Impact Assessment of KISEM supported by Kotak Mahindra Bank Limited

Kotak - IIT Madras Save Energy Mission (Project ID: KMBL202122044)

April 2025

Table of contents

Introduction

The introduction includes an executive summary, providing a concise overview of the report's objectives and scope.

Methodology

The methodology outlines the approach taken, incorporating sampling methods for stakeholder interaction.

Findings

The findings present a detailed analysis of the data collected, highlighting key trends and insights from the study.

Recommendations

The conclusion chapter highlights recommendations and way-forward basis key findings of the study.

Ethical Consideration

Informed consent: The interviews were done after the respondents gave their consent. Even after the interviews were completed, their permission was sought to proceed with their responses.

Confidentiality: The information provided by participants has been kept private. At no point were their data or identities disclosed. The research findings have been quoted in a way that does not expose the respondents' identities.

Comfort: The interviews were performed following the respondents' preferences. In addition, the interview time was chosen in consultation with them. At each level, respondents' convenience and comfort were considered.

Right to reject or withdraw: Respondents were guaranteed safety and allowed to refuse to answer questions or withdraw during the study.

Abbreviations

Abbreviations	Full Form
CSR	Corporate Social Responsibility
FGD	Focused group discussion
KISEM	Kotak - IIT Madras Save Energy Mission
KMBL	Kotak Mahindra Bank Limited
MCA	Ministry of Corporate Affairs
M&E	Monitoring and Evaluation
OECD-DAC	Organisation for Economic Co-operation and Development - Development Assistance Committee
UNSDG	United Nations Sustainable Development Goals

Project Details

Program ID	KMBL202122044
Year of Implementation	FY 2021-22
Program Duration	FY 2021-22 to FY 2022-23
Partner Organization	IIT Madras
Location	PAN India

Executive Summary

A sustainable environment is crucial for the well-being of all living organisms. It involves managing and conserving natural resources like water, air, soil, and biodiversity to ensure their availability for future generations. Human activities can lead to resource depletion, pollution, and habitat destruction, highlighting the need for sustainability.

Greenhouse gases (GHGs) result in climate change, which leads to various issues such as rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events. Electricity consumption is responsible for significant GHG emissions, accounting for approximately 24% of total emissions in 2022. Therefore, energy efficiency assumes great importance in mitigating these emissions and promoting a sustainable future. Kotak Mahindra Bank Limited (KMBL) has taken extensive measures to support environmental sustainability through its CSR program known as the Kotak - IIT Madras Save Energy Mission.

KMBL undertook an independent third-party impact assessment of the KISEM project for FY 2021-22 to 2022-23. The assessment involved consultations with stakeholders, including Energy auditors and SMEs.

Key findings from the study are as follows:

- The energy audit exercise was widely perceived as beneficial by the SMEs, with 79 percent reporting enhanced knowledge and practical information about energy practices. While some recommendations from the energy audit exercise were implemented, some recommendations were not implemented primarily due to cost implications.
- The motivations for participating in the energy audit were diverse. 56 percent of participants aimed to reduce energy bills, 38 percent sought to improve energy efficiency and 6 percent aspired to enhance sustainability in their organizations.
- Regarding willingness to pay for energy audit, 35 percent of participants would join depending on the cost, another 35 percent would still participate regardless the cost, 26 percent would not participate if it was not free, and 3 percent were unsure.
- Interestingly, while the feasibility of the recommendations was noted (with 82 percent finding the recommendations to be realistic and feasible, 15 percent somewhat feasible, and 3 percent did not know), as high as 60 percent respondents reported to face challenges in ensuring successful implementation, including difficulties in savings identification and quantification, 50 percent cited a lack of financing, 25 percent insufficient technical expertise, and 25 percent resistance or lack of awareness among employees.

01
Introduction

Introduction

1. Background

Established in 1985, Kotak Mahindra Group is one of India's leading financial services conglomerates. It aspires to be a trusted partner and contribute towards the economic, environmental, and social growth of the nation. The group is also committed to contributing towards the United Nations' (UN) Sustainable Development Goals (SDGs). The bank has a strong focus on CSR initiatives and believes in giving back to society. This sets out its vision, mission, governance, and CSR focus areas to fulfill its inclusive growth agenda in India. Under its CSR program, Kotak Mahindra Bank has committed significant funding for promoting a sustainable environment in India, recognizing its importance for the social and economic development of the country.

As part of its environmental initiative, Kotak Mahindra Bank partnered with the Industrial Energy Assessment Cell (IEAC) at the Indian Institute of Technology (IIT) Madras to support the energy assessment and sustainability study report under the project name 'Kotak - IIT Madras Save Energy Mission.' The bank's CSR support provides funds, instruments, training, and other resources to KISEM to help them efficiently carry out the assessment.

The Kotak - IIT Madras Save Energy Mission, established in 2018, operates with the motto of "research and technological service to the nation towards sustainable energy and resource management." As part of its mission, the center conducts walk-through and detailed energy assessments in typical process industries. These assessments aim to explore, evaluate, and recommend hidden potentials for reducing specific energy consumption in all possible ways.

This report aimed to assess the impact of Kotak Mahindra Bank Limited's Corporate Social Responsibility (CSR) funding for promoting a sustainable environment through its support to the Kotak - IIT Madras Save Energy Mission. The first chapter provides an overview of Kotak Mahindra Bank Limited, the Kotak - IIT Madras Save Energy Mission, the global and local context in energy conservation, and the need for such programs in India.

2. Global and local context

The pursuit of energy conservation and sustainable growth is universally recognized as an admirable goal. Across various sectors, there is a growing commitment to implementing energy conservation measures. Personnel in these sectors are increasingly keen to explore and adopt opportunities to conserve energy, minimize waste, and reduce overall operational costs.

Introduction

Global energy consumption peaked at approximately 620 exajoules in 2023, with the Asia Pacific region consuming nearly 50% of this amount. Improvements in energy efficiency have been a significant driver in reducing energy consumption and greenhouse gas emissions. The United Nations' Sustainable Development Goals (SDGs) track progress towards sustainable development.

1.3 Need for energy audits program India

Greenhouse gases (GHGs) result in climate change (CC), which leads to various issues such as rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events. These changes have far-reaching impacts on ecosystems, agriculture, water resources, and human health. Electricity consumption is responsible for significant GHG emissions, accounting for approximately 24% of total emissions in 2022. This is primarily due to the burning of fossil fuels for power generation, which releases large amounts of carbon dioxide (CO_2) and other GHGs into the atmosphere.

Given the substantial contribution of electricity consumption to GHG emissions, improving energy efficiency becomes crucial. Energy efficiency measures can significantly reduce the amount of energy required to perform the same tasks, thereby lowering GHG emissions. For instance, energy-efficient appliances, lighting, and industrial processes can reduce energy consumption and emissions without compromising performance.

Energy audits play a vital role in achieving energy efficiency. They involve a systematic evaluation of energy consumption patterns within a facility or organization. By identifying areas where energy is being wasted, energy audits provide actionable recommendations to enhance efficiency. These recommendations may include upgrading equipment, optimizing operational practices, and implementing energy management systems. By adopting these measures, organizations can reduce their energy consumption, lower their carbon footprint, and contribute to a more sustainable future.

Addressing the challenges posed by climate change requires a multifaceted approach, with energy efficiency being a key component. Through energy audits and the implementation of recommended measures, significant progress can be made in reducing GHG emissions and promoting environmental sustainability

Source: Global energy consumption - statistics & facts | Statista
Sustainable Development Report 2024
Energy Auditors | BUREAU OF ENERGY EFFICIENCY, Government of India, Ministry of Power

1.4 Why impact assessment?

To ensure transparency and accountability, Rule 8(3) of the CSR Rules mandates impact assessments for companies with a CSR obligation exceeding ₹10 crore in the three preceding financial years and for individual CSR projects with an outlay of ₹1 crore or more. The assessment must be conducted by an independent agency, ensuring an unbiased evaluation of the project's effectiveness.

Furthermore, companies are required to disclose impact assessment findings in their annual CSR report as part of the Board's Report, demonstrating the measurable social impact of their initiatives. Compliance with these regulations ensures that CSR initiatives contribute meaningfully to societal well-being while preventing tokenism or ineffective allocation of funds.

Ultimately, conducting impact assessments is not just a compliance requirement but a strategic tool for improving the efficiency, effectiveness, and accountability of CSR initiatives. It helps companies demonstrate the tangible impact of their social investments, strengthens stakeholder trust, and contributes to long-term sustainable development.

02
Methodology

Methodology

1. Approach

The study followed mixed-methods approach, which incorporated both quantitative and qualitative data collection and analysis methods. The study was conducted through a combination of literature review, surveys, focused group discussion, and interviews with key stakeholders.

The research began with a review of existing literature on the topic, to gain a thorough understanding of the current state of knowledge and identify any gaps or areas for further investigation. This was followed by the development of a survey instrument to gather quantitative data from a sample population. The survey was designed to elicit information on the participants' experiences, attitudes, and behaviors related to the thematic area.

Lastly, a series of interactions were conducted with key stakeholders, including energy auditors and SMEs. These interviews were semi-structured, and allowed for in-depth exploration of the assessment topic, as well as the opportunity to gain insights into emerging trends and best practice.

2. Methodology

Following were the main components of the study:

Methodology

Literature review 	A thorough examination of existing literature was carried out, incorporating both academic and industry sources. This process entailed a systematic search through relevant databases, publications, and publicly accessible industry sources.
Survey design 	A survey tool was created in alignment with the research questions and objectives. It was structured to gather both quantitative and qualitative data and underwent pre-testing before being distributed
Survey distribution 	KPMG resource personnel conducted the survey using an online tool for data collection. Respondents were chosen through a combination of random and purposive sampling methods to ensure a diverse and representative sample
Data collection 	Structured and semi-structured interviews were conducted with key stakeholders to gain insights into emerging trends and best practices. Data related to enterprise energy consumption, energy bills, and revenue were collected. The interviews were then analyzed using thematic analysis
Data analysis 	Quantitative data collected through the survey were analyzed. Qualitative data collected through the survey and interviews were analyzed using thematic analysis to identify patterns and themes in the data.
Synthesis 	The data gathered from the literature review, survey, and interviews were synthesized to form a comprehensive understanding of the assessment topic. This process included identifying key themes and trends, as well as examining any inconsistencies or gaps in the data
Reporting 	The findings of the research project are detailed in this comprehensive final report, which includes a summary of the results and recommendations for future assessments and improved practices.

2.3 Data collection tools

Based on the discussion with the KMBL team and with the objective of evaluating the project's total influence, it was decided to conduct interviews with stakeholders. Given the sensitive nature of the subject, purposive sampling method was utilized to ensure timely coverage diverse sample.

Given below was the list of tools utilized for primary data collection and engaging with key stakeholders:

Identified stakeholders	Sample covered	Tools utilized
Energy Auditors	5	• Structured questionnaire • Focused group discussions
SME qualitative	11	• Semi-structured questionnaire
SME quantitative	34	• Structured checklist

Structured checklist was used to collect quantitative data, enabling to draw objective conclusions about the relationships between variables in this assessment. The key respondents of the interview were Energy auditors and SMEs; and the purpose of this interview was to assess and measure the overall impact, among other parameters.

1.5 Limitations of the study

- Supporting documentation required to validate the calculated emission intensity was not available. This limited the ability to verify the accuracy and reliability of the reported figures.
- Due to absence of documentary evidence to confirm the incorporation of recommendations provided by IIT Madras, the extent to which these recommendations were adopted or their subsequent impact could not be assessed.
- The data received from SMEs exhibited significant gaps and inconsistencies, with its structure often misaligned with the requirements for conducting a comprehensive impact analysis. Although some graphical representations suggested a reduction in energy emissions, others failed to show consistent trends, further complicating efforts to establish a clear and reliable connection between the energy audit interventions and the observed outcomes.

03
Findings

3.1 Inclusiveness

KISEM audit eligibility criteria:

The KISEM Audit outlined specific eligibility criteria based on annual energy bills and regional coverage by various IITs. For organizations using only electricity as their energy source, the monthly electricity consumption ranged between 5,00,000 to 12,00,000 units, with an annual energy bill between INR 3 crores to 10 crores For those using both electricity and fuel in a 70:30 ratio, the monthly electricity consumption ranged between 3,50,000 to 8,50,000 units, with annual energy bills ranging from INR 2 crores to 6 crores for electricity and INR 2 crores to 4 crores for fuel, totaling INR 4 crores to 10 crores.

The audit regions were divided among various IITs: IIT Madras covered Tamil Nadu, Pondicherry, Kerala, and Southern Karnataka; IIT Bombay covered Maharashtra, Goa, and Northern Karnataka; IIT Indore covered Madhya Pradesh, Eastern Rajasthan, and Southern UP; IIT Gandhinagar covered Gujarat and Southern Rajasthan; and IIT Ropar covered Punjab, Haryana, Himachal Pradesh, Uttarakhand, and Northern Rajasthan.

Additionally, the enterprises were selected across various geographic locations and industrial sectors, majority being in engineering, followed by textile, auto parts, printing and packaging, plastic goods, cold storage, and chemicals. This broad inclusion ensures that diverse industries and regions benefit from the program, promoting a more balanced and comprehensive approach towards achieving the energy efficiency.

Industry standard instruments used by energy auditors:

- Power quality analyzer - Krykard/Haioki/Fluke
- Power Clamp Meter - Fluke/Krykard
- Lux Meter - Fluke
- Tachometer - Fluke
- Power Logger - Fluke/Haioki
- Acoustic Imager - Fluke
- Air Flow Meter - VF
- Ultrasonic Water flow meter - Flexim
- Vane anemometer – Testo

Cost of Energy Audits 20230605100.pdf

Findings

- Temperature Data Logger - Testo
- Phsycrometer - Testo
- Pitot tube manometer
- Flue gas analyzer - Kane/Testo
- Thermal Imager - Testo
- Ultrasonic Steam Trap Tester - Krone Marshall

Tachometer - Fluke

Power quality analyzer - Krykard/Haioki/Fluke

Power Logger - Fluke/Haioki

Thermal Imager - Testo

3.2 Relevance

Assessing willingness to pay for IIT's energy audit: participant perspectives (SME)

Among the sampled SME respondents it was noted that willingness to participate in the energy audit if it was not free of cost, varied responses were elicited. 35 percent of the respondents indicated that their participation would depend on the cost, suggesting that affordability was a crucial factor. Another 35 percent stated they would still participate, showing a strong commitment to the benefits of the audit regardless of the cost. However, 26 percent of the respondents mentioned they would not participate, if the audit was not free, highlighting the importance of price sensitivity of exercise for wider acceptance.

Alternative choices for energy audits: participant preferences beyond KISEM (SME)

Based on the feedback regarding alternative sources for conducting the energy audit it was noted that the majority of respondents (45 percent) stated they would have opted for a private consultancy firm. While 15 percent of the respondents were unsure about where they would have conducted the audit, reflecting some uncertainty or lack of knowledge about other available options. 18 percent were unsure or found the question not applicable, which may suggest reliance on IIT's reputation or a lack of consideration for alternatives. 12 percent would have turned to a government agency, showing trust in public sector services for such audits. Meanwhile, 9 percent would have considered other academic institutions, indicating a preference for academic rigor and research-based approaches.

3.2 Effectiveness

Effectiveness of energy audit exercise (SME)

Based on the feedback received from the participants regarding the Energy Audit exercise conducted by KISEM, majority of SMEs found the experience to be highly beneficial. Specifically, 79 percent of the respondents rated the exercise as "Very informative and useful," indicating that the audit provided significant value and insights. This positive response suggested that the participants gained substantial knowledge and practical information that they could apply to improve energy efficiency. On the other hand, 21 percent of the respondents found the exercise to be "Somewhat helpful."

While this indicated that there was room for improvement, it also showed that even those who were less enthusiastic still recognized some benefits from the audit.

However, Energy emission calculations show a moderate improvement across all the enterprises, this underscores the critical importance of reducing the electricity consumption and outcome of achieving lower emission intensity.

Emission Intensity calculations for SMEs:

Energy efficiency is the reduction of the share of energy input in production or achievement of the same production level with less energy. Thus, energy consumption can be saved considerably through appropriate measures, and efficient usage of energy can be a key concept in the fight against global warming. The main measure of energy efficiency is energy intensity that is often used to compare industries situations for fossil fuels. Energy intensity is calculated as the ratio of energy consumption to production per unit, implying that how much energy is used to produce a unit of output. This indicator also provides a general idea of a industrial structure, technology level, and the energy use performance.

Among the total enterprises selected for energy audit assessments for FY 2022-23, sample enterprises were chosen to assess energy intensity based on different sectors and lines of business, As part of stakeholder consultation, the sample enterprises were contacted to gather the necessary information related to energy consumption, fuel bills, production, and turnover for the preceding three financial years.

The selected enterprises for the energy audit assessments represent a diverse range of industries, showcasing the initiative's broad coverage. These enterprises span various sectors, including effluent water treatment, corrugated packaging, paper and craft manufacturing, metal production, plastic manufacturing, foundry operations, and chemical production.

The energy audits for various enterprises were conducted by IIT Madras, IIT Indore, IIT Ropar, IIT Bombay, and IIT Gandhinagar. These audits aimed to identify energy inefficiencies and recommend solutions to enhance energy efficiency and reduce carbon footprints.

The following enterprises responded with necessary information related to energy consumption, fuel bills, production, and turnover for the preceding three financial years. This comprehensive data collection was aimed towards thorough assessment of energy intensity and identification of potential areas for improvement.

Findings

Sr.no	Enterprise	District	State	Line of business
1	**12A**	Kanjampalyam	Tamil nadu	Effluent Water Treatment Industry
2	**13B**	Sriperumbudur	Tamil Nadu	Corrugated Boards & Boxes
3	**14C**	Dindigul	Tamil Nadu	Paper and Craft Manufacturing Mill
4	**17F**	Mohali	Punjab	Plastic Industry

Steps followed for calculation of Energy Intensity:

To calculate the production for each enterprise, data was collected on their output across different financial years.

The energy consumption for each enterprise was recorded in kilowatt-hours (kWh), the total energy consumption over the specified financial years was calculated. This involved summing up the annual energy consumption values for each enterprise. This method ensures consistency and accuracy in reporting energy consumption across different enterprises. To calculate the Carbon Footprint for each enterprise, the energy consumption data (in MWh) is multiplied by the emission factor provided by the CO2 database for the Indian power sector, which is 0.727 tCO2/MWh.

This emission factor represents the amount of CO2 emitted per megawatt-hour of electricity consumed. By applying this factor to the energy consumption data, the total CO2 emissions for each enterprise are determined.

To calculate the emission intensity for each enterprise, the total CO2 emissions (in tCO2) are divided by the production output (in units) for the corresponding period. This ratio provides the emission intensity, which indicates the amount of CO2 emitted per unit of production.

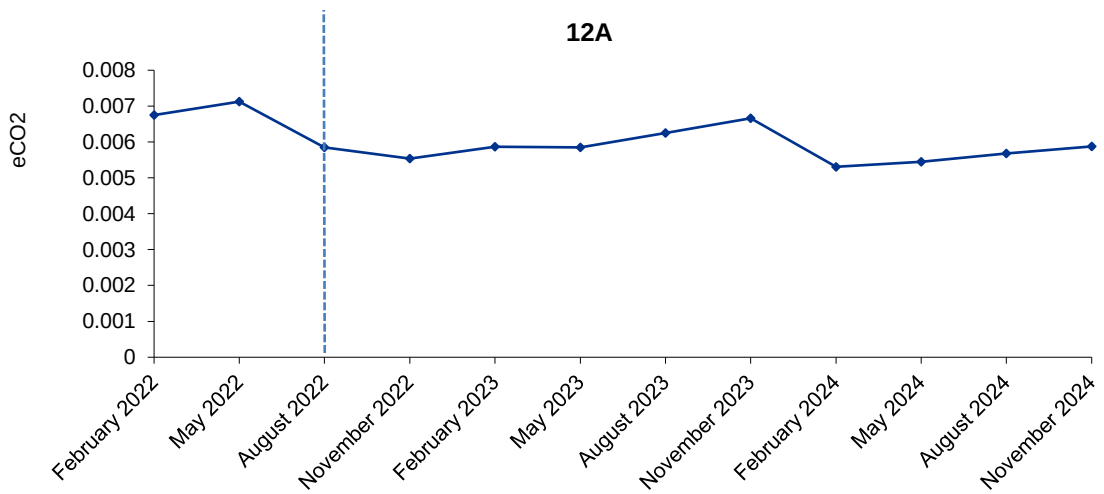
So essentially, energy intensity measures the amount of energy consumed per unit of production, offering insights into the efficiency of energy use in the production process. When the energy intensity decreases over time. This reduction indicates that the enterprise has become more energy-efficient, consuming less energy per unit of production.

By analyzing and comparing energy intensity, enterprises can identify opportunities to enhance energy efficiency. This approach helps in understanding the effectiveness of energy management practices and highlights areas where further improvements can be made to achieve greater sustainability.

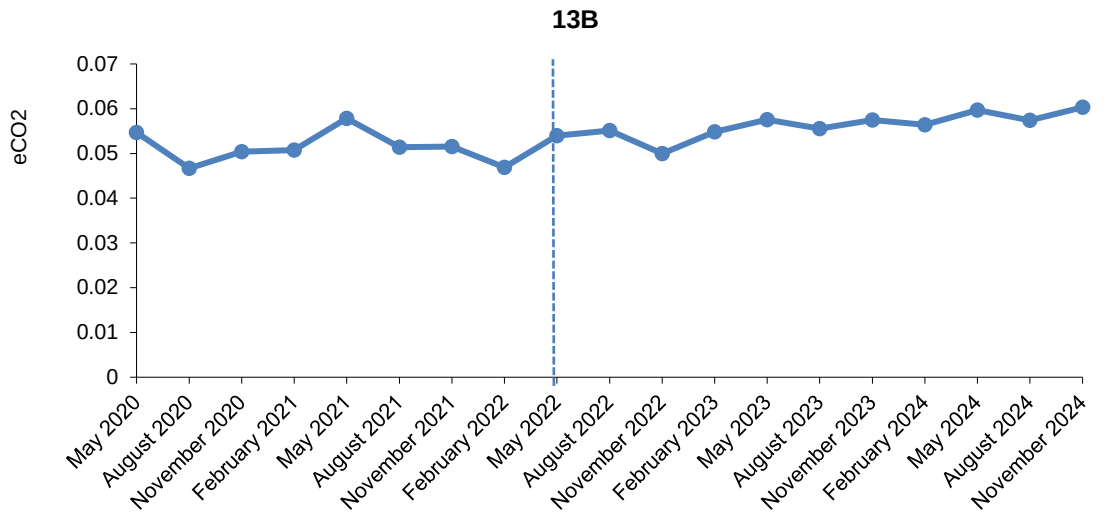
The line graphs illustrate the emission intensity trends for various companies over the observed periods. Graph 12A shows a clear trend starting from February 2022. After the energy audit in May 2022, there was a slight drop in emission intensity, suggesting better energy efficiency. However, the highest level of emission intensity was recorded in November 2023.

13B showed minor fluctuations in emission intensity values but remained relatively stable overall. The energy audit conducted in February 2023 provided a reference point for evaluating changes in emission intensity. The values continued to display minor fluctuations, indicating consistent energy efficiency practices.

14C exhibited significant fluctuations in emission intensity values before the energy audit in September 2022. After the audit, there was a slight decrease in emission intensity, suggesting improved energy efficiency. 17F experienced minor changes in their emission intensity reporting following the energy audit in May 2022.



Findings


13B
eCO2
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
May 2020
August 2020
November 2020
February 2021
May 2021
August 2021
November 2021
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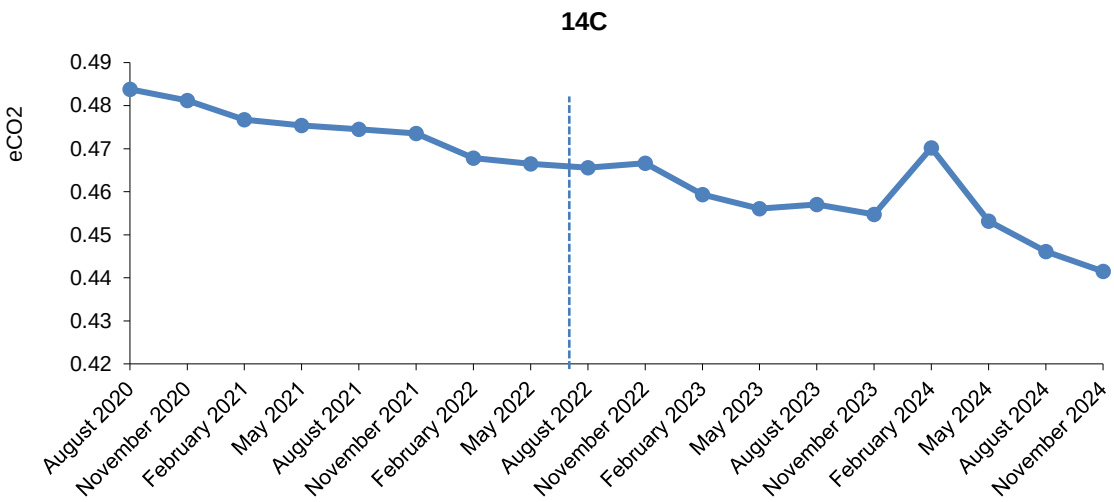
14C
eCO2
0.49
0.48
0.47
0.46
0.45
0.44
0.43
0.42
August 2020
November 2020
February 2021
May 2021
August 2021
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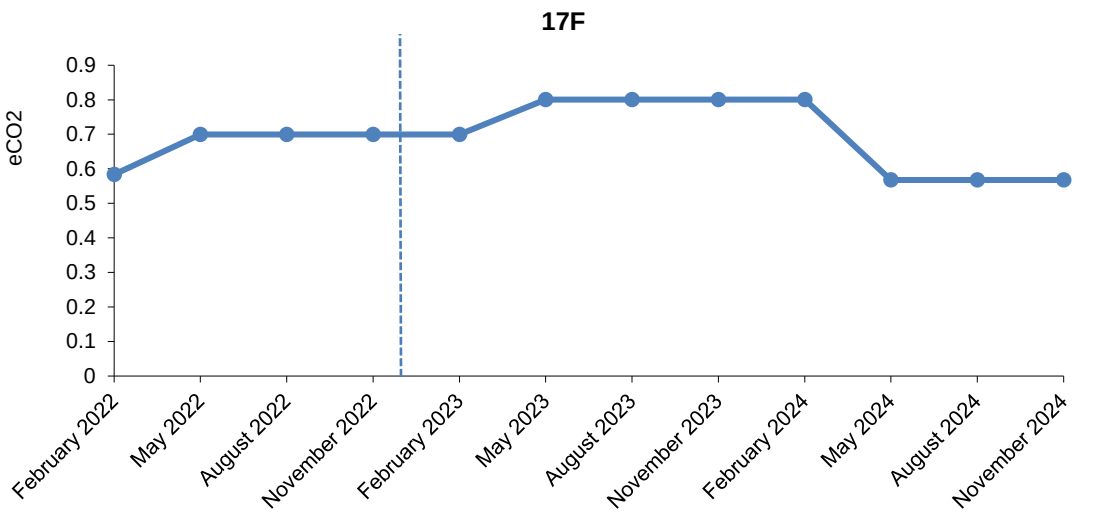

17F
eCO2
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
February 2022
May 2022
August 2022
November 2022
February 2023
May 2023
August 2023
November 2023
February 2024
May 2024
August 2024
November 2024

Findings

There is gradual increase in emission intensity, the level remained steady for about a year, indicating no major changes in energy efficiency during that time. Post May 2024, there was a noticeable drop in emission intensity, which then stayed stable through November 2024. This suggests that significant improvements in energy efficiency or emission control measures were likely implemented around mid-2024.

Overall, the emission intensity data for various companies reveals distinct trends and highlights the need for critical analysis and implementation of energy audit recommendations. Companies like 12A, 13B show relatively stable emission intensity values, while 14C demonstrates a gradual decrease, indicating effective emission management.

Challenges shared by SME in implementation measures:

The analysis highlighted several key challenges faced by SMEs in implementing energy efficiency measures. The most significant challenge, reported by 50 percent of the respondents, was the lack of access to financing or incentives. This indicated that financial constraints were a major barrier for SMEs when it came to adopting energy-efficient technologies and practices. Without adequate funding or incentives, SMEs struggled to invest in necessary upgrades and improvements.

Additionally, 25 percent of the respondents identified insufficient technical expertise or support as a challenge. This suggested that SMEs lacked the necessary knowledge and skills to effectively implement energy efficiency measures. Providing technical training and support could have helped bridge this gap and empowered SMEs to adopt sustainable practices.

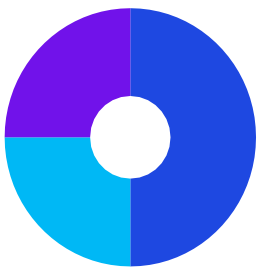
Another 25 percent of the respondents cited lack of awareness among employees as a challenge. This indicated the need for focused awareness sessions amongst the staff on the importance of energy efficiency measures

25%

Insufficient technical expertise or support as a challenge:

25%

Lack of awareness among employees:



50%

Lack of access to financing or incentives:

Challenges faced during Energy Audits as shared by the energy auditors

The analysis of the challenges faced in conducting the energy audit for SMEs revealed several key insights.

The most cited challenge included difficulty in accessing data or information from the SMEs. This indicated that obtaining accurate and comprehensive data from SMEs was a major hurdle in the energy audit process. While some respondents reported no challenges, suggesting that certain organizations were well-prepared and cooperative during the audit process, others highlighted an initial lack of participation from SMEs.

However, as the project progressed, there was a noticeable improvement in participation from energy-intensive industries that were also interested in implementing energy conservation measures. These industries benefited from the assessments, demonstrating the value of continued engagement and outreach.

Cost analysis of implementing energy audit recommendations: participant experiences: (SME)

Based on the feedback regarding the costs incurred in implementing the suggestions from the energy audit, the majority of respondents, 65 percent, reported costs above INR 1,00,000. This indicated that a significant portion of participants had to invest a substantial amount to implement the recommendations.

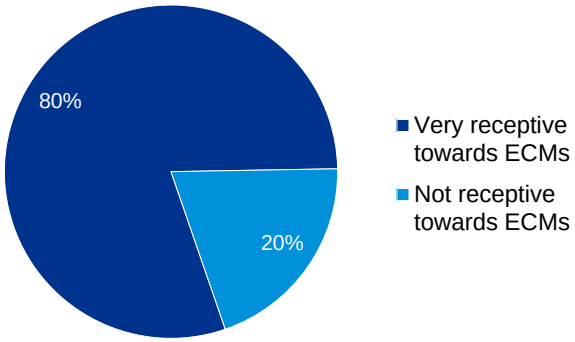
Additionally, 12 percent of the respondents incurred no cost, while 6 percent each reported costs up to INR 10,000 and between INR 10,000- 50,000. Meanwhile, 9 percent of the respondents did not know the costs, and 3 percent did not want to answer.

The majority of participants found it challenging to implement energy audit recommendations due to cost constraints. This highlights the need to explore financial support for SMEs for energy audits, conditional on implementing the findings within a specified timeframe. This approach would ensure the reduction in emission intensity, helping SMEs adopt energy-saving measures. By linking financial assistance to timely execution, SMEs can overcome financial barriers, promote sustainability, and contribute to broader environmental goals.

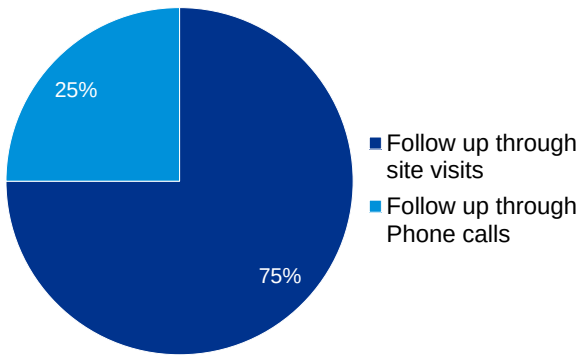
65%
reported costs above INR 1,00,000

Findings

Follow-up methods for ensuring implementation of energy efficiency measures in SMEs:



The SME respondents indicated that 80 percent of the them were very receptive to the energy audit recommendations. This suggested that a majority of the SMEs were open to implementing the suggested changes. However, 20 percent of the SMEs were not very receptive, indicating some resistance or challenges in adopting the recommendations.



The analysis indicated that 75 percent of the follow-up methods involved site visits, while 25 percent involved phone calls. This suggested that site visits were the most commonly used method for following up with SMEs to ensure the implementation of energy efficiency measures. Site visits allowed for direct observation and verification of the implemented measures, providing a more comprehensive assessment of the progress made by SMEs.

Phone calls, although less frequently used, still played a role in maintaining communication and providing support to SMEs. Combining both methods helped ensure that SMEs received the necessary guidance and assistance to successfully implement the recommended energy efficiency measures. Additionally, some respondents specified using all three methods - phone calls, site visits, and email communications - to follow up with SMEs. This comprehensive approach ensured continuous engagement and support for SMEs in their journey towards energy efficiency.

3.4 Coherence

Alignment with UNSDGs

The project's focus on promoting a sustainable environment through financing energy audits and is coherent with national and international priorities.

SDG 7: Affordable and Clean Energy

Energy audits play a crucial role in achieving SDG 7 by identifying opportunities to improve energy efficiency and reduce energy consumption. This aligns with the goal of ensuring access to affordable, reliable, sustainable, and modern energy for all. By pinpointing inefficiencies and recommending improvements, energy audits help organizations reduce their energy costs and reliance on non-renewable energy sources. This not only makes energy more affordable but also promotes the use of cleaner energy alternatives

SDG 9: Industry, Innovation, and Infrastructure

Energy audits encourage the adoption of innovative technologies and practices that enhance industrial energy efficiency and sustainability, aligning with SDG 9. They help industries upgrade their infrastructure to be more sustainable and resilient.

SDG 12: Responsible Consumption and Production

Energy audits support SDG 12 by promoting the efficient use of resources and reducing waste. They help organizations understand their energy consumption patterns and identify areas where energy use can be optimized. This leads to more sustainable consumption and production practices, reducing the environmental impact of industrial activities.

SDG 13: Climate Action

Energy audits are instrumental in combating climate change, which is the focus of SDG 13. By identifying ways to reduce greenhouse gas emissions and improve energy efficiency, energy audits help organizations lower their carbon footprint. This is critical in mitigating the impacts of climate change, as energy consumption is a major source of greenhouse gas emissions.

Alignment with National priorities – regulatory compliance for the customers

The Energy Conservation Act 2001 (hereafter referred to as EC Act 2001) was enacted on 29th September 2001. The EC Act 2001 empowers BEE to notify regulations regarding energy conservation and efficiency improvement. In accordance with the EC Act 2001, BEE notified the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit) Regulations, 2021, on 6 th October 2021. BEE subsequently amended these regulations with the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit) (Amendment) Regulations, 2022. The Ministry of Power (MoP) issued guidelines on 17thJanuary 2023, for energy accounting and auditing of distribution companies, in line with the BEE regulations. Distribution companies and energy audit firms must comply with this regulatory framework when preparing energy accounts and audit reports.

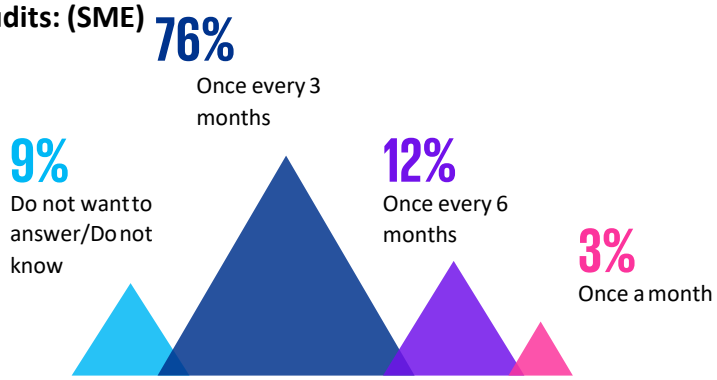
3.5 Sustainability

Feasibility of energy audit recommendations: (SME)

There is wide acceptance of the need for energy-efficient operations. However, there exists a modest gap between the acknowledgment of this need and the implementation of recommendations. For the sustainability of the intervention, it is suggested to spread more awareness about the role of energy audits in not just helping achieve Climate Action, but also in cost savings for wider acceptance. Additionally, exploring the feasibility of providing financial support to SMEs for energy audits, conditional on the implementation of findings in a time-bound manner, is crucial. Enhancing communication and transparency regarding the financial aspects of implementing energy efficiency recommendations is also important. Furthermore, providing additional support and resources to help SMEs overcome financial barriers and successfully implement energy-saving measures will ensure the effectiveness and sustainability of the intervention.

Frequency of follow-up after energy audits: (SME)

Based on the feedback regarding the frequency of follow-ups by IIT after the energy audit, the majority of respondents, 76 percent, indicated that IIT followed up once every three months. This suggests a quarterly follow-up schedule,



Source: Energy Audit regulatory compliance /beeindia.gov.in

which helps ensure that the recommended actions are being implemented and provides regular support to the participants. Additionally, 12 percent of the respondents reported that IIT followed up once every six months, indicating a biannual follow-up approach. A small portion, 3 percent, mentioned that IIT followed up once a month, showing a more frequent and proactive engagement. However, 6 percent of the respondents did not know how often IIT followed up, and 3 percent did not want to answer, indicating some uncertainty or reluctance to disclose this information.

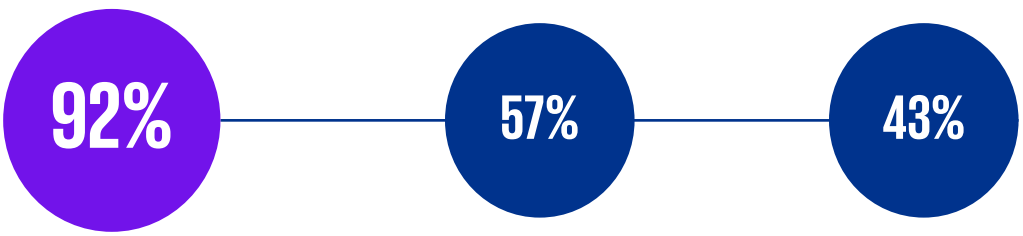
Measures to ensure accuracy and reliability of energy audit data: (Energy auditors)

To ensure the accuracy and reliability of the energy audit data, several measures were implemented. Experienced auditors conducted verification and cross-checking, while standardized measurement tools and techniques ensured consistent data collection. Regular quality checks and reviews further maintained data integrity. Additionally, leveraging the team's technical expertise and using Class A category standardized measurement instruments enhanced accuracy and reliability. These measures collectively contributed to the thoroughness and dependability of the energy audit assessments.

3.5 Impact

Implementation of the recommendations suggested by IITs

Based on the data received by the SMEs regarding the implementation of ECMs following insights were revealed.



92 percent of the total surveyed SMEs implemented the energy conservation measures.

57 percent of the ECMs implemented by the SMEs belong to the operational and maintenance of facility, which required periodic inspection.

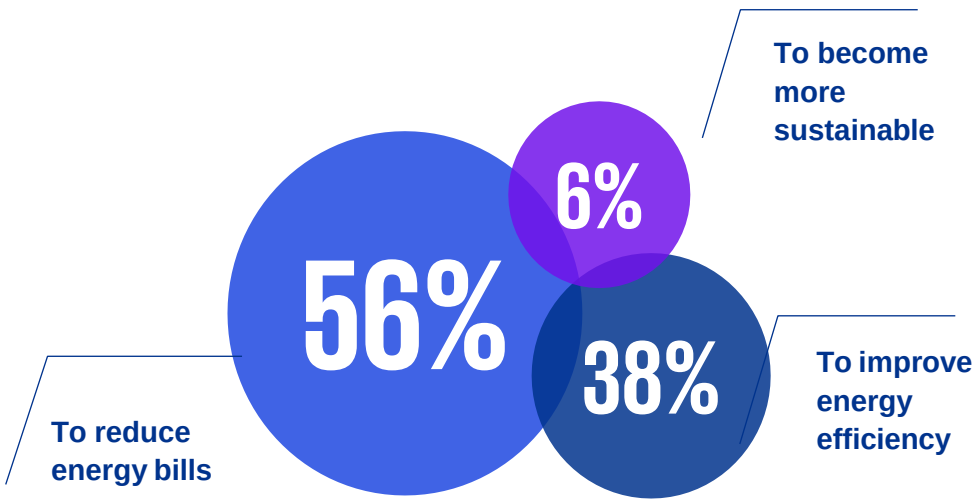
43 percent of the ECMs implemented by the SMEs belong to the replacement and installation of the parts and equipment's.

Motivations behind participating in energy audit: (SME)

Based on the feedback regarding the main reasons for participating in the Energy Audit exercise, the majority of respondents, 56 percent, aimed to reduce their energy bills. This highlighted a strong financial motivation among participants, indicating that cost savings was a significant driver for engaging in energy efficiency initiatives.

Additionally, 38 percent of the respondents participated to achieve energy efficiency. This showed a considerable interest in optimizing energy use and enhancing operational efficiency, which could lead to long-term benefits for the participants.

A smaller portion, 6 percent, joined the exercise to become more aligned with the sustainability goals. Although this was the least cited reason, it reflected a growing awareness and commitment to sustainable development goals among some participants.



Participant feedback and areas for improvement: (Energy auditors)

Based on the feedback received regarding areas of improvement for the energy audit exercise conducted by IIT, several key themes emerged. Participants expressed a need for continuous visits, even if chargeable, to ensure ongoing support and implementation of energy-saving measures. Some respondents highlighted difficulties in quantifying the savings achieved during the implementation of the recommendations due to lack of documentation.

Financial support for implementing the suggested energy conservation measures was a recurring theme. Many participants emphasized the importance of arranging financial assistance to help with the adoption of these measures. Additionally, there was a call for more innovative technology and expertise to reduce waste, improve resource efficiency, and enhance waste management processes.

04
Recommendations

Recommendations

Recommendations based on the stakeholder consultation:

Strengthening the onboarding of SMEs

- SME's with past 3 years of annual electricity bills and fuel bills should be considered during the onboarding process.
- Supporting documenting along with the energy consumption data should be obtained from SMEs, ensuring more responsive SME participate in the energy audits

Financial and technical support for implementation

- Arranging financial support for implementing energy conservation measures was suggested by the energy auditors.
- Provide technical training and support to SMEs to help them overcome challenges related to insufficient technical expertise or support.

Proper documentation and follow-up audits

- Conduct follow-up audits to assess the implementation of recommendations and ensure continuous improvement. Partner SMEs to share output numbers and energy/fuel bills to cross validate effectiveness of ECM.

Awareness and training

- To promote energy efficiency and sustainable practices among SMEs, it is essential to raise awareness among employees through targeted outreach and educational programs that highlight the benefits of energy conservation.
- Simultaneously, enhancing data collection processes by ensuring the accuracy and completeness of energy-related data from SMEs will support informed decision-making. This can be achieved by implementing standardized measurement tools and methodologies, along with conducting regular quality checks and audits to maintain the reliability and integrity of energy audit data.

References

1. Energy Ecology: Balancing Consumption and Conservation - Energy Ecology: Balancing Consumption and Conservation
2. What is the Sustainable Energy Transition and Why is it Key to Tackling Climate Change? - What is the sustainable energy transition and why is it key to tackling climate change? | UNDP Climate Promise
3. nergy Conservation: Concept and Approaches - Energy Conservation: Concept and Approaches | SpringerLink
4. IIT Madras Energy Consortium -Home - The Energy Consortium

Findings

Production per unit MT

Date	12A	13B	14C	17F
May 2020	0	751		0
August 2020	0	1108	2135	0
November 2020	0	1300	2032	0
February 2021	0	1561	2362	0
May 2021	0	1032	738	
August 2021	0	1406	2144	0
November 2021	0	1537	2303	0
February 2022	133491	1648	2201	61.7
May 2022	138874	1416	2202	70.1
August 2022	113520	1706	2388	107.3
November 2022	114596	1592	2179	92.4
February 2023	133094	1461	2209	81.1
May 2023	162350	1749	2096	71.3
August 2023	161019	1870	2342	64.0
November 2023	100248	1462	1795	75.1
February 2024	173888	1762	2186	72.1
May 2024	181057	1828	2002	91.6
August 2024	188738	1764	2341	79.1
November 2024	131585	1561	2218	90.6

Carbon Footprint (tCO2e)

Date	12A	13B	14C	17F
May 2020	0	41.035515	0	0
August 2020	0	51.712964	1032.71804	0
November 2020	0	65.53905	977.64052	0
February 2021	0	79.240092	1125.8322	0
May 2021	0	59.738317	350.76296	0
August 2021	0	72.279067	1017.18932	0
November 2021	0	79.187748	1090.81988	0
February 2022	900.758816	77.320085	1029.5774	36.003948
May 2022	989.449908	76.426602	1027.3964	49.037604
August 2022	663.640496	94.004735	1111.96104	75.116548
November 2022	634.39474	79.557791	1016.72404	64.676828
February 2023	781.210936	80.132121	1014.57212	56.7787
May 2023	949.755708	100.679322	956.09224	57.086948
August 2023	1007.0404	103.896297	1070.4348	51.22442
November 2023	668.159528	83.965592	816.30468	60.140348
February 2024	923.098072	99.35909	1027.71628	57.706352
May 2024	987.021728	109.113976	907.12152	51.992132
August 2024	1071.589276	101.224572	1044.4082	44.876256
November 2024	773.580344	94.121055	979.1236	51.433796

Emission intensity

Date	12A	13B	14C	17F
May 2020	0	0.054660016	0	0
August 2020	0	0.046678585	0.483796152	0
November 2020	0	0.050410311	0.481229111	0
February 2021	0	0.050778233	0.476715054	0
May 2021	0	0.057863931	0.475409026	0
August 2021	0	0.051398484	0.474501269	0
November 2021	0	0.05151783	0.473564314	0
February 2022	0.006747712	0.046910326	0.467847247	0.583912419
May 2022	0.007124803	0.053957699	0.466503658	0.699843754
August 2022	0.005846023	0.055106365	0.465548435	0.699843754
November 2022	0.005535924	0.049974303	0.466635904	0.699843754
February 2023	0.005869618	0.054830822	0.459345544	0.699843754
May 2023	0.005850051	0.057554194	0.456086469	0.800545138
August 2023	0.006254171	0.055548229	0.457024994	0.800545138
November 2023	0.006665066	0.057445915	0.454718213	0.800545138
February 2024	0.005308578	0.056400992	0.470194256	0.800545138
May 2024	0.005451442	0.059686767	0.453147942	0.567690067
August 2024	0.005677655	0.057394607	0.446124484	0.567690067
November 2024	0.00587894	0.060311586	0.441488354	0.567690067

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