GOVERNMENT OF INDIA
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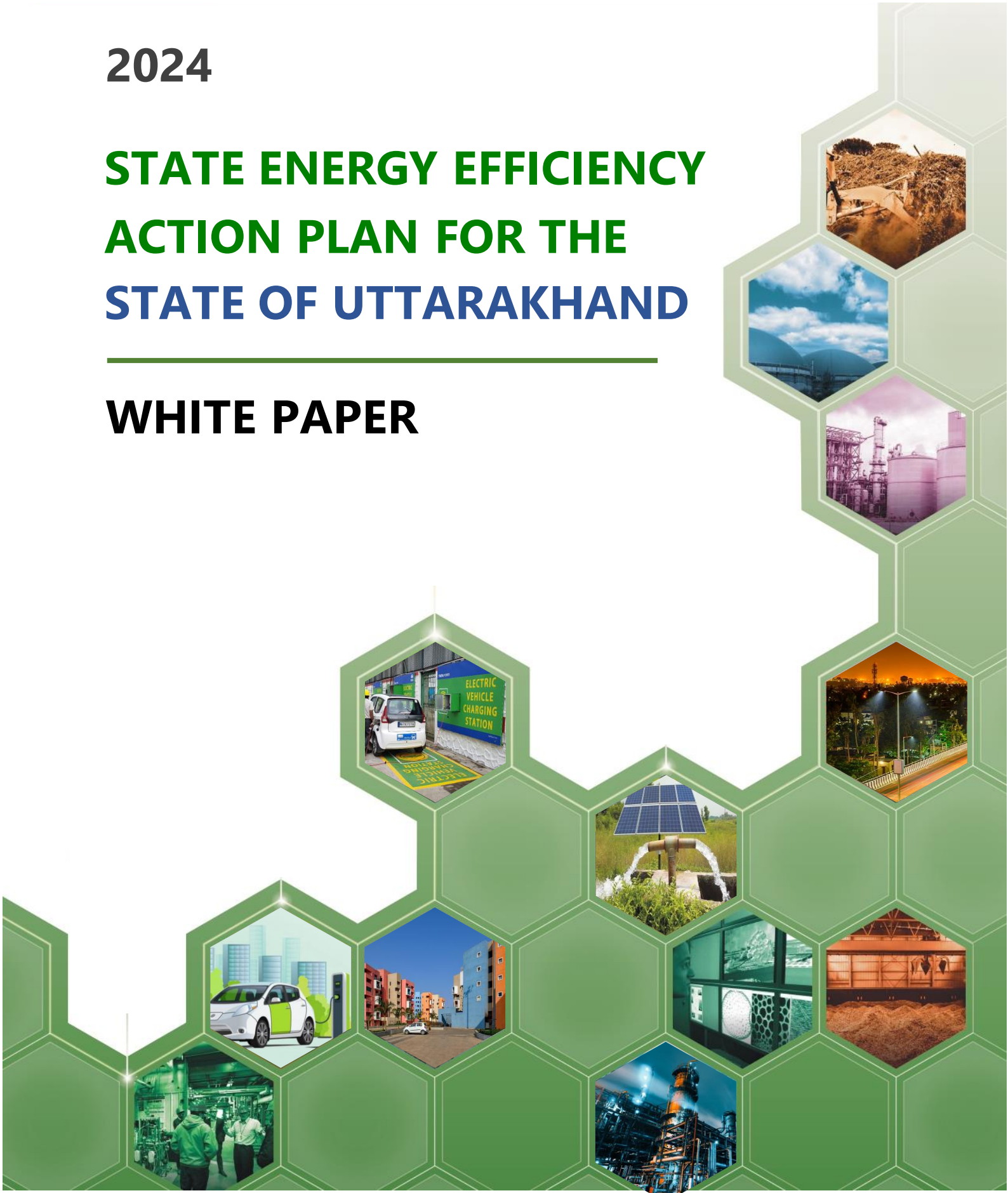
STATE ENERGY EFFICIENCY ACTION PLAN FOR THE STATE OF UTTARAKHAND

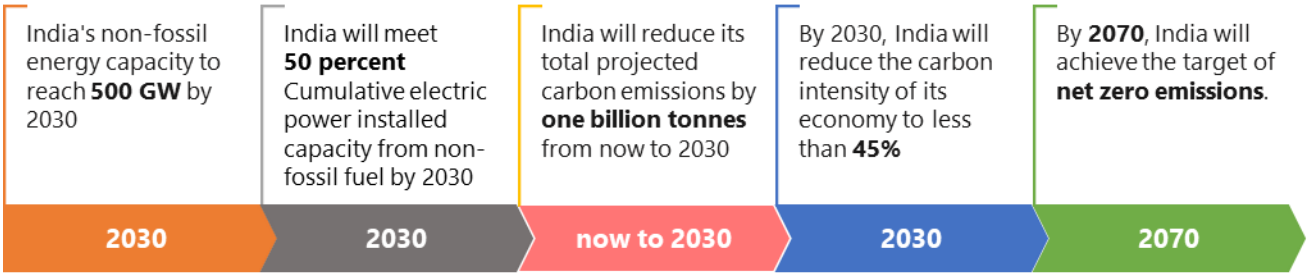
WHITE PAPER



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 Uttarakhand, 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 0.3399 million tonnes of oil equivalent (Mtoe) in a moderate scenario and 0.6725 Mtoe in an ambitious scenario for the State of Uttarakhand.

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 Uttarakhand, 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 (Uttarakhand Renewable Energy Development Agency- UREDA), 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 Uttarakhand referring the fiscal year 2020 as a base year. Industry, Building, Transport, Agriculture, and Municipalities are the identified focus sector for the state.


Buildings


Industries


Transport


Agriculture


Municipalities

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

Uttarakhand, situated in northern India, boasts abundant natural resources and an advantageous location for industrial growth. The state hosts a diverse array of industries spanning agriculture, tourism, and manufacturing. Among the prominent large and medium enterprises operating in Uttarakhand are Tata Motors, Bajaj Auto, Mahindra & Mahindra, Hero MotoCorp, and Nestle, primarily engaged in automobile manufacturing, food processing, and other manufacturing endeavours. According to the MSME annual report of 2020–2021, the state accommodates around 4.17 lakh MSME units, comprising both registered and unregistered entities, with over 58,040 being registered MSMEs (Micro, Small, and Medium Enterprises), collectively employing over 4 lakh individuals.

The proposed strategies for the industrial sector are:

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

The proposed strategy suggests enhancing coverage of energy consumption in designated consumers (DCs) by expanding and deepening the Perform, Achieve, and Trade (PAT) scheme in Uttarakhand. This involves including more industries as designated consumers by lowering eligibility thresholds and adding new sectors to the scheme. The Paper and Pulp sector joined PAT in 2012, and the Sugar sector was included in 2023. Moderate and ambitious Specific Energy Consumption (SEC) targets are set for non-PAT units in the pulp & paper sector and sugar plants with a capacity above 3000 TCD. It's anticipated that 50% of existing units will meet the moderate SEC target and 70% will achieve the ambitious SEC target. Growth projections estimate a 4.9% CAGR for the sugar sector and a 6.7% CAGR for the Paper & Pulp sector.

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. Capacity Building of Energy Managers and Energy Auditors in PAT DCs and new probable sectors for compliance with scheme and new technologies.

c. 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.
d. 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 targets Small and Medium Enterprises (SMEs), including MSMEs, in key sectors like pharmaceutical clusters (for moderate scenarios) and additionally food products (for ambitious scenarios). It focuses on implementing energy-efficient and innovative decarbonization technologies to help SMEs achieve their energy-saving goals. The strategy aims for a 4% energy savings in the moderate scenario and 14% in the ambitious scenario, employing technologies such as Conversion of HSD-fired Boiler to Biomass-fired Boiler, Installation of VFD for Screw Chiller Compressor, Electronically Commutated Motors for AHUs, and Condensate Recovery System. The expected outcome includes energy savings of 0.00071 MTOE and 0.00287 MTOE in the moderate and ambitious scenarios respectively.

Actionable Items:

a. Workshops on technology interventions for energy conservations in MSMEs.
b. Carrying out energy and resource-mapping studies in MSME clusters.
c. Demonstration projects on latest Energy Efficiency Technologies in SME clusters.
d. Periodic standardized energy audits for MSMEs on load basis and reimbursement of energy audit cost with a maximum cap.
e. Sector-specific policy development for financial assistance on implementation of ECMs suggested in energy audit.
f. Issuance of directives for implementation of ISO 50001, Energy Management System in organizations on load basis.
g. Phase wise plan to implement DSM scheme for replacement of existing inefficient (non-star rated) pumps through SDA/DISCOMS.

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 **0.0502 Mtoe** energy savings can be saved under the moderate scenario and **0.1004 Mtoe** under the ambitious scenario.

2. Buildings Sector

In Uttarakhand, despite having only 30.23% urban population, faces rising energy consumption in its buildings sector. To address this, the state government implemented the Uttarakhand Energy Conservation Building Code (UECBC) in 2018 for new commercial buildings. It mandates energy-efficient design and construction practices. A State Designated Agency (SDA) provides technical assistance for compliance. Additionally, the Bureau of Energy Efficiency (BEE) introduced Eco-Niwas Samhita (ENS) for residential buildings. Recently, the Energy Conservation (Amendment) Act, 2022, introduced the Energy Conservation and Sustainable Building Code (ECSBC) for both commercial and residential buildings to tackle energy consumption in the building sector. The suggested strategies for the building sectors are:

Effective Implementation of ECSBC

Uttarakhand is transitioning towards adopting the Energy Conservation and Sustainable Building Code (ECSBC), which encompasses both residential and commercial buildings, replacing the existing ECBC and ENS regulations. A strategy is proposed to increase the penetration of ECSBC compliant buildings in the state to achieve energy savings in the building sector.

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. Market Outreach for ECBC compliant Products, Radio Jingles, Social Media Awareness.
d. Pilot projects for Super ECBC buildings as case studies (initial 20 Buildings)
e. Home Energy Auditor Training, compliance structure and incentive on energy savings for first few residential projects.
f. Periodic upgradation of PWD Schedule of Rates (SoR) to incorporate latest energy efficient materials and technologies.
g. Inclusion of curriculum on energy efficiency in buildings, in universities and Schools

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 strategy has been proposed for the complete buildings sector, covering both commercial and domestic buildings. The electricity consumption pattern varies greatly between urban and rural areas. This is due to the variation in type and number of appliances being used by urban and rural residents.

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.
d. Workshops & Campaigns on behavioural change interventions for energy conservation.

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 in order 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. Capacity Building of Architects & Building Professionals and Developers.
d. Market Outreach for Star & Shunya Rating by Radio Jingles, Social Media Awareness.
e. Mandatory minimum set point of 24 degrees for air conditioners in all government buildings.
f. Transformation of iconic government buildings to Net-Zero energy buildings.

Implementation Methodology:

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

By implementing all the strategies in the buildings sector, it is estimated that approximately 0.0256 Mtoe in energy savings can be achieved under the moderate scenario. Under the ambitious scenario, the estimated energy savings increase to approximately 0.0337 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

Uttarakhand, a prominent tourist destination, experiences heavy vehicular traffic, primarily in the transportation sector, leading to substantial oil consumption. To promote sustainable transportation, the state government is actively encouraging the adoption of electric vehicles (EVs). As of 2023, there are 48,250 registered EVs in Uttarakhand, constituting 1.33% of the total registered vehicles. The sectoral transport share is dominated by 2-wheelers (71% of total registered vehicles), showing potential for transition to EVs. The

state has witnessed a growth in registered vehicles from 2,695,594 in FY 2018 to 3,322,590 in FY 2022, with an average Annual Growth Rate (AAGR) of 7.66%. By targeting the transition of 2-wheelers to EVs, significant reductions in primary energy consumption in Uttarakhand's transport sector can be achieved. 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 Uttarakhand until FY 2031 to electric vehicles (EVs) under two scenarios: moderate and ambitious. The focus will be on converting a significant portion of 2-wheelers to EVs due to their high share in registered vehicles and the availability and affordability of electric 2-wheelers. This transition is expected to play a crucial role in decarbonizing the sector and achieving substantial savings in fossil fuel-based energy consumption.

Actionable Items:

a. Establishment of regulatory mechanism to develop EV charging infrastructure.
b. Pilot projects on battery swapping stations.
c. Pilot projects on hydrogen fuel cell vehicles (HCVs).

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

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 **0.26 Mtoe** can be saved, while the ambitious scenario has the potential to save around **0.54 Mtoe**.

4. Agriculture Sector

Agriculture is a significant contributor to Uttarakhand's economy, accounting for about 9% of its GDP in 2019-20. The state's diverse topography and agro-climatic conditions support subsistence farming, with mixed cropping in hilly areas and single crops in plain areas. Major crops include basmati rice, wheat, coarse cereals, pulses, soybeans, and oilseeds. However, limited cultivable land, with only 14% of the total area available for cultivation due to forests and wastelands, poses challenges. Most farmers operate small and marginal holdings, leading to higher input costs per unit of output. Despite these challenges, farmers in Uttarakhand strive to maximize agricultural potential, aiming to increase food production and generate income through quality cash crops. Electricity consumption in the sector is primarily attributed to agricultural machinery/equipment and pump sets.

Following are the strategies proposed for the agriculture sector:

Transition of conventional diesel pumps to solar powered pumps

The proposed strategy in Uttarakhand's agriculture sector involves transitioning from conventional diesel pumps to solar-powered pumps by FY2027, aligning with the national goal of zero diesel use. The moderate scenario aims to convert 50% of diesel pumps to solar by 2027, while the ambitious scenario targets a 75% transition, aiming for maximum energy savings and environmental benefits. Transitioning to solar pumps will reduce reliance on fossil fuels, decrease carbon emissions, and improve air quality and environmental sustainability.

Actionable Items:

a. Greater outreach to relevant stakeholders
b. Capacity Building of Panchayat/Block Level officials

Implementation Methodology:

a. Access feasibility
b. Awareness and training programs
c. Financial incentives and support
d. Vendor selection and procurement
e. Installation and commissioning
f. Monitoring and mechanism

g. Evaluation and impact assessment

Replacement of inefficient (non-star rated) pumps with BEE 5 Star Rated Pumps along with smart control panel.

The long-term strategy aims to enhance energy efficiency in irrigation pumps in Uttarakhand until FY2031, with two proposed scenarios. In the moderate scenario, 50% of inefficient electric pumps will be replaced with BEE Star rated pumps, aiming for significant energy savings and improved efficiency. The ambitious scenario targets replacing 75% of inefficient electric pumps with BEE Star rated ones by FY2031, further enhancing energy savings and efficiency in irrigation systems.

Actionable Items:

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

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 strategies in the agriculture sector, it is estimated that approximately **0.00056 Mtoe** energy savings can be saved under the moderate scenario and **0.00108 Mtoe** under the ambitious scenario by FY2031.

Other Strategies

Replacement of inefficient sewerage and water pumps with BEE 5-star rated pumps under all municipal corporations of the state:

The strategy involves replacing inefficient sewerage and water pumps with more energy-efficient pumps, specifically the BEE 5-star rated pumps, in all municipal corporations. By adopting these pumps, Uttarakhand seeks to optimize energy consumption, reduce wastage, and minimize operational costs.

Actionable Items:

1. Initial Assessment and Energy Audit.
2. Funding and Budgeting.
3. Training and Capacity Building.
4. Awareness Campaign.
5. Monitoring and Measurement.

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 Uttarakhand Renewable Energy Development Agency (UREDA), and ASSOCHAM in consultation with Bureau of Energy Efficiency has developed a comprehensive State Energy Efficiency Action Plan for the State of Uttarakhand. 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 Uttarakhand's TFEC will reach 16.44 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 0.3399 Mtoe in total energy consumption by FY 2031. In the ambitious scenario, the reduction is projected to 0.6725 Mtoe. Additionally, this plan aims to generate awareness at a mass level and create a market potential of approximately Rs. 1237 Crore in the energy efficiency sector. Furthermore, it is anticipated to contribute to a reduction of 1.06 $MtCO_2e$ in the moderate scenario and 2.10 $MtCO_2e$ in the ambitious scenario in terms of CO_2 emissions by FY 2031.

Table 1: *Energy Savings Summary and Investment Potential*

Sectors	Energy Saving Potential (Mtoe)		Emission Saving Potential ($MtCO_2$)		Market Potential (INR Crore)
	Moderate	Ambitious	Moderate	Ambitious	
Industry	0.0502	0.1004	0.16	0.31	184.72
Buildings	0.0256	0.0337	0.08	0.11	62.02
Transport	0.2636	0.5373	0.82	1.68	988.78
Agriculture	0.00056	0.00108	0.00	0.00	1.98
Total	**0.3399**	**0.6725**	**1.06**	**2.10**	**~ 1,237.51**

Table 2: *Energy Savings 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	0.010	0.031	0.014	0.044	0.019	0.061	0.027	0.084	0.037	0.117	0.052	0.163	0.072	0.226	0.100	0.314
Building	0.0034	0.011	0.0047	0.015	0.0065	0.020	0.0090	0.028	0.0126	0.039	0.0175	0.055	0.0243	0.076	0.0337	0.105
Transport	0.0537	0.168	0.0746	0.234	0.1037	0.325	0.1441	0.451	0.2002	0.627	0.2781	0.871	0.3865	1.210	0.5370	1.681
Agriculture	0.0001	0.000	0.0002	0.001	0.0003	0.001	0.0003	0.001	0.0005	0.002	0.0007	0.002	0.0009	0.003	0.0013	0.004
Total	**0.067**	**0.210**	**0.093**	**0.292**	**0.130**	**0.406**	**0.180**	**0.565**	**0.251**	**0.784**	**0.348**	**1.090**	**0.484**	**1.515**	**0.672**	**2.105**