GOVERNMENT OF INDIA
MINISTRY OF POWER

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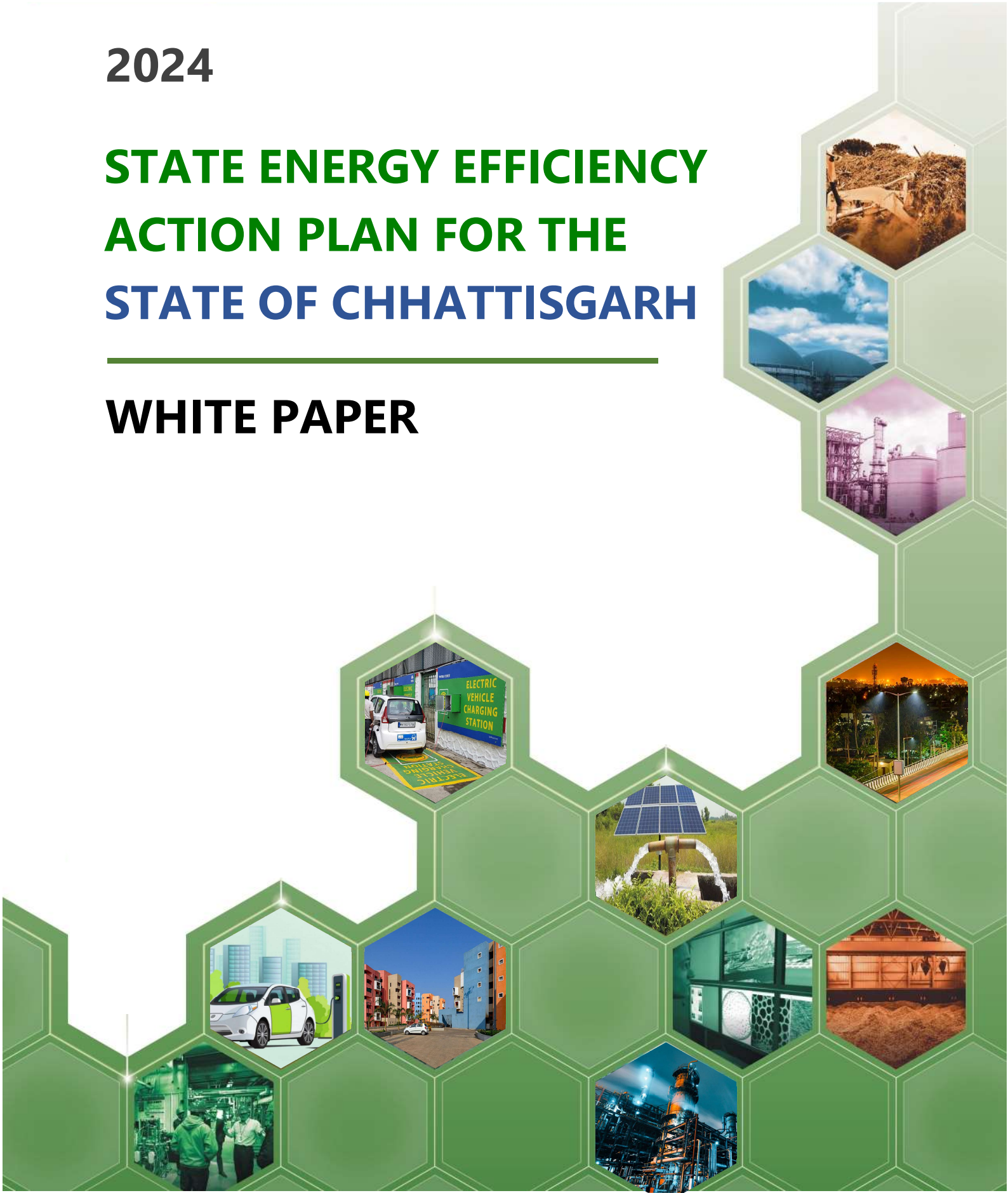
STATE ENERGY EFFICIENCY ACTION PLAN FOR THE STATE OF CHHATTISGARH

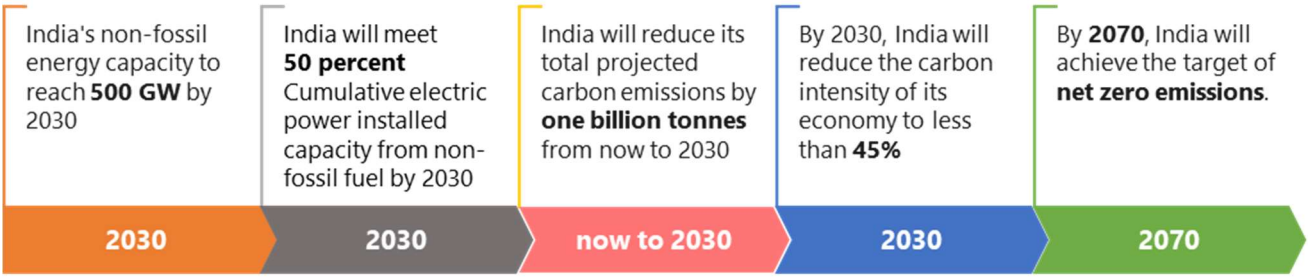
WHITE PAPER



Background

The increasing demand for energy puts a strain on the country's resources and has negative environmental impacts. Therefore, it is necessary to separate the country's economic growth from its energy demand. This objective is also reflected in India's Intended Nationally Determined Contribution submitted before the Paris Climate Conference, where the government emphasized energy conservation as a crucial mitigation strategy.

During the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2021, the Government of India presented India's climate action plan, which included five essential elements known as Panchamrit. These elements include the target of achieving net zero emissions by 2070 and obtaining 50% of the country's energy from renewable resources by 2030.



The main focus of this project was to develop strategies aimed at improving the energy efficiency of energy-intensive sectors within the state. This action plan aligns with the Nationally Determined Contributions (NDCs), also known as Panchamrit. For Chhattisgarh, the action plan identifies key sectors and evaluates the potential for energy conservation and efficiency improvements in the region.

The State Energy Efficiency Action Plan sets goals to be achieved by FY 2031, aiming for significant energy efficiency improvements by that year. The implementation of the proposed action plan is expected to result in estimated energy savings of **0.61 million tonnes of oil equivalent (Mtoe)** in a moderate scenario and **1.00 Mtoe** in an ambitious scenario for the State of Chhattisgarh.

Identification of the focus sectors

In order to facilitate the transition towards low-carbon development pathways, each state or union territory (UT) plays a crucial role. The Bureau of Energy Efficiency, under the guidance of the Ministry of Power in consultation with State Designated Agency, various stakeholders from different sector of the state and knowledge partner ASSOCHAM has developed state-specific energy efficiency action plan to ensure that resource allocation aligns with the state's requirements and aids in achieving state-specific goals related to sustainable development.

Identifying the focus sectors or areas is important because certain sectors within a state tend to consume a significant portion of energy. To determine the focus sectors for Chhattisgarh, a

comprehensive study was conducted, taking into account various parameters such as energy consumption patterns, emissions, Gross State Value Addition (GSVA), gap analysis in respective sectors, potential for energy efficiency and emission reduction, planned efforts by the state in prioritized sectors, State Designated Agency (Chhattisgarh State Renewable Energy Development Agency - CREDA), and inputs from stakeholders.

Based on the Total Final Energy Consumption (TFEC) in the state and its sectoral distribution, the following sectors have been identified as the focus sectors for devising energy efficiency strategies in Chhattisgarh referring the fiscal year 2020 as a base year. Industry, Building, Transport, and Agriculture are the identified focus sector for the state.


Industries


Buildings


Transport


Agriculture

By targeting these focus sectors and implementing energy efficiency measures, the state aims to optimize energy consumption, reduce emissions, and contribute to sustainable development goals.

Proposed Strategies with Implementation Methodology

The chapter discuss the proposed strategies outlined in the action plan for the identified focus sector along with their potential impact in terms of energy efficiency and emission reduction. These proposed strategies are stated below with their actionable items and implementation methodology.

1. Industry Sector

Chhattisgarh is a state abundant in natural resources like forests and minerals, driving a robust industrial sector. It leads in the production of tin, cement, sponge iron, and aluminium, with significant contributions from both government and private entities such as Tata and Jindal. The state's industrial landscape spans steel, cement, minerals, engineering, and agro processing, with MSMEs playing a vital role. Bhilai is a key export centre, particularly for iron & steel, aluminium, and cement. Known as the "Rice Bowl of India," Chhattisgarh hosts numerous rice mills, dal mills, and poha mills. Despite industrial prowess, there are challenges in modernization and energy efficiency, addressed through initiatives like the Perform Achieve & Trade (PAT) program, which has yielded notable energy savings.

The proposed strategies for the industrial sector are:

Deeping and Widening of Perform, Achieve and Trade (PAT) Scheme

The proposed strategy for Chhattisgarh involves expanding and intensifying the Perform Achieve & Trade (PAT) scheme to include more industries and sectors, such as rice mills, steel rerolling, and foundries. This expansion entails lowering the eligibility threshold for designated consumers (DCs) and incorporating new sectors into the scheme. Energy saving potential is estimated by assigning

moderate and ambitious specific energy consumption (SEC) targets to iron & steel non-PAT units and rice mill units. It is assumed that a percentage of existing units will achieve these targets.

Actionable Items:

a. Partial Risk guarantee program to encourage implementation of latest energy efficient technologies in the sectors (Over and above existing schemes with state contribution)
b. Mandatory Standardized Energy Audits in every three years for all units that have energy consumption below PAT threshold, in all notified PAT sectors, excluding MSMEs.
c. Development of mechanisms for B2B interaction with global technology suppliers.

Implementation Methodology:

a. Identification of potential sectors
b. Setting energy targets
c. Implementation of energy efficiency measures
d. Monitoring and verification
e. Trading of energy saving certificates

Energy Efficiency Interventions for MSME Clusters

The proposed strategy for Small and Medium Enterprises (SMEs) focuses on implementing a PAT-like scheme for unorganized and small industries in prominent sectors like Machinery and Food Processing. This scheme aims to encourage the adoption of energy-efficient and decarbonization technologies to meet energy saving targets. In the moderate scenario, it is projected that 50% of industries will adopt the strategy, while in the ambitious scenario, 70% adoption is expected.

Actionable Items:

a. Demonstration projects on latest Energy Efficiency Technologies in SME clusters.
b. Periodic standardized energy audits for MSMEs on load basis and reimbursement of energy audit cost with a maximum cap.
c. Sector-specific policy development for financial assistance on implementation of ECMs suggested in energy audit.
d. Issuance of directives for implementation of ISO 50001, Energy Management System in organizations on load basis.
e. Phase wise plan to implement DSM scheme for replacement of existing inefficient (non-star rated) pumps through DISCOMs.
f. Technical assistance for transition from inefficient (installed before 2010) boiler to EE boilers, use of EE motors with different drive and other ECMs.
g. Renewable Energy Transition in Industries & MSMEs

Implementation Methodology:

a. Identification of energy intensive MSME clusters
b. Conduct energy audits in the selected clusters.
c. Implementation of energy efficient interventions
d. Monitoring and verification

Considering the implementation of both the strategies in the industry sector, it is estimated that approximately **0.0584 Mtoe** energy savings can be saved under the moderate scenario and **0.0752 Mtoe** under the ambitious scenario.

2. Buildings Sector

In Chhattisgarh, urbanization and tourism have driven growth in both domestic and commercial building sectors, despite agriculture remaining a crucial part of the economy. With around 23% of the population in urban areas and agriculture occupying only 35.2% of land, there's a heightened demand for buildings and electricity. Implementation of the Energy Conservation Building Code (ECBC) and Eco Niwas Samhita (ENS) aims to reduce energy consumption, especially in residential buildings. While ECBC is mandatory for commercial buildings, integrating ENS into regulations is crucial for enhancing energy efficiency across the state.

The suggested strategies for the building sectors are:

Effective Implementation of ECBC and ENS (will be known as ESCBC once notified)

Chhattisgarh is in the process of adopting the unified Energy Conservation and Sustainable Building Code (ECSBC) for both commercial and residential buildings, consolidating ECBC and ENS guidelines. Projections suggest potential energy savings: 0.32 GWh in a moderate scenario and 0.44 GWh in an ambitious scenario for commercial buildings, and 22.41 GWh in a moderate scenario and 28.01 GWh in an ambitious scenario for residential buildings by FY 2031 through the implementation of ECBC and ENS.

Actionable Items:

a. Setting-up of effective enforcement plan with ULBs and SDA as monitoring agencies.
b. Development and maintenance of ECSBC compliance portal, directory of energy efficient materials/technologies.
c. Pilot projects for Super ECBC buildings as case studies (initial 20 Buildings)
d. Home Energy Auditor Training, compliance structure and incentive on energy savings for first few residential projects.
e. Periodic upgradation of PWD Schedule of Rates (SoR) to incorporate latest energy efficient materials and technologies.
f. Inclusion of curriculum on energy efficiency in buildings, in universities and Schools.
g. Best practices from other States may be included for implementation of ECBC in buildings sector.

Implementing Methodology:

a. Establishing guidelines
b. Awareness and training programs
c. Code adoption.
d. Compliance and enforcement
e. Performance evaluation
f. Incentives and recognition.

Replacement Program for inefficient (below than 3 star-rated) appliances:

The Standards & Labelling (S&L) Programme by the Bureau of Energy Efficiency (BEE) has been successfully implemented nationwide, resulting in notable energy savings. It involves the mandatory and voluntary use of energy-efficient electrical appliances across various sectors, with a significant focus on the buildings sector. Currently, the program encompasses 35 appliances, with 16 under mandatory regulation and 19 under voluntary regulation.

Actionable Items:

a. Development of state-specific implementation models and identification of relevant agencies.
b. Issuance of directive to government offices and buildings in the State to replace all existing inefficient appliances (lower than 3 Star Rated) with BEE 5-star rated appliances.
c. Phase-wise plan for replacement of existing inefficient appliances (lower than 3 Star Rated) with BEE 5-star rated appliances in all buildings, through DSM schemes.

Implementation Methodology:

a. Identification of inefficient appliances
b. Selection and procurement of energy efficient appliances
c. Distribution and installation of the appliances
d. Disposal of the old appliances
e. Monitoring and Evaluation

Mandatory BEE Star Rating or Shunya Rating for Government Buildings

The Star Rating and Shunya Rating of buildings is currently at a voluntary stage which is used as a benchmarking system for buildings to classify them in terms of 'Star-Rating' & 'Shunya Rating' on the basis of their energy performance. It is proposed that to promote Star Rating & Shunya Rating in all government & commercial buildings and conduct an assessment for their energy performance along with the ECBC Compliance process.

Actionable Items:

a. Issuance of directives to all government departments to conduct energy audits and target to achieve BEE Star Rating for their buildings.
b. Periodic energy audits for commercial buildings on load basis and incentives on achieving specific level of star rating for buildings.
c. Market Outreach for Star & Shunya Rating by Radio Jingles, Social Media Awareness.
d. Mandatory minimum set point of 24 degrees for air conditioners in all government buildings.
e. Promotion of installation of Rooftop Solar Systems on buildings

Implementation Methodology:

a. Identification for the eligible buildings
b. Compliance and Enforcement
c. Incentives and recognition
d. Performance evaluation

By implementing all the strategies in the buildings sector, it is estimated that approximately **0.05 Mtoe** in energy savings can be achieved under the moderate scenario. Under the ambitious scenario, the estimated energy savings increase to approximately **0.07 Mtoe**. These savings signify the potential reduction in energy consumption and improved energy efficiency resulting from the implementation of energy conservation measures and the promotion of sustainable building practices.

3. Transport Sector

In Chhattisgarh, the number of registered motor vehicles has steadily increased, with an average annual growth rate of 9.7% since FY 2016. Notably, there has been a rise in private vehicles, particularly in the two-wheeler and four-wheeler categories, indicating potential for a transition to electric vehicles (EVs). However, due to market availability constraints, this transition may take time and is considered part of a long-term strategy towards achieving sustainability goals. Targeting the transition of two-wheelers and four-wheelers to EVs could significantly reduce energy consumption in Chhattisgarh's transport sector, given their dominance among registered vehicles.

The following is the strategy proposed for Transport Sector:

Infrastructure Development for EV charging stations and Incentives to Consumers for quick transition to EVs.

The strategy proposes transitioning new vehicles registered in Chhattisgarh to electric vehicles (EVs) by FY 2031, with two scenarios: moderate and ambitious. Priority is given to converting two-wheelers due to their high share in registered vehicles and the availability of affordable electric options. Incentives aligned with the Chhattisgarh State EV Policy 2022 may be offered to consumers to facilitate this transition, aiming to decarbonize the sector and reduce fossil-fuel energy consumption significantly.

Actionable Items:

a. Establishment of regulatory mechanism to develop EV charging infrastructure.
b. Promotion of Renewable Energy based EV charging stations.
c. Pilot projects on battery swapping stations.
d. Pilot projects on hydrogen fuel cell vehicles (HCVs).
e. Disposal of electric vehicle batteries.

Implementation Methodology:

a. Identification of target areas.
b. Selection of charging technologies.
c. Procurement and installation of charging stations.
d. Operations and maintenance.
e. Incentives to consumers.
f. Awareness campaign.
g. Monitoring and evaluation.

Ethanol Blending Program

The Ethanol Blending Program is proposed to ensure mixing of ethanol in motor spirit (petrol) in a fixed ratio to offset a part of the energy consumed by petrol and bring about reduction in emissions. In the proposed strategy and in line with the country's target of 20% blending of ethanol blending in petrol by 2031, a 10% blending target is suggested in the moderate scenario and a 20% blending target is suggested in the ambitious scenario.

Actionable Items:

a. Financial Assistance on Biofuel production plants (Capital Subsidy for MSMEs)
b. Capacity Building for the investors
c. Monitoring mechanism for the supply of feedstock and production of ethanol.
d. Support for the research and development programs.

Implementation Methodology:

a. Policy and regulatory framework
b. Production of Ethanol
c. Procurement and Storage
d. Blending of ethanol
e. Distribution and Marketing
f. Awareness Campaigns
g. Monitoring and verification

Promotion of Standard and Labelling program of tyres for fuel efficiency in Vehicles

In this strategy the Bureau of Energy Efficiency has implemented a standard and labelling program for tyres to promote fuel efficiency in vehicles. It can be an effective way to encourage the adoption of more fuel-efficient tyres by consumers.

Actionable Items:

a. Awareness Campaigns
b. Capacity Building of Tyre Manufactures and Vehicles OEMs

By implementing the above-mentioned strategy, it is estimated that significant energy savings can be achieved. Under the moderate scenario, approximately **0.49 Mtoe** can be saved, while the ambitious scenario has the potential to save around **0.84 Mtoe**.

4. Agriculture Sector

Agriculture is the primary occupation in Chhattisgarh, with approximately 80% of the population dependent on it. Most farmer households belong to the small and marginal category. Despite challenges, the state government has prioritized agricultural development, resulting in significant growth in the sector. Farmers are striving to maximize agricultural potential and increase both food production and income through quality cash crops. Electricity consumption in agriculture mainly stems from machinery and pump sets, with various energy sources utilized. One significant

opportunity for reducing power consumption is by replacing old or inefficient pumps with 5-star rated energy-efficient pumps, particularly as irrigation pumps contribute significantly to power usage in the sector. Following are the strategy proposed for the agriculture sector:

Replacement of old pumps (10 years old) or less efficient pumps (non-star rated) with 5 Star rated Pumps along with smart control panel.

The strategy focuses on reducing energy consumption and enhancing efficiency in irrigation pumps, targeting a long-term implementation until FY2031. Two scenarios are proposed: the moderate scenario aims to replace 50% of inefficient electric pumps with BEE 5 Star rated pumps by FY2031, while the ambitious scenario targets replacing 70%. BEE Star rated pumps are designed to be more energy-efficient, resulting in cost savings for farmers.

Actionable Items:

a. Development of a phase-wise plan to implement Demand Side Management (DSM) scheme for replacing existing inefficient pumps through Energy Service Companies (ESCOs).
b. Effective incorporation of PM KUSUM Scheme

Implementation Methodology:

a. Energy audit and assessment
b. Identification of suitable pumps
c. Financial analysis
d. Incentives and support
e. Vendor selection and procurement
f. Installation and commissioning
g. Awareness and training
h. Monitoring and performance
i. Maintenance and support
j. Reporting and impact assessments

Considering the implementation of the mentioned strategy in the agriculture sector, it is estimated that approximately **0.006 Mtoe** energy savings can be saved under the moderate scenario and **0.008 Mtoe** under the ambitious scenario by FY2031.

Financing Mechanism

In the context of energy efficiency, a financial mechanism is a system put in place to provide financing for the implementation of energy efficiency measures. These mechanisms can include loans, grants, subsidies, tax incentives, and other financial tools that provide financial support for energy efficiency measures.

To achieve the targets and the cost savings, the state must implement various energy efficiency policies, schemes, and programmes, so to support the funding, the Bureau of Energy Efficiency has introduced various financing mechanism which the states can consider for the implementation.

The Bureau of Energy Efficiency has started a programme named 'The National Mission for Enhanced Energy Efficiency (NMEEE)' under the National Action Plan on Climate Change.

Energy Efficiency Financing Platform:
The Bureau of Energy Efficiency has started this financing initiative under the National Mission for Enhanced Energy Efficiency, the initiative aims to provide a platform to interact with Financial Institutions and project developers for implementation of energy efficiency projects.

Framework for Energy Economic Development:

The financing initiative was taken to ease the financing of energy efficiency projects through different fiscal instruments, the aim is to provide ease to stakeholders by implementation of schemes such as Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE), Venture Capital Fund for Energy Efficiency (VCFEE).

PRGFEE – Partial Risk Guarantee Fund for Energy Efficiency - "Addressing the credit risks and barriers to structuring the transactions Engaging financial institutions and building their capacity to finance EE projects on a commercially sustainable basis, it has a guarantee Period of Up to a maximum of 5 years. The Government of India has approved about INR 312 crores for PRGFEE.

VCFEE – Venture Capital Fund for Energy Efficiency - The VCFEE provides risk capital support to EE investments in new technologies, goods, and services. The Government of India has approved about INR 210 crores for PRGFEE.

Revolving Funds: Revolving funds are a financial tool that can be used to support sustainable development projects in various sectors, including agriculture, small business, and community infrastructure. These funds are given at a low-interest rate and are intended to support these sectors. The repayment of these loans is used to replenish the fund, enabling it to provide more loans to new borrowers.

Green Bonds: Green bonds are a type of financial instrument that are specifically designed to finance projects and initiatives with environmental benefits. They are typically issued by governments, municipalities, corporations, or other entities to raise capital for projects that promote sustainability, renewable energy, energy efficiency, climate change mitigation and other environmentally friendly initiatives.

Soft Loans: Soft loans, also known as concessionary loans or subsidized loans, are loans that are provided on more favourable terms compared to standard commercial loans. These loans typically have lower interest rates, longer repayment periods, and more flexible terms and conditions. Soft loans are often offered by governments, international financial institutions, or development agencies to support specific objectives such as economic development, social welfare, or sustainability.

Summary

Through extensive research and collaboration with various stakeholders, the Chhattisgarh State Renewable Energy Development Agency (CREDA), and ASSOCHAM in consultation with Bureau of Energy Efficiency has developed a comprehensive State Energy Efficiency Action Plan for the State of Chhattisgarh. This plan recognizes the necessity, potential, and opportunities for energy efficiency within the state. The action plan outlines a detailed roadmap for implementing these strategies, while also emphasizing the importance of monitoring their implementation through involvement from multiple stakeholders.

By projecting the state's total final energy consumption (TFEC) based on energy consumption and economic growth, it is estimated that Chhattisgarh's TFEC will reach 93.07 Mtoe by FY 2031.

In light of this projection, the action plan identifies Industry, Buildings, Transport, and Agriculture as the key focus sectors. It further analyses sector-specific strategies to achieve energy savings. In the moderate scenario, the implementation of this plan is expected to result in a reduction of **0.61 Mtoe** in total energy consumption by FY 2031. In the ambitious scenario, the reduction is projected to **1.00 Mtoe**. Additionally, this plan aims to generate awareness at a mass level and create a market potential of approximately Rs. 1836 Crore in the energy efficiency sector. Furthermore, it is anticipated to contribute to a reduction of **1.9 $MtCO_2e$** in the moderate scenario and **3.1 $MtCO_2e$** in the ambitious scenario in terms of CO_2 emissions by FY 2031.

Table 1: *Energy Savings Summary and Market Potential*

Energy Savings & Emission Reduction Potential FY 2031					
Sectors	**Energy Savings (Mtoe)**		**Emissions ($MtCO_2$)**		**Market Potential**
	Moderate	**Ambitious**	**Moderate**	**Ambitious**	
Industry	0.06	0.08	0.17	0.24	138
Buildings	0.05	0.07	0.17	0.22	132
Transport	0.49	0.84	1.55	2.64	1552
Agriculture	0.006	0.008	0.018	0.025	14
Total	**0.61**	**1.00**	**1.9**	**3.1**	**1,836**

Table 2: *Energy Savings and CO_2 reduction in Ambitious Scenario (Year-Wise)*

Sectors	2024		2025		2026		2027		2028		2029		2030		2031	
	Mtoe	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**	**Mtoe**	**$MtCO_2e$**
Industries	0.008	0.023	0.010	0.033	0.014	0.045	0.020	0.063	0.028	0.088	0.039	0.122	0.054	0.169	0.075	0.235
Building	0.007	0.022	0.010	0.031	0.014	0.043	0.019	0.060	0.027	0.084	0.037	0.116	0.052	0.162	0.072	0.225
Transport	0.084	0.264	0.117	0.367	0.163	0.510	0.226	0.708	0.314	0.984	0.437	1.367	0.607	1.899	0.843	2.639
Agriculture	0.001	0.002	0.001	0.003	0.002	0.005	0.002	0.007	0.003	0.009	0.004	0.013	0.006	0.018	0.008	0.025
Total	**0.100**	**0.312**	**0.139**	**0.434**	**0.193**	**0.603**	**0.268**	**0.838**	**0.372**	**1.164**	**0.517**	**1.618**	**0.718**	**2.248**	**0.998**	**3.123**