Bureau of Energy Efficiency
Government of India, Ministry of Power

STATE ENERGY EFFICIENCY ACTION PLAN

TELANGANA

Prepared by
Confederation of Indian Industry

Supported by
State Designated Agency

श्रीकांत नागुलापल्ली, भा.प्र.से.
अपर सचिव, एमओपी एवं महानिदेशक, बीईई
SRIKANT NAGULAPALLI, IAS
Additional Secretary, MoP & Director General, BEE

सत्यमेव जयते

Azadi Ka Amrit Mahotsav

ऊर्जा दक्षता ब्यूरो
(विद्युत मंत्रालय, भारत सरकार)
BUREAU OF ENERGY EFFICIENCY
(Ministry of Power, Government of India)

Foreword

The Bureau of Energy Efficiency (BEE), under the Ministry of Power, Government of India, has been actively working to promote energy efficiency across various sectors of the Indian economy through initiatives like the National Strategic Plan for Energy Efficiency and the National Mission ROSHANEE. These efforts align with India's commitment to doubling its energy efficiency improvement rate by 2030, as declared at the G20 summit.

To harness the vast potential for energy efficiency in sectors such as industry, buildings, agriculture, and transport, the State Energy Efficiency Action Plan (SEEAP) has been developed. SEEAP aims to establish clear state-wise focus areas and develop actionable strategies to mainstream energy efficiency interventions.

This report provides valuable insights for policymakers, government agencies, and other stakeholders to implement effective programs and achieve India's climate goals. It also serves as a platform for knowledge sharing and scaling up energy efficiency activities nationwide.

I am pleased to announce that most States/UTs have formed State Level Steering Committees (SLSCs) under the leadership of Chief Secretaries. These committees will play a crucial role in developing mechanisms to implement the identified action plans.

I encourage all stakeholders to review this document and contribute their valuable feedback to further enhance its effectiveness in promoting energy efficiency at the state level.

October, 2024

(Dr. Srikant Nagulapalli)

चौथा तल, सेवा भवन, आर.के. पुरम, नई दिल्ली-110066 / 4th Floor, Sewa Bhawan, R.K. Puram, New Delhi-110 066
दूरभाष / Tel. : 91 (11) 26766701, 20867389, फैक्स / Fax : 91 (11) 20867396
ई-मेल / E-mail : dg-bee@nic.in, वेबसाईट / Website : www.beeindia.gov.in

Preface

The Bureau of Energy Efficiency (BEE) has been involved in numerous of efforts aimed at developing and implementing energy efficiency programmes. As part of this initiative, BEE has proposed the above assignment, which aims to provide technical assistance for the identification of focus sectors for the "State Energy Efficiency Action Plan" in various states/UTs, to ensure that resources are allocated in accordance with state/UT requirements, and to estimate the potential of energy conservation in sectors that are prevalent in the region. The "State Energy Efficiency Action Plan" is sought in two parts: a 5-year short-term strategy and a long-term plan aimed at high-impact energy efficiency by FY 2030.

All states/UTs are grouped into six zones for this assignment: North-East, East, North-1, North-2, West, and South. In this context, the Bureau of Energy Efficiency (BEE), with the assistance of the Confederation of Indian Industry (CII), was involved in identifying major energy guzzling sectors in the West and South Zones, as well as reviewing all existing policies related to energy conservation, which will be presented in the form of this report "State Energy Efficiency Action Plan."

Policymakers, planners, domain consultants, and other important stakeholders would benefit from the State Energy Efficiency Action Plan. The report will also allow knowledge exchange among stakeholders and, in the long run, will help to scale up energy-efficiency programmes in their respective states.

Acknowledgment

The Confederation of Indian Industry (CII) extends its heartfelt appreciation to Sri Syed Ali Murtaza Rizvi, IAS, Principal Secretary, Energy Department, Government of Telangana and Sri N. Janaiah, Vice Chairman & Managing Director, TGREDCO for their unwavering support and encouragement throughout the development of the State Energy Efficiency Action Plan.

We extend our sincere gratitude to the Bureau of Energy Efficiency (BEE), Ministry of Power, Govt. of India, for their invaluable guidance and leadership in steering this significant undertaking, the "State Energy Efficiency Action Plan" for Telangana. CII is indebted to Shri Srikant Nagulapalli, Director General BEE, and Shri Milind Deore, Secretary, BEE, for their overarching guidance and unwavering support, which were instrumental in the successful completion of this project. We would also like to express our appreciation to Shri Abhishek Sharma, Joint Director and Shri Vikash Kumar Jha, Project Engineer, who provided regular consultations, assistance, feedback, and invaluable insights throughout the project.

CII is grateful to the proactive management of Telangana Renewable Energy Development Corporation Ltd. (TGREDCO) for its role in guiding and steering this prestigious assignment and their support in coordination throughout the project. We would also like to mention Shri G.S.V Prasad, General Manager, and Shri T. Srinivasulu, Project Director, and his team from TGREDCO. Their efforts and significant contributions have played a pivotal role in the development of this report.

We are also profoundly thankful to all the stakeholder departments, department heads of Telangana, and the various nominated officers for their pivotal roles in the assessment of policy frameworks and data for their collaborative efforts have greatly enriched the content of this report.

Table of Contents

	Acknowledgment	**3**
	Table of Contents	**4**
	Glossary	**6**
	List of Figures	**8**
	List of Tables	**9**
	Executive Summary	**10**
	1 INTRODUCTION	**12**
1.1	Background	12
1.2	About State Energy Efficiency Action Plan	12
1.3	Telangana Profile	14
1.4	Current Energy Scenario	15
1.5	Total Final Energy Consumption (TFEC)	16
1.6	Overview of Institutional framework and stakeholder mapping-Energy	23
	2 IDENTIFICATION OF FOCUS SECTORS	**24**
2.1	Methodology for identifying focus sectors	24
2.2	Identified focus sectors	24
	3 ENERGY DEMAND PROJECTION	**26**
3.1	Total Final Energy Consumption (TFEC) Forecasting by FY 2030-31	26
3.2	Energy Scenarios	28
	4 FOCUS SECTOR 1: INDUSTRY	**32**
4.1	Overview	32
4.2	Energy efficiency strategies in the industry sector	37
4.2.1	Strategy #1: Deepening of PAT Scheme	37
4.2.2	Strategy #2: Widening of PAT Scheme	38
4.2.3	Strategy #4: Promotion of Green Rating for Industries	47
4.3	Energy saving potential of the sector & monitoring mechanism	48
	5 FOCUS SECTOR 2: TRANSPORT	**51**
5.1	Overview	51

5.2 Energy efficiency strategies in the transport sector 51
5.2.1 Strategy #1: Facilitating Electrification of Road Transport 52
5.2.2 Strategy #2: Adequate Public Transport 56
5.2.3 Strategy #3: Promotion of Ethanol Blending 62
5.3 Energy saving potential of the sector & monitoring mechanism 64

6 FOCUS SECTOR 3: BUILDINGS 67
6.1 Overview 67
6.2 Energy efficiency strategies in the buildings sector 67
6.2.1 Strategy #1: Implementation of ENS 68
6.2.2 Strategy #2: Deepening of Standard & Labelling Programme 71
6.2.3 Strategy #3: BEE Star Rating of Buildings, Green buildings 75
6.3 Energy saving potential of the sector & monitoring mechanism 80

7 FOCUS SECTOR 4: AGRICULTURE 82
7.1 Overview 82
7.2 Energy efficiency strategies in the agriculture sector 82
7.2.1 Strategy #1: Transition of electrical pumps to solar powered pumps 82
7.2.2 Strategy #2: Replacement of inefficient pumps with BEE 5 Star Rated Pumps along with smart control panel 84
7.3 Energy saving potential of the sector & monitoring mechanism 85

8 SUMMARY 87

9 INVESTMENT POTENTIAL 89

10 FINANCING MODELS FOR ENERGY EFFICIENCY 90
10.1 On bill financing model 90
10.2 Energy service companies (ESCOs) Model of financing 92
10.3 Dealer or retailer financing model 95
10.4 Leasing financing model 97
10.5 Utilization of green finance 98
10.6 Bulk Procurement model 99

11 WAY FORWARD 101

12 REFERENCES 102

Glossary

AgDSM	Agriculture Demand side management
ATF	Aviation Turbine Fuel
BEE	Bureau of energy efficiency
BPL	Below Poverty Line
CAGR	Compound annual growth rate
CEA	Central Electricity Authority
DDUGJY	Deendayal Upadhyaya Gram Jyoti Yojana
DISCOM	Distribution company
DSM	Demand side management
ECBC	Energy Conservation Building Codes
EE	Energy Efficiency
ESCO	Energy Service Company
FAME	Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India
FEEED	Framework for Energy Efficient Economic Development
FO	Furnace Oil
GHG	Green House Gases
HHS	Hot Heavy Stock
KMT	Kilo Metric Tonnes
KUSUM	Kisan Urja Suraksha Evam Utthaan Mahabhiyan
LDO	Light Diesel Oil
LPG	Liquefied Petroleum Gas
LSHS	Low Sulphur Heavy Stock
MNRE	Ministry of New and Renewable Energy
MoP	Ministry of Power
MoPNG	Ministry of Petroleum and Natural Gas
MoU	Memorandum of Understanding
MSME	Micro, Small and Medium Enterprises
MTOE	Million tonnes of Oil Equivalent
MWh	Megawatt Hour
MW	Mega Watt
NITI Aayog	National Institution for Transforming India

NMEEE	National Mission on Enhanced Energy Efficiency
PAT	Perform, Achieve and Trade
RES	Renewable Energy Sources (Includes Electric Generation due to (a) Wind (b) Biomass Power (c) Solar Power (d) Urban & Industrial Wastes & (e) Small Hydro Power Projects of capacity less than or equal to 25 MW.
SDA	State designated agencies
SKO	Superior Kerosene Oil
TFEC	Total Final Energy Consumption
ULB	Urban Local Bodies
UTILITIES	Utility means the electric lines or electrical plant, and includes all lands, buildings, works & materials attached thereto belonging to any person acting as a generating company or licensee under the provisions of the Electricity Act,2003.

List of Figures

Figure 1 Key tasks in state energy action plan 13
Figure 2 Task wise expected outcome of the study 14
Figure 3 Installed Capacity of Telangana 16
Figure 4 TFEC of the state 17
Figure 5 Distribution of Energy Source For The State For FY2020 17
Figure 6 Energy supplied by primary fuels from FY 2015-16 to FY 2019-20 18
Figure 7 CAGR Comparison of various fuels from FY2015-16 to FY2019-20 19
Figure 8 Electricity consumption of Telangana over a period of FY2016 to FY2020 20
Figure 9 CAGR between FY2016 to FY2020 21
Figure 10 5 Institutional infrastructures of Energy Sector of Telangana 23
Figure 11 Gross State Domestic Product (INR lakh crore) and Final Energy Consumption (Mtoe) 28
Figure 12 Description of key energy scenarios 28
Figure 13 Factors Influencing Scenarios 29
Figure 14 District-wise major industries 32
Figure 15 MSMEs in Telangana as of FY2020 35
Figure 16 Specific Energy Consumption 38
Figure 17 Specific Energy Consumption (SEC) for sectors (BaU, MOD and AMB scenarios) 40
Figure 18 Specific Energy Consumption 40
Figure 20 Parameters for green rating of industries 47
Figure 21 Energy saving potential from adequate public transport 58
Figure 22 Blending of Fuel In FY's 2026 & 2031 63
Figure 23 Replacement of appliances 72
Figure 24 Projected green buildings 77
Figure 25 District Cooling System (DCS) 79
Figure 26 No. of electrical pumps vs solar pumps projected for FY2031 83
Figure 27 Replacement with E.E pumps for FY 2031 85
Figure 28 Major common energy consuming appliances and equipment in buildings sector . 91
Figure 29 Modality of financing energy efficiency projects through on bill financing model 91
Figure 30 On bill financing structure 91
Figure 31 Guaranteed Saving Model 93
Figure 32 Shared ESCO saving Model 94
Figure 33 Dealer and retailer financing model 95
Figure 34 Leasing financing model 97
Figure 35 Bulk procurement model 99
Figure 36 List Of References 102

List of Tables

Table 1 Major industries categorized by their fuel consumption 33
Table 2: Energy Saving Potential 38
Table 3: Energy Saving Potential 41
Table 4 Action Plans- Short Term (FY 2025-2026) 41
Table 5 Action Plans- Long Term (FY 2030-2031) 42
Table 6 Summary of energy saving from the strategies in industry sector 48
Table 7 Monitoring mechanism for industry sector 48
Table 8: Classification of vehicles as on FY2022 52
Table 9 Fuel Wise Vehicle Categories as on FY2022 52
Table 10: Energy Saving Potential 54
Table 11 Action Plans- Short Term (FY 2025-2026) 55
Table 12 Action Plans- Long Term (FY 2030-2031) 56
Table 13: Energy Saving Potential 59
Table 14: Energy Saving Potential 63
Table 15 Summary of energy saving from the strategies in transport sector 64
Table 16 Monitoring mechanism for transport sector 64
Table 17: Energy Saving Potential 69
Table 18: Energy Saving Potential 72
Table 19: Energy Saving Potential 77
Table 20 Summary of energy saving from building strategies 80
Table 21 Monitoring mechanism for building sector 80
Table 22: Energy Saving Potential 83
Table 23: Energy Saving Potential 85
Table 24 Summary of energy saving from the strategies 85
Table 25 Monitoring mechanism for agriculture sector 86
Table 26 Summary of energy consumption reduction and emission reduction- sector wise 88
Table 27 Investment Potential 89
Table 28 Various Risk in ESCOs Models 95

Executive Summary

India's rapid economic expansion and urbanization have paved the way for a huge increase in energy demand. As the nation continues to evolve and urban areas expand, the need for energy to power industries, transportation, and households has grown steadily. This burgeoning demand poses a complex challenge, as it requires a delicate balance between providing access to affordable and reliable energy for all while addressing environmental sustainability and energy security. In response to these challenges, India, in its updated Nationally Determined Contribution submitted during the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) in Glasgow, United Kingdom in 2021, unveiled a strategic framework for climate action. This framework, symbolized by the "Panchamrit" (five nectar) elements, signifies India's resolute commitment to achieve net-zero emissions by 2070 and secure 50% of its energy from renewable sources by 2030.

It is imperative to recognize the pivotal role that States and Union Territories (UTs) play in effecting a transition to low-carbon development pathways. To facilitate this vital transition, the Bureau of Energy Efficiency, operating under the aegis of the Ministry of Power, Government of India, has embarked on the development of State Energy Efficiency Action Plan (SEEAP). These plans are tailored to meet the distinctive requirements of each state, ensuring that resource allocation aligns with the state's sustainable development objectives. The SEEAP project aims to contribute to India's national targets and provide a comprehensive roadmap for enhancing energy efficiency across the state and the country.

For Telangana, SEEAP was developed by the Confederation of Indian Industry (CII), under the guidelines of Bureau of Energy Efficiency, Ministry of Power, GOI, in consultation with the State Designated Agency viz. Telangana Renewable Energy Development Corporation Ltd. (TGREDCO) with inputs & suggestions from various government departments and sector experts. The primary objective of the State Energy Efficiency Action Plan for Telangana is to formulate sector-specific strategies for enhancing energy efficiencyin the state.

Energy Landscape and Projections:

Telangana consumed 17.5 Mtoe of energy in FY 2020, primarily through oil (44%), electricity (29%), and imported coal (8%). With projected economic growth and considering energy intensity, total energy consumption is estimated to reach nearly 31.3 Mtoe by FY 2030.

Strategic Focus:

Based on factors like GSVA, energy consumption and feedback from stakeholders, four key sectors – Industry, Buildings, Transport, and Agriculture & Fisheries – were identified for targeted interventions. Dedicated strategies for each sector will optimize resource allocation and maximize impact.

Actionable Strategies:

1) **Industry:**
- Expand and enhance the Perform, Achieve and Trade (PAT) scheme to drive energy efficiency in designated industries.
- Promote green rating to incentivize sustainable practices and resource optimization.

2) **Transport:**
- Accelerate the electrification of road transport to reduce dependence on fossil fuels.
- Invest in and improve public transportation to encourage energy-efficient commuting.
- Expand the ethanol blending program to green the fuel mix and decrease emissions.

3) **Buildings:**
- Implement energy efficiency labelling for residential buildings to raise awareness and guide informed purchase decisions and aggressive implementation of ECBC.
- Intensify the Standard & Labelling Programme to promote energy-efficient appliances and equipment.
- Encourage BEE Star Rating and green building practices for new and existing constructions.

4) **Agriculture:**
- Facilitate the transition from conventional diesel pumps to solar-powered pumps to harness renewable energy and reduce fossil fuel reliance.
- Promote the replacement of old or inefficient pumps with 5-star rated models equipped with smart control panels for enhanced efficiency and operational savings.

Expected Outcomes:

This action plan, depending on the implementation scenario, is projected to achieve:

Energy Savings: Reduction of 3.85 Mtoe (moderate) and 5.49 Mtoe (ambitious) by FY 2030.

Market Potential: Creation of a ₹ 10,000 crore market for energy-efficient solutions and technologies.

Emission Reduction: Decrease in CO2 emissions by 12.1 MtCO2 (moderate) and 17.2 MtCO2 (ambitious) by FY 2030.

By focusing on strategic sectors and implementing targeted interventions, this plan seeks to drive significant energy savings, unlock market potential, and contribute to a cleaner environment for Telangana.

1 INTRODUCTION

1.1 Background

India is a diverse country with diverse energy consumption patterns in different states/UTs. Broadly, the energy consumption is divided in major sectors i.e., buildings, transportation, agriculture, and industries, etc. A need for a focused sector-based energy efficiency approach by states/UTs has been felt. For instance, there may be states with lesser urbanized areas and therefore lesser number of high energy consumption buildings. Such a state may need more focus on energy efficiency in sectors such as transportation, agriculture, etc.

Similarly, Industry sector has 53% of total primary energy demand in India, and more than 30% in most States, however, the level of energy efficiency initiatives and programmes is not commensurate with the energy consumption in this sector. Most states are yet to set energy saving targets for industry, apart from targets set for the PAT programme. Most states focus primarily on energy conservation for PAT Designated Consumers (DC) and monitor DCs for energy audits and compliance with specific energy consumption (SEC) targets. Only a few states have mandated energy audits for specific categories of industry other than PAT DCs and provision to provide financial incentives for implementing energy efficiency in industrial units.

In the transport sector, there is a need to include and promote energy efficient public transport besides policy level intervention for efficient or clean fuel vehicles. Several states have come forward with a state level incentivization for electric vehicles. Policy and framework for electric vehicles at the state level needs further focus. Though energy efficiency is a multi-dimensional subject, defining key focus areas to bridge gaps is the need of the hour. While some states may have the potential to improve efficiency in a particular sector, there may be gaps in terms of identification of these sectors.

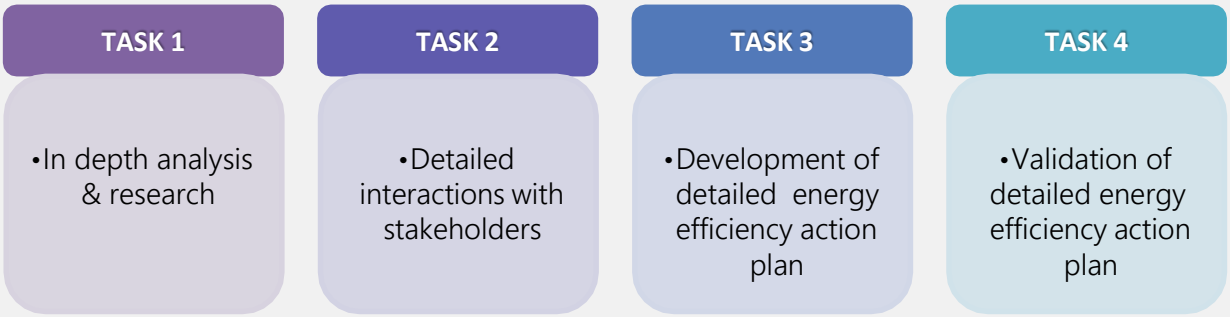
If, for instance, a state with many MSME industrial units, may focus on energy efficiency in the industrial sector alone, a large potential of achieving energy efficiency may be unearthed. This may involve activities and resource mobilization to create awareness in industry, replacement of appliances and machinery with the help of ESCOs, setting up and utilization of Revolving Investment Fund, besides others.

1.2 About State Energy Efficiency Action Plan

This assignment aims to provide technical assistance for the identification of focus sectors for the "**State Energy Efficiency Action Plan for Telangana**" state to ensure that the allocation of resources is as per the requirement of state and estimate the potential of energy conservation in sectors which are predominant in the region. The State Energy Efficiency Action Plan is sought in two parts, a short term-plan for a tenure of 5 years and a long-term plan targeting high impact energy efficiency by the year 2031.

The above said objective will be achieved by completion of four tasks as given in Figure 1.

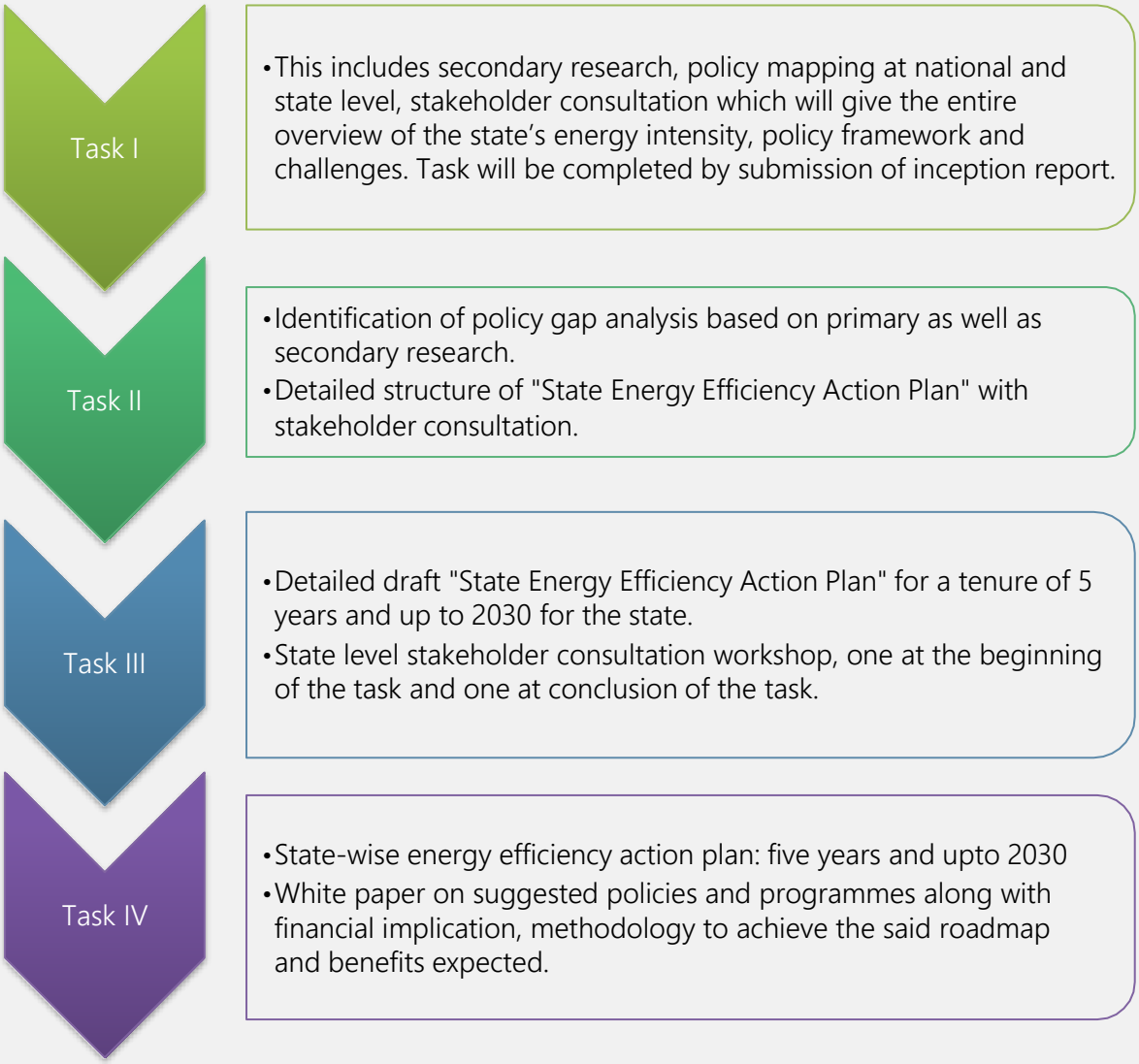
Figure 1 Key tasks in state energy action plan



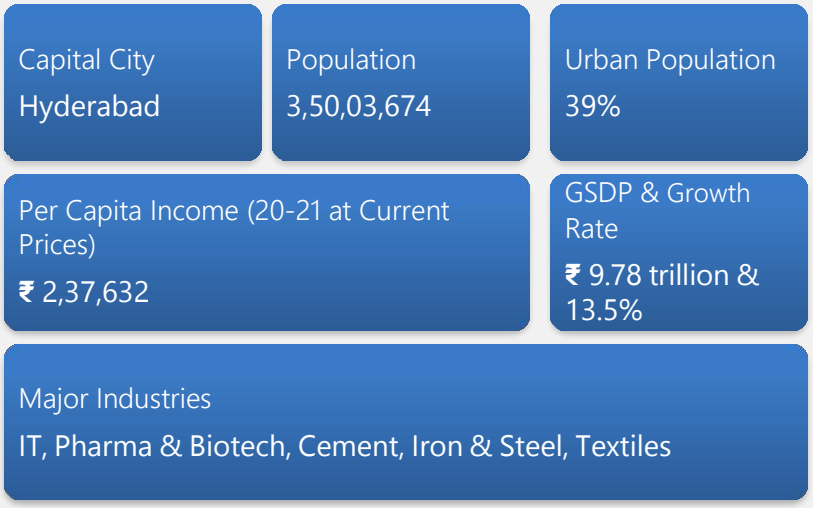
Outcome

Task wise outcome of the study is as detailed in Figure 2.

Figure 2 Task wise expected outcome of the study



1.3 Telangana Profile



[1]

Telangana is a state located in southern India, formed in 2014. It is the 12th largest state by area and the 10th most populous state in India.

The economy of Telangana is diverse, with a focus on industries such as information technology and software services, pharmaceuticals, agriculture, textiles, and manufacturing. Hyderabad is a major IT and technology hub, home to several tech companies and research institutions. The state has made significant strides in various sectors since its formation and continues to grow and develop. Its unique cultural identity, combined with economic and technological progress, makes Telangana a dynamic and vibrant state in India.

1.4 Current Energy Scenario

The energy sector in Telangana is one of the most important components of an infrastructure that affects the state's economic growth. Telangana is the 4th largest electricity producer in the southern region[2] and the country's 11th largest electricity producer[3].

Energy consumption is directly linked to the advancement of manpower with an ever-increasing population, increase in living standards, and the industrialization of developing countries. However, rising energy consumption has resulted in increased greenhouse gas emissions and has sparked severe environmental worries.

As an emerging economy, Telangana has a huge opportunity to meet its development goals in minimal energy consumption by adopting and choosing most energy efficient equipment

[1] https://www.telangana.gov.in/PDFDocuments/Telangana-Statistical-Abstract-2021.pdf
[2] https://npp.gov.in/public-reports/cea/monthly/installcap/2021/DEC/capacity2-Southern-2021-12.pdf
[3] https://npp.gov.in/public-reports/cea/monthly/installcap/2022/JUL/capacity1-2022-07.pdf

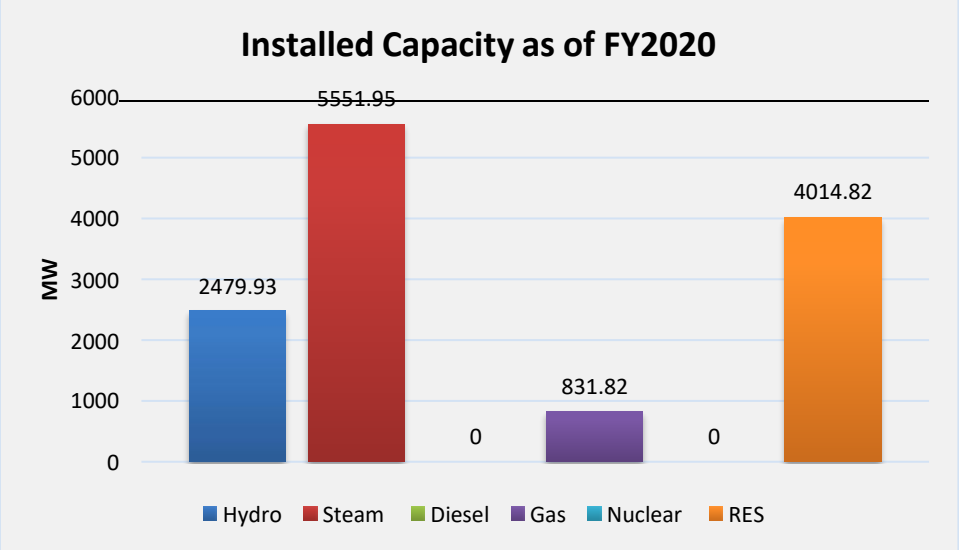
and measures. Energy efficiency will be critical in choosing the best energy portfolio for Telangana. Clean energy system deployment is gaining traction in Telangana as a result of policy initiatives. Adopting an energy-efficient lifestyle, on the other hand, is one of the most cost-effective options accessible.

Energy efficiency is gradually becoming a critical element of India's energy transformation strategy. Implementing comprehensive energy efficiency initiatives results in reduced air pollution, decarbonization, improved energy access, better resource utilization, and increased energy security. If energy efficiency measures are implemented, the transition to renewable energy will be speedier and less expensive.

As part of the Paris Agreement, India pledged to reduce its energy intensity (the amount of energy used per unit of GDP) by 33-35% by 2030 compared to 2005 levels. The Bureau of Energy Efficiency (BEE) has implemented numerous energy efficiency schemes, such as the National Mission for Enhanced Energy Efficiency (NMEEE), Demand Side Management (DSM), Energy Conservation Building Code (ECBC), and others, with positive outcomes.

In the following section, we will glance at Telangana's energy scenario. Steam contributing the highest at 43%, followed by RES, hydro and gas.

Figure 3 Installed Capacity of Telangana



The above installed capacity of the state is contributed by central, private and state where 47.95% is share of state, followed by private (38.66%), and central (13.4%).

1.5 Total Final Energy Consumption (TFEC)

The Total Final Energy Consumption (TFEC), also known as gross final energy consumption, is the sum of all end-use energy utilized to provide various energy functions. It focuses on energy elements such as electricity and secondary fuels like petrol, diesel, furnace oil, etc.

TFEC is a variable that was developed particularly to measure the progress of the Sustainable Development Goals. The categorization of states based on their TFEC allows for peer-to-peer comparison.

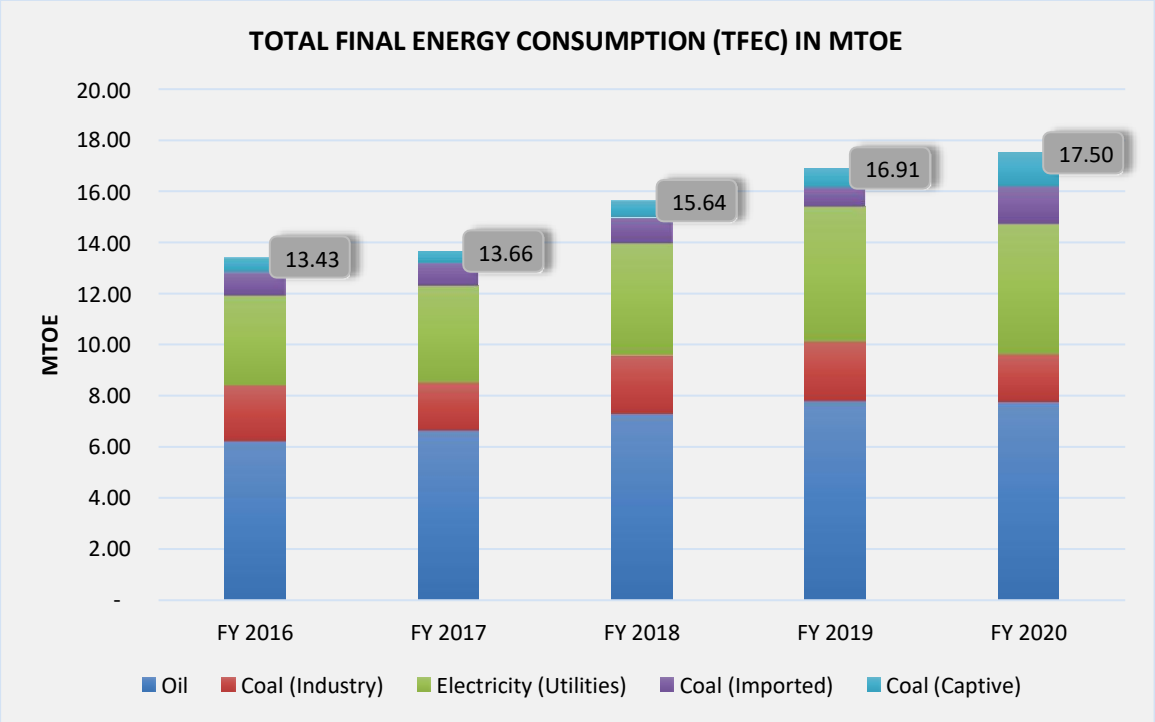
It also aids in the analysis of the energy-saving target, which will lower the intensity of GHG emissions, and it can be reached by improving energy efficiency and reducing the usage of fossil fuels.

The essence of progress towards a long-term sustainable economy is to benefit both people and the environment. To achieve economic growth and long-term development, we must drastically reduce our environmental footprint by altering how we create and use commodities and resources.

In the following section, we will examine the TFEC of Telangana and analyses the trend from FY2015-16 to FY2019-20 which will help us understand and identify energy saving potential. The baseline year is 2019-20 for all the subsequent sections.

The Total Final Energy Consumption[4] (TFEC) of Telangana for the FY2019-20 is 17.5 MTOE (Million Tonnes of Oil Equivalent). It accounts for the total energy consumed from electricity and fuel like coal, major petroleum products like LPG, diesel, ATF, furnace oil etc.

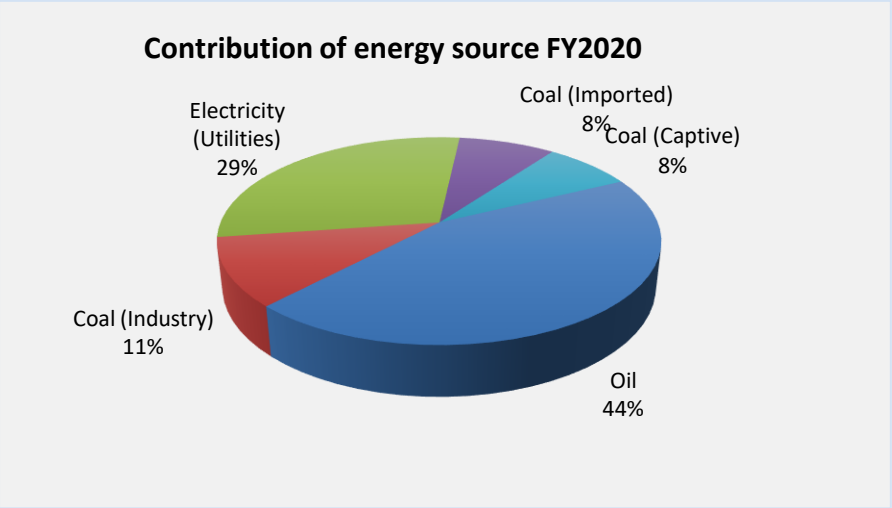
Figure 4 TFEC of the state



The distribution of energy source for the state for FY2020 is shown below. Oil has the highest consumption with 44% oil followed by electricity and coal.

Figure 5 Distribution Of Energy Source For The State For FY2020

[4] To eliminate double counting, coal utilized for electric power generation has been subtracted from state-level coal usage. The TFEC is calculated using data from the CEA General Review 2019 (electricity), the MoPNG's PNG Statistics (oil), and the Coal Directory (coal)



For the FY2019-20, Diesel, at 4.29 MTOE, accounts for the largest proportion of fuel supplied. Coal accounts for 3.21 MTOE an comes second in supply, followed by Petrol & LPG.

The energy supplied by Petrol and LPG is 1.44 and 1.15 MTOE respectively.

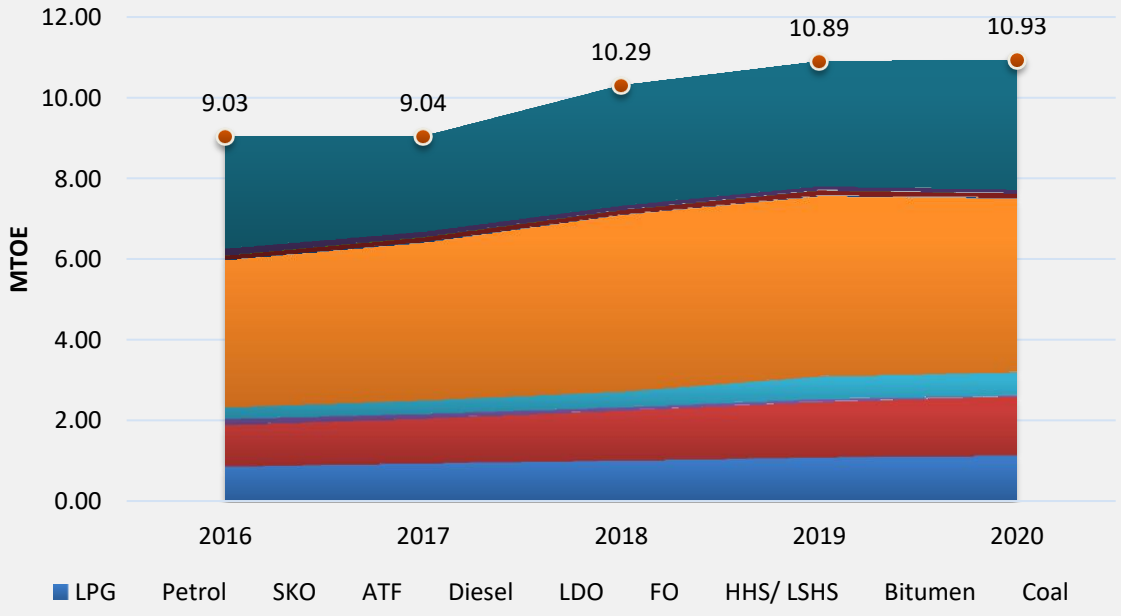
ATF (Aviation fuel) is also a major fuel, accounting for 0.58 MTOE of energy supply. FO (Furnace oil) is also used in State and supplies 0.11 MTOE of Energy.

The energy supplied by major fuels in TS for the period FY 2016 and 2020 is shown in Figure 9.

Growth was observed in LPG (3.80 %), Petrol (6.91%) in 2019-20 vis-à-vis 2018-19.

The negative trend was observed in coal, kerosene, diesel, furnace oil, bitumen, LDO in 2019-20 vis-à-vis 2018-19. Demand for these fuels were down, as a nationwide lockdown halted economic activity and travel, which eviscerated demand.

Figure 6 Energy supplied by primary fuels from FY 2015-16 to FY 2019-20[5]

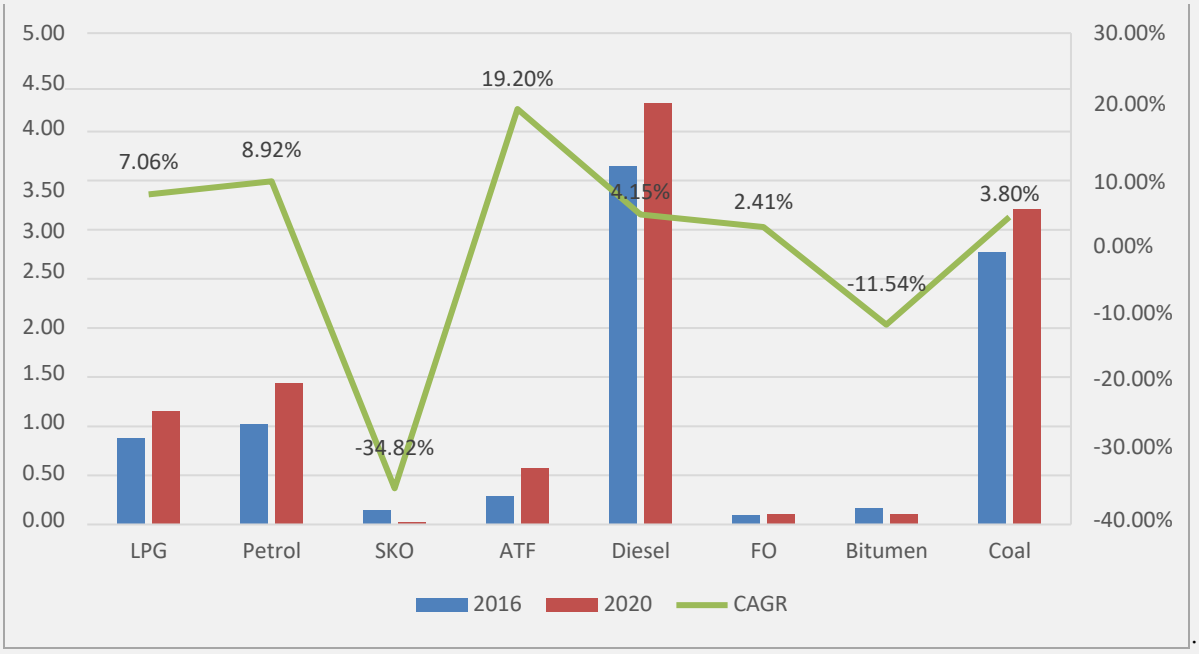


[5] https://mopng.gov.in/en/petroleum-statistics/indian-png-statistics from 2016 to 2020

Figure 9 shows the CAGR comparison of energy supplied by primary fuels from FY 2015-16 to FY2019-20 in Telangana. LPG, petrol, diesel, and furnace oil show an increasing CAGR growth over a period of five years. However, SKO and bitumen show a negative CAGR.

SKO (kerosene) consumption in the state for the public distribution system has been declining over the years, with the rate of reduction increasing in recent years. The Ujjwala Yojana, which provides LPG connections to BPL households, has hastened the decline in kerosene usage, as it has monetary incentives provided to states for decreased kerosene off-take.

Figure 7 CAGR Comparison of various fuels from FY2015-16 to FY2019-20[6]



The main types of loads on a system are domestic, commercial, agricultural, industrial, and municipal, traction etc. Accordingly, the consumers are categorized as domestic consumers, commercial consumers, agricultural consumers, industrial consumers (small, medium, and large), traction consumers and lastly municipal consumers which includes public lighting and public water and sewage system.

Electricity consumption by various categories of consumers served by utilities during the year 2019-20 was 59,365 MU registering a decrease of nearly 3% over previous year.

As seen from Figure 8, Agriculture category of consumers consumed highest energy i.e., 35% of total energy sold by Utilities and it is higher compared to 2018-19 i.e., 39%.

Domestic and Commercial consumers combined, are the second largest category amongst the consumers, and consumed 31% of total energy sales as compared to 28% during the previous year.

The Industrial sector was lower compared to the previous year while there might be a variety of causes for the revised grid energy usage, the key element that has contributed to this economic downturn is the economy's slowdown, which has been exacerbated by the unfortunate occurrence of Covid 19 and the GoI's imposition of the lockdown.

[6] https://mopng.gov.in/en/petroleum-statistics/indian-png-statistics from 2016 to 2020

It accounted for 23.08% of the total energy while in 2018-19, it was 27.8% of the total energy. Its contribution is the third highest among all sectors.

Figure 8 Electricity consumption of Telangana over a period of FY2016 to FY2020[7]

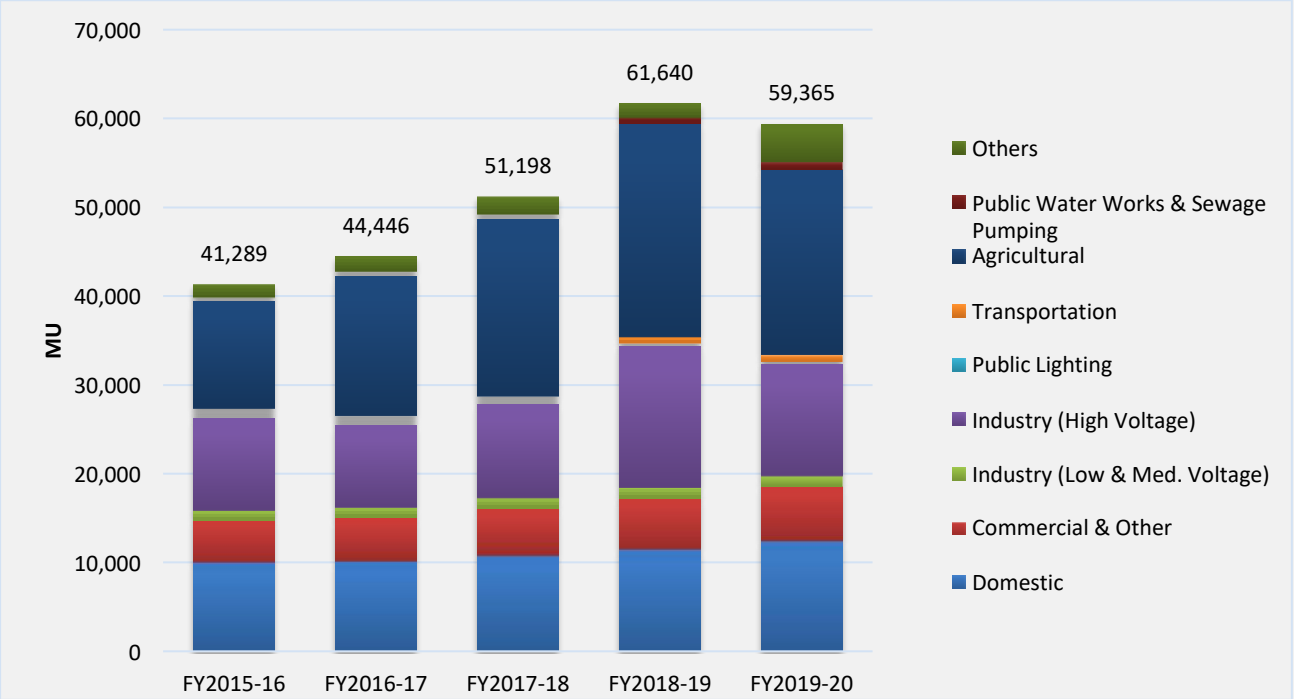
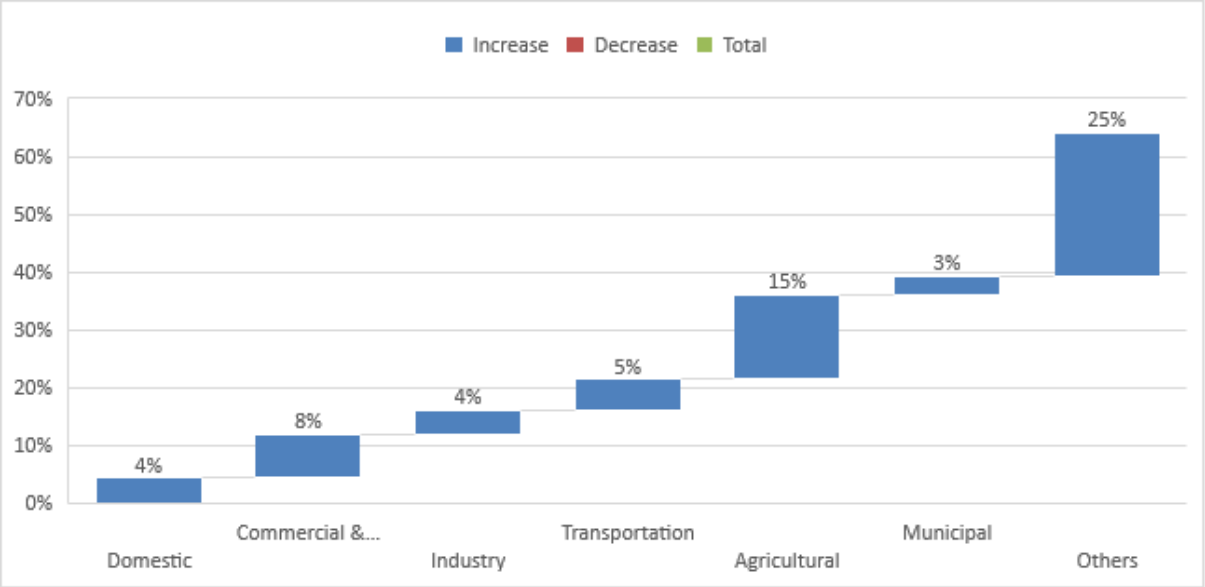


Figure 9 shows the CAGR spreading across the range of FY2015-16 to FY2019-20 for all the power consuming sectors. It can be observed that almost all the sectors signify an increasing growth in terms of energy consumption.

Figure 9 CAGR between FY2016 to FY2020



[7] CEA General Review Reports (FY19, FY20) & CEA Dashboard (FY16, FY17, FY18)

Telangana's electricity consumption has increased exponentially since the TRS government began supplying free power to the farm sector 24 hours a day, seven days a week.

Commercial sector shows the second largest growth of 8% which shows the increase in energy consumption of commercial consumers. Commercial businesses, malls, multiplexes, theatres, clubs, hotels, and other such entertainment/leisure enterprises are on the rise as a result of urbanization in the state of Telangana.

Transportation sector is also growing at a rate of 5% which is due to the increase in electrification of railway network in Telangana and addition of new infrastructure in various towns.

Industrial sector has a rising CAGR when compared to FY2015-16 and it can be linked to the industrial growth. Energy consumption has grown significantly in the commercial and industrial sectors because of uninterrupted power supply. Industries have been operating in three shifts. As a result of all of this, Telangana's electricity consumption has increased significantly more than in other states.

The state's MSME profile has shifted significantly towards capital-intensive industries. MSMEs are a central element of value chain of Telangana which has led to its massive progress.

Public lighting CAGR is the lowest and can be attributed to the replacement of streetlight to LEDs and public water supply has a positive CAGR due to the factors mentioned in the previous section.

1.6 Overview of Institutional framework and stakeholder mapping- Energy

Figure 10 5 Institutional infrastructures of Energy Sector of Telangana

TGGENCO	• Telangana Power Generation Corporation Limited (TGGENCO) is responsible for power generation in Telangana. TGGENCO operates thermal,hydel, and solar power plants in the state.
TGTRANSCO	• As per State Reorganization Act 2014, the then TRANSCO was divided into TGTRANSCO and APTRANSCO. Accordingly, TGTRANSCO along with TGPCC,TGPTC, TGBSC was established as a Company w.e.f. 2-6-2014 for the State of Telangana • TGTRANSCO ceased to do power trading and has retained powers ofcontrolling system operations of Power Transmission.
TGSPDCL	• TG Southern power Distribution Company Limited Hyderabad is a state Electricity Distribution company. TGSPDCL has a vast infrastructure facility in its operating area with 1,605 Nos. of 33/11 KV substations 3,102 Nos. of power transformers, 1,220 Nos. of 33 KV feeders 7,263 Nos. of 11 KV feeders and around 4,22,003 Nos. of distribution transformers of various capacities.
TGNPDCL	• TG Northern Power Distribution Company Limited is the electricity distribution company with headquarters at Warangal.
TGREDCO	• Telangana Renewable Energy Development Corporation Ltd., (TGREDCO) is nominated by Government of Telangana, for implementingthe all New and Renewable Energy Programmes and EV charging infrastructure for electric vehicles in the state as a State Nodal Agency toMinistry of New & Renewable Energy (MNRE) and promoting Energy Conservation activities State Designated Agency to Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India
SCCL	• The Singareni Collieries Company Limited (SCCL) is a Government coal mining company jointly owned by the Government of Telangana and Government of India on a 51:49 equity basis. The Singareni coal reserves stretch across 350 Km of the Pranahita – Godavari Valley of Telangana with a proven geological reserve aggregating to whopping 8791 million tonnes. SCCL is currently operating 20 opencast and 25 underground mines in 4 districts of Telangana with a manpower around 43,895.

2 IDENTIFICATION OF FOCUS SECTORS

2.1 Methodology for identifying focus sectors

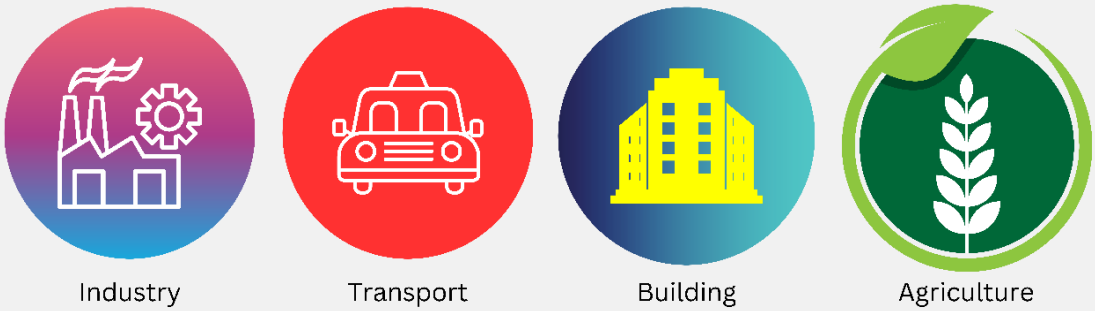
Methodology adopted for Identifying Focus Sectors for Telangana:

- Energy Consumption Analysis: The first step in identifying the focus sectors involved analyzing the state's energy consumption patterns. This analysis considered the overall energy consumption in Telangana, including both primary and secondary energy sources. Understanding the sectors responsible for significant energy consumption provided insights into areas where potential improvements could yield substantial benefits.
- Emissions: Simultaneously, an assessment of emissions generated by different sectors was conducted. This analysis helped in identifying sectors with higher carbon footprints and those contributing significantly to air pollution and greenhouse gas emissions.
- Gross State Value Addition (GSVA): The GSVA study provided an understanding of the economic contribution of different sectors to Telangana's economy. Sectors with high GSVA were given priority as improving energy efficiency and reducing emissions in these sectors could have a more significant impact on the state's overall economic growth.
- Gap Analysis in Respective Sectors: A thorough policy gap analysis was performed for each sector to identify existing challenges in these sectors. This step allowed identifying specific areas where targeted interventions and policies could yield the best results.
- Stakeholder Inputs: The inputs and feedback from various stakeholders and government agencies, were considered. This helped in understanding the priorities and concerns of key stakeholders in the state's energy and environmental landscape.
- State Designated Agency (SDA) and Government Vision: The focus sectors aligned with the state's long-term development agenda and the vision of the state government were given preference. This ensured that the selected sectors were in line with the overall strategic direction of the state.

2.2 Identified focus sectors

Above mentioned indicators and situation assessment were used to define target focus sectors and specific industries.

The following sectors are focused for the development of "State Energy Efficiency Action Plan" for Telangana.



Energy efficiency measures are thus becoming increasingly significant in these sectors, based not just on overall energy use but also on the potential for cost-effective improvements.

By focusing on these sectors, the report aims to provide actionable insights and policy recommendations to drive sustainable development and energy efficiency in Telangana.

3 ENERGY DEMAND PROJECTION

3.1 Total Final Energy Consumption (TFEC) Forecasting by FY 2030-31

The Kaya identity is a useful equation for calculating the total amount of anthropogenic carbon dioxide (CO2) emissions. The equation, which is based on information that is easily accessible, can be used to calculate current emissions as well as how the important variables must evolve through time in relation to one another in order to achieve a target level of CO2 emissions in the future. The identity has been utilized and is still crucial in the discussion of international climate policy choices.

The Kaya identity states the total emission level of CO2 as the product of four factors:

$$F = P \times (G/P) \times (E/G) \times (F/E)$$

where: F = Global CO2 emissions from human sources

P = Global population

G = Global Gross Domestic Product (GDP)

E = Energy consumption

The equation identity was developed by Yoichi Kaya, the identity is a specific application of the I = PAT identity, which relates human impact on the environment (I) to the product of population (P), affluence (A) and technology (T). On first inspection, the Kaya identity may appear to be a frivolous equation given its construction as cancelling terms leaves you with F = F. In practice, however, it is commonly used to calculate an absolute value for global CO2 emissions from anthropogenic activities. It is also helpful in understanding how the four factors need to change relative to each other over time to reach a target level of CO2 emissions in future, and to understand how the four factors have changed in the past.

The expression simply states that emissions of greenhouse gases are the product of the population, GDP per person, energy efficiency, and emissions intensity.

KAYA Equation usages in Policymaking:

The Kaya identity underlies the Intergovernmental Panel on Climate Change's (IPCC) analysis of emissions scenario literature. The analysis provided a basis for current assessments of

greenhouse gas emissions and possible response strategies. In the context of policymaking, the Kaya identity is often expressed as:

Global CO2 emissions from human resources= Global population X Global GDP per capita X Energy Intensity X Carbon Intensity

The expression simply states that emissions of greenhouse gases are the product of the population, GDP per person, energy efficiency, and emissions intensity.

Energy Intensity – varies by country and region with underlying factors such as economic structure, climate, geography, and energy efficiency policies.

Carbon Intensity – is driven by the prevailing form of energy generation. Measured on a total life cycle basis, renewable energy sources have a lower Carbon Intensity than fossil fuels.

The methodology employed for estimating the TFEC projection for Telangana involved analyzing historical trends in final energy consumption and Gross State Domestic Product (GSDP) and growth of GSDP as per the state's vision.

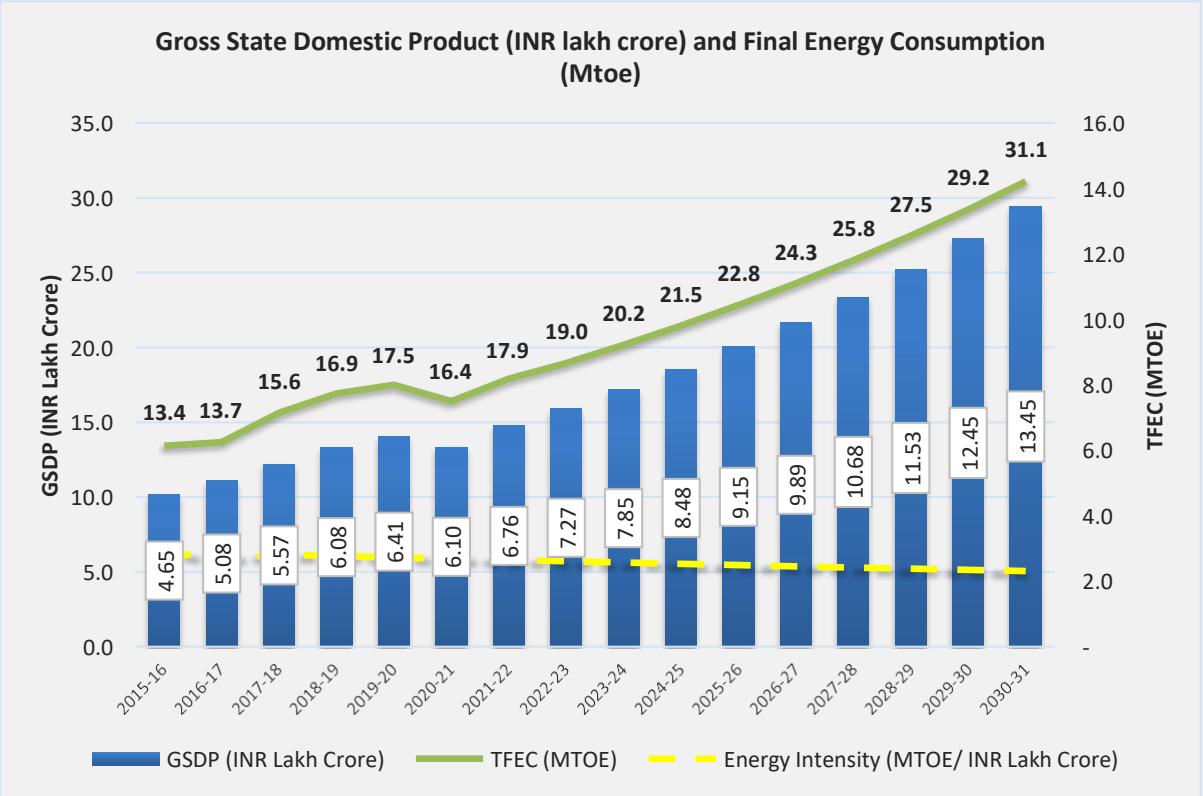
The state GSDP was ₹6.9 lakh crore in 2022. Based on this, the GSDP is expected to reach ₹13.45 lakh crore by FY 2031. The available historical energy data, when correlated with the GSDP of the corresponding year the energy intensity of the state can be evaluated.

The calculated energy intensity data of the state shows, a decreasing trend from FY 2016 to FY 2021 where it observed to be decreasing by 2% year on year. By assuming a similar trend to

continue till FY 2031, the expected energy intensity is about 2.33 MTOE/ ₹ lakh crore in FY 2031 as compared to 2.6 MTOE/₹ lakh crore in FY 2021.

Using the calculated GSDP of ₹13.45 lakh crore and energy intensity of 1.44 MTOE/₹ lakh crore, the TFEC for FY 2031 is calculated to be 31.1 MTOE. The graph below depicts the trends of GSDP, energy intensity and TFEC between FY 2016 to FY 2031 for the state of Telangana.

Figure 11 Gross State Domestic Product (INR lakh crore) and Final Energy Consumption (Mtoe)



By examining energy consumption and intensity trends, it is possible to identify factors that influence energy demand, such as changes in economic conditions, shifts in technology, and alterations in government policy. Additionally, analyzing energy intensity trends can provide insights into the efficiency of energy usage and the effectiveness of energy-saving measures.

3.2 Energy Scenarios

Following the projection of total final energy consumption (TFEC) for 2026 and 2031 of Telangana, Business as Usual (BAU), Moderate (MOD), and Ambitious (AMB) energy scenarios are estimated which offer strategic insights into potential savings within the identified focus sectors, namely transport, industries, buildings, and agriculture.

Figure 12 Description of key energy scenarios

Business as Usual (BAU) Scenario

- The BAU scenario represents a baseline projection of energy consumption for the state, assuming no specific interventions or changes in the existing trends.
- It serves as a reference point against which the impact of energy-saving strategies can be measured.

Moderate (MOD) Scenario

- The Moderate scenario takes into account moderate levels of technological interventions and policy and program initiatives.
- It reflects a realistic but not overly aggressive approach to energy efficiency measures, considering advancements in technology and moderate policy changes.

Ambitious (AMB) Scenario

- The Ambitious scenario considers high levels of technological advancements and ambitious policy and program interventions.
- It represents an optimistic outlook, showcasing the potential energy savings if the state adopts cutting-edge technologies and implements ambitious policies to enhance energy efficiency.

Factors Influencing Scenarios:

Technological Interventions: The level of advancement in technologies related to energy consumption plays a significant role in shaping the Moderate and Ambitious scenarios. This includes improvements in energy-efficient appliances, industrial processes, and renewable energy technologies.

Policy Interventions: The extent of governmental policies and programs aimed at promoting energy efficiency greatly influences the outcomes of the Moderate and Ambitious scenarios. This involves initiatives such as energy conservation policies, incentives for renewable energy adoption, and regulatory frameworks.

Figure 13 Factors Influencing Scenarios

Factors Influencing Scenarios	*Technological Interventions*	*Policy Interventions*
Transport	Electric vehicles, intelligent transportation systems.	Incentives for electric vehicles, emission standards.
Industries	Energy-efficient manufacturing, Industry 4.0 technologies.	Energy efficiency standards, financial incentives.
Buildings	Smart technologies, energy-efficient HVAC systems.	Stringent building codes, green building incentives.
Agriculture	Precision farming, sustainable practices.	Sustainable farming policies, incentives for efficiency.

These energy scenarios provide a framework for understanding the potential energy savings that can be achieved through strategic interventions in the designated sectors. It enables policymakers to make informed decisions based on a range of possibilities, from a conservative business-as-usual approach to ambitious and transformative energy efficiency measures.


INDUSTRY
SECTOR

4 FOCUS SECTOR 1: INDUSTRY

4.1 Overview

Telangana is a rapidly growing state in India, with a diverse industrial base. The state is located in the central part of India and has a strategic location advantage, with easy access to major ports and airports. The industry sector in Telangana is dominated by sectors such as Information Technology (IT), Pharmaceuticals, Textiles, and Automobiles. The state has a well-developed industrial infrastructure, including industrial parks, special economic zones (SEZs), and industrial clusters. The IT sector is a major contributor to the state's economy, with Hyderabad being a hub for IT and software development.

The pharmaceutical industry is another important sector especially in the state's capital city, with several national and international pharmaceutical companies operating in the state. Hyderabad is known for its world-class research and development facilities and is a major exporter of pharmaceutical products. The textiles sector is also significant in Telangana, with a large number of textile mills and garment manufacturing units. The state is known for its handloom and powerloom industry, which produces a variety of textiles such as cotton, silk, and woolen fabrics.

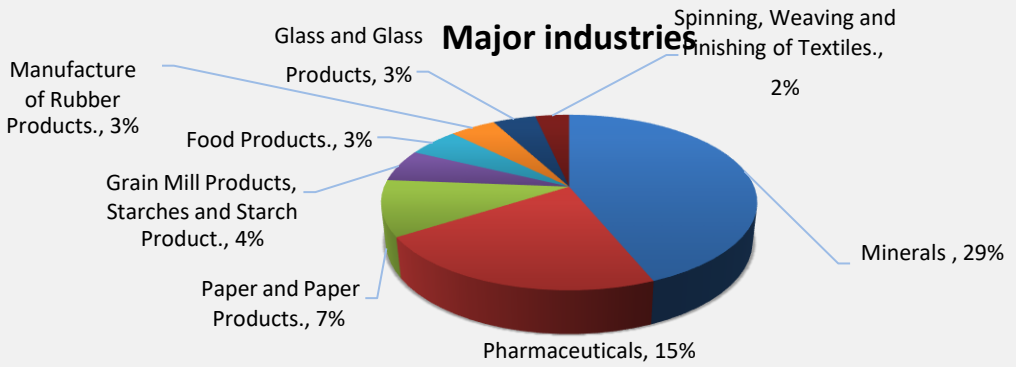
Figure 14 District-wise major industries

The automobile industry in Telangana is rapidly growing, with several global automobile and automobile parts having manufacturing units in the state.

In addition to these major sectors, Telangana has a growing food processing industry, with a focus on value addition and export-oriented production. The state is also promoting renewable energy and has set a target to achieve 25% of its total power consumption from renewable sources by 2025.

Ceramics (mineral products), pharmaceutical, food, textiles, etc are the major fuel consuming industries as per the Annual Survey of Industries 19-20 report.

Table 1 Major industries categorized by their fuel consumption.

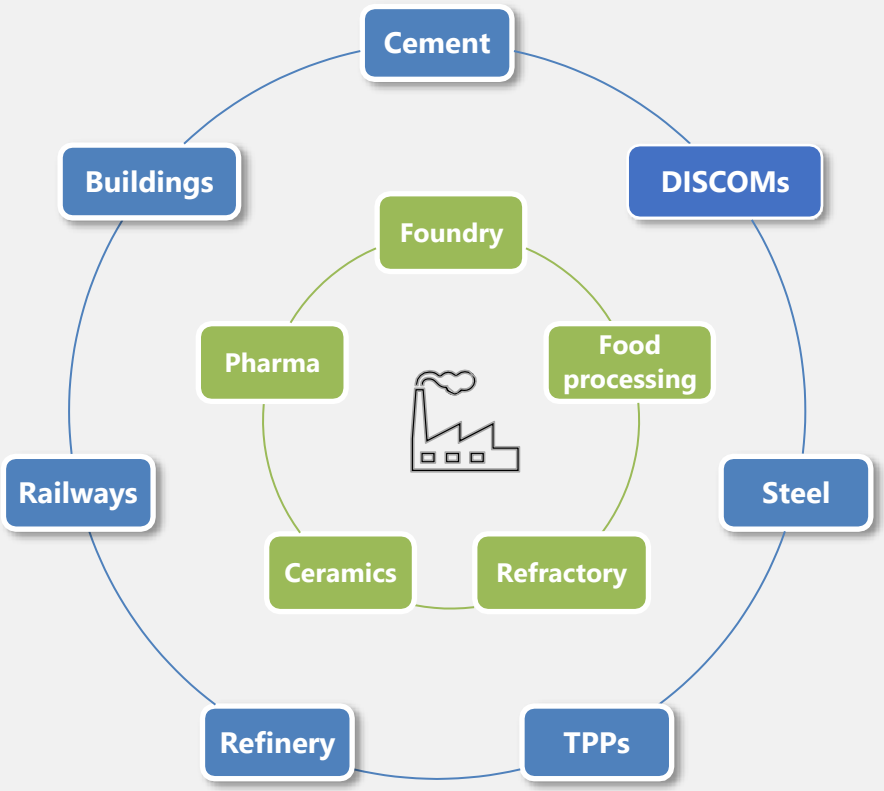


Food products have the highest production, followed by basic metals, pharmaceutical, minerals industry respectively.

Perform, Achieve and Trade (PAT) Scheme

The Perform, Achieve, and Trade (PAT) scheme is a market-based mechanism introduced by the Bureau of Energy Efficiency (BEE) in India as part of the National Mission for Enhanced Energy Efficiency (NMEEE) under the National Action Plan on Climate Change (NAPCC). The PAT scheme is designed to improve energy efficiency in energy-intensive industries.

The sectors covered under PAT Cycle are displayed below along with energy intensive Non-PAT sectors for Telangana.



The table below displays the designated consumers (DCs) in the state of Telangana from PAT Cycle I till PAT Cycle VIII spreading across various sectors.

SR NO	PAT CYCLE	YEAR	DCs
1.	PAT Cycle -I	2012-15	15
2.	PAT Cycle –II	2016-19	20
3.	PAT Cycle –III	2017-20	5
4.	PAT Cycle –IV	2018-22	3
5.	PAT Cycle –V	2019-22	4
6.	PAT Cycle –VI	2020-23	6
7.	PAT Cycle -VII-1	2022-25	19
8.	PAT Cycle -VII -2	2022-25	7
9.	PAT Cycle -VIII	2023-26	4
		Total (PAT CYCLE IV – VIII)	43

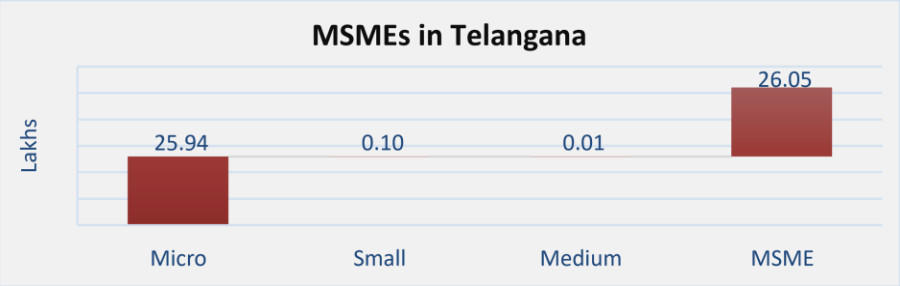
In the PAT cycles, 43 DCs covering 8 sectors such as Thermal power plants, Cement, Pulp & Paper, Iron & Steel, Textile, DISCOMs, Railway and Commercial buildings (hotels) etc., have been targeted in Telangana. TGREDCO is successfully working with BEE and Designated Consumers for its successful implementation in the state.

MSME Sector

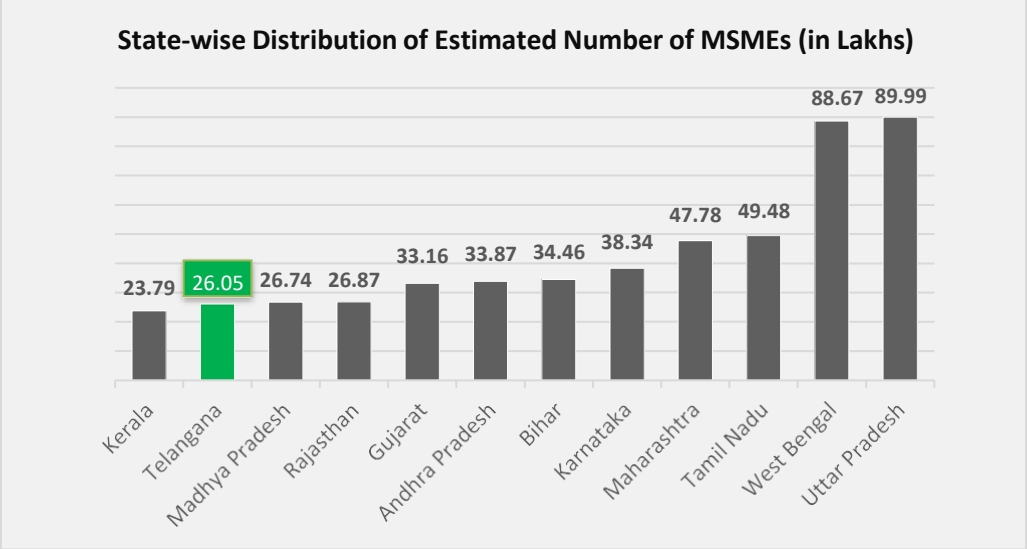
The MSME sector is a significant contributor to the Gross Domestic Product (GDP) of Telangana. As per the Annual Report 2020-21 of the Ministry of Micro, Small and Medium Enterprises, Government of India, the contribution of MSMEs to the GDP of Telangana was around 31.6% in the financial year 2019-20.

The number of registered MSMEs in Telangana has been steadily increasing. As per the MSME Annual Report 2020-21 of the Ministry of Micro, Small and Medium Enterprises, Government of India, the total number of registered MSMEs in Telangana was 26.05 lakhs[8] out of which 25.95 lakhs are micro enterprises as seen in the figure below.

Figure 15 MSMEs in Telangana as of FY2020



The below figure shows the MSME of states with highest distribution in the country. Telangana contributes to 4.11% (26.05 Lakhs) share in total number of MSMEs in India.



The state government has implemented several measures to boost the growth of MSMEs, including providing financial incentives, infrastructure support, skill development programs,

[8] Annual Report 2020-21, Ministry of Micro, Small and Medium Enterprises, Government of India

and technology adoption. These efforts have contributed to the growth and development of MSMEs in Telangana.[9]

One key area of focus for the state government has been the development of industrial clusters and parks specifically designed for MSMEs. These clusters and parks provide a conducive environment for MSMEs to set up and operate their businesses, with access to common infrastructure facilities, networking opportunities, and shared resources. These initiatives have helped MSMEs in Telangana to enhance their competitiveness and productivity.

The state government has also taken steps to promote entrepreneurship and innovation among MSMEs in Telangana. Programs such as the Telangana Innovation Policy, Technology Development and Innovation Policy, and Innovation in MSMEs have been launched to foster a culture of innovation, research, and development among MSMEs. These initiatives aim to improve the product quality, process efficiency, and market access of MSMEs in Telangana.

Furthermore, the state government has also facilitated access to finance for MSMEs in Telangana. Various schemes such as the Telangana Industrial Project Approval and Self-Certification System (TG-iPASS), the Telangana Industrial Development Policy, and the Telangana Financial Corporation have been introduced to provide financial assistance, credit, and capital to MSMEs at competitive rates.

Despite these positive developments, there are also challenges faced by the MSME sector in Telangana. Some of the common challenges include access to timely and adequate finance, infrastructure constraints, lack of technology adoption, skill gaps, and market access issues. Addressing these challenges and providing targeted support to MSMEs in these areas would further strengthen the MSME sector in Telangana.

MSME Clusters

Warangal is a major MSME cluster known for its metal and engineering industries, including foundries, automobile parts manufacturing, and textile processing. The Kakatiya Industrial Estate, located in Warangal, is a significant industrial hub in the region. There are over 7,000 MSMEs in Warangal district, providing employment to around 50,000 people.[10]

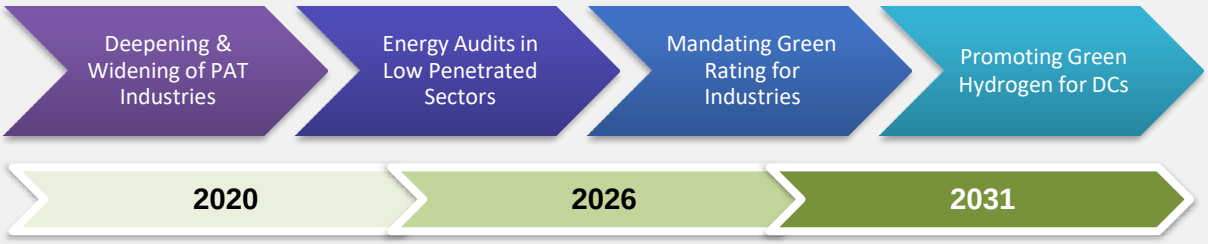
Nizamabad is known for its textile and garment manufacturing industry. The Industrial Estate in Nizamabad is a significant cluster for MSMEs engaged in textiles, readymade garments, and textile processing. There are over 1,000 registered MSMEs in Nizamabad district, providing employment to around 10,000 people.[11]

Karimnagar, a city located in northern Telangana, is known for its agro-based and food processing industries. The Industrial Estate in Karimnagar is a prominent cluster for MSMEs engaged in food processing, agro-based industries, and woodworking. There are over 1,500 registered MSMEs in Karimnagar district, providing employment to around 12,000 people.

[9] Telangana Industrial Policy 2014-19
[10] Department of Industries and Commerce, Government of Telangana.
[11] Department of Industries and Commerce, Government of Telangana.

4.2 Energy efficiency strategies in the industry sector

Some strategies that can be adopted to reduce the energy footprint of the industrial sector of Telangana are depicted below.



The policy aspects required at the state level for strategic actions in industrial sector is discussed in below chapters.

4.2.1 Strategy #1: Deepening of PAT Scheme

The deepening of the PAT scheme can help Telangana achieve its energy efficiency and emission reduction targets by incentivizing industries to adopt energy-efficient practices and technologies.

Deepening of PAT scheme involves identification of new DCs in existing sectors. Telangana, being one of the leading industrialized states in India, can benefit significantly from the deepening of the PAT scheme. The deepening of the PAT scheme can help Telangana achieve its energy efficiency and emission reduction targets by incentivizing industries to adopt energy-efficient practices and technologies. This can not only contribute to meeting the state's climate change goals but also lead to cost savings for the industries involved. Therefore, the deepening of the PAT scheme can be an effective tool for sustainable industrial development in Telangana.

The strategy and its implementation are explained below.

Scope Boundary

Lowering threshold of cement, iron & steel, and paper sector have been considered under the purview of this strategy.

(There are eight PAT sectors covered in Telangana i.e cement, thermal power plant, textile, iron & steel, discom, railway, pulp & paper, textile, & commercial building).

Implementing Agency

- The Bureau of Energy Efficiency (BEE) is responsible for implementing the Perform Achieve and Trade (PAT) Scheme for the industry sector.
- BEE sets energy efficiency targets for industries, monitors their performance, and facilitates the trading of energy-saving certificates.
- The Department of Industries can collaborate with BEE and TGREDCO to ensureindustry compliance and create awareness about the scheme.
- TGREDCO may assist BEE in identification of probable DCs who could be included under PAT and assigned mandatory SEC reduction targets.

Current Policy/Policies in Place

- PAT Cycle -IV notified 28th March 2018 for the Period 2018-19 to 2021-22 with 5 DCs in Telangana.

- PAT Cycle – V notified 29th March 2019 for the Period 2019-20 to 2021-22 with 10 DCs in Telangana.
- PAT Cyle -VI notified 13th April 2020 for the Period 2020-21 to 2022-23 with 5 DCs in Telangana.

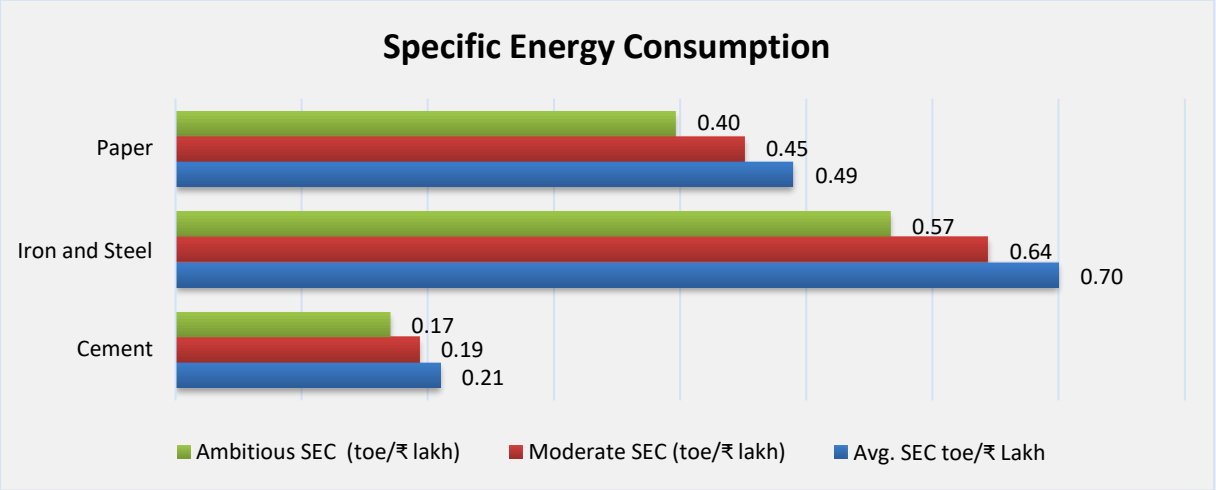
Implementation Period

Long Term

Saving Potential

Energy saving potential is estimated by calculating Specific Energy Consumption (SEC) for sectors like Cement, Iron & Steel and Pulp & Paper industries under moderate and ambitious scenarios. According to the Bureau of Energy Efficiency (BEE), there is an energy saving potential of nearly 2.5% during every cycle of a three-year period. In 2031, for the moderate scenario, an energy reduction of 8% is considered. Similarly, an energy reduction of 12% is considered for ambitious scenario.

Figure 16 Specific Energy Consumption



The following table illustrates the energy saving potential resulting from the deepening of the PAT strategy.

Table 2: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.45	0.34	0.76	1.14
CO_2 Emission Reduction Potential ($MtCO_2$)	1.42	1.07	2.37	3.55

4.2.2 Strategy #2: Widening of PAT Scheme

By bringing more industries under the PAT scheme, the state can ensure that a larger number of energy-intensive industries are actively working towards improving their energy efficiency.

This can help reduce the overall energy consumption of the state and reduce its carbon footprint. Additionally, the incentives offered under the PAT scheme can encourage industries to invest in energy-efficient technologies and processes.

Sectors such as pharmaceutical, food, rubber, plastic, and ceramics is underpinned by the state's prominent standing in these industries. Telangana stands as a global leader with the world's largest integrated pharmaceutical cluster, focusing on both R&D and manufacturing, and hosting the world's largest stent manufacturing unit. Additionally, the presence of 14 Special Food Processing Zones, industrial clusters in Madaram for rubber, approximately 6,000 operating plastic units (90% being MSMEs), and the designation of ceramics as a thrust area with sector-centric industrial parks underlines the state's diverse and substantial industrial footprint. The inclusion of these sectors in the PAT scheme will align with Telangana's commitment to optimizing energy consumption, improving energy efficiency, and fostering sustainable industrial growth.

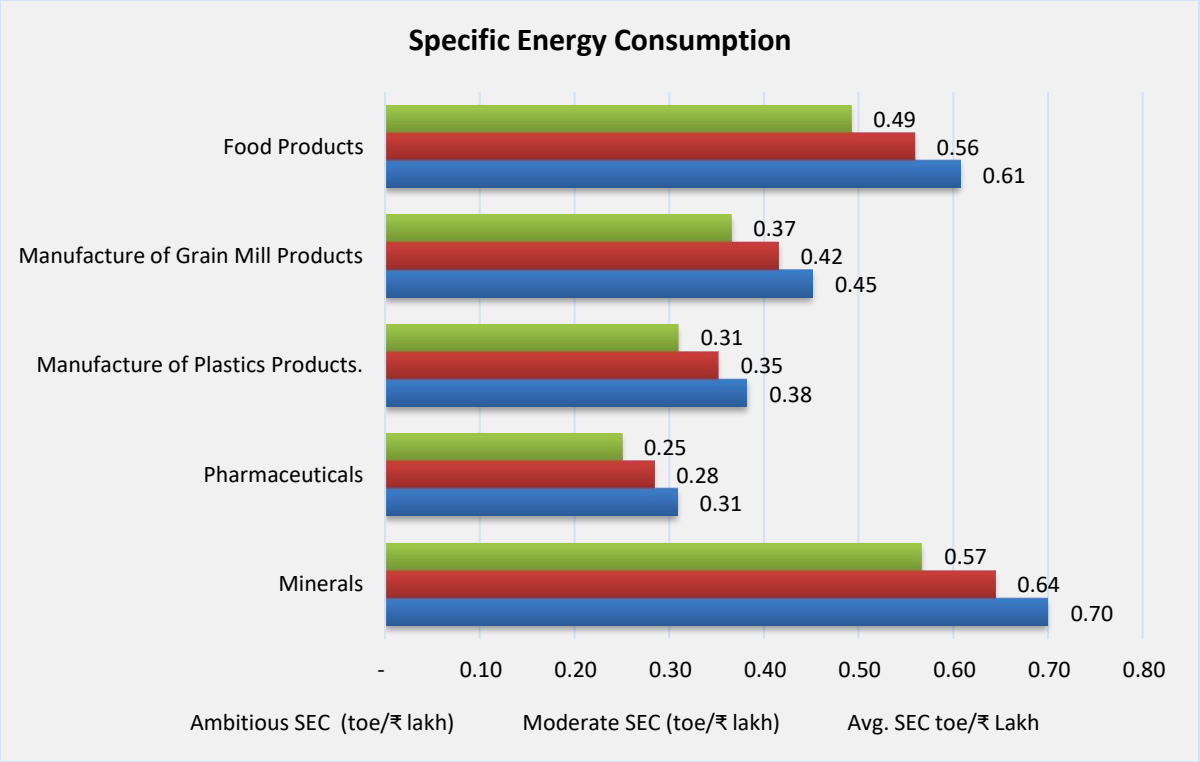
Scope Boundary
Sectors like pharmaceutical, food, rubber, plastic, ceramics, etc are considered based on energy consumption patterns of the industries, their contribution to the state's economy, and their potential for energy efficiency improvements.
Implementing Agency
• The Bureau of Energy Efficiency (BEE) is responsible for implementing the Perform Achieve and Trade (PAT) Scheme for the industry sector. • BEE sets energy efficiency targets for industries, monitors their performance, and facilitates the trading of energy-saving certificates. • The Department of Industries can collaborate with BEE and TGREDCO to ensureindustry compliance and create awareness about the scheme. • TGREDCO can assist BEE in identification of probable DCs who could be included under PAT and assigned mandatory SEC reduction targets.
Current Policy/Policies in Place
• PAT Cycle -VII notified 26th October 2021 for the Period 2022-23 to 2024-25 with 19 DCs in Telangana. • PAT Cycle – VII New notified 26th September 2022 for the Period 2022-23 to 2024-25 with 7 DCs in Telangana. • PAT Cyle -VIII notified 27th June 2023 for the Period 2023-24 to 2025-26 with 4 DCs in Telangana.
Implementation Period
Long Term

Saving Potential

To calculate the energy saving potential, the Specific Energy Consumption (SEC) values for these newly considered sectors were determined based on production and fuel consumption data from the Annual Survey of Industries for the year 2019-2020.

According to the Bureau of Energy Efficiency (BEE), each three-year cycle within the PAT scheme holds an energy saving potential of nearly 2.5%. Specific energy reduction targets were defined for both moderate and ambitious scenarios, translating into energy reduction percentages of 8% and 12% respectively.

Figure 17 Specific Energy Consumption (SEC) for sectors (BaU, MOD and AMB scenarios)



Based on the SECs of each industry, savings were derived considering 8% savings in moderate scenario and 12% in ambitious scenario.

Figure 18 Specific Energy Consumption

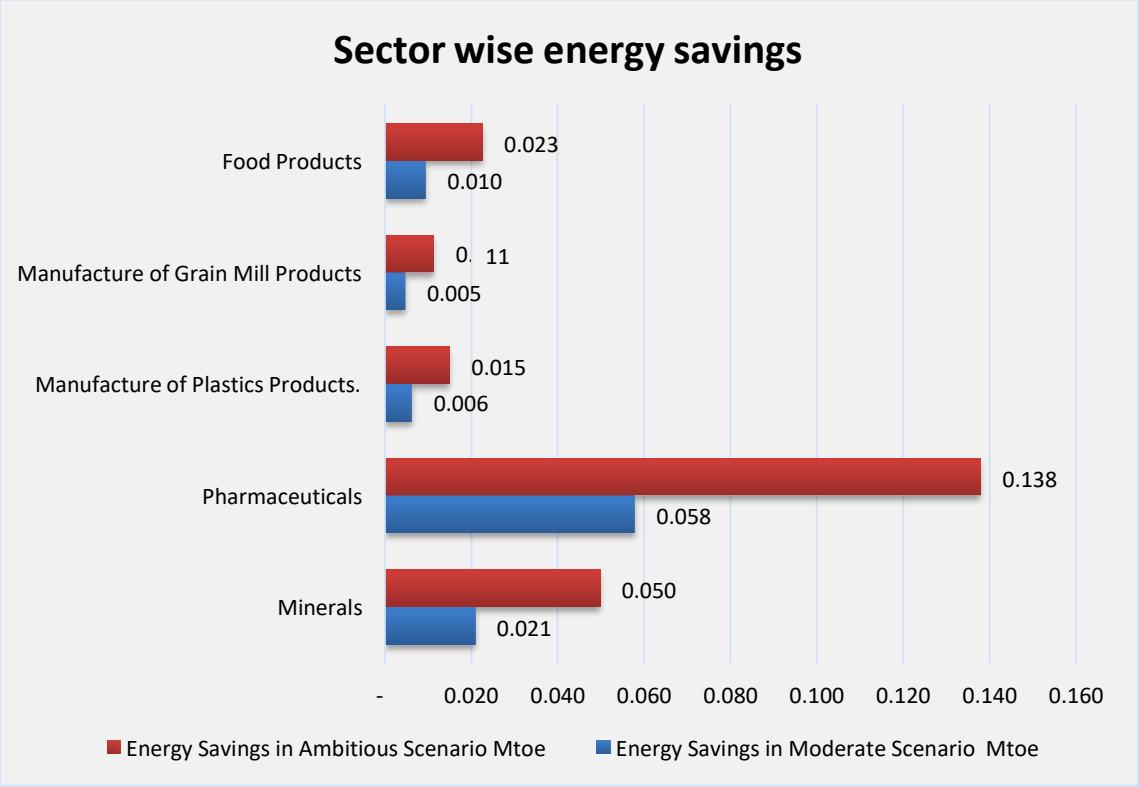


Table 3: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.06	0.08	0.10	0.15
CO_2 Emission Reduction Potential ($MtCO_2$)	0.19	0.24	0.31	0.47

Action Plans

The following table sets out a roadmap which provides a structured approach to achieving energy efficiency under deepening and widening of BEE's PAT Scheme, with specific action plans for each strategy from the short-term (2026) and long-term (2031) goals.

Table 4 Action Plans- Short Term (FY 2025-2026)

High-Efficiency Electric Motor Replacement Program:

- Conduct an industrial motor efficiency survey across key sectors in Telangana, collaborating with the Telangana Industrial Infrastructure Corporation (TGIIC) and industrial associations.
- Develop and disseminate technical guidelines for industries outlining the specifications and benefits of high-efficiency electric motors.
- Initiate awareness campaigns highlighting the cost savings and operational advantages associated with motor efficiency improvements.
- Collaborate with industry associations to raise awareness about the benefits of high -efficiency motors.
- Launch a subsidized high-efficiency motor replacement program, providing financial incentives for industries in partnership with the Telangana Renewable Energy Development Corporation (TGREDCO).
- Conduct training sessions for industrial engineers on motor selection, installation, and maintenance.
- Integrate smart technologies for continuous monitoring and optimization of motor performance.
- Strengthen partnerships with manufacturers to ensure a steady supply of high -efficiency motors.
- Phase out inefficient motors and minimize energy consumption in industries by providing financial incentives, such as subsidies or rebates, to industries that replace older, less efficient motors with IE class 3 or above motors and VFDs.
- Mandate that all new electric motors sold in the state must conform to IE class 3 or above efficiency standards.
- Integrate smart technologies for continuous monitoring and optimization of motor performance.

Energy Management Systems (EnMS)

- Develop awareness programs and training sessions on the benefits of implementing EnMS.
- Develop a comprehensive EnMS training program for industrial energy managers, incorporating case studies from successful implementations in the state.
- Encourage industries to adopt EnMS through financial incentives and recognition programs.
- Mandate EnMS training for key personnel in large industries, with support from Telangana Pollution Control Board (TGPCB).
- Enforce mandatory EnMS implementation in large energy-intensive industries.
- Establish a certification process for industries achieving significant energy savings through EnMS.
- Collaborate with educational institutions to integrate energy management into industrial training programs.

Performance Contracts and ESCOs:

- Conduct workshops and awareness programs for industries to familiarize them with the benefits and mechanisms of performance contracting and ESCOs.
- Develop standardized templates for performance contracts.
- Identify potential ESCOs and create a directory for industries in collaboration with the BEE.
- Pilot performance contracts in select industries, incorporating key performance indicators related to energy efficiency and emission reduction.
- Offer financial incentives for industries engaging with ESCOs.
- Evaluate the performance contracting framework based on pilot outcomes.
- Establish a regulatory framework supporting the widespread adoption of performance contracts.
- Create a certification process for ESCOs to ensure quality services.
- Develop a revolving fund to provide financial support for industries entering into performance contracts.

Table 5 Action Plans- Long Term (FY 2030-2031)

Green Procurement Practices

- Develop and disseminate comprehensive green procurement guidelines endorsed by the Telangana Industrial Policy Framework.
- Conduct training programs for procurement officers in collaboration with the Telangana Industrial and Commerce Department.
- Integrate green procurement criteria into government procurement policies through collaboration with the Telangana eProcurement Corporation Limited.
- Incentivize industries adopting green procurement practices through tax benefits or subsidies.
- Monitor and report the adoption of green procurement in key industries.
- Establish partnerships with industry associations to promote green supply chains.

- Mandate green procurement for government agencies and large industries.
- Collaborate with certification bodies to validate and promote green products.
- Conduct regular audits to ensure compliance with green procurement standards.

Electrification of Heat

- Conduct a comprehensive feasibility study, in collaboration with the TGGENCO and TGREDCO, to identify industries suitable for the electrification of heat.
- Develop and disseminate technical guidelines for industries, emphasizing the integration of renewable energy sources in electrification.
- Implement pilot projects for the electrification of heat in selected industries, incorporating performance benchmarks aligned with the Telangana Industrial Policy.
- Provide financial incentives, facilitated by the Telangana Industrial and Commerce Department, for industries transitioning to electric heat.
- Establish partnerships with technology providers for the deployment of efficient electric heating systems.
- Scale up electrification of heat across industries, integrating advanced technologies and artificial intelligence for system optimization.
- Mandate the integration of renewable energy sources into the electrification process through amendments to the Telangana Electricity Regulatory Commission's (TGERC) regulations.
- Develop a phased roadmap, in collaboration with the TSPCB, for the gradual phasing out of traditional heating methods in favour of electrification.

Biomass Gasification and Co-firing

- Conduct a detailed biomass resource assessment in collaboration with the TelanganaForest Development Corporation Limited and local agricultural departments.
- Identify industries suitable for biomass gasification and co-firing through collaboration with the TGIIC and TGREDCO.
- Collaborate with research institutions to assess the technical feasibility and environmental impact of biomass utilization.
- Implement pilot projects for biomass gasification and co-firing in collaboration with recognized technology providers.
- Provide financial incentives and subsidies for industries adopting biomass co-firing, facilitated by the Telangana Industrial Policy Framework.
- Develop a robust biomass supply chain and logistics infrastructure, adhering to Telangana Industrial Standards. For example, Punjab introduced a new Public-Private Partnership (PPP) model to streamline biomass supply chain logistics.

- Scale up biomass gasification and co-firing initiatives across industries, incorporating advanced biomass handling and conversion technologies.
- Establish partnerships with farmers and local communities for sustainable biomass production, supported by the Telangana Agriculture Department.
- Develop and enforce guidelines and standards, in collaboration with the TGPCB, for the efficient and sustainable utilization of biomass in industrial processes.

Transition from Furnace Oil (FO) to LNG for Industrial Boilers

- Conduct a comprehensive survey of industries currently utilizing furnace oil for boilers.
- Assess the technical feasibility of transitioning to liquefied natural gas (LNG) for various industries.
- Engage with LNG suppliers to ensure a reliable and cost-effective supply chain.
- Implement a phased transition plan for industries to shift from FO to LNG, incorporating financial incentives, facilitated by the Telangana Industrial Policy Framework.
- Monitor and assess the economic and environmental benefits of the transition through collaboration with the State Environmental Impact Assessment Authority.
- Establish partnerships with technology providers to optimize the combustion efficiency of LNG in industrial boilers.
- Complete the transition of all eligible industries from FO to LNG, enforced through the Telangana Pollution Control Board.
- Institutionalize a regulatory framework mandating the use of LNG in industrial boilers through Department of Boilers Government of Telangana.
- Explore opportunities for the integration of renewable energy sources, guided by the Telangana Renewable Energy Policy, in LNG-based heating systems.

Waste Heat Recovery Program (WHRP)

- Identify industries with significant waste heat recovery potential such as cement, glass, chemicals and ceramics through collaboration with the TGREDCO and the Telangana Industrial Infrastructure Corporation.
- Conduct comprehensive feasibility studies, involving recognized technology providers, to assess the technical and economic viability of waste heat recovery in these industries.
- Collaborate with the Telangana Pollution Control Board to establish emission standards that encourage waste heat recovery initiatives.
- Implement pilot WHRP projects in selected industries, incorporating financial incentives and subsidies, facilitated by the Telangana Industrial Policy Framework.
- Develop standardized guidelines for waste heat recovery, aligned with Telangana Industrial Standards.
- Establish partnerships with technology providers and financial institutions to support industries adopting waste heat recovery systems.
- Scale up waste heat recovery initiatives across industries, incorporating advanced technologies and machine learning for continuous optimization.
- Establish a certification process for industries achieving significant energy savings through WHRP, supported by the Telangana Industrial Policy.

- Integrate waste heat recovery into the regulatory framework for industrial energy efficiency, with continuous updates based on technological advancements and industry feedback.

Introduction of a scheme analogous to Perform Achieve Earn (PAE) in Telangana can serve as a catalyst for innovation and efficiency within the MSME sector.

PAE guidelines by BEE

Objective

Perform Achieve Earn (PAE) scheme is the new scheme that BEE is envisaging to unlock PAT like schemes for MSME which will help in improving SEC of energy-intensive industries and help in cost saving making industries more competitive. In the long-term BEE may also explore synergizing the emission Savings / Reduction by MSMEs to Evolving National Carbon market.

Key Features:

Key features include the following:

Particulars	Key features of scheme
Participation	Voluntary for MSMEs.
Compliance	No penalization, MSMEs will earn ESCerts on overachievement of targets.
ESCerts	Government will buy from MSME at levelized price of fuel.
Fund	BEE will form the corpus to support the programme and ensure the purchase of ESCerts.
Benefits	MSME generally use conventional technologies that offer several opportunities for improving efficiencies. Thus, lower investment can yield higher savings. Energy saving will help MSME to become more competitive and healthier work environment.

Benefits to MSMEs:

- MSMEs will receive comprehensive hand-holding support throughout the scheme's implementation, including guidance on identifying and adopting efficient technologies and measures, as well as collecting, analyzing, and reporting energy statistics.
- MSMEs will have the opportunity to monetize the ESCerts earned during the scheme, providing an additional financial incentive on top of the energy savings achieved. This mechanism encourages MSMEs to actively pursue energy efficiency measures.
- The scheme will generate a substantial amount of first-hand, measured, and verified data on industrial energy consumption. This will promote the adoption of Energy Management Systems (EMS) and ISO 50001 certification, leading to improved efficiency, productivity, and profitability for MSMEs.

The UNIDO-BEE project, "Promoting EE/RE in selected MSME Clusters in India," serves as a valuable outline for Telangana to enhance energy efficiency and promote renewable energy

adoption in its MSME clusters. Customizing this model to the state's unique industrial landscape can significantly contribute to sustainable growth and environmental stewardship.

Case Study: Promoting energy efficiency and renewable energy in selected micro, small and medium enterprises (MSME) clusters in India[12]

Objective

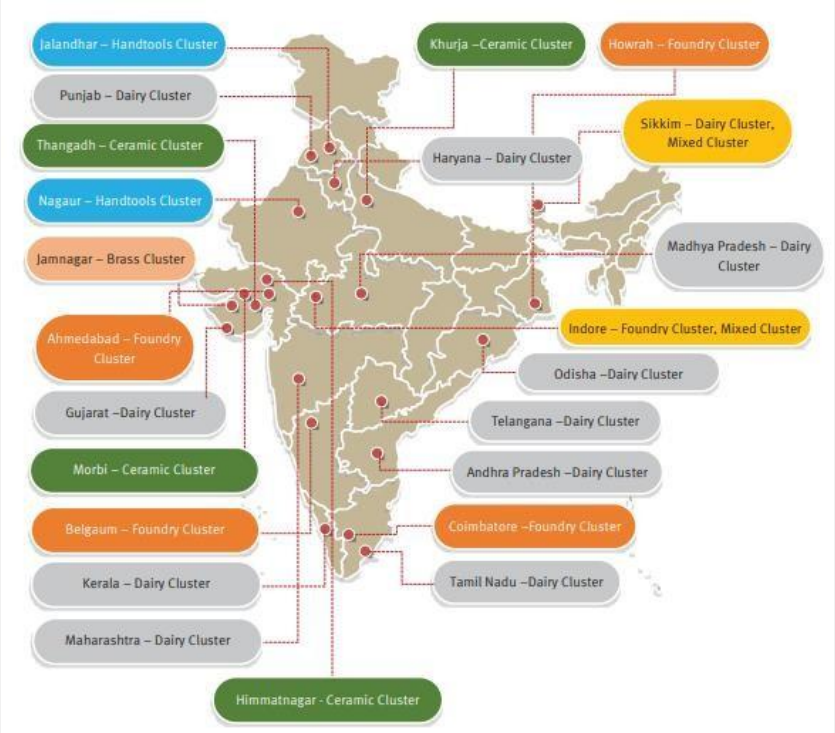
The objective of the UNIDO-BEE project "Promoting EE/RE in selected MSME Clusters in India" was to provide support and assistance to Micro, Small, and Medium Enterprises (MSMEs) in implementing Energy Efficiency (EE) and Renewable Energy (RE) technologies. The project aimed to enhance energy efficiency, reduce greenhouse gas (GHG) emissions, and promote sustainable practices within the MSME sector.

Project Activities:

- Organizing awareness programs and enterprise identification.
- Conducting walk-through audits.
- Preparing cluster-specific EE & RE-based technology compendium.
- Implementation support to participating units.

Impact

Through this project, more than 1800 EE & RE projects were facilitated in the MSMEs which are worth INR 250 crore and have a potential for annual GHG emission reduction of about 140,000 tCO2 across more than 1500 participating units.



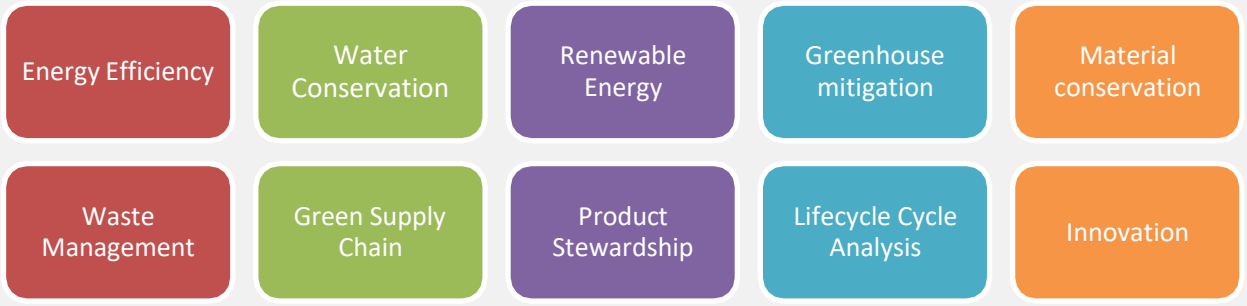
[12] Promoting energy efficiency and renewable energy in selected micro, small and medium enterprises (MSME) clusters in India (isid4india.org)

4.2.3 Strategy #4: Promotion of Green Rating for Industries

A green rating system for industries which provides a standardized methodology to measure and benchmark the environmental performance of industries across different sectors can serve as a valuable tool for industries and the state to assess, improve, and promote environmental sustainability. It facilitates the adoption of energy-efficient practices, encourages resource conservation, and aligns with the state's energy and environmental goals, ultimately leading to reduced energy consumption, improved environmental performance.

The rating system evaluates green features of companies against the following performance parameters[13]:

Figure 19 Parameters for green rating of industries



A case study to illustrate the implementation of this strategy is explained below.

Case of Rajasthan State Pollution Control Board (RSPCB)[14]

RSPCB launched the 'Green rating scheme for Industries in Rajasthan', on 7th July 2021. The program is aimed at enhancing and motivating the environmental performance of companies in Rajasthan, thereby enabling them to compete globally, in addition to achieving resource conservation and cost benefits. To ensure maximum participation of the industries in the scheme and to provide financial and other benefit to the green rated industries, the State Board has decided to provide the following incentives and recognition to the Green Rated industrial units:

Rating Category	Reduction in consent fee
Platinum	50%
Gold	25%
Silver	10%
Bronze	5%
Certified	-

[13]Based on 'Green Company Rating system' (GreenCo rating) which is a comprehensive evaluation framework developed by the Confederation of Indian Industry (CII).

[14]https://environment.rajasthan.gov.in/content/environment/en/rajasthan -state-pollution-control-board/GreenRatingScheme.html

Implementing a green rating system that evaluates these parameters and promotes sustainable practices in the industrial sector can contribute to improving energy efficiency and sustainability in the state. By incentivizing and recognizing industries that adopt environmentally friendly practices, the state can foster a culture of sustainability and promote the adoption of greener technologies and practices.

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.30	0.40	0.60	0.70
CO_2 Emission Reduction Potential ($MtCO_2$)	0.94	1.25	1.88	2.19

4.3 Energy saving potential of the sector & monitoring mechanism

Summary of energy saving potential and emission reduction potential of the industry sector is shown in the table below.

Table 6 Summary of energy saving from the strategies in industry sector

Strategies	*Energy Saving Potential in 2031 (MTOE)*	
	Moderate	Ambitious
1. *Deepening of BEE's Perform Achieve & Trade (PAT) Scheme*	0.76	1.14
2. *Widening of BEE's Perform Achieve & Trade (PAT) Scheme*	0.10	0.15
3. *Green Rating of Industries*	0.6	0.7
Total	1.46	1.99
Emission Reduction Potential (mTCO2)	4.56	6.21

Following are the possible monitoring mechanisms for strategies in industry sector.

Table 7 Monitoring mechanism for industry sector

Policy Type	Monitoring Mechanism
Regulatory	The Telangana Electricity Regulatory Commission (TGERC) is responsiblefor regulating the power sector in the state, including the implementation of energy policies for industries. The TGERC can monitor compliance with these policies through inspections, audits, and other enforcement measures.

Industry associations	Industry associations can play a key role in monitoring energy policies for their members.
SDA (State Designated Agency)	TGREDCO can monitor industry compliance with energy policies through data collection and analysis, as well as through partnerships with industry associations and other stakeholders.
Audits	Energy audits can be conducted by independent third-party providers to assess the energy consumption and efficiency of industrial facilities. These audits can help identify areas for improvement and track progress towards energy policy goals.
Reporting	Mandatory reporting requirements or through voluntary reporting programs that incentivize companies to disclose their energy use and emissions data.

TRANSPORT SECTOR

5 FOCUS SECTOR 2: TRANSPORT

5.1 Overview

Telangana has a significant number of two-wheelers, followed by cars and commercial vehicles. As per the latest statistics, the state has over 1.5 crore registered vehicles, out of which 81% are two-wheelers, 14% are cars, and the remaining 5% are commercial vehicles.

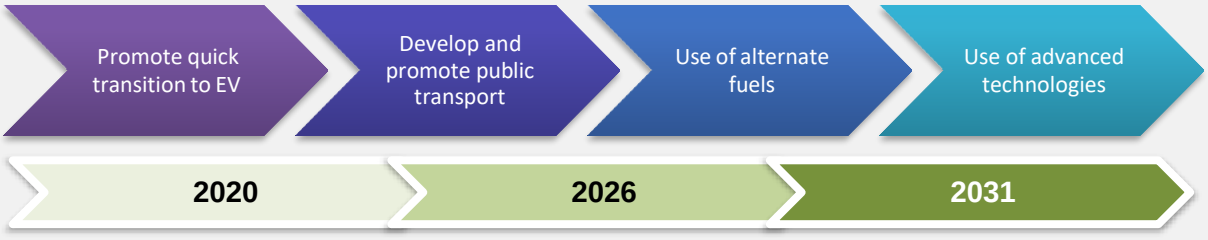
The most commonly used fuel for vehicles in Telangana is petrol, followed by diesel and CNG (compressed natural gas). The state also has a few electric vehicle charging stations in major cities.

One of the key initiatives taken by the Telangana government is the creation of an EV policy that provides a framework for the development of the EV ecosystem in the state. The policy includes measures such as tax exemptions, incentives for EV manufacturers and buyers, and the establishment of charging infrastructure. In addition to these initiatives, the Telangana government has also launched several pilot projects to test EV technology and infrastructure. For example, the state-run public transportation agency TSRTC has introduced a fleet of electric buses in various cities across the state. Similarly, the state government has partnered with private players to set up charging stations at strategic locations across the state.

However, In Telangana, the number of registered vehicles has increased significantly over the past decade, with over 1.5 crore registered vehicles as of 2021. This increase in vehicles has led to a corresponding rise in air pollution, particularly in urban areas. By increasing the adoption of electric vehicles, Telangana can reduce its carbon footprint and improve air quality. Additionally, the state has set a target of achieving 100% electrification of the public transport system by 2030, and increasing the electrification of road transport will be crucial in achieving this goal.

5.2 Energy efficiency strategies in the transport sector

The strategic areas that can be focused on in the short-term and long-term for reducing the energy consumption of transportation sector are shown below.

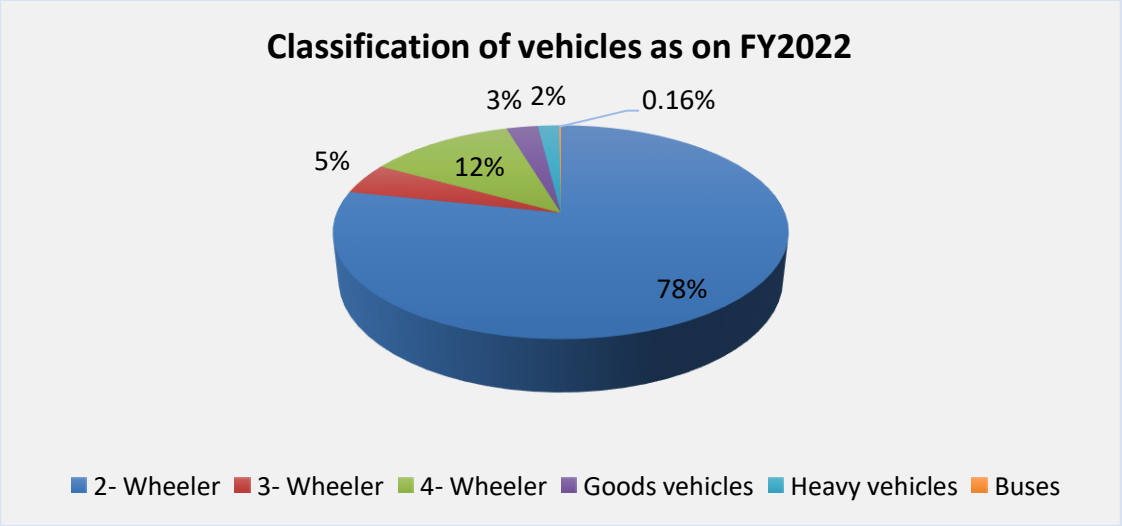


The polis interventions required for reducing the energy consumption of the transport sector are discussed in the subsequent section.

5.2.1 Strategy #1: Facilitating Electrification of Road Transport

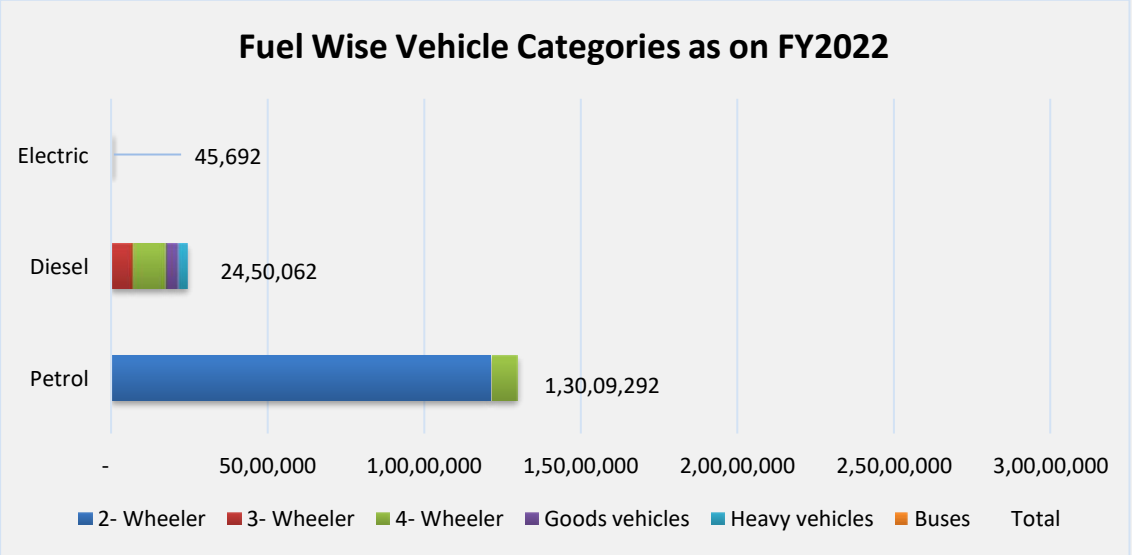
Electric vehicles are significantly more efficient than their petrol or diesel counterparts. While electric vehicles can convert around 60% of the electrical energy from the grid to power the wheels, petrol or diesel cars can only convert 17%-21% of the energy stored in the fuel to the wheels, resulting in a wastage of around 80%. Thus, electrification of road transport is a good way to reduce energy consumption and emissions, particularly as the grid becomes greener with increased use of renewables.

Table 8: Classification of vehicles as on FY2022



Despite being one of the fastest growing electric vehicle markets in India with favourable demand-side incentives through their EV policy and an established charging infrastructure, Telangana still has a long way to go to transition from ICE vehicles to electric vehicles, with only 0.3% of registered vehicles being electric.

Table 9 Fuel Wise Vehicle Categories as on FY2022



Telangana should prioritize the transition to electric two-wheelers and three-wheelers, particularly in cities like Hyderabad. Given the urban nature of these areas and the shorter commuting distances, electric two-wheelers offer a practical and sustainable solution,

supported by their lower upfront costs, ease of charging infrastructure implementation, and compatibility with shorter travel ranges. Subsequently, transitioning to electric three-wheelers would further bolster last-mile connectivity, benefiting both urban mobility and environmental sustainability. While electrification of heavy and goods vehicles faces challenges such as higher upfront costs, limited range, and charging infrastructure concerns, focusing on the smaller, more agile modes of transport could serve as an effective stepping stone toward broader electric vehicle adoption in the state.

The strategy and its implementation are explained below.

Scope Boundary

Applicable to all categories of road transport, including two-wheelers, three-wheelers, four-wheelers, buses, and commercial vehicles.

Implementing Agency

- Telangana Transport Department
- Telangana Road Transport Corporation (TGRTC)
- DISCOMs
- TGREDCO (EV Cell)
- Department of Industries
- Telangana Pollution Control Board (TGPCB)
- Municipal Corporations and Urban Development Authorities

Current Policy/Policies in Place

The Telangana Electric Vehicles and Energy Storage Policy 2020-2030 was launched to promote electric vehicles.

Key Objectives:

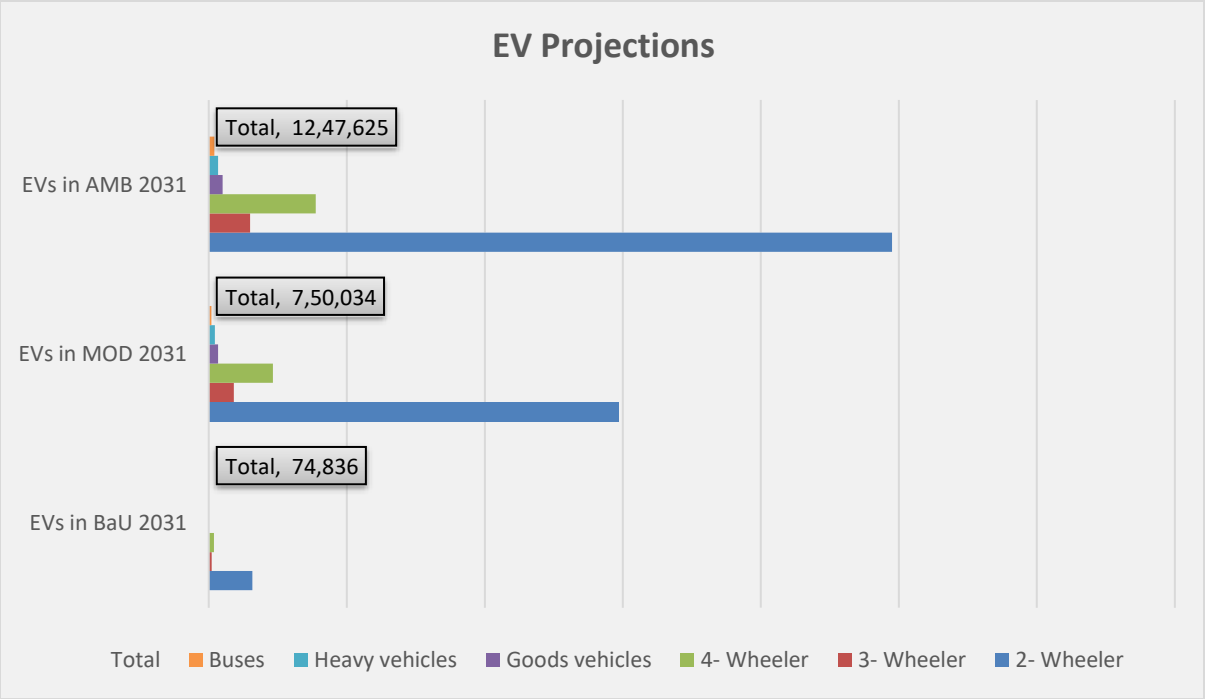
- 100% exemption of road tax and registration fee for the first 200,000 electric two-wheelers purchased and registered in Telangana. 100% exemption of road tax and registration fee for the first 500 electric buses purchased and registered in Telangana.
- 5.25% interest subvention for five years capped at INR 5 Cr. Interest-free loans up to 50% of the cost for state government employees to purchase EVs.
- 60% transportation subsidy with 10% reduction per year for five years, capped at INR 5 Cr.
- Setting up of fast charging stations in Hyderabad and other towns in a phased manner.

Implementation Period

- Short-term (1-2 years): Focus on building charging infrastructure in urban centers and along major highways, creating awareness campaigns, and introducing initial incentives for EV buyers.
- Medium-term (3-5 years): Expand charging infrastructure to semi-urban and rural areas.
- Long-term (6-10 years): Achieve significant electrification of road transport, establish a comprehensive charging network, encourage local EV manufacturing and battery production, and closely monitor the environmental impact.

Saving Potential

The shift of ICE vehicles proposed under this strategy towards electric mobility aligns with Telangana's ambitious targets of achieving 80% electric two- and three-wheelers, 40% electric buses, and 70% electric commercial cars by 2030. According to projections, under a "business as usual" scenario which is based on the historic economic and energy growth rate (6%) of this sector, there is a marginal increase in the number of electric vehicles (EVs), as displayed in the figure below.



However, the implementation of this strategy to convert the existing petrol and diesel fleet, considering a 3% to 5% adoption rate, could result in substantial energy savings, reaching up to 1.06 MTOE under the ambitious scenario in 2031. With the state currently at 0.3% EVs of the total vehicle count, this strategy aims to achieve 5% EVs, contributing significantly to Telangana's long-term sustainability goals.

Table 10: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.33	0.47	0.64	1.06
CO_2 Emission Reduction Potential ($MtCO_2$)	1.0	1.5	2.0	3.3

Action Plans:

The following table sets out a roadmap which provides a structured approach to achieving energy efficiency for this strategy, with specific action plans for each strategy from the current year to the short-term (2026) and long-term (2031) goals.

Table 11 Action Plans- Short Term (FY 2025-2026)

Action Plan:	***Pantographs for EV Charging***
1)	Infrastructure Integration: Incorporate pantograph charging infrastructure into the design of greenfield highway projects, prioritizing key transportation corridors in Telangana.
2)	Public-Private Partnerships: Collaborate with private charging infrastructure providers for the seamless implementation of pantograph charging stations, ensuring effective coverage across the state.
Action Plan:	***Adoption of Battery Swapping for 2 & 3 Wheelers***
1)	Pilot Projects: Identify ten model cities in Telangana for launching pilot battery swapping projects in collaboration with EV manufacturers and service providers.
2)	Infrastructure Investment: Allocate funds for the setup of battery swapping stations, ensuring compliance with safety and technical standards
3)	Consumer Incentives: Offer incentives such as reduced swapping fees or subscription-based packages to encourage widespread adoption of battery swapping for two- and three-wheelers.
Action Plan:	***Electric Rickshaw Adoption Programme***
1)	Awareness Campaigns: Though the state provides 100% exemption of road tax & registration fee for first 20,000 Electric 3 Wheelers purchased & registered within Telangana, there are only 300 e-rickshaws in the state as of 2022. Launch targeted awareness campaigns and implement skill development programs maintenance and repair of electric vehicles.
2)	Financial Literacy Programs: Partner with regional cooperative banks and microfinance institutions to conduct financial literacy programs specifically designed for e-rickshaw drivers. Form a dedicated financial assistance scheme under the Telangana Cooperative Society to facilitate favorable loan options
3)	Demonstration Programs: Organize e-rickshaw demonstration programs at key industrial zones and marketplaces. Engage with local EV manufacturers, for on-site test-drive events and technical support.
Action Plan:	***Smart Parking Solutions***
4)	Smart Parking Solutions: Integrate smart parking solutions with EV charging infrastructure in urban centers, from Maharashtra's "Park and Charge" initiative, optimizing parking spaces to serve as EV charging hubs.

Table 12 Action Plans- Long Term (FY 2030-2031)

Action Plan:	***Scrap Policy***
1)	Introduce a "Cash for Clunkers" program, similar to Delhi's initiative, offering incentives for replacing old, polluting vehicles with electric ones. Implement this policy to accelerate the transition to cleaner and more sustainable transportation options in Telangana.
Action Plan:	***Green Hydrogen Programme- Transport:***
1)	Establish a Green Hydrogen Fund, specific to Telangana, providing low-interest loans and grants for domestic hydrogen fuel cell technology manufacturing.
2)	Offer priority sector lending with favorable interest rates to companies engaged in hydrogen fuel cell production within the state.
3)	Develop a comprehensive plan for establishing a network of hydrogen fueling stations, prioritizing strategic locations along transportation routes within the state.

5.2.2 Strategy #2: Adequate Public Transport

Public transport in Telangana is provided by various modes including buses, metro rail, and suburban rail. The major public transport operator in the state is the Telangana Road Transport Corporation (TSRTC), which operates a fleet of over 10,000 buses across the state. Public transport plays an important role in reducing greenhouse gas emissions by providing an alternative to private vehicle use. However, public transport vehicles also emit pollutants that can affect air quality and public health.

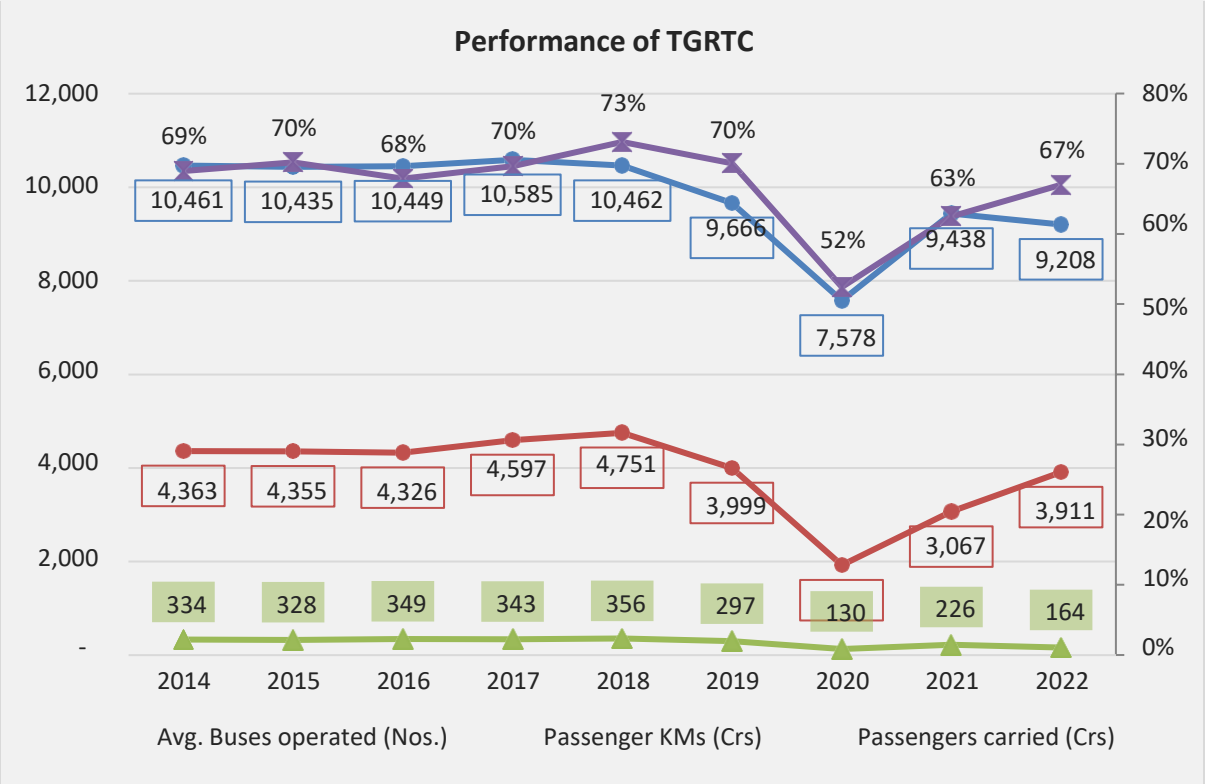
According to a study conducted by the Telangana Pollution Control Board in 2018, the transport sector was the largest contributor to air pollution in the state, accounting for approximately 50% of the total emissions. Within the transport sector, road transport, including public transport buses, was the largest contributor. The government of Telangana has taken several measures to promote the use of cleaner public transport. For example, the state has introduced electric buses and is gradually transitioning its bus fleet to cleaner fuels such as compressed natural gas (CNG) and liquefied natural gas (LNG). The Hyderabad Metro Rail project, which began operations in 2017, also provides an alternative to road transport and has helped to reduce emissions.

According to the Ministry of Housing and Urban Affairs' report "Ease of Living Index 2020," Hyderabad, which is one of the biggest metropolitan cities in the state and the country, ranked 31st among 49 cities in terms of mobility, which takes into account the availability, accessibility, and quality of public transport services.

The report also indicates that Hyderabad has a relatively low percentage of people who use public transport as their primary mode of commuting, with only 23% of people using public transport compared to 57% who use private transport. Hence, facilitating adequate public transport is crucial to reduce energy consumption and GHG emissions of the state.

Telangana Road Transport Corporation holds a fleet of nearly 9400 buses as on 2022, serves about 60 lakhs passengers every day. The graph below displays the key operational

performance parameters including average number of buses on the road, passengers carried and occupancy ratio ratios.



Declining Fleet Size:

According to the data from TGRTC, the fleet size of buses has been declining over the past few years. In 2014-15, the fleet size was 10,461[15], which decreased to 9,666 in 2019-20[16] and further to 9208 in Feb 2022-23. The decrease in fleet size has been attributed to the aging of buses and the lack of investment in new buses. The SRTC has not been able to replace the aging fleet due to financial constraints, resulting in the decline in the number of buses.

Declining Ridership:

The decline in fleet size has also affected the ridership of Telangana TGRTC. According to the data from the Ministry of Road Transport and Highways, the total number of passengers carriedby TGRTC has decreased from nearly 95 lakh passengers transported per day in 2017- 18 to 45 lakhs[17] in Feb 2023. The occupancy ration declined from 99.85% in 2017-18 to 67% in 2023.

The decline in ridership has been attributed to the lack of investment in new buses, resulting in a decrease in the frequency of buses and the quality of service provided to the passengers.

Need for Scaling Up of Public Buses:

The declining fleet size and ridership of TGRTC highlight the urgent need for massive scaling up of public buses in cities like Hyderabad. The population of Hyderabad has been growing rapidly, and the current public transportation infrastructure is inadequate to meet the growing demand. The lack of investment in new buses has resulted in a decline in the quality

[15] MoRTH Review of the Performance of State Road Transport Undertakings 2017-18
[16] https://yourti.in/document/7w6y5bp3/ RTI TGRTC 2019
[17] https://www.tsrtc.telangana.gov.in/corporationprofile.php

of service provided to the passengers, which has discouraged people from using public transportation.

According to the World Bank, the ideal bus-to-population ratio in a city is 1:1,000. However, in Hyderabad, the ratio is currently 1:3,300, which is significantly lower than the ideal ratio. To meet the growing demand for public transportation, the city needs to increase the number of buses significantly. The government needs to invest in new buses, improve the frequency of buses, and provide better infrastructure for public transportation, such as bus shelters and dedicated bus lanes.

The strategy and its implementation are explained below.

Scope Boundary
The policy aims to optimize fuel utilization and reduce carbon emissions by encouraging the adoption of fuel-efficient buses, hybrid technologies, and alternative fuels. It will cover various aspects such as fleet modernization, route optimization, fuel management, and integrated model of transport.
Implementing Agency
• State Department of Transport • Telangana Road Transport Corporation (TSRTC) • State Pollution Control Board • Urban Development Authorities and Municipal Corporations
Current Policy/Policies in Place
Electric Vehicle & Energy Storage Policy 2020-2030: This policy aims to promote the adoption of electric vehicles (including buses).
Implementation Period
Short-term (1-2 years): Conduct a comprehensive assessment of existing public transport services, identify gaps in coverage, and prioritize areas with the highest demand for bus services. Medium-term (3-5 years): Procure additional buses, upgrade the existing fleet, and establish new bus routes based on demand patterns and urban development plans. Long-term (6-10 years): Invest in innovative technologies to enhance the overall efficiency of the public transport system.

Saving Potential

According to the Ministry of Urban Development report on Public Transit, cars and two-wheelers consume less than 50% of the total fuel consumption by all modes, however the total emission produced by these two modes is more than 60%. This is due to high level of congestion in the cities resulting in slow speeds and thus higher emissions. The public transport system is the most effective way to reduce the number of vehicles as well as the total emissions on the road. This is also the only way to a more equitable allocation of road space with people, rather than vehicles.

The energy saving potential is estimated by categorizing districts of the state based on the population, thus arriving on total fuel consumption per day by vehicles with and without public transport per day.

Figure 20 Energy saving potential from adequate public transport

			Fuel consumption (kL/day)		Savings Potential	
Sr No.	Population	No. of Urban Agglomerations	Without Adequate PT	With Adequate PT	kL/day	MTOE/year
Cat-1	<5 Lakhs	13	18	17	13	0.00
Cat-2	5-10 Lakhs	1	559	502	57	0.02
Cat-3	10-20 Lakhs	0	2617	2112	0	0.00
Cat-4	20-40 Lakhs	0	2802	2099	0	0.00
Cat-5	40-80 Lakhs	0	37164	38395	0	0.00
Cat-6	>80 Lakhs	1	38395	37163	1232	0.40

The following table displays the saving potential in moderate scenario and under ambitious scenario.

Table 13: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.15	0.21	0.3	0.43
CO_2 Emission Reduction Potential ($MtCO_2$)	0.5	0.7	0.9	1.3

Action Plans

This section describes several action plans that can be implemented across the public transport sector for this strategy.

Assessment and Planning Phase

Conducting a comprehensive assessment of the current public transport bus fleet's energy consumption, identifying energy-intensive routes

Fleet Modernization Phase

Gradually replacing older, less energy-efficient buses with newer models that comply with energy conservation standards and adopting hybrid or electric buses where feasible.

Fuel Management Phase

Implementing measures to ensure optimal fuel usage, such as fuel-efficient driving practices, fuel quality monitoring, and exploring the use of cleaner alternative fuels.

Infrastructure Development Phase

Establishing necessary infrastructure, such as charging or refueling stations for electric, hybrid, or alternative fuel buses.

Monitoring and Evaluation Phase

Regularly evaluating the policy's progress through key performance indicators (KPIs) such as energy consumption reduction, emissions reduction, and cost-effectiveness.

The following case studies that can be adopted and implemented in the state of Telangana.

Delhi Case Study: Aggregator Policy[18]

All cab companies, food delivery firms, and e-commerce entities operating in Delhi will be required to switch to an all-electric fleet by April 2030. The policy will apply to both existing and new players in the market.

Cab aggregators will be required to obtain a license from the Delhi government to operate in the city.

The license will be valid for a period of five years and will be renewable upon compliance with the policy's provisions.

The policy will mandate the use of only electric vehicles (EVs) with a valid permit from the Delhi Transport Department.

The government will provide incentives and subsidies to promote the adoption of EVs by cab aggregators.

Cab aggregators will be required to maintain a minimum fleet size of 2% electric vehicles in the first year, 5% in the second year, 10% in the third year, and 25% in the fourth year, and 100% by 2030.

[18]https://transport.delhi.gov.in/sites/default/files/Transport/circulars-orders/motor_vehicle_act-hindi-english_23052023.pdf

The policy will also require cab aggregators to set up charging infrastructure for their EV fleet and install GPS-enabled meters for fare calculation.

The policy will ensure the safety of passengers and drivers by mandating that all drivers undergo background checks and providing insurance coverage for both passengers and drivers.

The policy will also regulate surge pricing, commission charged by the cab aggregators, and other operational aspects to ensure a level playing field for all players in the market.

Development of an Integrated Metro-Bus Transportation System

Case of Kochi

Kochi, a major port city in the Indian state of Kerala, has been facing significant traffic congestion and air pollution due to the rapid increase in the number of vehicles on the roads. To provide efficient and sustainable mobility solutions, the Kochi Metro Rail Limited (KMRL) has been developing a multimodal transport system that integrates the metro, buses, informal transport, and ferries.

The following are the key features of the multimodal integration between metro, buses, informal transport, and ferries of Kochi.

Integrated Fare System

The KMRL has implemented an integrated fare system that enables commuters to use the metro, buses, and ferries with a single ticket. The integrated fare system has reduced the transaction time for the commuters and increased the efficiency of the system.

Last Mile Connectivity:

The KMRL has established last-mile connectivity solutions, such as feeder buses and auto-rickshaws, to provide seamless connectivity from the metro stations to the final destinations. The last-mile connectivity solutions have reduced the travel time and increased the accessibility of the system.

Smart Card System:

The KMRL has implemented a smart card system that enables commuters to use the metro, buses, and ferries with a single card. The smart card system has reduced the dependence on cash and increased the efficiency of the system.

Real-time Passenger Information (RTPI) System:

The KMRL has implemented a RTPI system that provides real-time information on the arrival and departure of the metro, buses, and ferries. The RTPI system has increased the convenience of the commuters and reduced the waiting time.

Intermodal Transfer Facilities:

The KMRL has established intermodal transfer facilities, such as bus bays and boat jetties, at the metro stations to provide seamless transfer between the different modes of transport. The intermodal transfer facilities have increased the efficiency of the system and reduced the travel time.

Multi-Level Parking:

The KMRL has established multi-level parking facilities at the metro stations to provide parking space for the commuters using private vehicles. The multi-level parking facilities have reduced the on-road parking and the traffic congestion.

Bicycle Sharing System:

The KMRL has established a bicycle sharing system at the metro stations to provide an eco-friendly mode of transport for short distances. The bicycle sharing system has increased the accessibility of the system and reduced the air pollution.

5.2.3 Strategy #3: Promotion of Ethanol Blending

Promotion of ethanol blending of fuels can have a significant impact on the economy and environment of Telangana. By blending ethanol with petrol, the state can reduce its dependence on imported crude oil and promote the use of cleaner fuels. According to the Ministry of Petroleum and Natural Gas, India's ethanol blending program has resulted in a reduction of 7.9 million tonnes of CO2 emissions in 2020-21.

Moreover, Telangana is an agricultural state with a surplus production of sugarcane, which is a key feedstock for ethanol production. The state can leverage its agricultural resources to promote the production of ethanol and create new job opportunities. In fact, the central government has set a target of achieving 20% ethanol blending in petrol and 5% in diesel by 2025, which will create an additional demand of 1,000 crore liters of ethanol.[19]

The strategy and its implementation are explained below.

Scope Boundary
Production, distribution, and utilization of ethanol-blended fuels in the transportation sector.
Implementing Agency
• Ministry of Petroleum & Natural Gas (MoPNG) • Transport Department • Department of Industries
Current Policy/Policies in Place
Currently, the state does not have a policy. It is recommended that the state formulate a policy following the suit of Tamil Nadu government's Ethanol Blending Policy 2023.
Implementation Period
Medium-term (1-5 years): Develop infrastructure for the storage, transportation, and distribution of ethanol, encourage investment in ethanol production facilities, and progressively increase the ethanol blending ratio. Long-term (6-10 years): Achieve higher blending ratios as per national and state targets, monitor the environmental and economic impacts of the program. Medium-term (3-5 years): Procure additional buses, upgrade the existing fleet, and establish new bus routes based on demand patterns and urban development plans. Long-term (6-10 years): Invest in innovative technologies to enhance the overall efficiency of the public transport system.

[19]https://www.niti.gov.in/sites/default/files/2021-06/EthanolBlendingInIndia_compressed.pdf

Saving Potential

The saving potential is estimated based on following assumptions.

Figure 21 Blending of Fuel In FY's 2026 & 2031

	FY 2026		FY 2031	
Blending of fuel	Moderate	Ambitious	Moderate	Ambitious
Utilization of Vehicles	80%	80%	80%	80%
Fuel Blending %age	20%	30%	20%	30%
Already Blending in Fuel%	10%	10%	10%	10%
Incremental Fuel Blending	10%	20%	10%	20%
Amount of fuel blended (Mn Lit)	539	1,079	733	1,467
GCV of Oil (Kcal/Kg)	10,350	10,350	10,350	10,350
Density (Kg/lit)	0.85	0.85	0.85	0.85
Energy Saved (MTOE)	0.47	0.95	0.65	1.29

Table 14: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.24	0.47	0.65	0.97
CO_2 Emission Reduction Potential ($MtCO_2$)	0.74	1.48	2.02	3.03

Action Plans

While the promotion of ethanol in the "National Policy on Biofuels" falls under the purview of the Ministry of Petroleum and Natural Gas at the national level, the state can play a supportive role in implementing and encouraging the policy within its jurisdiction. Here are a few ways the state can support the promotion of ethanol:

1. Establishing Ethanol Production Infrastructure: Telangana can take initiatives to set up ethanol production infrastructure such as distilleries and ethanol blending units. This can involve attracting private investments or establishing state-owned facilities to produce ethanol from various feedstocks like sugarcane, molasses, agricultural residues, and other suitable sources.
2. The state government can mandate and incentivize ethanol blending in transportation fuels. This involves ensuring that a certain percentage of ethanol is blended with petrol and diesel.
3. The state can create awareness campaigns to educate fuel retailers and consumers about the benefits of ethanol blending, such as reduced greenhouse gas emissions and improved air quality.

4. The state government can provide subsidies, technical assistance, and guidance to farmers to grow high-yielding and energy-rich crops like sugarcane, sweet sorghum, corn, or any other feedstock suitable for ethanol production.
5. State can ease storage, movement, and permit norms for industrial fuel-grade ethanol.
6. Incentive to setup new distilleries to produce ethanol and to install any method approved by CPCB, Capital subsidy (technical civil works, plant and machinery).
7. Interest subsidy at 7% on term loan for 5 years with cap in addition to the assistance received under central government.

5.3 Energy saving potential of the sector & monitoring mechanism

Energy saving potential of the transport sector is 1.7 MTOE and 3 MTOE for moderate and ambitious scenarios FY2030 respectively as seen from Error! Reference source not found.

Table 15 Summary of energy saving from the strategies in transport sector

Strategies	*Energy Saving Potential in 2031 (MTOE)*	
	Moderate	Ambitious
1. *Electrification of Road Transport*	0.64	1.06
2. *Facilitating Adequate Public Transport*	0.30	0.43
3. *Ethanol Blending Programme*	0.65	0.97
Total	1.59	2.45
Emission Reduction Potential (mTCO2)	4.97	7.67

Following are the monitoring mechanisms that could be implemented to track the progress and effectiveness of the policies in the transport sector in Telangana:

Table 16 Monitoring mechanism for transport sector

Policy Type	Monitoring Mechanism
Data Collection	Regular data collection and analysis can help track progress towards these targets and indicators. The state government can collect data on the number of electric vehicles on the road, the amount of fuel consumed, and the usage of public transportation. This data can be analyzed to assess the effectiveness of policies and identify areas where improvements can be made.
Reporting	The state government can publicly report on progress towards climate change targets and indicators. This can be done through annual reports or other public documents. By making this information public, the

	government can increase accountability and transparency, and encourage public engagement and participation.
Stakeholder engagement	Engaging with stakeholders, including industry, civil society, and the public, can help ensure that policies are effective, and that progress is being made. The state government can establish stakeholder groups or committees to provide feedback on policies, identify potential challenges, and suggest improvements.
Technology Assessment	Regularly assessing emerging transport technologies and their potential impact on greenhouse gas emissions can help inform policy decisions and ensure that policies remain up to date with the latest developments.

BUILDING SECTOR

6 FOCUS SECTOR 3: BUILDINGS

6.1 Overview

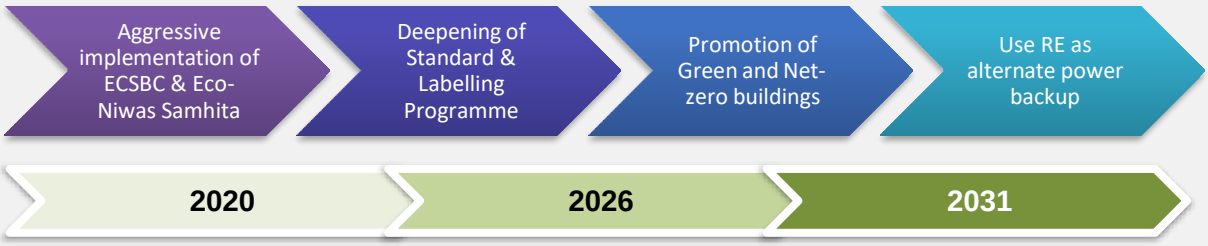
The building sector in Telangana is booming, with both residential and commercial construction seeing significant growth in recent years.

The residential building sector in Telangana has been growing steadily due to several factors such as increased urbanization, rising incomes, and a growing middle class. The demand for affordable housing has also been on the rise in the state similarly commercial building sector in Telangana has also been growing, particularly in Hyderabad, which has emerged as a major business hub in India. The state government has been actively promoting Hyderabad as a destination for investment, which has led to an influx of businesses and corporations in the city. As a result, there has been a growing demand for commercial real estate in the state. The state government has also implemented several policies to promote the growth of the commercial sector, including a single-window clearance system for obtaining approvals for commercial projects. The IT sector, in particular, has been a major contributor to the growth of the commercial sector in Telangana.

Overall, the building sector in Telangana is expected to continue growing in the coming years hence there is a significant scope for energy efficiency.

6.2 Energy efficiency strategies in the buildings sector

The following strategies can be used to achieve the energy reduction targets of domestic and commercial sectors.



Telangana has implemented several policies and initiatives to promote energy efficiency in the building sector. Some of the key policies include the Telangana Building Permission Approval and Self Certification System (TG-bPASS) and Telangana Energy Conservation Building Code (TGECBC).

TG-bPASS was introduced in 2020 to simplify the building permission approval process and reduce the time required for obtaining approvals. The system aims to ensure that all new buildings in Telangana comply with energy efficiency and environmental norms. Over 20,000 building permissions were granted through TG-bPASS within the first six months of its launch[20].

[20] TS-bPASS Online Dashboard

ECBC was introduced in 2019 to promote energy-efficient building design and construction in Telangana. The code provides guidelines for building envelope, lighting, HVAC, and renewable energy systems. According to the official website of Telangana Renewable Energy Development Corporation Limited (TGREDCO), TGECBC has been adopted by various government departments and private organizations. However, the state has to reinforce thisby amending and notifying ECBC to meet local or regional conditions and needs.

The policy interventions required for reducing the energy consumption of domestic and commercial sector is discussed in the subsequent section.

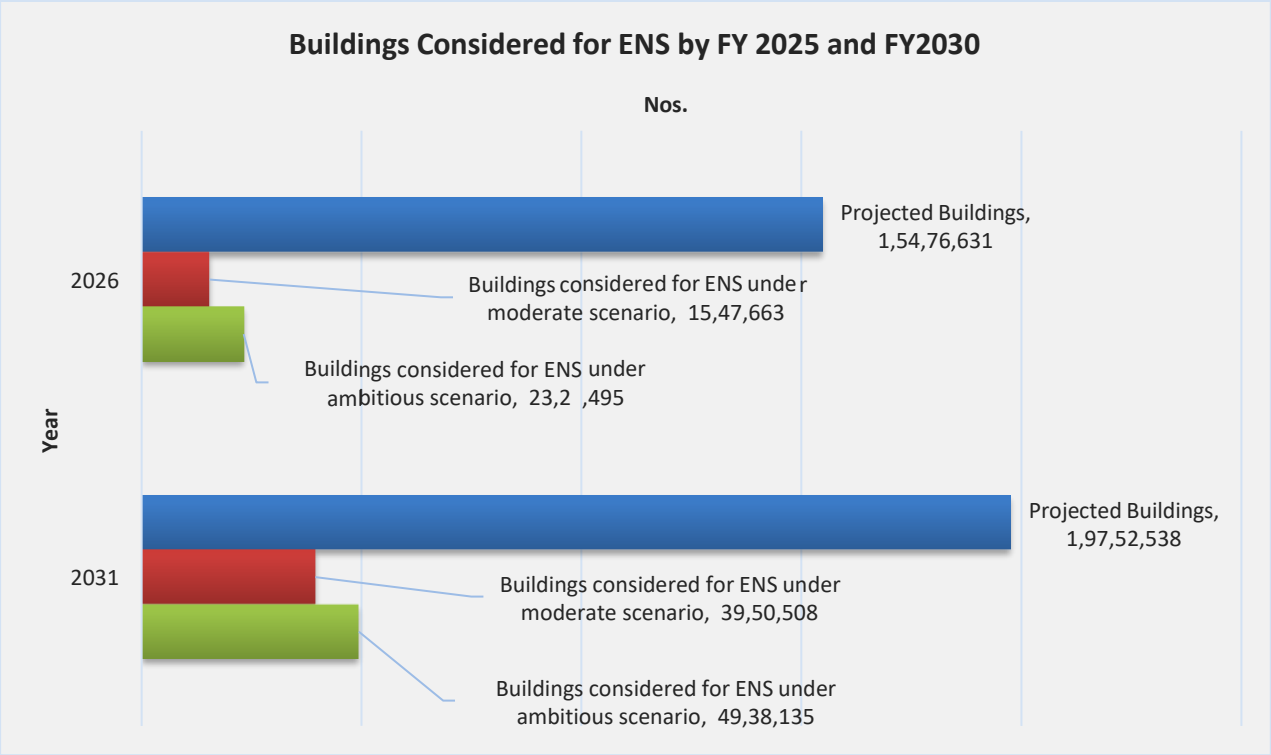
6.2.1 Strategy #1: Implementation of ENS

Eco Niwas Samithi (ENS) is a program launched by the Ministry of Power to promote energy efficiency in residential buildings. The importance of ENS for energy efficiency lies in its potential to reduce energy consumption and greenhouse gas emissions, which are major contributors to climate change. By promoting energy-efficient practices in residential buildings, ENS can help reduce the demand for energy and promote the use of renewable energy sources. This, in turn, can help in achieving the country's goal of reducing its carbon footprint and mitigating the impact of climate change.

The strategy and its implementation are explained below.

Scope Boundary
ENS applies to "Residential buildings" with plot area ≥ 500m2. The policy applies to new residential buildings, including single-family homes, multi-family buildings, and gated communities. The policy provides guidelines and specifications for energy-efficient building design, construction, and operation. The policy covers various aspects of building design and construction, such as orientation, insulation, lighting, ventilation, and renewable energy systems.
Implementing Agency
• Department of Town and Country Planning (DTCP) • Telangana Housing Corporation • Bureau of Energy Efficiency • TGREDCO
Current Policy/Policies in Place
Telangana is preparing the draft of Eco Niwas Samitha.
Implementation Period
Short Term

According to the housing Census 2011 of Telangana, there nearly 91 lac establishments which are further categorized into residence, offices, shops, schools, hotels, hospitals, factories, etc under urban sector. Total number of residential households were projected to 2031 as shown below:



Energy Saving Potential

The saving potential for FY2031 is 0.18 MTOE which is estimated by calculating energy saving per household (kWh/household) which is then multiplied with the projected households for FY2026 and FY2031 for both moderate and ambitious scenarios. Similarly, the GHG saving potential for this strategy is 0.56 $MtCO_2$.

Table 17: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.12	0.16	0.27	0.35
CO_2 Emission Reduction Potential ($MtCO_2$)	0.37	0.51	0.84	1.09

Action Plans

This section describes several action plans that can be implemented across the residential sector for this strategy.

1. **Pilot Project for ENS Case Studies:**

   Allocate funds for pilot projects that can serve as case studies for the successful implementation of ENS in different types of residential buildings. Collaborate with developers, architects, and energy experts to create showcase projects that demonstrate the practicality and benefits of ENS.

2. **Mandatory Labelling for New Construction:**

   Draft legislation to mandate BEE's Energy Efficiency Labelling for all new residential construction projects. Ensure that builders and developers comply with energy efficiency

standards and obtain the appropriate label before occupancy permits are granted. Telangana can consider a threshold of 500 m^2 and all residential buildings with a built-up area exceeding this threshold would be subject to mandatory labelling.

3. Local Government Demonstration Projects:

Encourage local government departments to undertake energy efficiency upgrades in their residential buildings as demonstration projects. Share the success stories and cost savings to inspire homeowners to follow suit.

4. Consumer Education Initiatives:

Develop and distribute educational materials and online resources about BEE's ENS and Energy Efficiency Labelling programme and its benefits in the local language.

Create a user-friendly online platform where homeowners can calculate potential savings and access information about energy-efficient products and services.

5. Awareness Campaigns:

Conduct regular workshops and training sessions in collaboration with local authorities and educational institutions.

Offer these workshops to builders, architects, and homeowners to educate them on energy-efficient building practices and the significance of BEE's Energy Efficiency Labelling.

6. Behavioral Energy Efficiency Program (BEEP) for Telangana

Case Study: Behavioral Energy Efficiency Program by BSES Rajdhani Power Limited (BRPL) in Delhi

BSES Rajdhani Power Limited (BRPL), one of the power distribution companies in Delhi, implemented a successful Behavioral Energy Efficiency Program. The program focused on providing personalized Home Energy Reports (HERs) and an integrated web portal to selected residential consumers, aiming to improve energy efficiency and reduce energy consumption.

Based on results in comparable markets, Home Energy Reports (HERs) have the potential to save 1-2% of BRPL‟s peak power demand. The program was rolled-out across South and West Delhi in the month of October, 2018. Considerable saving has been observed under this program[21]

Components:

- Home Energy Reports (HERs): Selected consumers receive personalized reports detailing their energy consumption patterns, comparisons with similar households, and energy-saving recommendations.
- Integrated Web Portal: An interactive online platform allows consumers to access their energy usage data, track their progress, and access energy-saving tips and resources.

[21] BSES Rajdhani Power Limited (BRPL) website

- Behavioral Change Campaigns: Conduct awareness campaigns and programs to educate consumers about energy efficiency, energy-saving practices, and behavioral changes that lead to energy conservation.
- Incentives and Rewards: Provide incentives and rewards to encourage active participation and achievement of energy-saving targets.

6.2.2 Strategy #2: Deepening of Standard & Labelling Programme

The Bureau of Energy Efficiency (BEE) in India has implemented a standard and labelling program to promote the use of energy-efficient appliances. Under this program, old and inefficient appliances are encouraged to be replaced with new ones that meet the minimum energy performance standards (MEPS) set by the BEE.

The labels help consumers make informed choices, thereby reducing energy consumption and costs. In the context of domestic buildings, the S&L Programme can significantly reduce energy consumption by promoting the use of energy-efficient appliances, lighting, and building materials.

This, in turn, will help in mitigating greenhouse gas emissions, reducing energy bills for consumers, and promoting sustainable development.

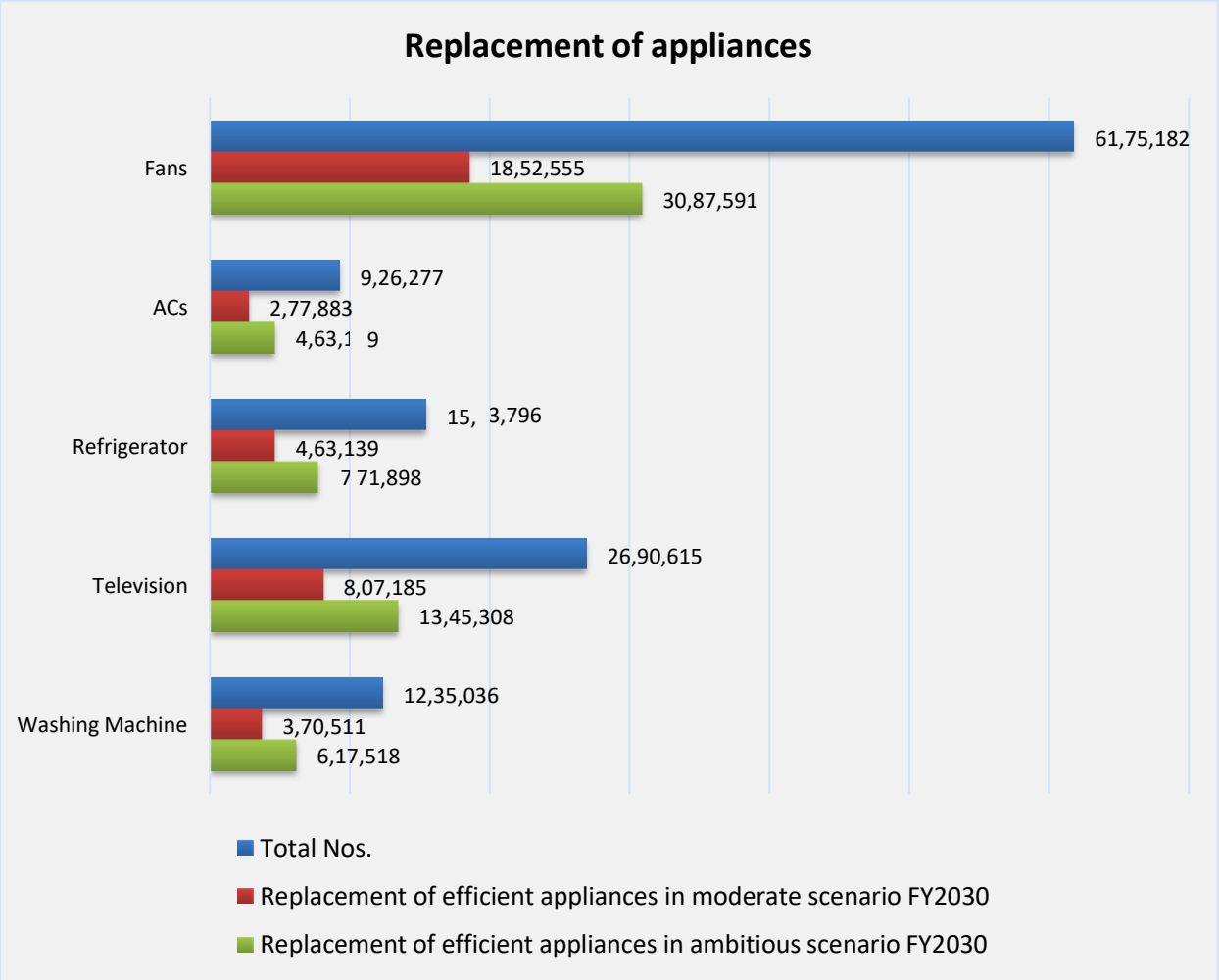
The implementation of the strategy is explained below:

Scope Boundary
The policy will cover a wide range of energy-consuming products, including but not limited to household appliances (e.g., refrigerators, air conditioners, fans), lighting products, industrial equipment, and commercial appliances.
Implementing Agency
• Bureau of Energy Efficiency (BEE) • TGREDCO • Telangana Electricity Regulatory Commission (TGERC)
Current Policy/Policies in Place
BEE's Standard & Labelling Programme
Implementation Period
Short-term (1-2 years): Conduct a comprehensive review of existing S&L initiatives and identify gaps in the coverage of products. Develop an action plan for implementing the policy and creating public awareness. Medium-term (3-5 years): Assess energy savings, and periodically update the efficiency standards to align with advancements in technology and evolving consumer needs.

Saving Potential

The saving potential is estimated by assuming 30% of appliances will be replaced with efficient appliances in moderate scenario and 50% appliances will be replaced under ambitious scenario.

Figure 22 Replacement of appliances



To realize these savings, it is crucial to transition older 5-star rated appliances to the new 1-star rating and phase out older 4-star and below rated appliances, as the market now offers appliances with more energy-efficient technologies.

The state can play a role in enhancing monitoring, verification, and enforcement (MV&E) activities in collaboration with the BEE to effectively enforce energy efficiency standards and encourage the adoption of energy-efficient appliances.

Table 18: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.04	0.05	0.08	0.10
CO_2 Emission Reduction Potential ($MtCO_2$)	0.11	0.17	0.24	0.30

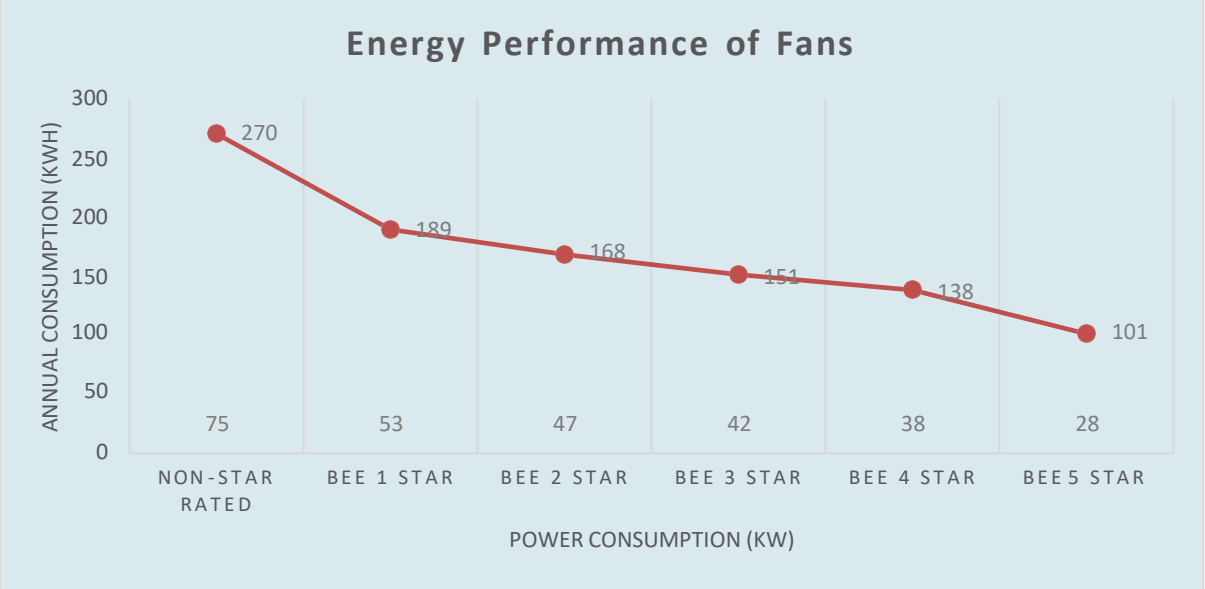
Action Plans

This section describes several action plans that can be implemented across the sector for this strategy.

1. Bulk-purchase initiatives for superfan technologies

Fans play a vital role in the daily lives of people across India, especially in a state Telangana with a hot and dry climate. However, it is also important to note that fans are one of the largest consumers of electricity in households and commercial spaces. In Telangana, the energy consumption by fans is estimated to be around 12% of the total energy consumption, which is significant.

To address this issue and promote energy-efficient fans, the government of Telangana can initiate a bulk-purchase scheme for superfan technologies like BLDC (Brushless Direct Current) fans. These fans are known for their energy efficiency and can save up to 50% of energy compared to traditional fans. This can significantly contribute to energy conservation efforts in Telangana and reduce the energy consumption of fans.



The scheme can be implemented in partnership with manufacturers, promoted through awareness campaigns, and made easily accessible to consumers with the help of local distribution companies.

The scheme can be implemented by partnering with manufacturers of BLDC fans and offering bulk purchase orders at discounted rates. The scheme can also be extended to government offices, public institutions, and commercial buildings. Additionally, the existing five-star rating for fans can be promoted to become the new one-star minimum. This will encourage manufacturers to produce more energy-efficient fans and drive down the prices of energy-efficient fans further.

To ensure the success of the scheme, the state designated agency (SDA) can collaborate with the Bureau of Energy Efficiency (BEE) to create awareness among the public about the benefits of energy-efficient fans and the importance of purchasing energy-efficient products. The SDA can also work with local distribution companies to ensure that energy-efficient fans are available and easily accessible to consumers.

Case Study of Delhi: BEE 5 star rated Super Energy Efficient Fan Replacement Scheme[22]

BSES Rajdhani Power Limited (BRPL) has launched a limited period 'FAN Replacement Scheme' in partnership with leading BLDC FAN manufacturers like R R Kabel Ltd, Halonix Technologies Private Ltd, Atomberg Technologies Private Limited.

It will enable BRPL domestic consumers, to either exchange their old fans with the new BEE 5 star rated super energy efficient BLDC Fans (herein after referred as "BLDC Fans") or can directly purchase them. Consumers can avail discount up to 64%* on MRP under buyback mode and 62%* on MRP on new purchase of BLDC Fans

Wattage of the BLDC Fans offered in the scheme is 28 Watts whereas average wattage of old non star rated ceiling fans is around 75 Watts. Hence replacing the non-star rated ceiling fan with BLDC Fans would result in savings to the tune of 63%.

All the models in the scheme are Remote Controlled and has a sweep of 1200mm. Consumers can avail maximum 3 BLDC fans under buyback or maximum 2 BLDC fans under without buyback with an overall ceiling of 3 BLDC fans per CA. 50000 BLDC Fans are available on first come first serve basis valid till 20th March 2021 or till stocks last under which 40000 BLDC Fans are available for purchase under Buyback Mode and 10000 BLDC Fans are available for fresh purchase without any exchange of old fan

Case Study: Energy Efficient Air Conditioners in India by BEE and CLASP[23]

Objective

The objective of the project is to accelerate access to energy-efficient air conditioners (ACs) in India, considering the country's growing middle-class population and rising disposable income. The focus is on creating awareness about energy-efficient schemes and interventions to influence purchase decisions and promote the adoption of high-quality and affordable AC products.

Project Activities:

- The government of India expects that 300 million ACs will be purchased in India. Awareness of energy-efficient schemes and intervention campaigns will be key to purchase decisions.
- CLASP collaborated closely with BEE by providing technical and institutional support to accelerate access to ACs in India.
- AC efficiency policies were launched in 2006 in India, seeing an increase in energy efficiency by 47 %. The introduction of Minimum Energy Performance Standards (MEPS) and revised star rating plan are some policies by BEE with the support of CLASP.
- Over the past 15 years, India has manufactured more than 63 million efficient AC units that reduced the country's electricity consumption by 85 TWh. Efficient ACs have also lowered electricity bills by an estimated USD 5.6 billion.

[22]https://www.bsesdelhi.com/web/brpl/other-initiative

[23]Increasing Access to Air Conditioners in a Heating India, CLASP

2. **Promote Energy-Efficient and Low-GWP Refrigerant-Based Cooling:**
    a) Launch awareness campaigns highlighting the benefits of energy-efficient and low-GWP refrigerant-based cooling systems for public and private stakeholders.
    b) Introduce financial incentives, such as rebates or tax credits, for the purchase and installation of energy-efficient cooling systems.
    c) Enforce regulatory measures that mandate the use of low-GWP refrigerants in cooling systems to reduce environmental impact.
3. **Energy-Efficient Public Procurement:**
    a) Establishing a certification process for service technicians to ensure proper installation and maintenance of cooling systems.
    b) Regularly update the Public Works Department (PWD) Schedule of Rates (SoR) to incorporate the latest energy-efficient materials and technologies in procurement projects.
4. **Promotion of Heat Pumps**:
    a) Provide subsidies and financial incentives to consumers and businesses for the installation of heat pumps for space cooling and hot water supply.
    b) Collaborate with manufacturers to promote research and development in heat pump technology and offer market-based incentives for adopting this technology.
5. **Mandatory Use of 4-Star Rated Appliances:**
    a) Enforce regulations requiring the use of 4-star rated appliances in all commercial and government buildings to reduce energy consumption and greenhouse gas emissions.
    b) Establish a monitoring and enforcement mechanism to ensure compliance with the mandatory rating requirements.

6.2.3 Strategy #3: BEE Star Rating of Buildings, Green buildings

Green buildings rating in India incorporates various features such as energy-efficient lighting, heating, ventilation, and air conditioning systems, and use renewable energy sources such as solar and wind power.

The Telangana government has introduced several policies and initiatives to promote the construction of green buildings in the state. In 2016, the government launched the Telangana Energy Conservation Building Code (TGECBC), which mandates that all new buildings and major renovations in the state comply with energy efficiency standards.

Additionally, the state government has introduced various incentives for developers and builders who construct green buildings, including reduced property tax rates and faster approvals for building plans.

Several notable green building projects have been completed in Telangana in recent years, including the Hyderabad Metro Rail Project, which incorporates energy-efficient lighting and HVAC systems, and the Telangana Industrial Infrastructure Corporation (TGIIC) Tower, which features a solar panel array and rainwater harvesting systems.

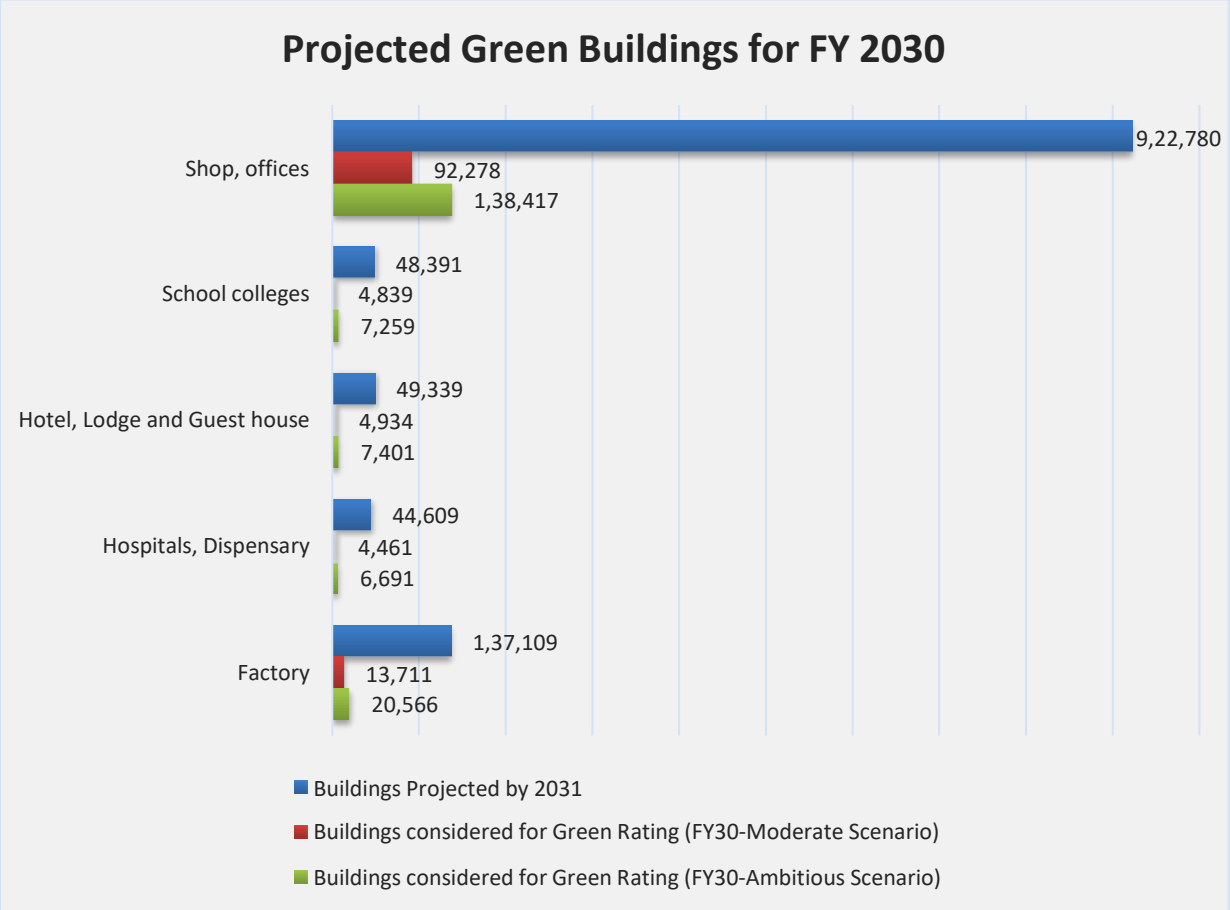
The strategy and its implementation are explained below.

Scope Boundary
The policy will cover commercial buildings, including office complexes, malls, IT parks.
Implementing Agency
• Certification Body • Department of Country and Town Planning • TGREDCO
Current Policy/Policies in Place
The Telangana is actively implementing mandatory energy conservation building code (ECBC) in commercial buildings in the state. However, the Star Rating and Shunya Rating of buildings is currently at a voluntary stage only.
Implementation Period
Phase 1 (2022-2024) • Launch public awareness campaigns to inform builders, developers, and the public about the advantages of energy-efficient and green building practices. • Create financial incentive programs to encourage voluntary adoption. Phase 2 (2025-2028): • Gradually introduce mandatory compliance for new building construction based on specific criteria. • Develop technical resources and capacity for builders and architects to achieve high BEE star ratings and green building certifications. Phase 3 (2029-2031): • Enforce mandatory compliance for a broader range of building categories. • Monitor and evaluate the policy's impact on energy consumption and environmental sustainability.

Saving Potential

As per the housing census data, commercial buildings are further divided into offices, schools, hotels, lodges, factories, etc. The total number for each of the category in the state is projected to FY2025 and FY2031 and 10% penetration is assumed for moderate scenario and 15% for ambitious scenario for FY2031.

Figure 23 Projected green buildings



Saving Potential

Moderate Scenario: It is assumed that in 2026, 5% of the buildings are green rating certified, and in 2031, 8% of the buildings are certified. Similarly, for Ambitious Scenario: It is assumed that in in 2026, 7% of the buildings are green rating certified, and in 2031, 10% of the buildings are green rating certified.

Green Rated Buildings in India incorporating both active (technology-based) and passive (design-oriented) strategies to improve energy efficiency measures can lead to a 15% potential savings in energy efficiency compared to conventional buildings. This is considered as ambitious scenario.

The energy saving potential of implementation of this strategy is mentioned below.

Table 19: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.08	0.15	0.19	0.28
CO_2 Emission Reduction Potential ($MtCO_2$)	0.25	0.47	0.61	0.88

Action Plans

This section describes several action plans that can be implemented across the sector for this strategy.

1. **Development of Compliance Portal:**

   Develop and maintain an Energy Conservation Building Code (ECBC) compliance portal. This portal can serve as a resource for builders, architects, and contractors to access information on energy-efficient and green materials and technologies.

2. **Market Outreach and Awareness:**

   Conduct market outreach campaigns to promote ECBC-compliant products. Utilize various communication channels such as radio jingles, social media, and awareness programs to educate the public about the benefits of energy efficiency.

3. **Pilot Projects for Super ECBC and Net Zero Buildings:**

   Initiate pilot projects to showcase the of benefits of Net Zero (Energy) Rating. Select an initial set of 20 buildings as case studies to demonstrate the feasibility and advantages of higher energy efficiency standards.

4. **Home Energy Auditor Training:**

   Establish training programs for home energy auditors. Create a compliance structure that rewards residential projects for energy savings achieved through energy-efficient measures, such as insulation and lighting upgrades.

5. **Government Building Energy Audits and BEE Star Rating Target:**

   Issue directives to all government departments to conduct comprehensive energy audits of their buildings. Set specific targets for achieving BEE (Bureau of Energy Efficiency) Star Ratings for government-owned buildings. This will serve as a leading example for energy efficiency in the state.

6. **Capacity Building for Professionals:**

   Develop training and capacity-building programs for architects, building professionals, and developers focused on energy-efficient building design and construction practices. Encourage them to incorporate energy-efficient technologies and designs into their projects.

7. **Transformation of Iconic Government Buildings:**

   Identify and select iconic government buildings for transformation into Net-Zero energy buildings. Implement energy-efficient retrofits, renewable energy integration, and smart technologies to showcase the possibilities of sustainable construction and operation.

8. **Mandatory Temperature Set Point for ACs**:

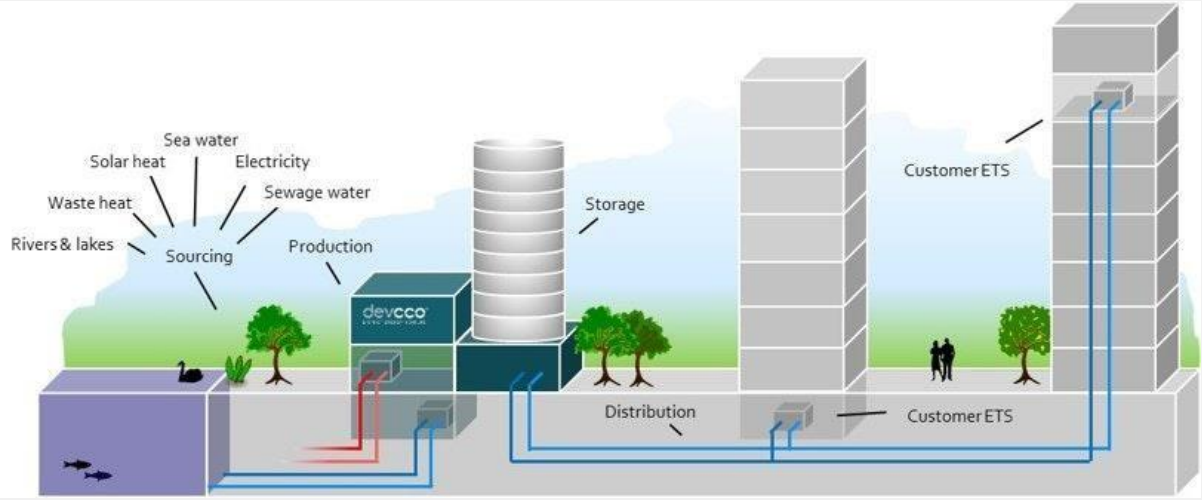
   Enforce a mandatory minimum set point of 24°C for air conditioners in all government buildings.

9. Promoting District Cooling in Telangana

District Cooling Systems (DCS) are centralized cooling systems that provide efficient and sustainable cooling to multiple buildings and facilities. DCS can help reduce the carbon footprint, lower energy consumption, and improve air quality.

Involvement of Municipalities and Utilities: The state government will work closely with municipalities and utilities to promote the adoption of district cooling systems (DCS). Municipalities will be encouraged to provide the necessary infrastructure for DCS, including space for thermal storage tanks and access to the distribution network.

Figure 24 District Cooling System (DCS)[24]



Case of Gujarat International Finance Tech-City (GIFT City)[25]
Gujarat International Finance Tech-City or GIFT City is India's first merchant DCS developed by the Government of Gujarat. GIFT City has been developed on 886 acres of land with a planned total built up area of 5.76 Mn Sqm, and includes commercial buildings, residential buildings, social buildings such as hotel, club and malls, and a hospital. With DCS, the total requirement of 270,000TR of air conditioning shall be met with just 180,000TR of chillers. Each plant has been designed with chilled water based stratified thermal energy storage tank, which can be charged during off-peak period and discharged during peak period, thus reducing the electrical demand from 240MW to 135 MW only. GIFT City is a notable example of DCS that was properly planned with involvement of authorities and municipal corporation for planning and implementation of DCS in Gift city. GIFT city has experienced challenges in terms of demand assessment. Currently, only one plant of 10,000TR is operational feeding eight buildings. In DCS, capital costs are "front-loaded" because of the high costs of installing basic plant infrastructure and pipe mains in the early years.

[24] https://www.iea.org/articles/the-go-to-guide-for-sustainable-district-cooling
Energy transfer station (ETS)

[25] https://eeslindia.org/wp-content/uploads/2021/03/Final-Report_National-District-Cooling-Potential-Study-for-India.pdf

6.3 Energy saving potential of the sector & monitoring mechanism

Energy saving potential of the building sector is displayed in the table below.

Table 20 Summary of energy saving from building strategies

Strategies	*Energy Saving Potential in 2031 (MTOE)*	
	Moderate	Ambitious
1. *Implementation of Eco Niwas Samitha*	0.27	0.35
2. *Deepening of S&L Programme*	0.08	0.10
3. *Promotion of Green Rating of Buildings*	0.19	0.28
Total	0.54	0.73
Emission Reduction Potential (mTCO2)	1.69	2.27

Following are the monitoring mechanisms that could be implemented to track the progress and effectiveness of the policies in the building sector in Telangana:

Table 21 Monitoring mechanism for building sector

Policy Type	Monitoring Mechanism
Reporting & Disclosure	Establishing a system for enforcing compliance with energy efficiency codes and standards under operating conditions every few years can help ensure that buildings are meeting the required standards for reducing carbon emissions.
Performance contracting	The government can encourage performance contracting, where third-party contractors are responsible for implementing energy efficiency measures in buildings. The contractors can be required to report on energy savings achieved and the government can monitor these savings.


AGRICULTURE
SECTOR

7 FOCUS SECTOR 4: AGRICULTURE

7.1 Overview

The state of Telangana has a significant agricultural sector, with a large number of farmer's dependent on irrigation to cultivate crops. However, the use of electric pumps for irrigation has resulted in significant pollution and rising energy costs for farmers.

7.2 Energy efficiency strategies in the agriculture sector

7.2.1 Strategy #1: Transition of electrical pumps to solar powered pumps

The use of energy-efficient pumps can result in significant energy savings. In Telangana, the agricultural sector consumes about 36% of the total electricity generated in the state in FY 2020, and pumps account for 80% of this energy consumption. Therefore, there is a significant opportunity for energy savings by improving pump efficiency. A policy on solar pumps for the agriculture sector in Telangana can help promote sustainable irrigation practices and reduce the dependence on conventional energy sources.

The strategy and its implementation are explained below.

Scope Boundary
The policy will encompass the establishment of solar feeder distribution networks to supply electricity specifically for agricultural and irrigation purposes. The focus will be on transitioning existing electrical pumps used in agriculture and other relevant sectors to solar-powered pumps.
Implementing Agency
• Bureau of Energy Efficiency (BEE) • Department of Agriculture • TGREDCO • DISCOMs
Current Policy/Policies in Place
• Component-C of PM KUSUM Scheme is a new initiative from the Government of India aimed at ensuring reliable day time power supply for irrigation, reducing subsidy burden on DISCOMs. • Under this Component, individual farmer having grid connected agriculture pump will be supported to solarize pump. • Solar PV capacity up to two times of pump capacity in kW is allowed under the scheme, so that the farmer will be able to use the generated solar power to meet the irrigation needs and get additional income by selling surplus solar power to DISCOMs.
Implementation Period

- Component-C of PM KUSUM Scheme is a new initiative from the Government of India aimed at ensuring reliable day time power supply for irrigation, reducing subsidy burden on DISCOMs.
- Under this Component, individual farmer having grid connected agriculture pump will be supported to solarize pump.
- Solar PV capacity up to two times of pump capacity in kW is allowed under the scheme, so that the farmer will be able to use the generated solar power to meet the irrigation needs and get additional income by selling surplus solar power to DISCOMs.

Saving Potential

The number of electrical pumps is projected till FY 2031. If 2% of these pumps are converted to solar pumps in moderate scenario and 5% in ambitious scenario, it would result into energy savings of 0.22 MTOE and 0.27 MTOE respectively.

Figure 25 No. of electrical pumps vs solar pumps projected for FY2031

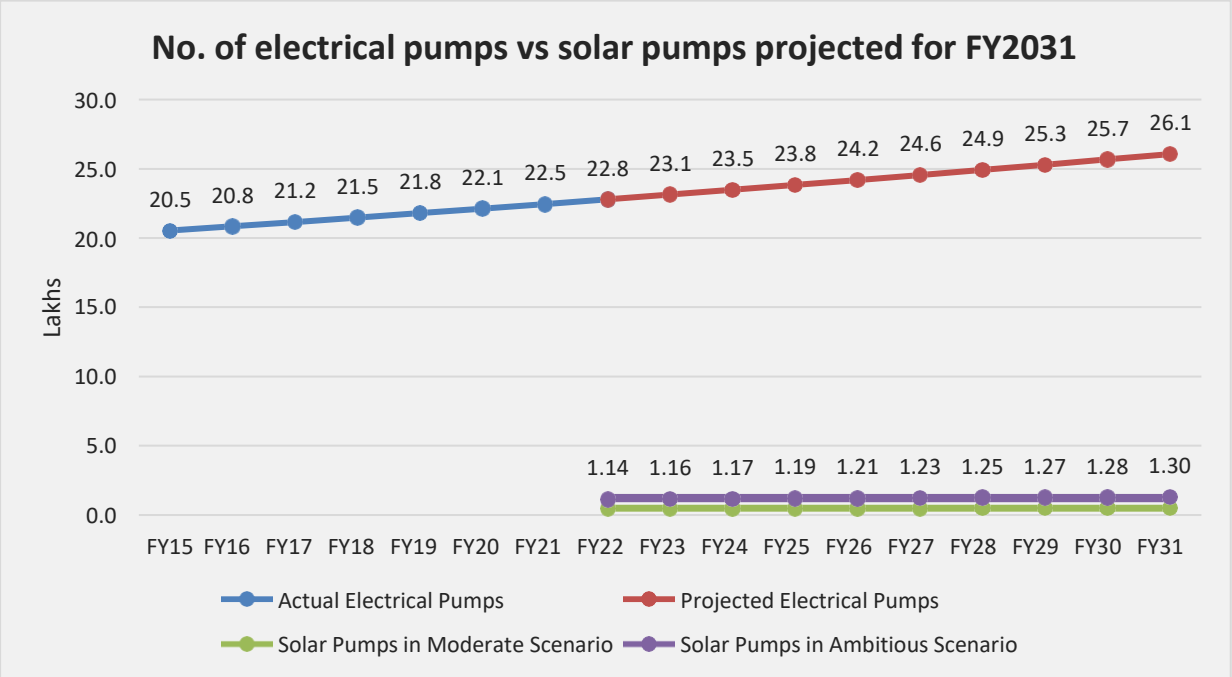


Table 22: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.10	0.12	0.22	0.27
CO_2 Emission Reduction Potential ($MtCO_2$)	0.31	0.39	0.67	0.84

7.2.2 Strategy #2: Replacement of inefficient pumps with BEE 5 Star Rated Pumps along with smart control panel

According to a report published by the Bureau of Energy Efficiency (BEE), inefficient pumps account for a significant portion of the energy consumption in India's agricultural sector. The report states that up to 30% of the energy consumed by agricultural pumps in India is wasted due to inefficient pump sets, resulting in a loss of about Rs. 50,000 crores annually.
The BEE report also highlights that a large proportion of agricultural pumps in India are inefficient and outdated. Out of the estimated 20 million agricultural pumps in India, only 10% are estimated to be energy-efficient, while the remaining 90% are inefficient and consume more energy than required. This highlights the importance of replacing inefficient pumps in the agricultural sector with more energy-efficient options to reduce energy consumption and reduce electricity bills.

The strategy and its implementation are explained below.

Scope Boundary
The policy will focus on the agriculture sector of Telangana specifically targeting inefficient pumps used for irrigation purposes. It will cover the replacement of existing inefficient pumps with BEE 5-star rated pumps and smart control panels in agricultural fields and related irrigation systems.
Implementing Agency
• Bureau of Energy Efficiency (BEE) • Department of Agriculture • TGREDCO • Telangana Electricity Regulatory Commission (TSERC) • DISCOMs
Current Policy/Policies in Place
• BEE's S&L Programme • Under AgDSM programme EESL has been retrofitting BEE star rated pump sets in TS.
Implementation Period
Long Term

Saving Potential

The number of electrical pumps is projected till FY 2031. If 10% of these pumps are replaced with BEE 5-star rated pumps in moderate scenario and 15% in ambitious scenario, it would result into energy savings of 0.08 MTOE and 0.16 MTOE respectively.

Figure 26 Replacement with E.E pumps for FY 2031

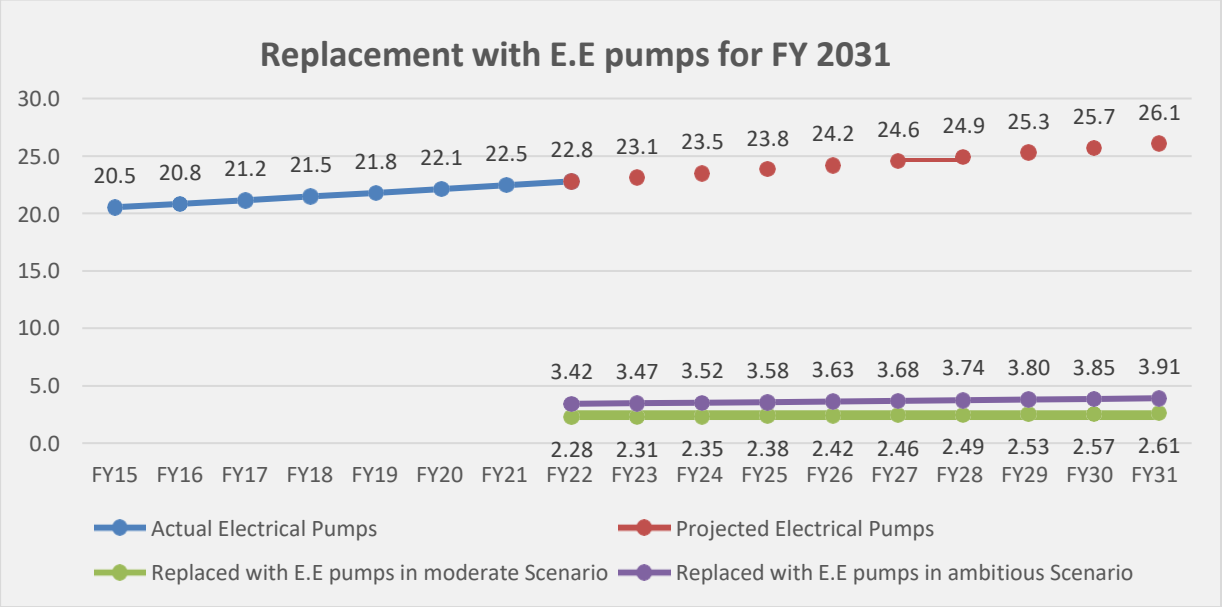


Table 23: Energy Saving Potential

Particulars	*2026*		*2031*	
	Moderate	Ambitious	Moderate	Ambitious
Energy Saving Potential (Mtoe)	0.03	0.04	0.05	0.06
CO_2 Emission Reduction Potential ($MtCO_2$)	0.09	0.12	0.16	0.19

7.3 Energy saving potential of the sector & monitoring mechanism

Energy saving potential of the agriculture sector is displayed below.

Table 24 Summary of energy saving from the strategies

Strategies	*Energy Saving Potential in 2031 (MTOE)*	
	Moderate	Ambitious
1. *Transition to solar powered pumps*	0.22	0.27
2. *Replacement of inefficient pumps with BEE 5 Star Rated Pumps along with smart control panel*	0.05	0.06
Total	0.27	0.33
Emission Reduction Potential (mTCO2)	0.84	1.03

Following are the monitoring mechanisms that could be implemented to track the progress and effectiveness of the policies in the agriculture sector in Telangana:

Table 25 Monitoring mechanism for agriculture sector

Policy Type	Monitoring Mechanism
Benchmarking	Benchmarking can be used to compare the energy consumption patterns of different farms in the same region. This can help identify the most efficient farms and highlight areas where other farms can improve their energy efficiency.
Awareness Programs	Educating farmers about the benefits of energy efficiency and providing training on energy-saving practices can help increase adoption rates and improve the effectiveness of energy efficiency policies.
Reporting and Monitoring	Regular reporting and monitoring can help ensure that energy efficiency policies are being implemented effectively and that progress is being made towards energy-saving goals. This can include regular reporting on energy consumption patterns, energy savings achieved, and greenhouse gas emissions

8 SUMMARY

The state energy efficiency action plan identifies significant energy-saving potential in Telangana through the implementation of energy efficiency and conservation strategies.

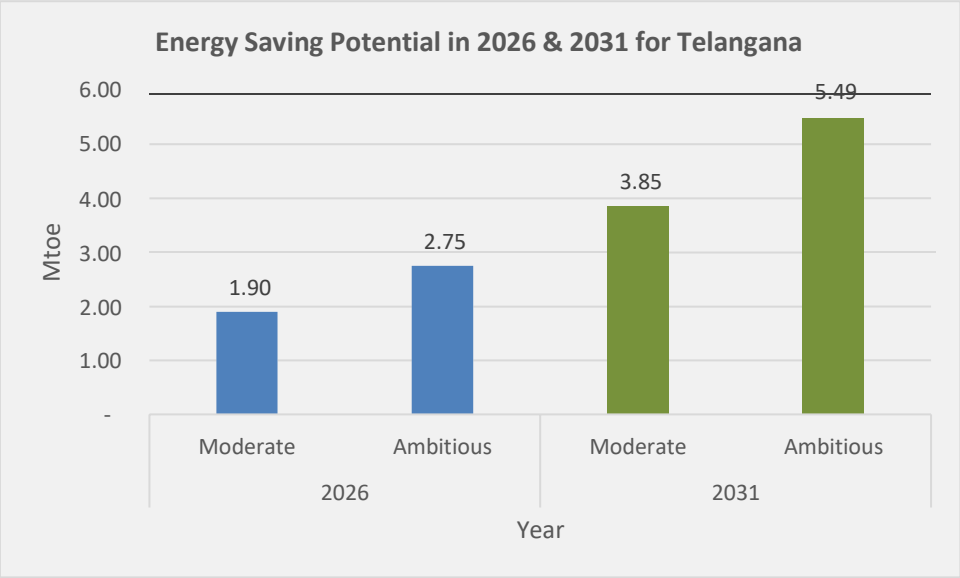
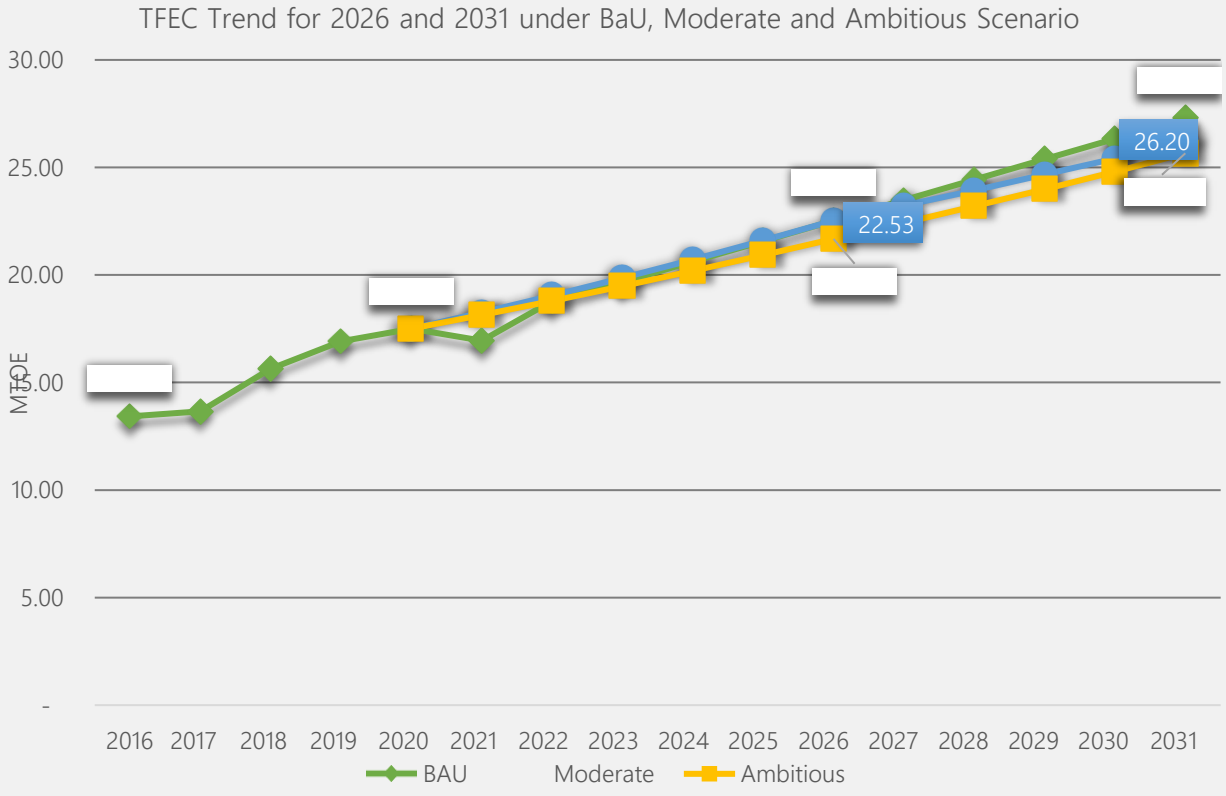


Figure 27 Energy Saving Potential in 2026 & 2031 for Telangana

The state has the opportunity to 3.85 save Million Tonnes of Oil Equivalent (Mtoe) by 2031 under the moderate scenario and nearly 5.49 Mtoe under the ambitious scenario.



The above figure illustrates the Total Final Energy Consumption (TFEC) for the state in 2026 and 2031 under different scenarios. In the Business as Usual (BaU) scenario, TFEC is projected to reach nearly 31.3 Mtoe by 2031. This scenario assumes that present energy consumption patterns will continue without significant changes in policies, technology, or behavior. The BaU scenario helps understand the likely trajectory of energy consumption without specific energy efficiency measures or conservation efforts.

In the moderate scenario, which assumes some moderate-level energy efficiency measures and conservation efforts will be implemented, TFEC is reduced to 26.20 Mtoe by 2031.

In the ambitious scenario, aggressive and transformative efforts are assumed to be implemented, aiming to significantly reduce energy consumption and achieve substantial energy savings. Under this scenario, the state can reduce its TFEC to 25.66 Mtoe by 2031.

The table below shows the summary of energy consumption reduction and emission reduction - sector wise. The total energy consumption reduction is 5.9 Mtoe and the total emission reduction is 17.2 MtCO2 under ambitious scenario. The biggest reduction in energy consumption is in the transport sector, at 2.4 Mtoe, followed by the industry sector at 2 Mtoe. The biggest reduction in emissions is in the transport sector, at 7.7 MtCO2, followed by the industry sector at 6.2 MtCO2.

Table 26 Summary of energy consumption reduction and emission reduction- sector wise.

Sector	Emissions Reduction (MtCO2) - FY2031		Energy Consumption Reduction (Mtoe) - FY2031	
	Moderate	Ambitious	Moderate	Ambitious
	MtCO2 reduction	MtCO2 reduction	Mtoe Reduction	Mtoe Reduction
Transport	**5.0**	**7.7**	**1.6**	**2.4**
Industry	**4.6**	**6.2**	**1.5**	**2.0**
Buildings	**1.7**	**2.3**	**0.5**	**0.7**
Agriculture	**0.8**	**1.0**	**0.3**	**0.3**
Total	**12.1**	**17.2**	**3.9**	**5.5**

To achieve these energy savings, collaborative efforts are required from all stakeholders, including the national government, state government, state departments, large and small industries, and citizens. By working together, Telangana can effectively reduce energy consumption, enhance sustainability, and contribute to a greener and more energy-efficient future.

9 INVESTMENT POTENTIAL

The strategies outlined in the State Energy Efficiency Action Plan are designed to yield substantial energy savings across various sectors. These energy savings, in turn, translate into a reduced demand for energy generation. To effectively implement these strategies, there is a need for investments in energy efficiency projects and the development or modification of policies that create a conducive environment for such projects.

Investments in energy efficiency projects are critical for the successful execution of the plan and offer benefits, including:

- Economic Growth: These investments accelerate economic growth by creating job opportunities and fostering innovation in energy-efficient technologies and practices.
- Environmental Benefits: Energy efficiency investments lead to a significant reduction in greenhouse gas emissions, contributing to a cleaner and more sustainable environment.
- Energy Security: By reducing the state's energy consumption, investments in energy efficiency enhance energy security and reduce dependence on external energy sources.

The table below displays the economic opportunities that energy efficiency measures in each of the focus sectors present under ambitious scenario by FY 2031.

Table 27 Investment Potential[26]

Sector	Emissions Reduction (MtCO2) - FY2031		Energy Consumption Reduction (Mtoe) - FY2031		Investment Potential
	Moderate	Ambitious	Moderate	Ambitious	
	MtCO2 reduction	MtCO2 reduction	Mtoe Reduction	Mtoe Reduction	INR Crores
Transport	**5.0**	**7.7**	**1.6**	**2.4**	**₹4,507**
Industry	**4.6**	**6.2**	**1.5**	**2.0**	**₹3,653**
Buildings	**1.7**	**2.3**	**0.5**	**0.7**	**₹1,335**
Agriculture	**0.8**	**1.0**	**0.3**	**0.3**	**₹606**
Total	**12.1**	**17.2**	**3.9**	**5.5**	**₹10,102**

The energy saving investment potential of the state is estimated to be nearly ₹10,102 crores by the year 2031, under the ambitious savings scenario, with the transport sector constituting highest energy saving investment potential followed by industry sector.

[26]The Ministry of Power, Government of India, in consultation with the Bureau of Energy Efficiency (BEE), has established a reference price for per metric tonne of oil equivalent. For the year 2018 -19, this benchmark price stands at INR 18,402. This price serves as a benchmark for assessing the economic value of the energy saved through the energy efficiency measures.

10 FINANCING MODELS FOR ENERGY EFFICIENCY

Energy efficiency stands as one of the most effective approaches for meeting the growing energy demand, curbing greenhouse gas emissions, and delivering socio-economic advantages. To fully harness the potential of energy efficiency, substantial investments are necessary to stimulate technological availability in the market and encourage energy efficiency adoption among end consumers. Various developed countries have successfully unlocked energy efficiency financing potential through innovative models, some of which are also under exploration in India, notably the Energy Service Companies (ESCOs) model. The present study delves into several financing models that could prove helpful across commercial, residential, and industrial sectors. In India, several financing strategies are already prevalent, including:

There are several other financing strategies employed globally and adopted by developed countries:

10.1 On bill financing model

On-bill financing can aid in increasing the household sector's adoption of climate-friendly and energy-efficient appliances (such as lighting, air conditioners, and refrigerators). Because it lowers monthly electricity costs and hence boosts purchasing power, it provides homes with a host of important advantages.

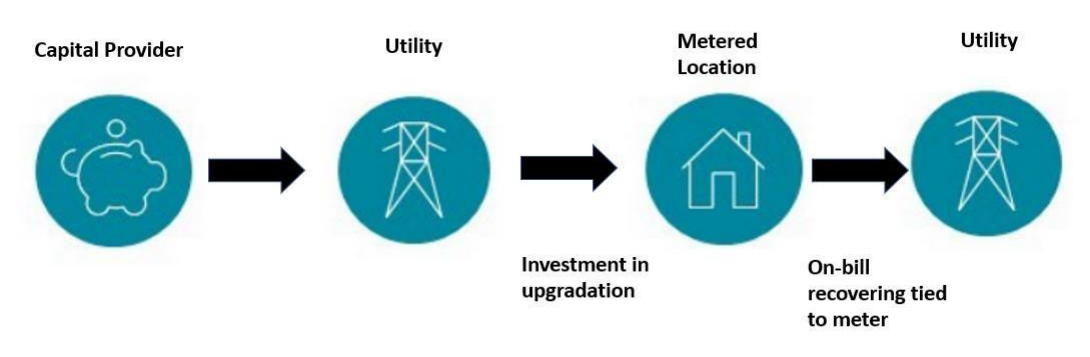
It has been demonstrated that basic energy efficiency measures like insulation, air sealing, heat pumps, and lighting upgrades produce an average energy savings of 25%. Through on-bill initiatives, an electric company or a third-party financier can cover the initial cost of energy-saving upgrades and equipment. Ratepayers can use a percentage of the savings realised as a consequence of the upgrades to pay down the cost of these investments through a monthly payment on their electric bill. On-bill financing makes energy-saving upgrades more accessible

and affordable for consumers of all sorts and income levels by moving the initial costs to the utility.

Figure 28 Major common energy consuming appliances and equipment in buildings sector

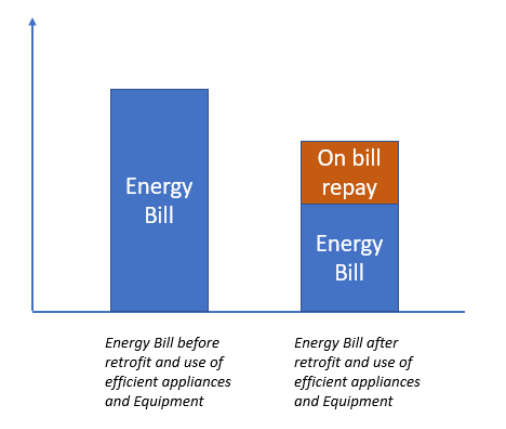
Energy efficiency is frequently the fastest-acting alternative to reduce the consumption of fossil fuels. The plan of delivering EE appliances to consumers may be more significant in order to offer them significant benefits. With the OBF model, consumers won't be put at a financial disadvantage because the payback is mostly funded by savings on electricity costs. The only party having an interest in the suggested model for using energy-efficient equipment will be the consumer.

Figure 29 Modality of financing energy efficiency projects through on bill financing model



Improvements in efficiency of houses and buildings are treated by tariffed on-bill programmes as an investment in system dependability and as the creation of less expensive distributed energy resources. The utility makes investments and seeks cost recovery through tariffs using its recognized authority while utilizing the current systems for sending bills and collecting money. The investment in energy savings is linked to the location rather than a specific customer up until the point at which the utility's investment is recouped. A tariffed investment does not increase the owner's debt profile the same way a bank loan would.

Figure 30 On bill financing structure



With adjustment of cost of appliances in monthly payment of electricity bills, this business model enables clients to access a wider choice of energy services, including demand response, electrification of transportation and heating systems, and efficiency enhancements.

Case Study: ECOFRIDGE-On bill financing

The government of Senegal (in 2020), in association with African Development Bank, United4Effciency, Renewable Energy and Energy Efficiency (ECREEE) &BASE offered efficient refrigerator and cooling product on EMI basis which was repaid through utility bills. The credit assessment of customer was done through their track record of payment of utility bill. As of Nov 2022, ECOFRIDGE GO model has achieved:

- Selling of 2527 new energy efficient ACs and emission reduction of 18824 MTCO2
- Total energy of 22,836 MWh energy saving
- Financing of 1 million USD

10.2 Energy service companies (ESCOs) Model of financing

Energy service companies (ESCOs) design, plan, construct, and secure funding for initiatives that lower energy use, energy expenditures, and maintenance and operations expenses at their clients' facilities. A project's technical and performance risks are typically assumed by ESCOs, who also serve as project developers for a wide variety of energy conservation measures (ECMs) (Energy Efficiency and Renewable Energy, n.d). Because they employ the performance-based contracting model, ESCOs set themselves apart from other businesses that provide energy-efficiency solutions. The payment made to an ESCO for a project is closely correlated with the real energy cost savings.

The utility might be able to reach economies of scale that would further reduce costs with strong user acceptance and bundling that offers a kind of "mass customisation." To guarantee programme success, the utility would keep handling billing, quality control, monitoring, and reporting. Customers' invoices would show the improvement measures' net energy cost reductions versus service fees. Customers may think about upgrading for extra services like new windows or a refrigerator when the initiative started to show benefits.

- ESCO in Industry

Energy service companies (ESCOs) are becoming one of the most popular off-balance-sheet methods of financing in the energy efficiency sector. Depending on the needs of the client, ESCOs engage in a variety of activities, including, but not limited to, conducting energy audits of existing facilities, designing and implementing energy efficiency projects, locating opportunities to save energy, outsourcing energy infrastructure and technology, and directly funding or arranging the financing of energy projects (Ablaza 2019c).

Ownership of the energy asset or infrastructure may lie with the ESCO (or even a third party) rather than the energy end user, depending on the contracting arrangement. Energy performance contracting (EPC), which aids in reducing the financial and performance risk associated with energy efficiency projects, is being used by an increasing number of ESCOs. Although an equipment replacement or retrofit tries to lower total energy consumption, the energy savings that the end user actually experiences may differ from what was anticipated or promised for a variety of technical reasons.

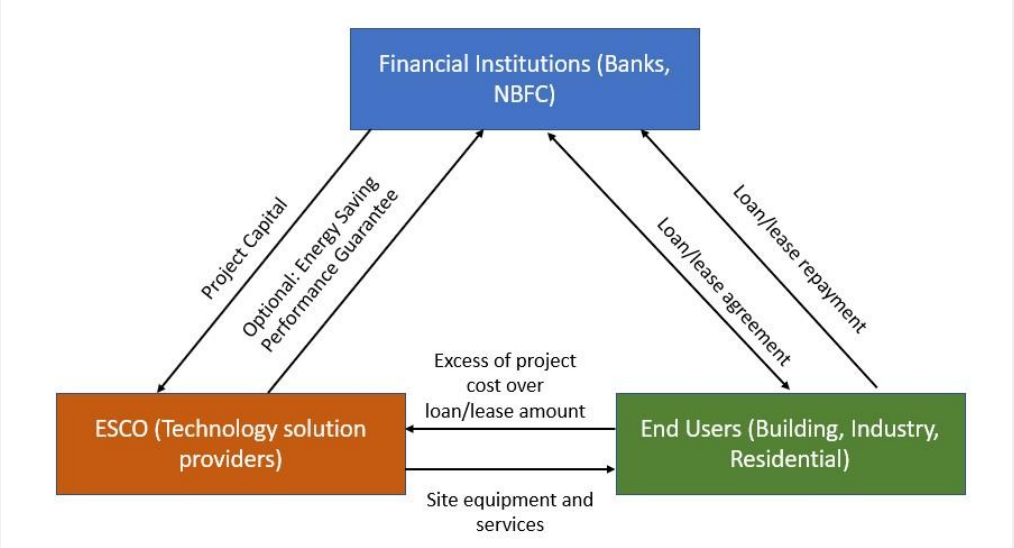
In an EPC, the ESCO guarantees energy savings as long as predetermined operational and maintenance guidelines are followed. Processes for measurement and verification are also put in place to make it easier to calculate the actual energy savings. The ESCO reimburses the energy end user with an amount equal to the gap if the project doesn't achieve the guaranteed energy savings. Because utility rate volatility is a market-based risk that should be managed separately from the energy efficiency project, performance guarantees are usually linked to energy savings (e.g., kWh) rather than monetary savings. There are two models in Energy Efficiency.

- Guaranteed Saving Model of ESCO

The energy savings promised by the ESCOs carrying out the projects equate to cost savings. The host facility's owner pays the ESCO a predetermined amount based on the guaranteed energy savings from the project.

The ESCO covers the shortfall if savings fall short of the guarantee. The ESCO may receive (but is not guaranteed) a bonus payment if the savings are greater. The M&V protocol and the ESCO's payment terms will be laid forth in the ESPC. According to this concept, the host facility or facility owner may raise equity capital, and the FI will cancel the ESCO's debt. The host facility or facility owner then offers a loan. The facility owner/host facility then uses its savings to pay the FI's interest and loan repayments.

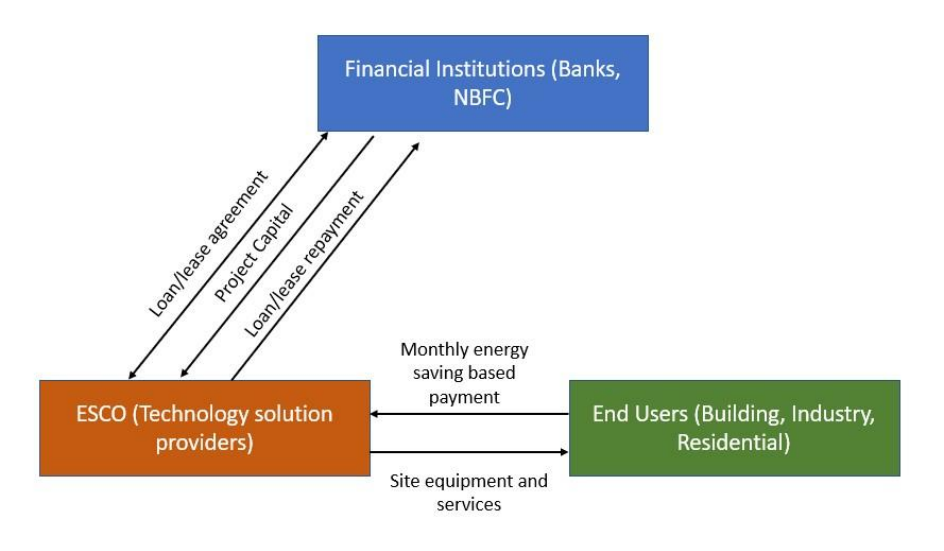
Figure 31 Guaranteed Saving Model



- Shared Saving Model of ESCO

Energy services companies deploy the Energy Savings Performance Contracting (ESPC) strategy in a turnkey manner. Design, engineering, construction, installation, commissioning, measurement, and verification are all part of ESCO services. Additionally, ESCO s handle training, financing, and operations and maintenance. The main criterion in this situation is to share the value of the energy savings, and this is what makes up the ESCOs' revenue stream. Beyond the duration of the contract, any savings are retained by the facility owner/host facility.

Figure 32 Shared ESCO saving Model



Various risk have been identified in the ESCO model through one of the research papers (Muhammad Ery Wijaya, et.al., 2021).

Table 28 Various Risk in ESCOs Models

Risk category	Impact	Likelihood
Economic and Financial	High	Medium
Finance resources	High	Medium
Operational and Behavioural	Medium	Low
Awareness	Medium	Medium
Measurement and verification	Medium	Medium
Technical solution and services	Medium	Medium
Technology	Medium	Low
Regulatory	High	Medium

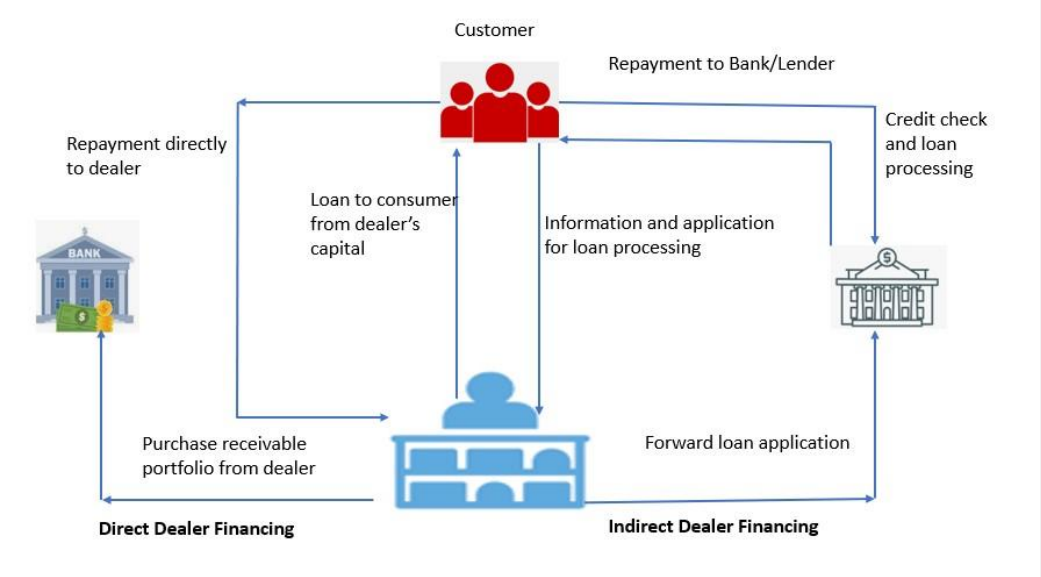
Source: Climate Policy Initiative, 2021

10.3 Dealer or retailer financing model

In direct dealer financing dealer directly provide loan to consumer or through partnership with third party financing institutions. Dealer can get access to finance by selling its purchase receivable portfolio to Bank. In indirect financing arrangement, dealer forward the consumer loan application form and other information to bank and bank access the credit worthiness of consumer before processing the loan. Consumer's repayment is directly to Bank and Dealer works as intermediary or facilitator.

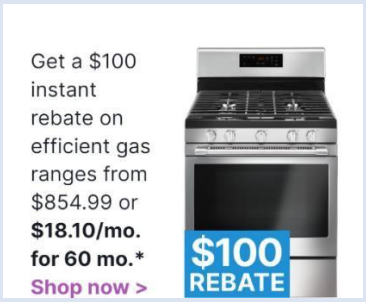
Dealer financing lowers the cost of loan for consumers and easier access to credit facility. Dealer also helps the consumer to do all paperwork, credit risk assessments etc. Dealer can negotiate with multiple finance provider for lending at discounted interest rates.

Figure 33 Dealer and retailer financing model



Case study: ECO-Financing Model by Enervee

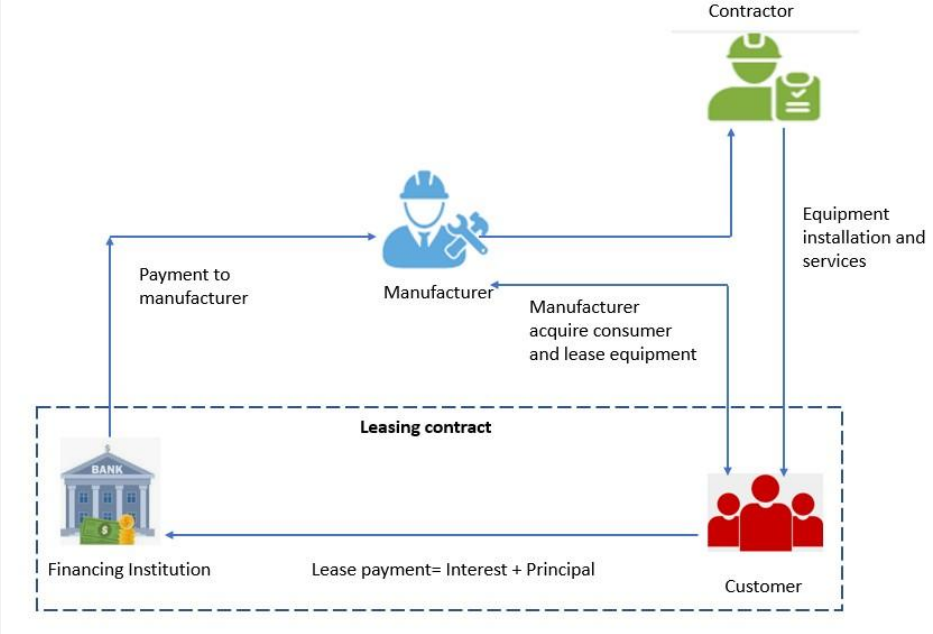
Los Angeles based Enervee company, a provider of energy efficient appliances through online marketplace announced the ECO-Financing model for making energy efficient appliances affordable. The program was launched in collaboration with lenders Southern California Gas Company & the Sate of California. Enervee also partnered with best buy to provide end to end consumer services such delivery and installation. ECO-Financing model provided consumer favorable loan terms, low-cost EMI, no down payment facility and instant rebate. Consumer could buy the product upto $ 5000. Initially it was targeted to reach 5.7 millionconsumers of SOCalGas and expansion later. Under this program consumer could purchase Clothes washers/dryers, dishwashers, kitchen appliances etc.



10.4 Leasing financing model

Leasing an asset-based financing where the financier (lessor) finances its assets to customer (lessee) for a fixed period of time through an agreement between lessor and lessee (IFC, 2009). In such model leasing is managed by partnership between financing institution, technology provider and contractor or service vendor.

Figure 34 Leasing financing model



Manufacturer install equipment through contractor or service provider at the customer end. Equipment is financed by banking or financing institution where the customer pays fixed monthly instalment to Bank and Bank pays fixed monthly payment to manufacturer. Manufacturer takes liability for services, maintenance.

Case Study: Ultimate Home Comfort by York: A leasing model by Johnson Control

Johnson Control, provides smart and sustainable cooling and heating solutions for building. It launched a 10 years leasing program for HVAC system for residential buildings under its brand YORK. This industry led program provided owners a new, energy efficient system with no down payment and service warranty for 10 years and even at low monthly payment. It provided stress free cooling and heating services to homeowners with 53% saving in energy. Financing was provided by third party- Fundient Capital LLC and YORK covered its cost from customer through fixed monthly payment. York initially piloted leasing program in United State for three years and made many contractor its partners which increased its profit. At the expiry of the contract the customer had following options:

- Lease to own and pay balance pending amount of loan to financier.
- No-renew and handover the equipment to financier.
- New 10 year lease with new equipment.
- Extension of lease for 2 years without maintenance and parts facilities

10.5 Utilization of green finance

Any structured financial activity that is intent to improve environmental outcome and enhance the access of finance for environmental benefit can be referred to as a green finance (World Economic Forum, 2020). Green finance directly linked with Environment Social and Governance (ESG) factor. Green finance benefits the broader context of the business rather than traditional source of finance which look at the profitability and cashflow. Grant is also a part of green finance generally provided by either Government or Internationally established institutions (Non-profit). Example: Government Environmental Facility (GEF) fund. GEF is an independent operating financing organization that provides grants for projects under climate change, biodiversity, land degradation etc. Grants has big role for enhancing energy efficiency adoption at large scale.

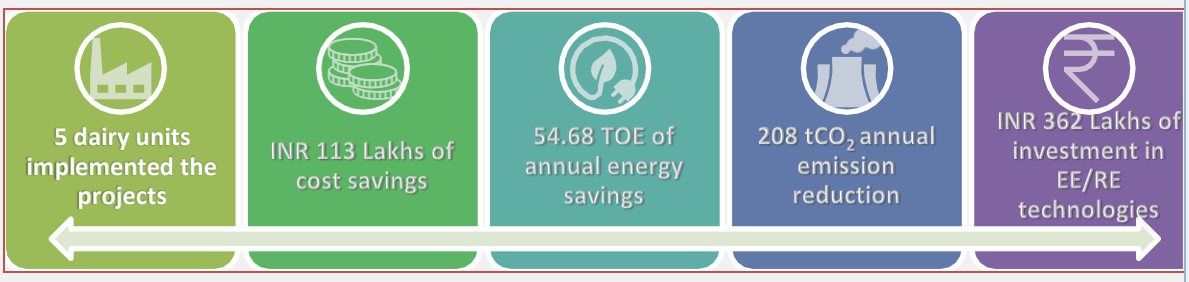
Case Study: CII's Dairy Project- Promoting Energy Efficiency and Renewable Energy in Selected MSME Clusters in India" initiated by GEF, BEE and UNIDO

In 2020 dairy cluster received grants for promotion of energy efficient technology under a program-"Promoting Energy Efficiency and Renewable Energy in Selected MSME Clusters in India" initiated by GEF, BEE and UNIDO.

The main objective of the project was to facilitate the implementation of energy efficient and renewable energy technologies in Rajasthan dairy clusters of India. The project of scaling up and expanding activities in Rajasthan dairy cluster had four major components:

- Component 1: Increasing capacity of suppliers in the category of Renewable and Energy efficient products.
- Component 2: Facilitate the implementation of energy efficient and Renewable energy technologies, best practices in MSMEs cluster of India.
- Component 3: Scaling up the project at national level.
- Component 4: Strengthening of policy, Institutional and decision-making frameworks.

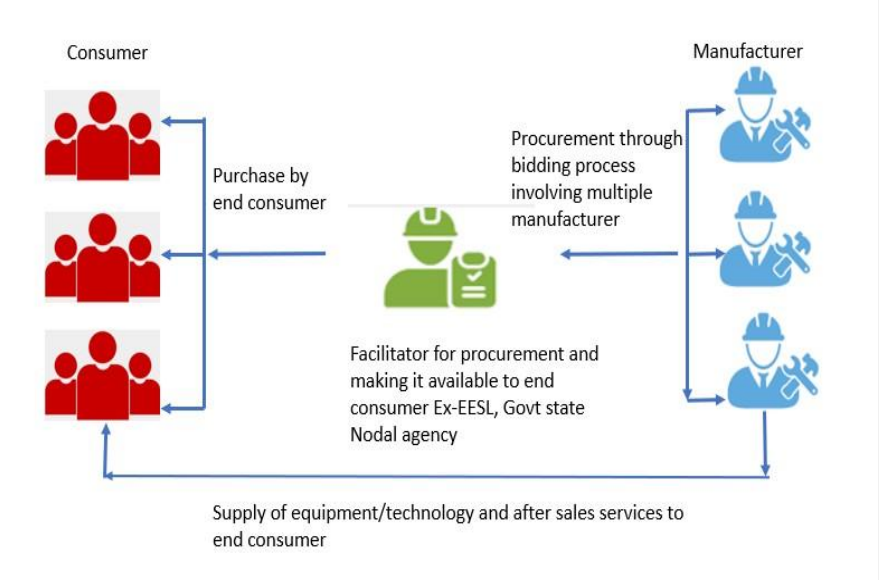
And key outcomes of the project is as given below:



10.6 Bulk Procurement model

Procurement of appliances and equipment in large volume helps in achieving economies of scale and bulk procurement bring down the cost significantly and make it more affordable to end consumer.

Figure 35 Bulk procurement model



Bulk procurement model brings buyer and seller at a common platform where the manufacturer is able to generate profit through large volume and consumer gets product at lower price than market. Bulk procurement model providers negotiate with manufacturer and brings down the product price in multiple bidding round. The procurement costs are also down because of elimination of middle parties for selling the product in the market.

Bulk procurement model does not cover the financing requirements of consumer for purchasing the product rather brings down cost of the product.

Case study: Bulk Procurement model of EESL
Energy Efficiency Services Ltd. (EESL) targeted a program for replacement of standard motors with energy efficient motors for end consumers (PAT Industries and SMEs). The additional benefit of such bulk procurement model through EESL was the extend warranty of motors, Motor price reduction, information sharing on best practices and training to industries on operation and maintenance.
As shown in below table EESL, procured IE-3 motors, in bulk at price less than the market price and helped industries to save energy consumption and money.

Motor specification (IE-3)	*No of motors procured.* *(Nos Lakh)*	*Market price of Motor (Rs Lakh)*	*EESL Procured price (Rs Lakh)*
1.10	0.15	0.08	0.05
1.50	0.15	0.08	0.06
2.20	0.15	0.11	0.07
3.70	0.15	0.14	0.09
5.50	0.15	0.20	0.13
7.50	0.15	0.23	0.16
11	0.10	0.47	0.25
15	0.10	0.49	0.31
22	0.10	0.65	0.40

11 WAY FORWARD

The “State Energy Efficiency Action Plan” report for Telangana provides a roadmap for the state to achieve its energy efficiency goals. The report covers various sectors, including industry, buildings, transportation, and agriculture, and identifies opportunities for energy savings and greenhouse gas emissions reductions.

Formalizing the action plan as a guiding policy document provides a strong foundation for action. Integrating proposed strategies into relevant sectoral policies and regulations across industries, buildings, transportation, and agriculture creates a framework for incentivizing energy-efficient practices. This structured approach ensures alignment with Telangana's Nationally Determined Contributions (NDCs), allowing for a data-driven pursuit of energy efficiency goals.

Establishing a dedicated task force or working group is a vital first step. This group, comprised of representatives from government, industry, NGOs, and energy experts, fosters collaboration across diverse stakeholders. Their combined expertise will be crucial for prioritizing key intervention areas based on cost-effectiveness, potential impact, and feasibility. Developing a clear implementation timeline with defined milestones and establishing robust monitoring, evaluation, and reporting (M&E) mechanisms are essential for tracking progress and refining strategies as needed.

Securing adequate funding is critical for successful implementation. A multi-pronged approach is recommended, leveraging public funds through budgetary allocations for key initiatives within the action plan. Financial instruments like grants, loans, and public-private partnerships (PPPs) can attract private sector investment. Additionally, innovative financing mechanisms such as energy efficiency bonds can further incentivize private capital flow towards energy - saving solutions.

Implementing training and capacity building programs for policymakers, industry professionals, and consumers empowers stakeholders with the necessary knowledge and skills to actively participate in energy-saving initiatives. Furthermore, fostering collaboration between industry and academia/research institutions is key. This fosters innovation in energy-efficient technologies, promotes knowledge sharing, and ultimately contributes to a more sustainable future for Telangana.

By adopting this multifaceted approach, Telangana can translate the vision outlined in the "State Energy Efficiency Action Plan" into tangible results. Policy development, stakeholder engagement, resource mobilization, and knowledge advancement will work together to drive significant energy savings, reduce greenhouse gas emissions, and propel Telangana towards a more sustainable future.

12 REFERENCES

Figure 36 List Of References

[1] State-Energy-Efficiency-Index-2021-22

[2] Socio Economic Survey 2020-21

[3] National Power Portal- Installed Capacity 2021

[4] National Power Portal- Installed Capacity 2022

[5] Telangana Statistical Abstract 2021

[6] TGERC Load Forecasts and Resource Plans

[7] a) Central Electricity Authority of India- General Review Report 2015-2020 (Electricity data)
b) Ministry of Petroleum and Natural Gas - Indian PNG Statistics Report 2015-2020 (Oil data)
c) Ministry of Coal- Annual Report 2015-2020 (Coal Data)

[8] CEA General Review Reports (FY19, FY20) & CEA Dashboard (FY16, FY17, FY18)

[9] CEA General Review Report 2015-20

[10] RBI- Handbook of Statistics on Indian States- Gross State Domestic Product (Constant Prices) from 2015 to 2022

[11] Annual Report 2020-21, Ministry of Micro, Small and Medium Enterprises, Government of India

[12] United Nations Industrial Development Organization (UNIDO)

Promoting energy efficiency and renewable energy in selected micro, small and medium enterprises (MSME) clusters in India

https://isid4india.org/promoting-energy.php

[13] 'Green Company Rating system' (GreenCo rating)

https://www.greenco.in/

[14] Rajasthan State Pollution Control Board, Govt of Rajasthan

https://environment.rajasthan.gov.in/content/environment/en/rajasthan-state-pollution-control-board/GreenRatingScheme.html

[15] E-AMRIT, NITI Aayog, Govt of India- Benefits of Electric Vehicles

https://e-amrit.niti.gov.in/benefits-of-electric-vehicles

[16] Vahan Dashboard – Statewise vehicles data as on FY 2021

[17] "ROADMAP FOR ETHANOL BLENDING IN INDIA 2020-25"-NITI Aayog & Ministry of Petroleum and Natural Gas

https://mopng.gov.in/files/uploads/Ethanol_blending_in_India_(7).pdf

[18] BEE Eco Niwas Samitha- Star Label for Energy Efficiency Homes

https://econiwas.beeindia.gov.in/star-label-foree-homes.php

[19] BSES Rajdhani Power Limited (BRPL) website

[20] Impact of Energy Efficiency Measures for The Year 2021-22- Bureau of Energy Efficiency

[21] Impact of Energy Efficiency Measures for The Year 2020-21- Bureau of Energy Efficiency

[22] Urban Population- Census of India 2011

[23] BEE 5 star rated Super Energy Efficient Fan Replacement Scheme- BSES Rajdjani Power Limited (BRPL)

https://www.bsesdelhi.com/web/brpl/other-initiative

[24] Energy Efficient Air Conditioners in India by BEE and CLASP

https://www.clasp.ngo/updates/increasing-access-to-air-conditioners-in-a-heating-india/

[25] Gujarat International Finance Tech-City

[26] National-District-Cooling-Potential-Study-for-India- EESL India

https://eeslindia.org/wp-content/uploads/2021/03/Final-Report_National-District-Cooling-Potential-Study-for-India.pdf

Bureau of Energy Efficiency

Ministry of Power, Govt. of India 4th Floor, Sewa Bhawan, R. K. Puram, New Delhi - 110066 (INDIA) T: +91 11 26766700 | F : +91 11 26178352 Email: admin@beenet.in | www.beeindia.gov.in