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# **CAPACITY BUILDING OF LOCAL SERVICE PROVIDERS (LSP) UNDER GEF-UNIDO-BEE PROJECT “PROMOTING EE/RE IN SELECTED MSME CLUSTERS IN INDIA”**

## **Final Closing Report Brass Cluster-Jamnagar**

Submitted to  
(Prepared under GEF-UNIDO-BEE Project)



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Contents

**List of Abbreviations ..... 3**

**EXECUTIVE SUMMARY ..... 4**

**1. PROJECT BACKGROUND..... 8**

**2. CLUSTER SCENARIO ..... 9**

**3. PROJECT ACTIVITIES ..... 10**

**4. LSP MAPPING..... 11**

**6. CAPACITY BUILDING WORKSHOPS ..... 16**

**7. TECHNOLOGY FEASIBILITY STUDIES..... 17**

## List of Tables

Table 1: Project Phases .....	5
Table 2: Workshop key indicators.....	6
Table 3 : List of clusters identified .....	8
Table 4: Workshop summary .....	16
Table 5: Summary of Technologies Identified .....	17
Table 6: Highlights of identified technologies .....	0
Table 7: Outcome of capacity building workshops.....	0

## List of Figures

Figure 1: Summary of Technology Feasibility Studies 10 units.....	7
Figure 2: Jamnagar Brass Cluster .....	9
Figure 3: Typical Energy consumption in different type of units.....	9
Figure 4: Stake holders mapping .....	10
Figure 5: Major activities of the project .....	10
Figure 6: Geographic Location of LSPs.....	11
Figure 7: Skill Set of LSPs.....	12
Figure 8: Employee Strength of LSPs .....	12
Figure 9: Educational Qualification of LSPs.....	12
Figure 10: SWOT Analysis.....	13
Figure 11: Objective of Training Need Assessment .....	14
Figure 12: Identified training modules.....	14
Figure 13: Workshop participation .....	16
Figure 14: Summary of Capacity Building Workshops .....	0
Figure 15: Key highlights of feasibility studies.....	1

## List of Abbreviations

BEE	Bureau of Energy Efficiency
CO <sub>2</sub>	Carbon dioxide
DPR	Detailed Project Report
EE	Energy Efficiency
FI	Financial Institution
LSP	Local Service Provider
MSME	Micro and Medium Scale Industries
OEM	Original Equipment Manufacturer
RE	Renewable Energy
TOE	Tonnes of Oil Equivalent
UNIDO	United Nations Industrial Development Organisation

## EXECUTIVE SUMMARY

Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, in collaboration with United Nations Industrial Development Organization (UNIDO) is executing a Global Environment Facility (GEF) funded national project “Promoting energy efficiency and renewable energy in selected MSMEs clusters in India”.

The overall aim of the project is to develop and promote a market environment for introducing energy efficiency and enhanced use of renewable energy technologies in process applications in 12 selected energy-intensive MSMEs clusters across 5 sectors in India (with expansion to more clusters later). This will enable improvement in the productivity and competitiveness of units, as well as reduce overall carbon emissions and improve the local environment. The main objective of the project is to increase the capacity of suppliers of EE/RE product and service providers. It also aims at implementing the identified projects and technological practices by MSMEs.

The major focus areas of the project activities were:

- Capacity Development of Local Service Providers (LSP) in the cluster on aspects of energy efficiency. The capacity development activities were preceded by comprehensive LSP mapping exercise and training need assessment for LSPs.
- Identification of technologies that can led to significant improvement in improving energy efficiency and these technologies are to supported by preparation of “Detailed Project Report (DPR)” which can be further considered for implementation by the MSME units.

Through the activities in the above areas, following were the expected outcomes of the project:

- Creating a scope for energy savings, by increasing the level of end-use demand and implementation of energy efficiency and renewable energy technologies
- Improving the productivity and competitiveness of units
- Reducing overall carbon emissions and improving the local environment
- Increasing the capacity of energy efficiency and renewable energy product suppliers,
- Strengthening policy, institutional and decision-making frameworks
- Scaling up of the project to a national level

One of the clusters under the project activity was – “Brass cluster-Jamnagar” which is one of the biggest brass cluster in India and during 2017-18 around INR 300 crore (USD 71 million)<sup>1</sup> worth of brass parts were produced by industries in Jamnagar, of which 90% was marketed within the country and 10% was exported.

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<sup>1</sup> <https://ic.gujarat.gov.in/documents/news/08-09-2017-18-35-56external-profile-saurashtra-final-070917-08092017.pdf>

## Project Closure Report

The project was carried out by implementation of activities under 4 phases, the work packages were finalized in consultation with the project partners and key stakeholders. Following table highlights the activities and deliverables under each phase:

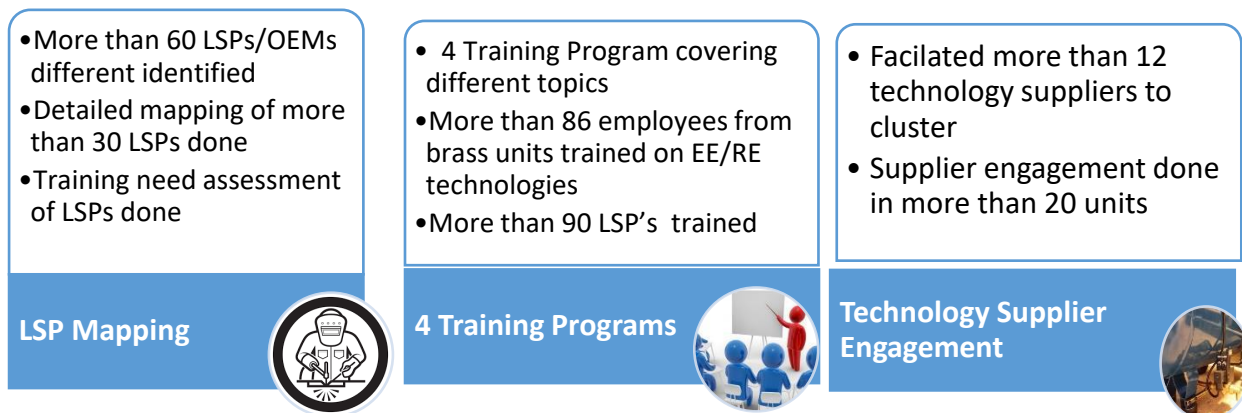
**Table 1: Project Phases**

Phases	Deliverables
Phase 1 - Stakeholder Consultation	<ul style="list-style-type: none"> <li>• Inception Report</li> <li>• List of LSPs in each cluster</li> </ul>
Phase 2 - LSP Mapping & LSP Training Need Assessment	<ul style="list-style-type: none"> <li>• Comprehensive LSP mapping report</li> <li>• Comprehensive report on training need assessment of LSPs</li> </ul>
Phase 3 - Targeted capacity development programs and augmenting capacity of LSP	<ul style="list-style-type: none"> <li>• 5 Comprehensive category wise training materials per cluster</li> <li>• Proceedings of 4 training programs in each cluster</li> <li>• OEM and LSP Engagement</li> </ul>
Phase 4 - Development of bankable DPR's for the identified technologies in each cluster	<ul style="list-style-type: none"> <li>• 10 bankable DPRs in each cluster, with details of submission to banks for possible financing ( max of 2 DPR for single technology)</li> </ul>

Following are the key activities and outcomes at brass Cluster:

- Cluster specific list of LSPs under various service categories
- Comprehensive LSPs mapping based on demand and supply needs of local industries
- Comprehensive training need assessment of LSPs
- Comprehensive category wise training material for each cluster
- Four training/capacity building workshops in various region of the Cluster
- Identification of high potential energy efficient technologies and preparation 10 bankable DPRs on those technologies

Following is the summary of the activities at the Brass Cluster:



**LSP Mapping:** The first key activity under the project was conducting LSP Mapping exercise for the cluster. The objective of the mapping was to identify the LSPs based on the demand and supply needs of brass units against available local service providers in the cluster and nearest locations. The LSPs were identified based on the major process and operations involved in the brass units.

Local service providers in the cluster majorly comprises of maintenance operators, technicians, fabricators, energy auditors, engineering consultants, plant design engineers and other people who frequently provide their services to brass units..

Comprehensive LSP data was collected through meeting with service providers and through various interaction during stakeholder workshops. The LSP were analyzed based on existing skill sets, employee strength, years in service and possible area for improvement through training and capacity development. More than 85 LSPs were visited and interviewed and analysis and detailed outcome of the mapping exercise is provided in report.

**LSP Training Need Assessment:** One of the major activities of the LSP mapping exercise was also to assess the training requirement of LSPs to accelerate energy efficiency adoption in the cluster. The training need assessment was carried out by doing desk analysis followed by interviews and interaction with the stakeholders. These meetings helped us in understanding the perceptions of different stakeholders in terms of training needs, what are the areas of improvement, various gaps that exists in terms of technology/services. The survey was conducted for around 30 LSPs and some of the major brass units in the cluster. Based on the survey, the gaps were identified for incorporating energy efficiency consideration in their services and based on this the training programs modules were prepared for capacity development programs.

**Capacity Development Programs:** One day training programs were organized in Jamnagar cluster to train the local service providers and the units on best operating practices, latest technologies/innovations and to create awareness on importance of energy efficiency and renewable energy. The workshops provided a platform to interact with 180+ stakeholders in the cluster. Following are the key indicators for the workshops:

Table 2: Workshop key indicators

S. No	Dates	Workshop Theme	No of LSPs/OEMs	Total No of Participants
1	10-Apr-18	Thermal System	97	183
2	28-Apr-18	Electrical System and Renewable Energy		
3	15-May-18	Thermal System and Utilities		
4	30-May-18	Utilities and Renewable Energy		

**Detailed Project Report on Energy Efficiency and Renewable Energy Technologies:** In addition to the focus on LSP capacity development, one of the major activities under the project was to identify

## Project Closure Report

the high energy efficient technologies in the cluster that can be implemented by the industries. The detailed project report was prepared for energy efficient technologies considering the current technologies in use. The detailed project report covered the information on current system, evaluation of current energy use and on implementation of identified technologies what could be the possible energy savings and investment required for implementation. The DPR also covered various financial analysis for the technologies so it can be directly shared with Financial Institutions for debt financing if required. At brass cluster more than 10 different technologies were identified and after detailed discussion with stakeholders, 10 DPR for 6 replicable technologies in 10 units were prepared.

The table shows summary of savings anticipated in the 10 units (10 DPRs) through the various technological feasibility studies and engagement of suppliers/OEMs in the cluster.

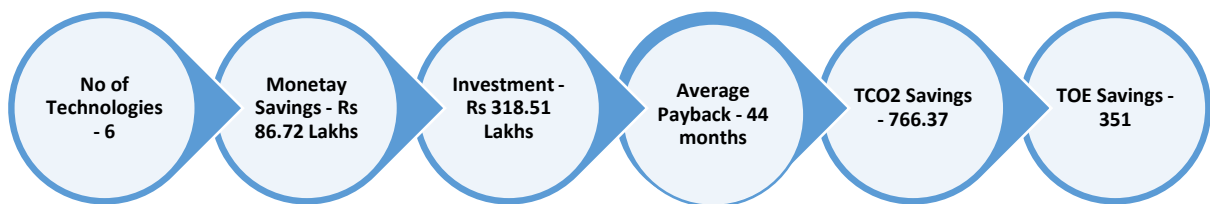


Figure 1: Summary of Technology Feasibility Studies 10 units



## 1. PROJECT BACKGROUND

Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, in collaboration with United Nations Industrial Development Organization (UNIDO) is executing a Global Environment Facility (GEF) funded national project “Promoting energy efficiency and renewable energy in selected MSMEs clusters in India”.

The overall aim of the project is to develop and promote a market environment for introducing energy efficiency and enhanced use of renewable energy technologies in process applications in 12 selected energy-intensive MSMEs clusters across 5 sectors in India (with expansion to more clusters later). This will enable improvement in the productivity and competitiveness of units, as well as reduce overall carbon emissions and improve the local environment.

The details of the sectors and clusters identified is as below:

Table 3 : List of clusters identified

Sector	Cluster
Brass	Jamnagar, Gujarat
Ceramics	Khurja, Uttar Pradesh
	Morbi, Gujarat
	Thangadh, Gujarat
Dairy	Gujarat
	Kerala
	Sikkim
Foundry	Belgaum, Karnataka
	Coimbatore, Tamil Nadu
	Indore, Madhya Pradesh
Hand tools	Jalandhar, Punjab
	Nagaur, Rajasthan

**CONFEDERATION OF INDIAN INDUSTRY** – CII Sohrabji Godrej Green Business Centre has been engaged by Bureau of Energy Efficiency to carry out the assignment on “Capacity building of Local service providers (LSPs) under GEF-UNIDO-BEE project **“Promoting Energy Efficiency and Renewable energy in selected MSME clusters in India”** for the Brass cluster Jamnagar.

## 2. CLUSTER SCENARIO

Jamnagar is known as the Brass City of India. There are about 4000 brass related units alone in Jamnagar. Majority of these units are in operation since last 15 to 20 years. All these units are in pockets of Shankartekri, MP Shah Udyognagar, Patel colony and dared areas.

The products manufactured in Jamnagar are consumed by industries as a part/component of their final product and these part/components require a lot of machining activities like turning, milling, grinding, drawing, boring, threading etc.

- Building hardware like Door & Window Hinges, Stoppers, Knobs, Studs, Handles, Sanitary & bathroom fittings Like Venetian Blinds, Hangers, Taps, Curtain fittings
- Automobile & Cycle tube valves, Industrial control valve
- Agricultural Implements like Tractor accessories
- Brass jewellery like necklace, ear rings, bracelet, rings, bangles and brass buttons
- Various other precision machine components as per customers specification
- Pen parts

Brass units in Jamnagar cluster are majorly engaged in three different types of operations; Casting (Casting and Foundry), machining and electroplating. In a typical brass unit major energy sources in manufacturing of brass parts are electrical and thermal energy. Electrical energy is being used in melting of brass in induction furnaces, operation of electrical utilities; while thermal energy is being used in brass melting operation and reheating applications. Typically, percentage of total energy consumption in different type of units in the cluster is presented in figure.<sup>2</sup>



Figure 2: Jamnagar Brass Cluster

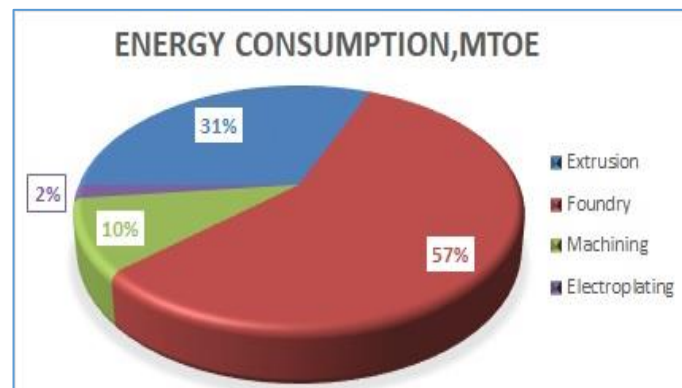


Figure 3: Typical Energy consumption in different type of units

<sup>2</sup> <http://www.dcmsme.gov.in/reports/Jamnagartexttile/ClusterSummaryJamnagarBrass.pdf>

### 3. PROJECT ACTIVITIES

The project activities were initiated with the initial mapping of the stakeholders in the brass cluster and understanding of roles, functions and other activities. The following figure provides an overview of the direct and indirect relationship with respect to energy efficiency activities under the project. The involvement of each stakeholder is critical to undertake the activities of the project.

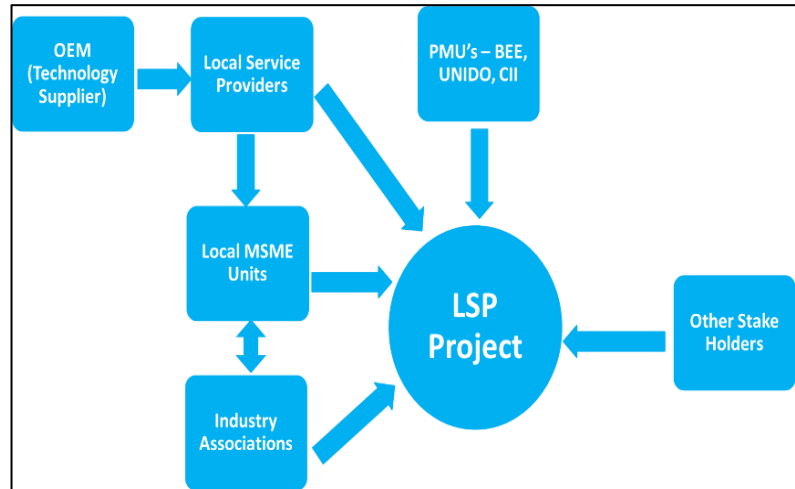


Figure 4: Stake holders mapping

The major focus areas of the project activities were:

- Capacity Development of Local Service Providers (LSP) in the cluster on aspects of energy efficiency. The capacity development activities were preceded by comprehensive LSP mapping exercise and training need assessment for LSP
- Identification of 10 technologies that can led to significant improvement in improving energy efficiency and these technologies are to be supported by preparation of Detailed Project Report (DPR) which can be further considered for implementation by the MSME units.

Following are the major activities undertaken for the project and are further covered in detail in subsequent sections of the report:



Figure 5: Major activities of the project

## 4. LSP MAPPING

The objective of the mapping was to identify the LSPs based on the demand and supply needs of brass units against available local service providers in the cluster and nearest locations. In Jamnagar brass cluster most of units are dependent on outside LSPs for small repair and maintenance activities like motor rewinding, insulation of furnaces, electrical panel repairing, electrical wiring of plants etc. Most of local service providers operate directly with plants whereas some of the local service providers have their sub vendors and through these sub vendors/dealers they operate with units. In addition this original Equipment Manufacturers (OEMs) also provide direct services to units for all the major equipment's like induction furnace, transformers, blowers, burners etc.

Typical operations of service providers in Jamnagar are as follows:-

- All major OEMS directly provide services to brass units
- Some OEMS in the cluster have sub vendors and these sub vendors provide service to brass units
- Small repair and maintenance activities are either done by local technicians from outside the plant.

The LSPs can be categorized as follows:

- All major OEMS directly provide services to brass units which
- OEMS who provide service to the units through sub vendors
- Local technicians and operators who do the repair and maintenance activities

A comprehensive LSP data was collected through personal interaction and interaction during stakeholder workshops. We have analyzed the information and found following things about the local service providers of the clusters; existing skill sets, Employees strength, Years of service and areas in which LSPs need training.

### Geographic Location

Most of the LSPs catering to brass units are located in Jamnagar. For the major energy consuming equipment's like Furnace ,blowers, air compressor etc. plants are dependent upon the OEM's which are spread across the Gujarat through their local channel partners' network. Another location where the concentration of LSPs is more is Rajkot as it is an industrial belt.

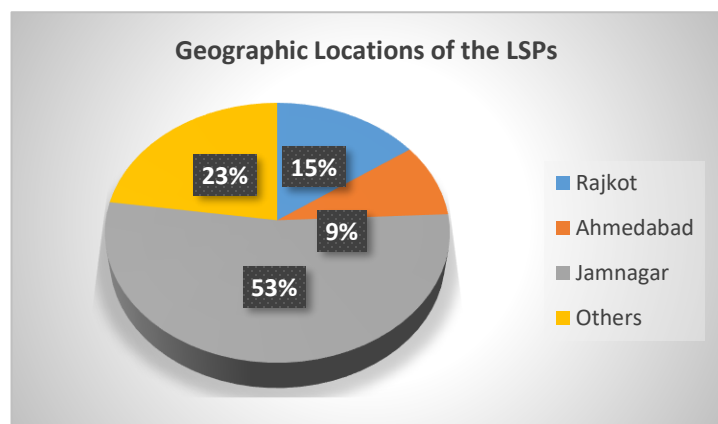


Figure 6: Geographic Location of LSPs

### Skill Set

In Jamnagar Cluster, the skill set of 60% of LSPs on existing technologies and operations is low. This is mainly due to fact that most of the LSPs are small in size and during the field survey to brass units, almost all the maintenance related activities in the plant are carried out by diploma and hands on experience people. Only about 33% fall in medium category which includes few motor rewinders, mechanical repair and maintenance operators of utilities.

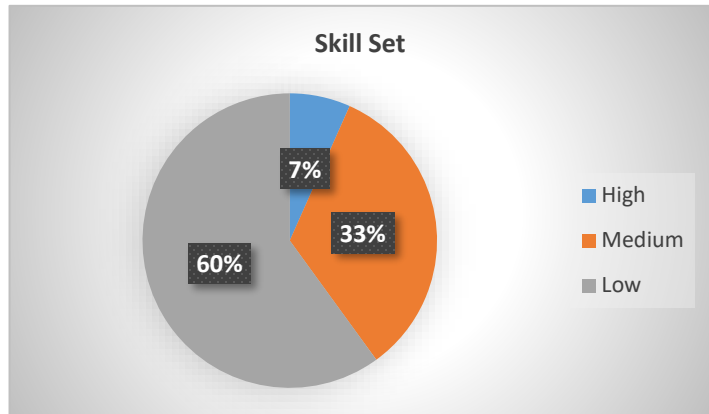


Figure 7: Skill Set of LSPs

### Employee Strength

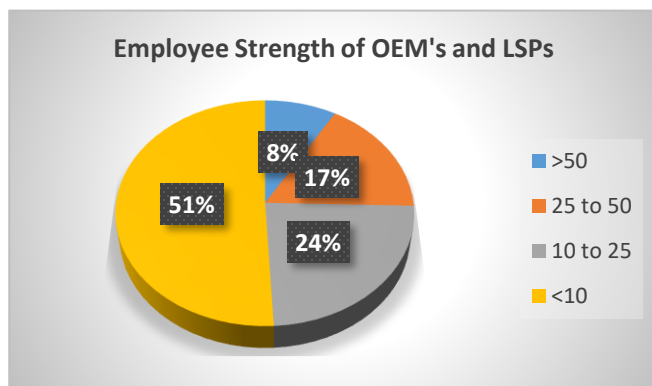


Figure 8: Employee Strength of LSPs

Majority of the LSPs in the cluster are small players with average number of employees strength less than 10 people. However the role of OEMS in the cluster is also significant as all the major critical equipment's for process as well as for utilities are supplied directly by OEMS and some of them have more than 50 people as their employee's strength.

### Educational Qualification

Most of the stakeholders who participated in the survey have very basic technical background. Local service providers and the employees of brass units in the cluster have a mix of graduates, diploma holders and uneducated people having practical hands on experience. The survey helped us in identifying various gap towards advancements in latest EE/RE technologies.

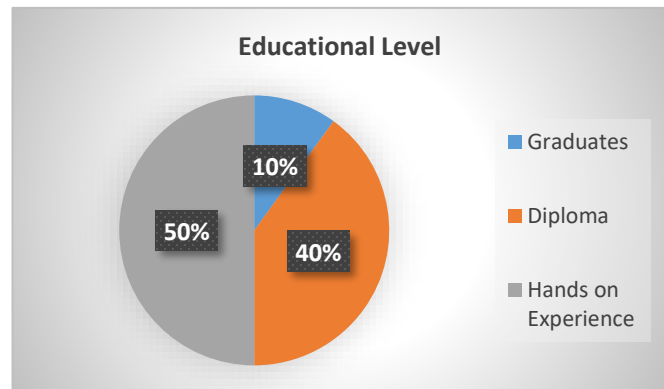


Figure 9: Educational Qualification of LSPs

Based on the LSP data, strength and weakness of service providers were analyzed and also what are the opportunities and threats for them in the cluster were identified during the mapping process SWOT analysis was also done based on the demand supply need of the services in the cluster.

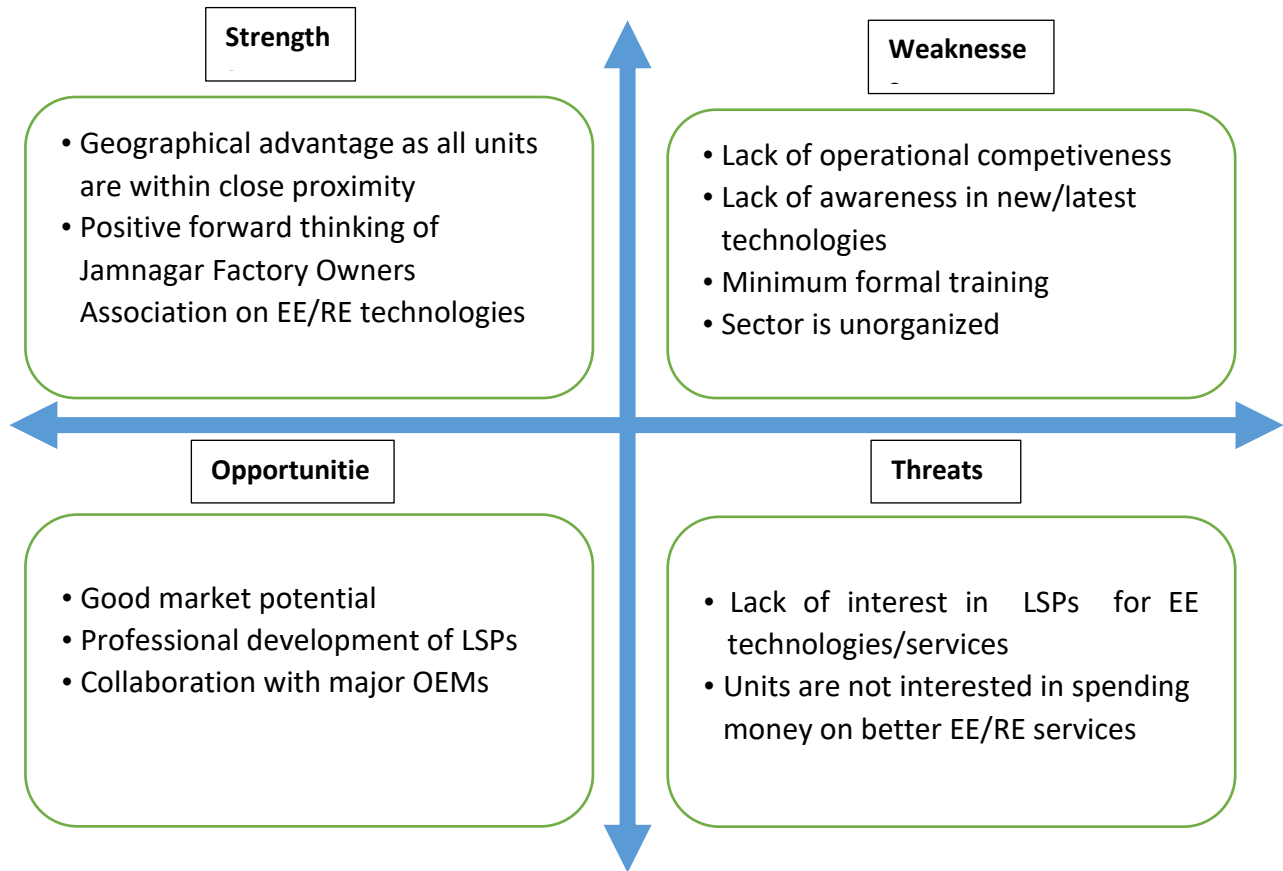


Figure 10: SWOT Analysis

## 5. TRAINING NEED ASSESSMENT

The LSP mapping exercise helped to understand the current skill set and knowledge level of LSPs

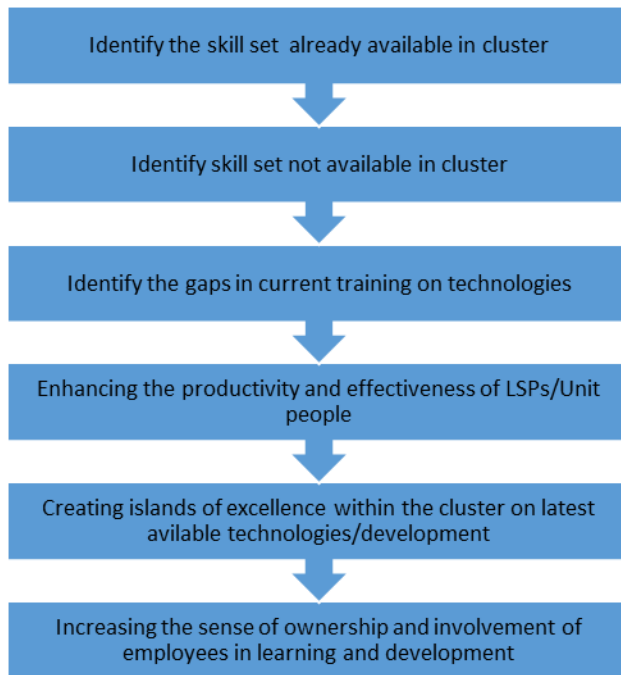


Figure 11: Objective of Training Need Assessment

and also to understand the training requirement for accelerating energy efficiency in the cluster. As part of LSP mapping exercise, the training need assessment for the LSP was also conducted through structured survey and interviews and based on which the training and capacity development requirement were assessed and the training programs were prepared accordingly.

The main objective of this assessment was to identify the gaps of Local Service Providers in the cluster in terms of skill set, technical knowledge and organizational strength. The training need assessment helped to determine whether a training need exists and if it does, what type of training was required to fill the gap. The expectation of knowledge, skills sets and abilities

of officials at different levels was different so there training needs were also different.

After the identification of training needs, the topics for the programs should be designed in such a way that the training plan caters the priorities of a wide range of stakeholder’s mainly local service providers and unit employees who are working at shop floor. After consultation with the main stakeholders in the cluster and based on the survey results some of the key topics identified. The outcome of the training need assessment is given below:

- Training need analysis conducted for various stakeholders in the cluster helped in identifying the gaps and methods to bridge the same.
- Stakeholders of Jamnagar brass cluster are medium skilled and had average educational



Figure 12: Identified training modules

## Project Closure Report

background, so training modules should focus more on operational optimization and advancements in EE/RE technologies.

- There was a huge competition among various local service providers in the cluster to become technology competitive.
- Assessment helped in highlighting the training needs and recommending most appropriate modules for each target group.
- Detailed course content would cover relevant case studies and best operating practices that would benefit the various stakeholders in the cluster.
- Survey results showed most of the stakeholders are interested in getting trained on best operating practices of induction furnace, renewable energy, reheating furnace modification, EE burners etc.



## 6. CAPACITY BUILDING WORKSHOPS

In Jamnagar brass cluster four training programs were conducted at Jamnagar in Jamnagar Factory Owner’s Association office to train the local service providers and brass units on best operating practices, latest technologies/innovations and create awareness on importance of energy efficiency & renewable energy. These workshops also provided a platform to 180+ stakeholders to interact with each other in the cluster. The detailed agenda for each workshop was decided based on the training need assessment survey and multiple meetings conducted with all the stakeholders in the cluster. At each event, CII introduced the workshop, followed by UNIDO providing vision and more details of the project. This was followed by presentations from technology suppliers on energy efficient technologies and services available in the market with open Q & A sessions after each presentation.

The following table shows the summary of workshops completed at brass cluster:

Table 4: Workshop summary

S. No	Dates	Workshop Theme	No of LSPs/OEMs	Total No of Participants
1	10-Apr-18	Thermal System	97	183
2	28-Apr-18	Electrical System and Renewable Energy		
3	15-May-18	Thermal System and Utilities		
4	30-May-18	Utilities and Renewable Energy		

The four training programs organized in Jamnagar Brass cluster helped in the capacity building of all the stake holders in the cluster which include service providers, OEMs and brass units.

The graph below shows the workshop participation in Jamnagar.

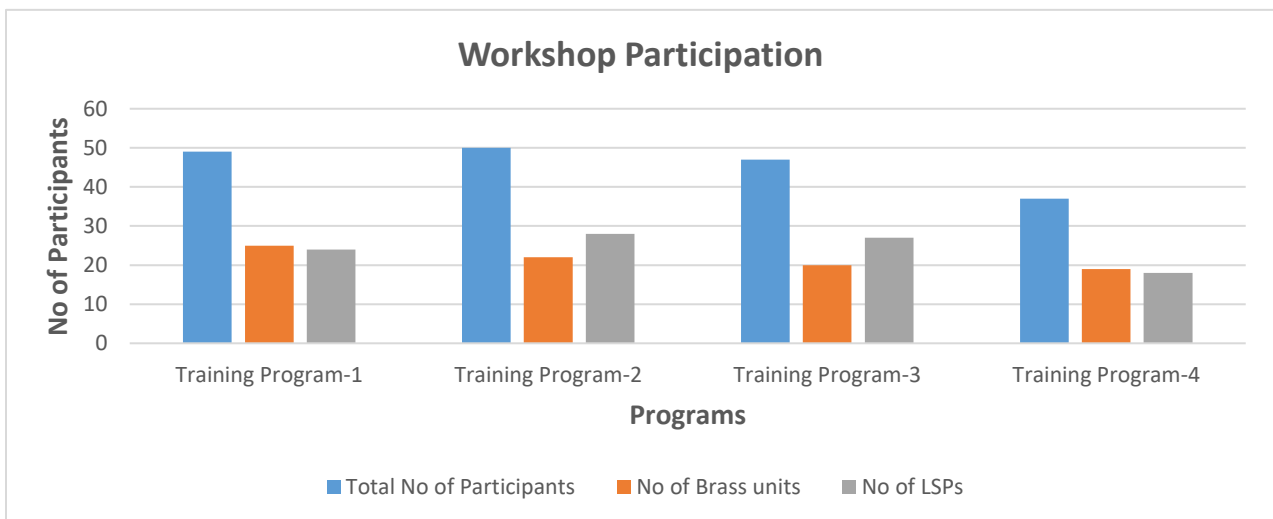


Figure 13: Workshop participation

## 7. TECHNOLOGY FEASIBILITY STUDIES

In addition to the focus on LSP capacity development, one of the major activities under the project was to identify the high energy efficient technologies in the cluster that can be implemented by the industries. The detailed project report was prepared for energy efficient technologies considering the current technologies in use. The detailed project report covered the information on current system, evaluation of current energy use and on implementation of identified technologies what could be the possible energy savings and investment required for implementation. The DPR also covered various financial analysis for the technologies so it can be directly shared with Financial Institutions for debt financing if required. In brass cluster more than 10 different technologies were identified and after detailed discussion with various stakeholders, 10 DPR for 6 replicable technologies in 10 units were prepared. Following are the details on possible energy savings and cost savings that can be achieved by implementation of the identified technologies:

**Table 5: Summary of Technologies Identified**

Name of Technology	Plant Name	Monetary savings/year, Rs Lakhs	Investment, Rs. Lakhs	Pay Back, Months	TOE savings /year	T CO <sub>2</sub> savings /year
Replacement of old FO fired furnace with EE NG fired Furnace	Rajhans Metals Private Limited	7.88	14.02	21	26.12	93.88
	Gold Metals	8.04	11.03	16	28.04	107.96
Replacement of Coal fired to Induction Melting Furnace	Madhav Cast	2.39	9.01	45	13.69	4.67
	Elite Enterprise	5.67	20.30	43	30.71	13.72
Replacement of Coal fired to PNG melting furnace	Uma Cast	3.54	8.87	30	3.44	35.03
Replacement of Thyristor induction based furnace with IGBT induction furnace	Venus Braasotech	6.06	31.62	63	6.68	63.72
	Top manufacturing company	8.57	26.29	37	9.45	90.08
Solar PV System	Rajhans Impex Private Limited	22.95	118.2	62	29.03	276.75
	Shiv-om Brass	15.30	70.88	56	184.50	19.35
Hydroxy Fuel generator for fuel fired reheating furnaces	Senor Metals Pvt Ltd	6.32	8.24	16	19.35	61.23
	<b>Total</b>	<b>86.72</b>	<b>318.51</b>	<b>44</b>	<b>351.00</b>	<b>766.37</b>

The identified technologies have high replication potential and can be implemented in majority of the brass units.

Following table highlights the key benefits of the technologies identified in the cluster:

Table 6: Highlights of identified technologies

Name of Technology	Benefits						Replication Potential	
	Energy Efficiency	Renewable Energy	Skill Improvement	Productivity	Waste Management	Environment	Integrated Plants	Machining plants
Replacement of old FO fired furnace with EE NG fired Furnace	√		√	√		√	√	
Replacement of Coal fired to Induction Melting Furnace			√	√	√	√	√	
Replacement of Coal fired to PNG melting furnace	√		√	√	√	√	√	
Replacement of Thyristor induction based furnace with IGBT induction furnace	√		√	√		√	√	
Solar PV System		√	√			√	√	√
Hydroxy Fuel generator for fuel fired reheating furnaces	√		√			√	√	

## 8. CONCLUSION AND WAY FORWARD

Local Service Providers are an important stakeholder in accelerating energy efficiency and renewable energy in Jamnagar Brass Cluster. Many of the industries are now pursuing the energy efficiency in their operations as the benefits are well understood and many of the industries are implementing this measure. But with time sustained of EE measure is also important and can be achieved by capacity development and skill upgradation of local service providers so they incorporate energy efficiency considerations in their services of also the suppliers/service providers are available. Key highlights of the capacity building activities of stakeholders in the cluster is shown

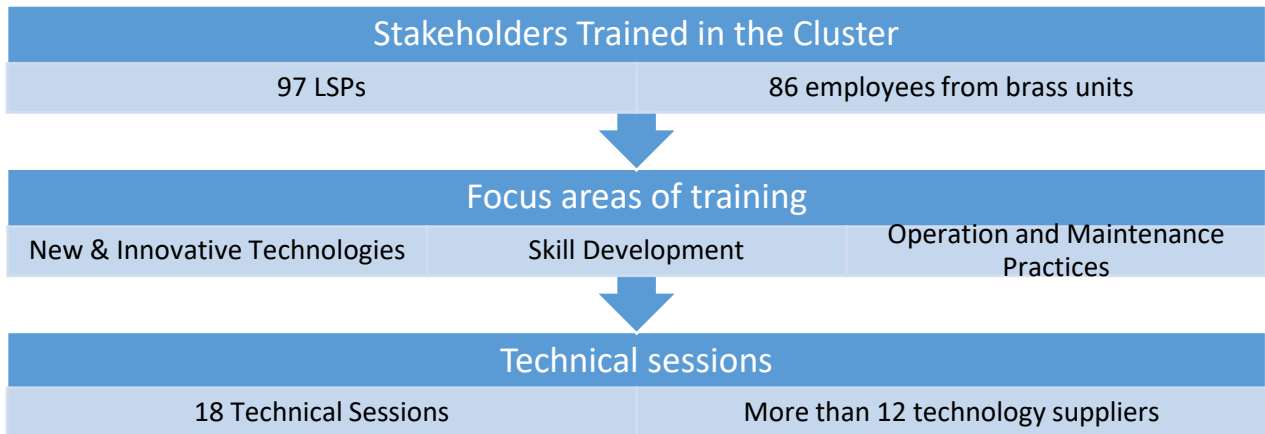


Figure 14: Summary of Capacity Building Workshops

below:

The various training programs across the cluster not only developed the technical capability of LSPs in the cluster but also improved the skill and productivity of the various stake holders in the cluster. The training programs also provided a platform for the LSPs to interact with the OEMs and other stake holders. Following table summarize the outcome of the capacity building programs for LSP and the brass units:

Table 7: Outcome of capacity building workshops

Focus Areas for Improvement	Capacity and Skill Development	OEM Interaction
Induction melting Furnace	√	√
Induction billet heater	√	√
Combustion systems (Burners and Recupertors)		√
Electrical System - Operation & Maintenance	√	
Compressed Air System	√	√
Pumps and Pumping System	√	√
Electrical Safety	√	
Renewable Energy	√	√

The energy efficient practices if adopted can not only result in cost savings but also have other co-benefits such as improvement in safety, environment and work environment and in addition to co-benefits there also exists synergies among different EE aspects for an example the for eg. Installation of induction furnace in place of conventional coal fired furnace would reduce the energy requirement but would also result in enhancement of productivity. The industries are to be made aware such co-benefits and synergies which exists between different aspects.

With the efforts to the implementation of Energy Efficiency/Renewable energy projects through the various detailed project reports indicates that there is a good potential for benefits – both low hanging and medium to high investments options. The industries implement the low hanging fruits (with lesser investment) faster as with minimum or no investments the saving can be achieved. However, for the high investment projects finance is a major hindrance and usually one of the major reasons for delay in implementation. Through this project some of the key technologies that are highly replicable in the cluster has been identified and for these technologies bankable DPRs were prepared. The report covers the possible options of financing from different banks and other various financial indicators to see the project is viable for implementation in the cluster or not. Key highlights of the identified technologies is shown below:

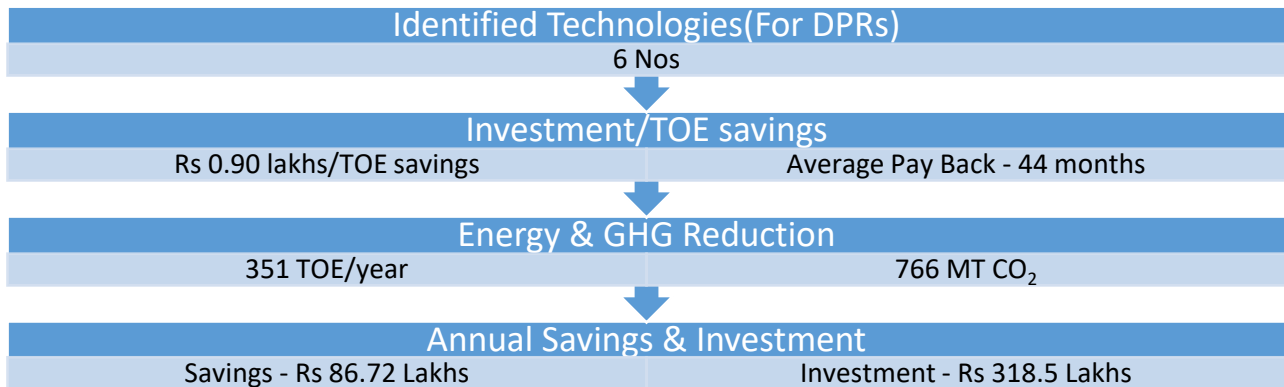


Figure 15: Key highlights of feasibility studies

Through this project, the efforts have been initiated for making industries and local service providers in the cluster aware about the benefits on pursuing energy efficiency and improving the competitiveness of the industries at the cluster. Many of the identified measures are highly replicable and the efforts initiated through the project would be continued after the period through more collaboration and cooperation activities among the stakeholders. There are several small and medium scale brass units in the cluster and the project can create much larger impact on overall environment management of the clusters. The LSPs have been engaged with different stake holders throughout the project which helped them in their capacity development and lot initiatives can be taken further for their capacity building such as national level skill program for LSPs on energy efficiency/renewable energy , creating a vendor base in the cluster for new clean technologies and facilitating LSPs interaction with major OEMs for implementation of technologies in the cluster.