

Detailed Project Report On Premium efficiency IE3 motors

Lexicon Ceramic Pvt. Ltd.

Morbi (Gujarat)

Prepared for

Bureau of Energy Efficiency

(13/GEF-UNIDO-BEE/LSP/14/4562)



©Bureau of Energy Efficiency, 2018

This DPR has been originally prepared by TERI as a part of 'Capacity Building of LSPs' activity under the GEF-UNIDO-BEE project 'Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India'.

Suggested Format for Citation

This document may be reproduced in whole or in part and in any form for educational and non-profit purposes without special permission, provided acknowledgement of the source is made. BEE and TERI would appreciate receiving a copy of any publication that uses this document as a source. A suggested format for citation may be as below:

GEF-UNIDO-BEE Project, Bureau of Energy Efficiency, 2018
"Capacity Building of Local Service Providers"

For more information

GEF-UNIDO-BEE PMU

Bureau of Energy Efficiency

4th Floor, Sewa Bhawan, Sector-1,

R.K. Puram, New Delhi-110066

Email: gubpmu@beenet.in

pmc@teri.res.in

Website: www.beeindia.gov.in

www.teriin.org

Disclaimer

This document is an output of an exercise undertaken by TERI under the GEF-UNIDO-BEE project's initiative for the benefit of MSME units and is primarily intended to assist the decision making by the management of the intended unit for the proposed technology. While every effort has been made to avoid any mistakes or omissions, GEF, UNIDO, BEE or TERI would not be in any way liable to any person or unit or other entity by reason of any mistake/omission in the document or any decision made upon relying on this document.

Acknowledgement

The Energy and Resources Institute (TERI) places on record its sincere thanks to Global Environment Facility (GEF), United Nations Industrial Development Organization (UNIDO) and Bureau of Energy Efficiency (BEE) for giving opportunity to partner in this prestigious assignment on Capacity Building of Local Service Providers (LSPs) under the GEF-UNIDO-BEE project 'Promoting energy efficiency and renewable energy in selected MSME clusters in India'.

TERI is particularly grateful to Mr Milind Deore, Director, Bureau of Energy Efficiency, Mr Sanjay Shrestha, Industrial Development Officer, Industrial Energy Efficiency Unit, Energy and Climate Branch, UNIDO, Mr Niranjana Rao Devela, National Technology Coordinator, UNIDO, Mr Vijay Mishra, Cluster Leader, Morbi Ceramic Cluster, UNIDO, Mr Narendra Sanghat, M/s Lexicon Ceramic private limited and Morbi Ceramics Association for their support and guidance during the project.

Last but not least, the interactions and deliberations with numerous ceramic units, Industry Associations, technology providers and who were directly or indirectly involved throughout the study were exemplary and the whole exercise was thoroughly a rewarding experience for TERI.

The Energy and Resources Institute (TERI)
New Delhi

Table of contents

Acknowledgement.....	1
List of tables.....	1
List of figures.....	1
List of abbreviations	1
Executive summary.....	i
1.0 Details of the unit.....	1
1.1 Particulars of unit	1
2.0 Energy profile.....	3
2.1 Process flow diagram	3
2.2 Details of technology identified.....	3
2.3 Energy used and brief description of their usage pattern.....	4
2.4 Energy sources, availability & tariff details	4
2.5 Analysis of electricity consumption.....	4
2.6 Analysis of other energy forms/ fuels.....	5
3.0 Proposed technology for energy efficiency	7
3.1 Replacement of standard efficiency under-loaded induction motors with premium efficiency class (IE3) motors.....	7
3.1.1 Background	7
3.1.2 Observations and analysis.....	7
3.1.3 Recommendation.....	9
3.2 Cost benefit analysis.....	9
3.3 Pre-training requirements	11
3.4 Process down time for implementation.....	11
3.5 Environmental benefits.....	11
3.5.1 CO ₂ reduction.....	11
3.5.2 Reduction in other pollution parameters (gas, liquid and solid).....	11
4.0 Project financials	13
4.1 Cost of project and means of finance	13
4.1.1 Particulars of machinery proposed for the project	13
4.1.2 Means of finance	13
4.2 Financial statement (project)	13
4.2.1 Assumptions	13
4.2.2 Payback	14
4.2.3 NPV and IRR.....	14
4.3 Marketing & selling arrangement	15
4.4 Risk analysis and mitigation	16
4.5 Sensitivity analysis	16

5.0	Conclusions & recommendations.....	17
5.1	List of energy conservation measures.....	17
5.2	Summary of the project.....	17
5.3	Recommendations	17
6.0	Financing schemes for EE investments for MSME sector.....	19
	Annexures	25
	Annexure 1: Budgetary offers / quotations	27
	Quotation 1: Aakash Powertech Pvt. Ltd.	27
	Annexure 2: Instruments used.....	29

List of tables

Table 1.1: Particulars of the unit.....	1
Table 2.2: Details of Induction Motors	3
Table 2.3: Energy used and description of use.....	4
Table 2.4: Energy sources, availability and tariffs	4
Table 2.5: Electricity consumption profile	4
Table 2.6: Analysis of other energy/ fuel consumption	5
Table 3.1.1: Details of Induction Motors	7
Table 3.2: Cost benefit analysis for recommended energy savings measures	10
Table 4.1.1: Particulars of machinery proposed for the project	13
Table 4.1.2: Means of finance.....	13
Table 4.2.1: Assumptions made.....	13
Table 4.2.2: Payback.....	14
Table 4.2.3a: NPV and IRR (100% equity).....	14
Table 4.2.3b: NPV and IRR (D/E- 70:30).....	15
Table 4.2.3c: NPV and IRR (D/E- 50:50)	15
Table 4.3: Marketing & selling arrangements	15
Table 4.4: Risk analysis and mitigation	16
Table 4.5: Sensitivity analysis	16
Table 5.1: Summary of the energy conservation measures	17
Table 5.2: Summary of the project	17
Table 6.1: Major government schemes	19
Table 6.2: BEE's VCFEE and PRGFEE scheme	20
Table 6.3: IREDA's financing guidelines.....	21
Table 6.4: Major EE financing schemes/initiatives of SIDBI.....	22
Table 6.5: JBIC-SBI Green Line	23
Table 6.6: Canara bank scheme of EE SME loans	24

List of figures

Figure 2.1: Process flow chart.....	3
Figure 2.5: Demand pattern and energy consumption profile	5
Figure 2.6: Percentage share of various fuel types in the unit	5
Figure 3.1.2a: Power consumption trend of associated motors	8
Figure 3.1.2b: Percentage loading of the associated motors	8

List of abbreviations

BEE	:	Bureau of Energy Efficiency
CO ₂	:	Carbon Dioxide
D/E	:	Debt /Equity
DPR	:	Detailed Project Report
DSCR	:	Debt Service Coverage Ratio
EE	:	Energy Efficient
GEF	:	Global Environmental Facility
GHG	:	Green House Gas
HSD	:	High Speed Diesel
IDC	:	Investment without interest defer credit
IGDPR	:	Investment Grade Detailed Project Report
IRR	:	Internal Rate of Return
kW	:	Kilo Watt
kWh	:	Kilo Watt Hour
LSPs	:	Local Service Providers
MGO	:	Minimum Guaranteed Offtake
MSME	:	Micro, Small and Medium Enterprises
MT	:	Metric Tonne
NG	:	Natural Gas
NPV	:	Net Present Value
O&M	:	Operation and Maintenance
PCB	:	Pollution control board
PGVCL	:	Paschim Gujarat Vij Company Limited
RE	:	Renewable Energy
ROI	:	Return On Investment
SCM	:	Standard Cubic Meter
SME	:	Small and Medium Enterprises
SPP	:	Simple Payback Period
TERI	:	The Energy and Resources Institute
Toe	:	Tonnes of oil equivalent
UNIDO	:	United Nations Industrial Development Organization
VFD	:	Variable Frequency Drive
WACC	:	Weighted Average Cost of Capital

Executive summary

The overall aim of the GEF-UNIDO-BEE project 'Promoting Energy Efficiency (EE) and Renewable Energy (RE) in selected MSME clusters in India' is to develop and promote a market environment for introducing energy efficiency and enhancing the use of renewable energy technologies in process applications in selected energy-intensive MSME clusters in India. This would help in improving the productivity and competitiveness of the MSME units, as well as in reducing the overall carbon emissions and improving the local environment.

Under the GEF-UNIDO-BEE Project, TERI has been entrusted to undertake Capacity building of Local Service Providers (LSPs) to BEE. The Scope of Work under the project,

- Organizing 4 one-day training/ capacity building workshops for LSPs in each cluster.
- Development of 10 bankable DPRs for each cluster, based on mapping technology needs with capacities of local technology suppliers/service providers, and also replication potential and applications to banks in each cluster.

Brief introduction of the MSME unit

Name of the unit	M/s Lexicon Ceramic Pvt. Ltd.
Constitution	Private Limited
MSME Classification	Medium
No. of years in operation	11
Address: Registered Office:	S No. 141/P1, B/H. 66kV sub-station, Halvad road, At. Unchimandal, Morbi- 363642 (Gujrat)
Industry-sector	Ceramic
Products manufactured	Digital Wall tiles
Name(s) of the promoters/ directors	Mr Narendra Sanghat
Existing banking arrangements along with the details of facilities availed	Axis Bank

Brief highlights of the past financial position of the MSME unit

		(Rs lakh)
		FY 2012
S. No	Particulars	(Audited)
1	Total income	24.5
2	Net profit	8.5

A detailed assessment study was undertaken in the identified area with the use of the sophisticated handheld instruments. Energy consumption pattern and production data were collected to estimate the specific energy consumption of the unit. The unit level baseline of the unit was also estimated using the historical data. The total energy consumption of the unit during last 12 months was 883 toe which is equivalent to 421 lakh rupees. The total CO₂ emission during this period is estimated to be 3,824 tonnes. Electricity, diesel and natural gas were considered for CO₂ emission estimation.

M/s Lexicon Ceramic private limited is India's leading largest manufacturer of high quality digital wall tiles. The total annual production of the unit during 2017-18 is estimated to be 31,500 tones (10,000 boxes per day @ 9 kg per box). The major source of energy is natural gas used in the kiln and electricity, consume in the material preparation and lighting.

Accepted/ recommended technology implementation

The recommended technology considered after discussion with the plant personnel for implementation in the unit is given below.

Technology	Annual energy saving	Investment ¹ (Rs lakh)	Monetary savings	Simple payback period (Years)	Emission reduction (tonnes of CO ₂)
	Electricity (kWh)		(Rs lakh/ year)		
Replacement of standard efficiency under-loaded induction motors with premium efficiency class (IE3) motors	25,133	5.0	1.8	2.8	20.6

Other benefits

- The proposed project is not expected to bring in any change in process step or operating practices therefore no change expected in the product quality.
- Implementation of the selected technology in the unit may result in reduction in CO₂ emissions.

Cost of project & means of finance

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	5.0	5.0	5.0
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	12.3	7.6	8.9
4	NPV	Rs. In Lakh	0.4	-0.3	-0.1
5	DSCR	-	-	2.1	0.9

¹ Investment including the price of motor - Rs. 5.0 lakh

1.0 Details of the unit

1.1 Particulars of unit

Table 1.1: Particulars of the unit

1	Name of the unit	M/s Lexicon Ceramic Pvt. Ltd	
2	Constitution	Private Limited	
3	MSME Registration No/UAN	EMI2400913005207	
4	PCB consent No.	PCB ID: GPCB/CCA/Morbi-289/ID-43321 351550	
5	Date of incorporation / commencement of business	2007	
6	Name of the Contact Person	Mr Narendra Sanghat	
7	Mobile / Ph. No	+91-7623000335	
8	Email	info@lexiconceramic.com	
9	Address: Registered Office	S No. 141/P1, B/H. 66kV sub-station, Halvad road, At. Unchimandal, Morbi- 363642 (Gujrat)	Owned
10	Factory	S No. 141/P1, B/H. 66kV sub-station, Halvad road, At. Unchimandal, Morbi- 363642 (Gujrat)	Owned
11	Industry / Sector	MSME/Manufacturing	
12	Products Manufactured	Digital wall tiles	
13	No of hours of operation/ shift	8	
14	No of shifts/ day	03	
15	No of days/year	350	
16	Installed Capacity	36000 MT per year	
17	Whether the unit is exporting its products (Yes/ No)	Yes	
18	Quality Certification, if any	Yes	

2.0 Energy profile

2.1 Process flow diagram

Manufacturing of ceramic item uses wide range of raw material combination to produce different shape, size and colour. It requires both electrical and thermal energy at different stages of the process to operate the ball mill, casting/moulding, kilns, cutting & finishing machines and utilities such as motors, pumps air compressor etc. Ceramic manufacturing process primarily consists of mould preparation, body material preparation, shaping, drying and firing. Typical process flow chart is shown with figure 2.1.

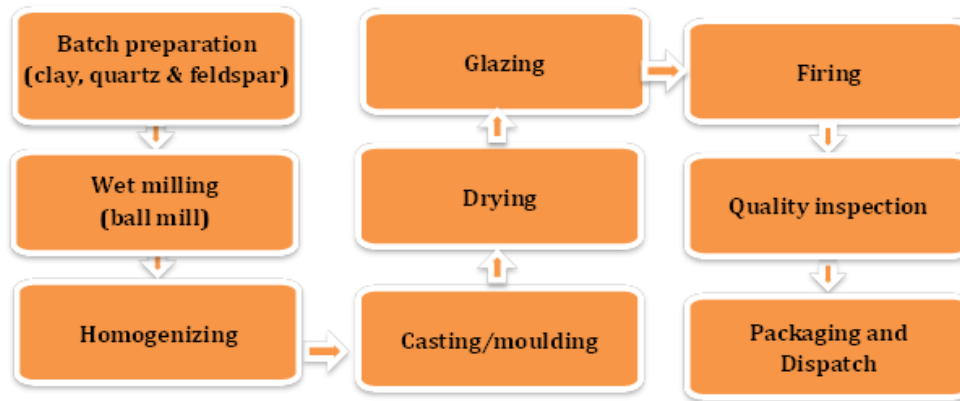


Figure 2.1: Process flow chart

2.2 Details of technology identified

The details of the induction motor installed in the unit are given in table 2.2.

Table 2.2: Details of Induction Motors

Parameters/ Equipment ID	Combustion blower	Smoke Fan	Rapid cooling	Hot air fan	Final Cooling
Equipment	Induction motor	Induction motor	Induction motor	Induction motor	Induction motor
Rated capacity, kW	45	55	45	55	22
Make	Siemens (Germany)	Siemens (Germany)	Siemens (Germany)	Siemens (Germany)	Siemens (Germany)
Rated voltage, volt	440	440	440	440	440
Full load ampere, amp	73.8	24.6	90.2	90.2	73.8
Frequency, Hz	50	50	50	50	50
Mode of operation (batch/continuous)	continuous	continuous	continuous	continuous	continuous
Nos. of rewinding	NA	NA	NA	NA	NA

2.3 Energy used and brief description of their usage pattern

The unit uses grid power supplied by Paschim Gujarat Vij Company Limited under the tariff category HTP-I. Table 2.3 provides the details of energy uses.

Table 2.3: Energy used and description of use

S No	Energy source	Description of use
1	Electricity	Motive power for different drives in different process sections and utilities
2	Natural Gas	Kiln

2.4 Energy sources, availability & tariff details

Different energy sources, availability of listed energy types and their respective tariffs are given in table 2.4.

Table 2.4: Energy sources, availability and tariffs

Source	Remarks	Price
Electricity (PGVCL)	HTP-1	Demand charges: <ul style="list-style-type: none"> For first 500 kVA of billing demand: Rs. 150/- per kVA per month For next 500 kVA of billing demand: Rs. 260/- per kVA per month Energy charges: @ Rs. 4.20/kWh Power factor penalty: <ul style="list-style-type: none"> 1% of energy charges for every point drop in PF between 0.85 to 0.90 2% of energy charges for every point drop in PF below 0.85 Power factor rebate: <ul style="list-style-type: none"> 0.5% of energy charges for every point increase in PF over 0.95.
Natural gas	Gujarat Gas Ltd.	<ul style="list-style-type: none"> Minimum Guaranteed Offtake (MGO): Rs. 32.70/SCM Non - Minimum Guaranteed Offtake (Non-MGO): Rs. 35.97/SCM

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Total electricity consumption (kWh)	Sanctioned load/demand (kW)	Power factor	Recorded demand, kVA	Demand charges (Rs)	Energy charges (Rs)	Monthly bill (Rs)
Nov-17	257,354	650	1.0	534	83,840	1,080,887	1,621,330
Dec-17	274,452	650	1.0	573	93,980	1,152,698	1,726,542
Jan-18	317,424	650	1.0	553	88,780	1,333,181	1,977,745
Feb-18	221,908	650	1.0	531	83,060	932,014	1,391,137
Average	2,67,785	650	1.0	548	87415.00	1124694.90	1,679,189
Total	3,213,414	-	-	-	1,048,980	13,496,339	20,150,262

Figure 2.5 presents contract demand, recorded maximum demand and the energy consumption of the unit.

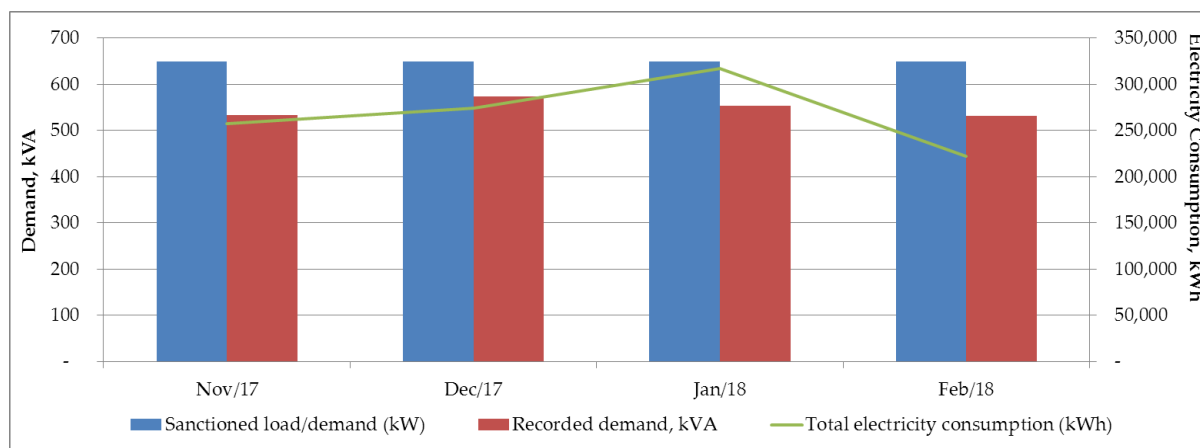


Figure 2.5: Demand pattern and energy consumption profile

2.6 Analysis of other energy forms/ fuels

The analysis of the other fuels/forms of energy used in the unit is given in table 2.6.

Table 2.6: Analysis of other energy/ fuel consumption

Parameters	NG (SCM)	HSD (Liter)
Consumption unit/year	676,620	2,000
Calorific value per unit	8,935	9,202
Equivalent toe per year	604.6	1.8
Price (Rs per unit)	32.3	29.9
Total price per year	21,854,826	59,792

The share of various energy forms used in the unit is given in figure 2.6.

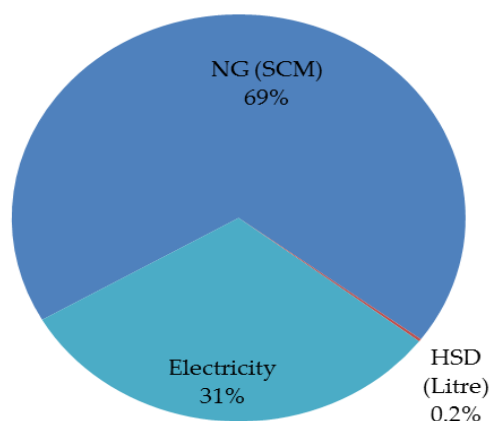


Figure 2.6: Percentage share of various fuel types in the unit

The plant is consuming about 3,213,414 kWh of electricity per year. The annual consumption of the HSD is 2,000 litres and NG is 676,620 SCM. The total energy consumption of the unit during last 12 months is estimated to be 883 toe which is equivalent to 421 lakh rupees. The

total CO₂ emission during this period is estimated to be 3,824 tonnes. Electricity, Diesel and NG were considered for CO₂ emission estimation.

3.0 Proposed technology for energy efficiency

Based on the measurements, observations/ findings during detailed assessment study conducted in the unit, the following technology has been identified for energy efficiency improvement. The detail is given below.

3.1 Replacement of standard efficiency under-loaded induction motors with premium efficiency class (IE3) motors

3.1.1 Background

The Lexicon Ceramic Private Limited is manufactures of the digital wall tiles. The facility is operating a roller kiln which has a production capacity of about 112 tonne per day. The details of the induction motor associated with auxiliary system of the kiln in the unit are given in table 3.1.1

Table 3.1.1: Details of Induction Motors

Parameters/ Equipment ID	Combustion blower	Smoke Fan	Rapid cooling	Hot air fan	Final Cooling
Equipment	Induction motor	Induction motor	Induction motor	Induction motor	Induction motor
Rated capacity, kW	45	55	45	55	22
Make	Siemens (Germany)	Siemens (Germany)	Siemens (Germany)	Siemens (Germany)	Siemens (Germany)
Rated voltage, volt	440	440	440	440	440
Full load ampere, amp	73.8	24.6	90.2	90.2	73.8
Frequency, Hz	50	50	50	50	50
Mode of operation (batch/continuous)	continuous	continuous	continuous	continuous	continuous
Nos. of rewinding	NA	NA	NA	NA	NA

The operational parameters of the associated kiln motors were observed and portable power analysers were used to observe variation in its power consumption for a long operating period of the individual motors.

3.1.2 Observations and analysis

The input power parameters of install motors were recorded. It has been observed that the installed motors are standard efficiency motors and are being operated at lower loading. The average loading percentage of all the associated motors is shown in the figure below.

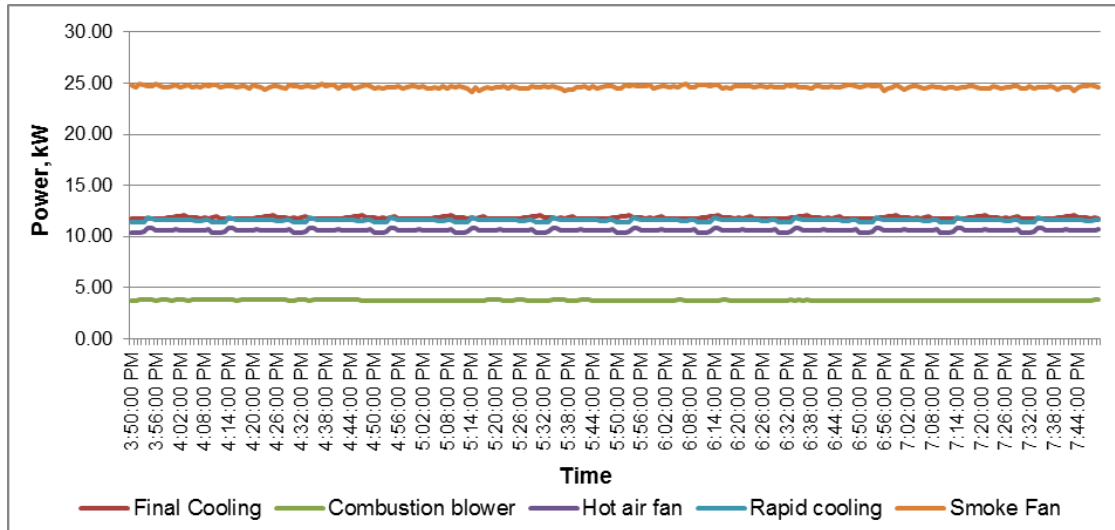


Figure 3.1.2a: Power consumption trend of associated motors

The loading percentage of the associated motors is shown in figure 3.1.2.

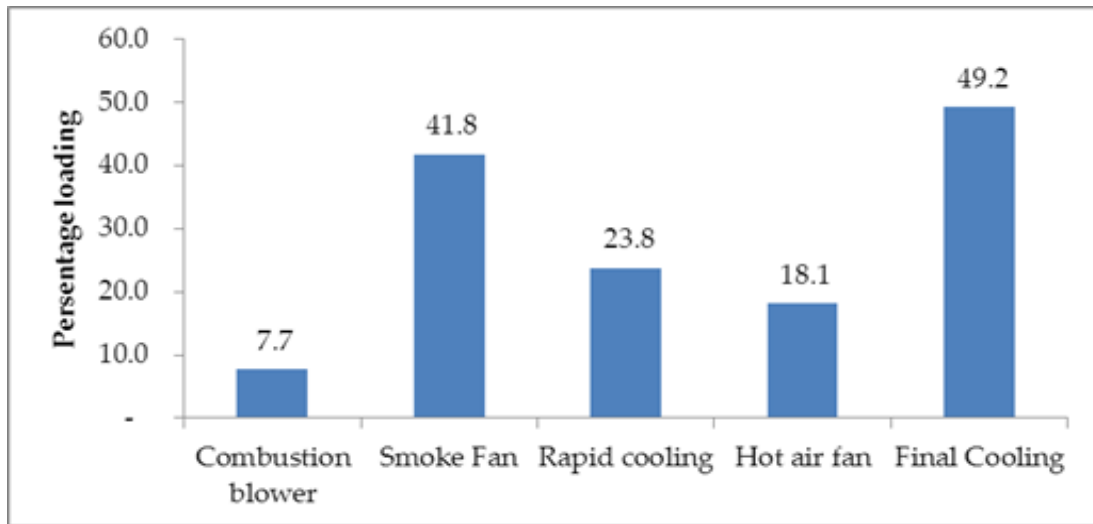


Figure 3.1.2b: Percentage loading of the associated motors

It may be observed that the operating loading of the individual motors are less than 50%. More over few motors such as combustion blower, rapid cooling and hot air fans are loaded by 7.7%, 23.8% and 18.1% respectively. The efficiency of the induction motor falls down with lower loading percentage. The figure shows the effect the efficiency with of induction motor loading.

It can be observed that with decrease in motor loading the power factor and the motor efficacy drops down, and both the parameters drastically falls down after the loading drops down below 50%.

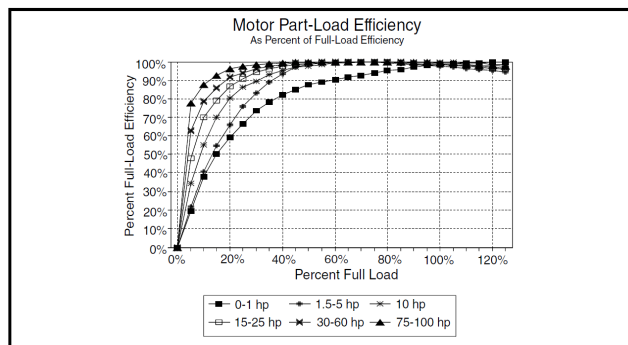


Figure 2 Part-Load Motor Efficiency Range

3.1.3 Recommendation

The unit may resize the existing lower loaded motors with IE3 motors, apart from improvement in loading percentage; the IE3 motor may also provide an added advantage of better design aspect which creates differences in the operating efficiency. The figure show in shows the defences in the operating efficiency of the IE3 motor from standard motor.

3.2 Cost benefit analysis

The estimated annual energy savings by replacement of existing standard efficiency, induction motor associated with the kiln with optimum capacity premium efficiency, 50 Hz induction motor is 25,133 kWh equivalent to a monetary saving of Rs 1.8 lakh. The investment requirement is Rs 5.0 lakh with a simple payback period of 2.8 years. The detailed calculations of the recommended energy conservation measures for DPR are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

Parameters	Unit	Combustion blower		Smoke Fan		Rapid cooling		Hot air fan		Final Cooling	
		Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Motor Capacity	kW	45	15	55	55	45	45	55	15	22	22
Design RPM	rpm	2,880	2,880	1440	1440	2880	2880	1440	1440	1440	1440
Full load efficiency	%	89.6	93.3	92.1	95.7	91.7	95.4	92.1	93.7	89.9	94.5
% age of full load efficiency w.r.t. loading	%	78	90	100	100	90	90	95	95	100	100
Estimated operational efficiency (rated eff. X % age of full load)	%	69.9	84.0	92.1	95.7	82.5	85.9	87.5	89.0	89.9	94.5
Average input power	kW	3.90	3.20	24.96	24.00	11.67	11.20	10.83	10.60	12.03	11.40
Average loading	%	7.7	23	41.8	41.8	23.8	23.8	18.1	66.5	49.2	49.2
Annual operating hours	hours/Year	8,400	8,400	8,400	8,400	8,400	8,400	8,400	8,400	8,400	8,400
Reduction in power consumption	kWh/hour	-	0.70	-	0.96	-	0.47	-	0.23	-	0.63
Annual reduction electricity consumption	kWh/year	-	5,880	-	8,064	-	3,965	-	1,932	-	5,292
Tariff rate	Rs./kWh	-	7.2	-	7.2	-	7.2	-	7.2	-	7.2
Annual monetary benefits	Rs./Year	-	42,336	-	58,061	-	28,547	-	13,910	-	38,102
Total investment	Rs	-	47,840	-	1,99,100	-	1,58,520	-	30,000	-	68,210
Simple payback period	Years	-	1.13	-	3.43	-	5.55	-	2.16	-	1.79

3.3 Pre-training requirements

Not required

3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 1 days after commissioning and testing.

3.5 Environmental benefits

3.5.1 CO₂ reduction²

Implementation of the selected energy conservation measures in the unit may result in reduction in CO₂ emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 20.6 tonne of CO₂ per year.

3.5.2 Reduction in other pollution parameters (gas, liquid and solid)

There is not significant impact on the reduction in other pollution parameters including gas, liquid and solid.

² Source for emission factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories & electricity: CO₂ Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

4.0 Project financials

4.1 Cost of project and means of finance

4.1.1 Particulars of machinery proposed for the project

The particulars of machinery proposed for the project is given in table 4.1.1.

Table 4.1.1: Particulars of machinery proposed for the project

S. No.	Name of machinery (Model/ specification)	Name of manufacturer, contact person	Basis of selection of supplier	Remarks (after sales service etc.)
1	IE3 standard premium efficiency motor	Aakash Powertech Pvt. Ltd, (Hindustan Electric motors)	Reputed supplier	-

4.1.2 Means of finance

The means of finance for the project is shown in table 4.1.2.

Table 4.1.2: Means of finance

S. No.	Details	100% equity	D/E- 70:30	D/E- 50:50
1	Additional (Share) Capital	5.0	1.5	2.5
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	3.5	2.5
5	Others	-	-	-
	Total	5.0	5.0	5.0

4.2 Financial statement (project)

4.2.1 Assumptions

The assumptions made are provided in table 4.2.1.

Table 4.2.1: Assumptions made

Details	Unit	100% equity	D/E- 70:30	D/E- 50:50
General about unit				
No of working days	Days		350	
No of shifts per day	Shifts		2	
Annual operating hours	Hrs/year		8400	
Installed production capacity	tonnes/year		36000	
Production in last financial years	tonnes/year		31500	
Capacity utilization factor	%		88	
Proposed investment (Project)				
Total cost of the project	Rs. in lakh	5.0	5.0	5.0
Investment without interest defer credit (IDC)	Rs. in lakh	5.0	5.0	5.0
Implementation time	Months	3	3	3
Interest during the implementation phase	Rs. in lakhs	-	0.02	0.02
Total investment	Rs. in lakhs	5.0	5.0	5.0

Details	Unit	100% equity	D/E- 70:30	D/E- 50:50
Financing pattern				
Own funds	Rs. in lakhs	5.0	1.5	2.5
Loan funds (term loan)	Rs. in lakhs	-	3.5	2.5
Loan tenure	Years	-	5.0	5.0
Moratorium period (No EMI (interest and principal amount))	Months	-	3.0	3.0
Total repayment period	Months	-	60.0	60.0
Interest rate	%	-	10.5	10.5
Estimation of costs				
Operation & maintenance costs	%		5	
Annual escalation rate of O&M	%		5	
Estimation of revenue				
Reduction in energy cost	Rs. lakh/year		1.8	
Total saving	Rs lakh/year		1.8	
Straight line depreciation	%		16.2	
IT depreciation	%		80.0	
Income tax	%		34.0	
Period of cash flow analysis	Years		5	

4.2.2 Payback

The simple payback period on the investments made are shown in table 4.2.2.

Table 4.2.2: Payback

Details	100% equity	D/E- 70:30	D/E- 50:50
Total project cost (Rs. In lakh)	5.0	5.0	5.0
Cash flow as annual saving (Rs. In lakh/year)	1.8	1.8	1.8
O&M Expenses for first year (Rs. In lakh/year)	0.3	0.3	0.3
Net Cash flow (Rs. In lakh/year)	1.6	1.5	1.5
SPP (months)	38.7	38.9	38.8
Considered (month)	38.7	38.9	38.8

4.2.3 NPV and IRR

The NPV and IRR calculations are shown in table 4.2.3.

Table 4.2.3a: NPV and IRR (100% equity)

Particulars / years	0	1	2	3	4	5
	(Rs.in lakhs)					
Profit after tax	-	0.74	1.31	0.25	0.20	0.18
Depreciation	-	0.81	0.81	0.81	0.81	0.81
Cash outflow	5.00	-	-	-	-	-
Net cash flow	-5.00	1.55	2.12	1.06	1.01	0.99
Discount rate % @ WACC	9.30	9.30	9.30	9.30	9.30	9.30
Discount factor	1.00	0.92	0.84	0.77	0.70	0.64
Present value	-5.00	1.42	1.78	0.81	0.71	0.64
Net present value	0.35					
Simple IRR considering regular cash flow	12.28%					

Table 4.2.3b: NPV and IRR (D/E- 70:30)

Particulars / years	0	1	2	3	4	5
(Rs.in lakhs)						
Profit after tax	-	0.56	1.17	0.08	0.08	0.11
Depreciation	-	0.81	0.81	0.81	0.81	0.81
Cash outflow	5.02	-	-	-	-	-
Net cash flow	-5.02	1.37	1.98	0.90	0.89	0.93
Discount rate % @ WACC	10.10	10.10	10.10	10.10	10.10	10.10
Discount factor	1.00	0.97	0.83	0.75	0.68	0.62
Present value	-5.02	1.25	1.63	0.67	0.61	0.57
Net present value	-0.29					
Simple IRR considering regular cash flow	7.55%					

Table 4.2.3c: NPV and IRR (D/E- 50:50)

Particulars / years	0	1	2	3	4	5
(Rs.in lakhs)						
Profit after tax	-	0.61	1.21	0.13	0.11	0.13
Depreciation	-	0.81	0.81	0.81	0.81	0.81
Cash outflow	5.02	-	-	-	-	-
Net cash flow	-5.02	1.42	2.02	0.94	0.93	0.95
Discount rate % @ WACC	9.90	9.90	9.90	9.90	9.90	9.90
Discount factor	1.00	0.91	0.83	0.75	0.69	0.63
Present value	-5.02	1.29	1.67	0.71	0.64	0.59
Net present value	-0.11					
Simple IRR considering regular cash flow	8.92%					

4.3 Marketing & selling arrangement

The marketing and selling arrangements of the unit are given in table 4.3.

Table 4.3: Marketing & selling arrangements

Items	Remarks
Main Markets (locations)	Pan India and abroad
Locational advantages	-
Indicate competitors	Other manufacturing units
Any USP or specific market strength	-
Whether product has multiple applications	NA
Distribution channels (e.g. direct sales, retail network, distribution network)	Direct sales
Marketing team details, if any.	NA

4.4 Risk analysis and mitigation

The risk analysis and mitigation for the proposed options are given in table 4.4.

Table 4.4: Risk analysis and mitigation

Type of risk	Description	Mitigation
Technology	The equipment/technology provided by the supplier may not be of high quality, which may result in underperformance.	The equipment/technology should be procured from standard/reputed vendors only.
Market /Product	Demand of the product manufactured by the unit may change resulting in lower capacity utilization.	Regular vigilance/tab on the market scenario by the SME will help in better understanding of new substitute product. The unit may modify the product line based on the emerging market trend.
Policy/Regulatory	Changes in government regulation/policy related to pollution and taxes & duties can affect the viability of the unit.	Local industrial association may play a role in discussing these issues with the relevant governmental bodies on a regular basis, so that any concerns of the unit are brought to their notice.

4.5 Sensitivity analysis

A sensitivity analysis for various scenarios which may affect the return on investment is given in table 4.5.

Table 4.5: Sensitivity analysis

S. No.	Scenario	D/E ratio	Payback period (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
1	10% increase in estimated savings	100% equity	38.7	0.4	1.2	-	10.1
		70:30:00	38.7	0.2	1.1	0.1	10.6
		50:50:00	38.7	0.3	1.2	0.1	10.5
2	10% reduction in estimated savings	100% equity	38.7	0.4	1.2	-	10.1
		70:30:00	38.7	0.2	1.1	0.1	10.6
		50:50:00	38.7	0.3	1.2	0.2	18.1
3	10% rise in interest rates	70:30:00	38.7	0.2	1.1	0.1	10.6
		50:50:00	38.7	0.3	1.2	0.1	10.4
4	10% reduction in interest rates	70:30:00	38.7	0.3	1.2	0.1	10.7
		50:50:00	38.7	0.3	1.2	0.1	10.5

5.0 Conclusions & recommendations

The DPR prepared for the resizing of existing under loaded standard motor with premium efficiency class IE3 motors based on the performance assessment study conducted at unit and the acceptance of the unit management. The brief of selected energy conservation measure is given below.

5.1 List of energy conservation measures

The brief summary of the energy conservation measures are given in table 5.1.

Table 5.1: Summary of the energy conservation measures

Technology	Annual energy saving Electricity (kWh)	Investment (Rs lakh)	Monetary savings (Rs lakh/ year)	Simple payback period (Years)	Emission reduction (tonnes of CO ₂)
Replacement of standard efficiency under-loaded induction motors with premium efficiency class (IE3) motors	25,133	5.0	1.8	2.8	20.6

The measure has an estimated investment of 5.0 lakh rupees and can yield a savings of 1.8 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 20.6 tonnes of CO₂. The financial indicators provided above in the table shows the project is financially viable and technically feasible.

5.2 Summary of the project

The summary of the project is given in table 5.2.

Table 5.2: Summary of the project

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	5.0	5.0	5.0
2	D/E Ratio	-	-	70:30	50:50
3	Project IRR	%	12.3	7.6	8.9
4	NPV	Rs. In Lakh	0.4	-0.3	-0.1
5	DSCR	-	-	2.1	0.9

5.3 Recommendations

The financial indicators provided above show the project is financially viable and technically feasible. It is recommended that the implementation of the identified the energy conservation measures may be undertaken by the unit.

6.0 Financing schemes for EE investments for MSME sector

Government of India has many schemes to provide concessional finance for EE technologies among MSMEs. Some major government schemes are summarised in table 6.1.

Table 6.1: Major government schemes

Name of the scheme	Brief Description and key benefits
ZED assessment and certification	<p>Assessment process, fee and subsidy are as follows: Online (e-Platform) self-assessment: Nil fee Desk Top assessment : Rs 10,000 per SME Complete assessment : Rs 80,000 ZED rating per SME; Rs 40,000 for additional ZED defence rating; Rs 40,000 for re-rating The rating costs will include cost of Rs 10,000/- as certification cost by QCI. Subsidy for Micro, Small and Medium Enterprises are 80%, 60% and 50% respectively.</p>
Credit Linked Capital Subsidy Scheme (CLCSS) (2000-ongoing)	<p>15% capital subsidy of cost of eligible plant and machinery / equipment for adoption of proven technologies for approved products / sub-sectors for MSE units subject to ceiling of INR 15 lakhs</p>
Credit Guarantee Fund Scheme for Micro and small Enterprises (in partnership with SIDBI) (2000-ongoing)	<p>This scheme was launched by MoMSME and SIDBI to alleviate the problem of collateral security and enable micro and small scale units to easily adopt new technologies. Under the scheme, collateral free loans up to Rs 1 crore can be provided to micro and small scale units. Additionally, in the event of a failure of the SME unit which availed collateral free credit facilities to discharge its liabilities to the lender, the Guarantee Trust would guarantee the loss incurred by the lender up to 75 / 80/ 85 per cent of the credit facility.</p>
Technology and Quality Up gradation Support to MSMEs (TEQUP) (2010-ongoing)	<p>The benefits available to SMEs under TEQUP include – technical assistance for energy audits, preparation of DPRs and significant capital subsidy on technologies yielding an energy savings of over 15%. The scheme offers a subsidy of 25% of the project cost, subject to a maximum of Rs. 10 lakhs. TEQUP, a scheme under NMCP, focuses on the two important issues in enhancing competitiveness of the SME sector, through EE and Product Quality Certification.</p>
Technology Upgradation Fund Scheme (TUFS) (1999-ongoing)	<p>Interest subsidy and /or capital subsidy for Textile and Jute Industry only.</p> <ol style="list-style-type: none"> To facilitate Technology Up gradation of Small Scale (SSE) units in the textile and jute industries. Key features being: <ul style="list-style-type: none"> Promoter's margin -15%; Subsidy - 15% available on investment in TUF compatible machinery subject to ceiling of Rs 45 lakh; Loan amount - 70% of the cost of the machinery by way of Term Loan

Name of the scheme	Brief Description and key benefits
	<ul style="list-style-type: none"> • Interest rate: Reimbursement of 5% on the interest charged by the lending agency on a project of technology upgradation in conformity with the Scheme • Cover under Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGMSE) available <p>2. To enable technology upgradation in micro and small power looms to improve their productivity, quality of products and/ or environmental conditions</p> <ul style="list-style-type: none"> • 20% margin subsidy on investment in TUF compatible specified machinery subject to a ceiling of Rs 60 lakhs or Rs 1crore (whichever is applicable) on subsidy amount to each unit - released directly to the machinery manufacturer.
Tax incentives	<ul style="list-style-type: none"> • Accelerated depreciation is provided to the customers / users of the energy saving or renewable energy devises under the direct tax laws. • Under indirect taxes, specific concessional rates of duty are only available to CFLs and not to all energy efficient products • A further waiver of import tariffs and taxes for EE technology imports are dealt on a case to case basis, meaning higher costs for those imported technologies that are not available in the domestic markets at present.

Two financing schemes have been created by Bureau of Energy Efficiency (BEE) under The National Mission for Enhanced Energy Efficiency (NMEEE) for financing of energy efficiency projects - Venture Capital for Energy Efficiency (VCFEE) and Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE). These funds seek to provide appropriate fiscal instruments to supplement the efforts of the government for creation of energy efficiency market. Highlights of these two schemes are provided in the table 6.2.

Table 6.2: BEE's VCFEE and PRGFEE scheme

Venture Capital for Energy Efficiency (VCFEE)	<ul style="list-style-type: none"> • This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. • A single investment by the fund shall not exceed Rs 2 crore • Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less
Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)	<ul style="list-style-type: none"> • A PRGF is a risk sharing mechanism lowering the risk to the lender by substituting part of the risk of the borrower by granting guarantees ensuring repayment of part of the loan upon a default event. • Guarantees a maximum 50% of the loan (only principal). In case of default, the fund will: <ul style="list-style-type: none"> ○ Cover the first loss subject to maximum of 10% of the total guaranteed amount ○ Cover the remaining default (outstanding principal) amount on

Venture Capital for Energy Efficiency (VCFEE)	<ul style="list-style-type: none"> This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. A single investment by the fund shall not exceed Rs 2 crore Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less
	<p>partial basis upto the maximum guaranteed amount</p> <ul style="list-style-type: none"> PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower. The Guarantee will not exceed Rs 300 lakh per project or 50% of loan amount, whichever is less. Maximum tenure of the guarantee will be 5 years from the date of issue of the guarantee

Indian Renewable Energy Development Agency (IREDA), a non-banking financial institution established by the government also extends financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation. The detailed financing guidelines for energy efficiency projects are provided in table 6.3.

Table 6.3: IREDA's financing guidelines

Eligible companies who can apply	Private Sector Companies/ firms, Central Public Sector Undertaking (CPSU), State Utilities/ Discoms/ Transcos/ Gencos/ Corporations, Joint Sector Companies which are not loss making.
Minimum loan amount	<ul style="list-style-type: none"> Rs. 50 lakh
Type of projects considered for term loans	<ul style="list-style-type: none"> Replacement / retrofit of selected equipment with energy efficient equipment Modification of entire manufacturing processing Recovery of waste heat for power generation
Incentive available	<ul style="list-style-type: none"> Rebate in central excise duty Rebate in interest rate on term loan Rebate in prompt payment of loan instalment
Interest rate	<ul style="list-style-type: none"> 10.60% to 11.90% depending upon the grading of the applicant with prompt payment rebate of 15 bps if payment is made on / before due dates Interest rates are floating and would be reset on commissioning of the project or two years from the date of first disbursement. Thereafter, the rates will be reset after every two years. Rebate of 0.5% in interest rates are available for projects set up in North Eastern States, Sikkim, J&K, Islands, Estuaries. Rebates of 0.5% in interest rates are also available for projects being set up by SC/ST, Women, Ex Servicemen and Handicapped categories involving project cost of upto Rs. 75.00 lakh.
Loan	Upto 70% of the total project cost. Promoter's contribution should be Minimum 30% of the total project cost
Maximum debt	3:1

equity ratio	The project cash flow should have a minimum average Debt Service Coverage Ratio of 1.3
Maximum repayment period	12 years with moratorium of maximum 12 months
Procurement procedures	The borrower is required to follow the established market practices for procurement and shall demonstrate that the quality goods and services are being purchased at reasonable and competitive prices. Wherever the loan is sanctioned against international lines of credit such as the World Bank, Asian Development Bank, KfW, etc., the relevant procedures will have to be followed and requisite documents will have to be submitted by the borrower

Small Industries Development Bank of India (SIDBI) has several schemes and focused lines of credit for providing financial assistance for energy efficiency and cleaner production projects for SMEs. Highlights of some of the major financial assistance schemes/projects managed by SIDBI are given in table 6.4.

Table 6.4: Major EE financing schemes/initiatives of SIDBI

End to End Energy Efficiency (4E) Program	<p>Support for technical /advisory services such as:</p> <ul style="list-style-type: none"> • Detailed Energy Audit • Support for implementation • Measurement & Verification <p>Financing terms:</p> <ul style="list-style-type: none"> • Terms loans upto 90% • Interest rate upto 3% below normal lending rate.
TIFAC-SIDBI Revolving Fund for Technology Innovation (Srijan Scheme)	<p>To support SMEs for up-scaling and commercialization of innovative technology based project at flexible terms and interest rate.</p> <p>Preference accorded to sustainable technologies / products. Soft term loan with an interest of not more than 5%.</p>
Partial Risk Sharing Facility for Energy Efficiency (PRSF) Project (supported by World Bank)	<p>Sectors covered:</p> <ul style="list-style-type: none"> • Large industries (excluding thermal power plants) • SMEs • Municipalities (including street lighting) • Buildings <p>Coverage:</p> <ul style="list-style-type: none"> • The minimum loan amount Rs 10 lakh and maximum loan amount of Rs 15 crore per project. • The extent of guarantee is 75% of the loan amount
JICA-SIDBI Financing Scheme	<ul style="list-style-type: none"> • The loan is used to provide SMEs with funds necessary to invest in energy-saving equipment (and some medical equipment) in the form of two-step loans through SIDBI or three-step loans through intermediary financial institutions.

	<ul style="list-style-type: none"> • Project uses an Energy Saving Equipment List approach • Equipment/machinery with energy saving potential less than 10% is not eligible. • Interest rate: As per credit rating and 1% below the normal lending rate • Separate technical assistance component which is used for wetting of loan applications, holding seminars to raise awareness of energy saving among SMEs and to improve the ability of financial institutions to screen loan applications for energy-saving efforts
KfW-SIDBI Financing Scheme	<p>Coverage</p> <ul style="list-style-type: none"> a) SMEs for energy efficiency projects b) SMEs and clusters for cleaner production and emission reduction measures, waste management and Common Effluent Treatment Plant (CETP) facilities <p>Interest rate</p> <p>As per credit rating and 1% below the normal lending rate</p> <p>Eligible criteria</p> <p>3 t CO₂ emission reduction per year per lakh invested</p> <p>List of eligible equipment/technology and potential suppliers developed for guidance</p>

State Bank of India (SBI) has been provided a green line of credit by Japan Bank for International Cooperation (JBIC) for financing of energy efficiency investments. Highlights of the line of credit are given in table 6.5.

Table 6.5: JBIC-SBI Green Line

<p><u>Key Features</u></p> <ul style="list-style-type: none"> • Amount : USD 90 million • Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment) <p><u>Eligibility Criteria</u></p> <ul style="list-style-type: none"> • Projects contributing to preservation of global environment, i.e. significant reduction of GHG emissions • Acceptance of JBIC-MRV (“J-MRV”) by the project proponent in terms of the numerical effect of the environment preservation. To ensure effective GHG reduction emissions in Green financed projects, JBIC reviews such effects through simple and practical Measurement Reporting Verification (MRV) process both in (a) prior estimation and (b) ex-post monitoring. • Procurement in line with the “Guidelines for Procurement under Untied Loans by Japan Bank for International Cooperation”
--

Canara bank has a dedicated scheme for financing EE investment among SME sector as mentioned in table 6.6.

Table 6.6: Canara bank scheme of EE SME loans

Purpose	For acquiring/adopting energy conservation/savings equipment/measures by SMEs
Eligibility	Units under Small and Medium Enterprises Cost of energy for the unit should constitute not less than 20% of the total cost of production Unit should possess energy audit report issued by an approved energy Consultant/Auditor. Borrowal a/cs-ASCC code S1 or S2 during previous review. Current account holders having dealings exclusively with us satisfactorily for a period of last one year
Maximum loan	Maximum Rs 100 lakhs in the form of term loan
Security	Prime: Assets created out of loan Collateral: Upto Rs.5 lakhs – NIL Above Rs.5 lakhs, as determined by the bank
Repayment	Maximum 5-7 years including moratorium of 6 months
Guarantee cover	Cover available under CGMSE of CGTMSE available for eligible loans
Margin	10% of the project cost
Rate of interest	1% less than the applicable rate
Upfront fee	1% of the loan
Insurance cover	Assets acquired and charged as security to Bank to be insured
Special offer, if any	Grants : Bank provides 25% of the cost of Energy Audit / Consultancy charges with a maximum of Rs 25000/- to the first 100 units on a first come first served basis which is in addition to the grant of Rs 25000/- being provided by IREDA(First 100 units)



Among the private sector banks in India, Yes Bank is also active in financing of renewable energy and energy efficiency projects. The bank has an MOU with SIDBI for providing funding for EE through PRSF.



Most commercial banks charge interest rate between from 11% to 13% from MSMEs depending upon general criteria such as credit ratings, references, past lending record, balance sheet for last 3 years and so on. Interest rebate is offered for a few customers whose collateral value is around 125% of the loan amount. Further 0.5% concession in interest rate was offered to women entrepreneurs

Annexures

Annexure 1: Budgetary offers / quotations

Quotation 1: Aakash Powertech Pvt. Ltd.

 aakash powertech pvt. ltd. power channelling solutions		AAKASH POWERTECH PVT.LTD				 hindustan ELECTRIC MOTORS			
Express Zone, A- Wing, Unit No. 501-505, W E Highway, Malad (E), Mumbai -400097 Tel No:- 61441600 , Fax No:- 61441650 Email:- info@aakashpower.com									
HINDUSTAN IE3 induction motors suitable for 415V±10%, 50Hz±5%, combined ±10%, 3 phase supply, foot mounted (B3 construction), ambient temperature 50°C, TEFC, Class 'F' insulation, IP55 protection, continuous rated (S1 duty) with bare shaft & key as per IS: 325 / IEC: 60034-1.									
KW	HP	Frame	Type Designation	Price	KW	HP	Frame	Type Designation	Price
2 Pole, 3000 RPM					4 Pole, 1500 RPM				
0.37	0.5	71	IE3	5150	0.37	0.5	71	IE3	5440
0.55	0.75	71	IE3	6710	0.55	0.75	80	IE3	7120
0.75	1	80	IE3	6930	0.75	1	80	IE3	7230
1.1	1.5	80	IE3	7570	1.1	1.5	90S	IE3	8920
1.5	2	90S	IE3	8670	1.5	2	90L	IE3	10840
2.2	3	90L	IE3	11140	2.2	3	100L	IE3	12910
3.7	5	100L	IE3	14290	3.7	5	112M	IE3	16360
5.5	7.5	132S	IE3	22580	5.5	7.5	132S	IE3	22720
7.5	10	132S	IE3	23370	7.5	10	132M	IE3	26860
9.3	12.5	160M	IE3	37820	9.3	12.5	160M	IE3	43340
11	15	160M	IE3	40840	11	15	160M	IE3	43340
15	20	160M	IE3	47840	15	20	160L	IE3	52850
18.5	25	160L	IE3	61490	18.5	25	180M	IE3	67640
22	30	180M	IE3	68210	22	30	180L	IE3	74080
30	40	200L	IE3	101450	30	40	200L	IE3	102200
37	50	200L	IE3	123180	37	50	225SX	IE3	119520
45	60	225M	IE3	158520	45	60	225MX	IE3	144870
55	75	250M	IE3	213420	55	75	250MX	IE3	199100
75	100	280S	IE3	266540	75	100	280SX	IE3	242300
90	120	280M	IE3	307470	90	120	280MX	IE3	282250
110	150	315S	IE3	388360	110	150	315SX	IE3	341860
125	170	315M	IE3	443700	125	170	315MX	IE3	379190
132	180	315M	IE3	477310	132	180	315MX	IE3	400580
160	215	315L	IE3	522850	160	215	315LX	IE3	506660
180	240	315L	IE3	550430	180	240	315LX	IE3	547660
200	270	315L	IE3	610440	200	270	315LX	IE3	570530
225	300	355S	IE3	645970	225	300	355SX	IE3	704340
250	335	355M	IE3	683760	250	335	355MX	IE3	703880
275	370	355L	IE3	723880	275	370	355LX	IE3	761080
315	425	355L	IE3	741290	315	425	355LX	IE3	816900

 aakash powertech pvt. ltd. power channelling solutions		AAKASH POWERTECH PVT.LTD		 hindustan ELECTRIC MOTORS	
Express Zone, A- Wing, Unit No. 501-505, W E Highway, Malad (E), Mumbai -400097 Tel No:- 61441600 , Fax No:- 61441650 Email:- info@aakashpower.com					
HINDUSTAN IE3 induction motors suitable for 415V±10%, 50Hz±5%, combined ±10%, 3 phase supply, foot mounted (B3 construction), ambient temperature 50°C, TEFC, Class 'F' insulation, IP55 protection, continuous rated (S1 duty) with bare shaft & key as per IS: 325 / IEC: 60034-1.					
KW	HP	Frame	Type Designation	Price	
6 Pole, 1000 RPM					
0.37	0.5	80	IE3	7560	
0.55	0.75	80	IE3	7750	
0.75	1	90S	IE3	8960	
1.1	1.5	90L	IE3	9580	
1.5	2	100L	IE3	14720	
2.2	3	112M	IE3	15550	
3.7	5	132S	IE3	22910	
5.5	7.5	132M	IE3	28180	
7.5	10	160M	IE3	42010	
9.3	12.5	160L	IE3	46980	
11	15	160L	IE3	51710	
15	20	180L	IE3	67550	
18.5	25	200L	IE3	96470	
22	30	200L	IE3	96470	
30	40	225MX	IE3	148440	
37	50	250MX	IE3	199630	
45	60	280SX	IE3	239120	
55	75	280MX	IE3	274590	
75	100	315SX	IE3	327750	
90	120	315MX	IE3	410120	
110	150	315MX	IE3	457320	
125	170	315LX	IE3	506820	
132	180	315LX	IE3	533860	
160	215	315LX	IE3	555880	
180	240	355MX	IE3	679090	
200	270	355MX	IE3	679090	
225	300	355LX	IE3	743430	
250	335	355LX	IE3	743430	

Effective from 16.11.2017

Annexure 2: Instruments used

Instruments	Model/ Make	Application	Accuracy
Power analysers	Fluke: 435, Fluke: 43B,	Electrical Parameters Harmonics analysis, power logging	$\pm 0.5\%$
Thermal imager	875-2/Testo	Surface Temperature & Image	$\pm 2\%$