed with an investment of around 4.29 crores
- Total five service providers have supplied the systems
- All are polycrystalline silica plants with panel warrantee of 20 years and inverter warrantee for 5 years
- Average per unit cost of electricity from the Grid is about Rs. 7/kWh



42 to 60

Months

Simple payback

period









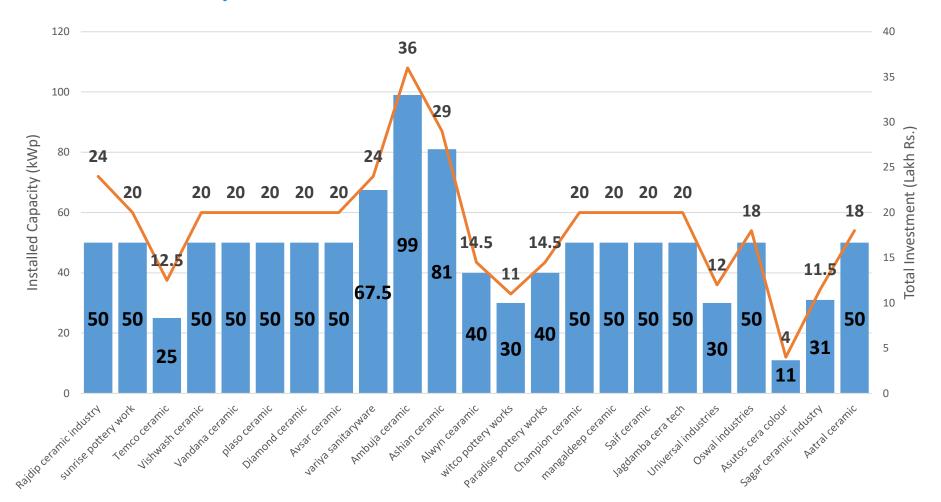








#### Roof Top Solar PV Installations and Investment



















#### Leave Energy Efficient 28W BLDC Ceiling Fans

- The moulds have to be completely dried in 24 hours so that the shaped ware can be cast the following day.
- Typically, one ceiling fan is required for every four moulds, and each unit has about 400-800 fans which run for almost 20 hours a day (depending on ambient weather conditions).
- Energy audits showed that the conventional fans consuming 70– 75W at full speed and the performance was poor due to age
- Typically, a unit incurred monthly expenditure of 5000–8000 rupees on maintenance and repair of fans.
- More than 120 sanitary ware units are already replaced about 17600 conventional fans with 28W energy efficient BLDC fans
- A total investment of about 3.82 crore rupees, against which they are saving an estimated 3.35 crore rupees annually in energy cost. This measure is saving over 4.82 million kWh of electricity and avoiding 4120 tonnes of CO<sub>2</sub> emissions each year.

#### **Demand Aggregation Model**



66% Energy Efficient

Warranty

kWh Annual Savings

















### Other Energy Conservation Interventions

Energy Conservation Measure	Implemented units	Estimated Annual Energy Savings
Low thermal mass car in tunnel kiln	15	43200 SCM of PNG
High alumina media /lining in glaze ball mill in place of natural lining	20	22 Lakh kWh
VFD screw air compressor system in place of fixed motor compressor (30 HP and 20 HP systems)	35	3.86 Lakh kWh
Modification in existing tunnel kiln design— double deck system and shortening of firing zone	3	810000 SCM of PNG
Replacing old compressed air pipeline with seamless (joint-less) pipe line to avoid air leakages	10	7000 kWh
Waste heat recovery from exit flue gas	4	15960 SCM of PNG

















### **Gujarat Dairy Cluster**



Concentrated Solar **Thermal Steam Generation system** 



MBR+ICR technology in effluent treatment plant



250 TR Freon package chiller

More than 110 EE/RE measures were implemented and resulted annual energy savings of 5799 toe which in turn reduced 32484 tonnes of carbon dioxide emissions



















- Premium Efficiency Air Compressors Gujarat Dairy Cluster
- Variable Frequency Drives for various applications
- Condensate Recovery
- Waste Heat Recovery from **Boilers and Powder Plant**
- Energy Efficient Lighting
- Solar PV and Thermal **Applications**
- Installation of High Efficiency **Screw Compressors**
- Heat Pump
- Back Pressure Turbine
- Methane capture from dairy effluent
- De-superheaters at Refrigeration **systems**
- Energy Efficient Bulk Milk Coolers

- Replace of evaporator condensing system with PHE system
- Ring-main system for compressor air distribution system
- Replaced spray pond type cooling tower system with Induced draft cooling tower for **Chilling Centre**
- Replaced existing condensing system with new condensing chiller system (Falling Film Chiller)
- Installation of Biomass fired boilers











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#### Success Story – Coimbatore Foundry cluster



**Cupola Furnace Modification** 



**Core Modification Process through Cold** box core shooter



State of the art energy efficient compressed air system

More than 50 EE/RE measures were implemented and resulted energy savings of 189 toe which in turn reduced 1843 tonnes of carbon dioxide emissions

















### Success Story - Foundry Cluster

- PF improvement
- Power Quality Improvement by Installing Harmonics Filter
- Induction furnace refractory lining optimization to increase the life and more yield.
- De-slagger is added to the molten metals to reduce the slag formation.
- Furnace cooling tower energy optimization
- Harmonics mitigation through 12 pulse rectifier with Phase shift transformer
- Shot blast machine dust collector pulley modification

- Ring-main system for compressor air distribution system
- Cupola Furnace modification
- Premium Efficiency Air Compressors
- Variable Frequency Drives for various applications
- Energy Efficient Lighting
- Solar PV
- Installation of High Efficiency Screw Compressors
- Energy Efficiency Motors, Fans and Pumps
- Change in Shell core making process
- Minimize Radiation Losses from Induction Furnace

















### **Past Project Activities**



















#### **Energy Management Centers**

Twelve energy management centers are established and functioning successfully.







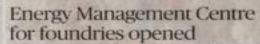












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### **Pilot Projects**

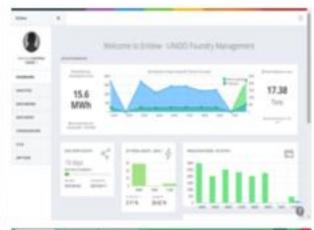
Solar Thermal Steam Generation at Amulfed Dairy

Biomass Gasifier for Sand Drying at Belgaum Foundry Cluster

Cloud Based Data Analytics for Foundries

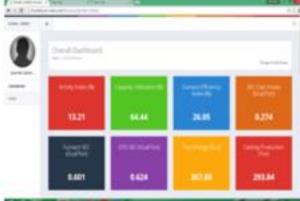




























### Project Workshops in Coimbatore, Delhi and Sikkim































### **LSP Training Programs**

Trained around 1000 LSPs as well as unit owners through 43 capacity building workshops in 12 clusters.

Thangadh





Jalandhar

**Gujarat Dairy** 





Sikkim

Morbi





Nagaur





















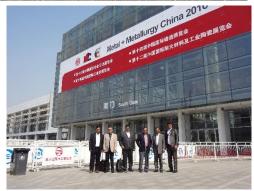
### **International Study Tours**

Organized 4 International Study tours to China, Japan & New Zealand





























#### In-house Training Programs at AIP-NPC, Chennai

Twelve (3-days) residential training programs were completed on "Best Operating Procedures for Energy Management in MSMEs" and trained more than 240 entrepreneurs and cluster leaders.



























#### Outreach





#### Foundries to get more pilot projects on energy efficiency

S. STERBARDS PROFESSA

the the foundries in County tore, numbering more than 500, и корчесть ресумст оп mengy efficiency and others ables is bringing in better swareness, new technologles, and systems for better energy efficiency.

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The total project cost was It's Million \$ and 50 % of it was spent, An many as 30 plan projects had been aster tioned so far and 20 more were in the pipeline. The in-dustries had pooled in 19 errors inventment so for our

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### **Ongoing Project Activities** Phase-II



















#### Technical Assistance in 22 clusters

Targeted Industries: 1100

Targeted Investments: 71.60 cr

Targeted Savings: 10 to 12 kilo TOE

Appointed consultants to provide technical assistance (Energy audits, technology identification and implementation support) to increase the uptake of energy efficiency and renewable energy investments in MSME's in existing as well as new clusters



















#### **Capacity Building Workshops**

## Organizing about 64 Capacity Building Workshops

Cloud-based Data Analytics Benchmarking Tool

Appointed consultants to develop a cloud-based data analytics

energy management as well as benchmarking tool for 5 sectors (Ceramic, Foundry, Dairy, Hand tools and Brass)



















#### Regional Conclaves

### Organizing 3 Regional Conclaves

(Dairy, Ceramic and Foundry – one for each)

#### Residential Training Programs

Organizing **20** residential 5 day training program at AIP-NPC Targeted to train 200 representatives from 22 clusters



















### Thank you

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