# WHITE PAPER

STATE ENERGY EFFICIENCY ACTION PLAN FOR UT OF LADAKH



# 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 energyintensive sectors within the state. This action plan aligns with the Nationally Determined Contributions (NDCs), also known as Panchamrit. For UT of Ladakh, 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 both short-term goals to be achieved by FY 2026 and long-term goals to be achieved by FY 2031, with the objective of achieving significant energy efficiency improvements by 2030. The implementation of the proposed action plan is expected to result in estimated energy savings of 0.049 million tonnes of oil equivalent (Mtoe) in a moderate scenario and 0.093 Mtoe in an ambitious scenario for UT of Ladakh.

# 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 UT of Ladakh, 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 (Ladakh Power Development Department), 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 the UT of Ladakh referring the fiscal year 2020 as a base year. Transport, Buildings, and Industries are the identified focus sector for the state.

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. Transport Sector

In 2020, the state witnessed a total of 2032 vehicles registration. With the continuous growth of the sector, energy consumption has also surged, leading the state to implement multiple policies to address this issue. In 2022, the UT has introduced its electric vehicle (EV) policy, offering incentives for transitioning to EVs and promoting infrastructure development throughout the region. The following are the suggested strategies for the transportation sector:

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

This strategy suggests a plan to convert newly registered vehicles in the state to electric vehicles until the fiscal year 2031. The conversion targets are based on two different scenario trajectories: the moderate scenario and the ambitious scenario. These targets align with the guidelines outlined in the Ladakh Electric Vehicle and Allied Infrastructure Policy 2022. The focus of the conversion efforts is primarily on two-wheelers, as they have the highest number of registered vehicles and, therefore, represent a significant portion of the overall vehicle in the fleet.

Implementing Agency: Ladakh PDD, DISCOMs, PSUs and private sector

#### 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

Under this strategy, it is proposed to ensure the 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.

#### Implementing Agency: Department of Transport/ RTO

#### 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 all these above-mentioned strategies, it is estimated that significant energy savings can be achieved. Under the moderate scenario, approximately 0.043 Mtoe can be saved, while the ambitious scenario has the potential to save around 0.081 Mtoe. These savings indicate the reduced energy consumption resulting from the transition to electric vehicles, contributing to a more sustainable and efficient transportation sector.

# 2. Building Sector

Out of the total population in UT of Ladakh, approximately 23% of the population resides in urban areas as per census 2011. ECBC and ENS are expected to be implemented in upcoming years, which will lead to decrease in the energy consumption in the state. Currently, the codes are not notified yet. Despite the significant urbanization in the UT of Ladakh, the commercial sector, which is a key component of the urban landscape, accounts for only 46.7% of the total electricity consumption in the building sector. The suggested strategies for the building sectors are:

# Effective Implementation of ECSBC

In the recent amendment to the Energy Conservation (EC) Act in 2022, a unified code called the "Energy Conservation and Sustainable Building Code" (ECSBC) has been introduced. This new code will encompass both commercial and residential buildings. Until the implementation of ECSBC in states, the existing Energy Conservation Building Code (ECBC) and Eco-Niwas Samhita (ENS) will be referred to as ECSBC. To achieve energy savings in the building sector, it is proposed to effectively implement the Energy Conservation and Sustainable Building Code (ECSBC) by increasing the number of ECBC and ENS compliant buildings in the state.

Implementing Agency: Bureau of Energy Efficiency, Ladakh PDD, Urban Local Bodies and PWD.

#### **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 to incorporate latest energy efficient materials and technologies
- g. Inclusion of curriculum on energy efficiency in building, in universities and schools

## Implementing Agency:

- 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 building 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.

## Implementing Agency: Ladakh PDD, DISCOMs, ESCOs

#### Actionable Items:

- a. Development of state-specific implementation models and identification of relevant agencies
- b. Issuance of directive to government office and building in the state to replace all existing inefficient appliances with BEE 5-star rated appliance.
- 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

# Promotion of BEE Star Rating and Shunya Rating of 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.

Implementing Agency: BEE, Ladakh PDD, Urban Local Bodies and PWD

## 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

# Promotion of Geothermal Heating System in the buildings

Ladakh, a region located in the northernmost part of India, is known for its harsh winters and extreme weather conditions. Due to the region's location and climate, the residents of Ladakh have to rely heavily on electricity for heating purposes in buildings. A geothermal heating system uses the natural heat of the earth to warm buildings. The system uses pipes buried underground to circulate water that absorbs the earth's natural heat. The heated water is then used to warm buildings through a series of radiators or underfloor heating systems.

# Implementing Agency: BEE, Ladakh PDD, PWD, ULB

# Actionable Items:

- a. Conduct a feasibility study on Geothermal Heating System in Ladakh
- b. Develop regulatory frameworks for Geothermal Heating System in Ladakh
- c. Provide incentives and subsidies for Geothermal Heating System adoption in Ladakh.
- d. Promote public awareness and education on Geothermal Heating System
- e. Collaborate with international organizations and experts on Geothermal Heating System

# Implementation Methodology:

- a. Feasibility Study
- b. Policy and Regulations
- c. Awareness Building
- d. Technical Assistance
- e. Incentives and subsidies
- f. Demonstration Projects
- g. Collaboration with Industry
- h. Energy Audits
- i. Financial Analysis
- j. Long Term Maintenance Plans

## Passive Solar Heating (PSH) Mainstreaming

In Ladakh's extreme winter climate, poorly insulated buildings rely on coal and biomass for heating. Despite 40 years of NGO promotion, Passive Solar Heated (PSH) houses haven't gained traction, and modern construction ignores PSH concepts. To achieve a Carbon Neutral Ladakh as envisioned by the Prime Minister, addressing hurdles to PSH adoption, establishing design guidelines, offering training, suggesting policy changes, and raising awareness are essential steps toward mainstreaming PSH buildings.

#### Lead-Acid Battery House cum Sentry Post

Designing buildings to maintain indoor temperatures above 15 degrees Celsius is crucial for consistent battery performance. By situating lead-acid batteries within a Passive Solar Heated (PSH) room, their thermal mass can serve as thermal banks, while also functioning as electrical storage. These batteries, rich in water content, offer effective thermal mass, releasing stored heat indoors after sunset. This battery house can also serve as a PSH-guard post, featuring its solar power generation (rooftop SPV) for lighting fences and the post itself. This innovative approach not only optimizes battery function but also enhances soldier safety by mitigating the risk of accidental fires in Ladakh's challenging conditions.

## Phase Change Material Integration in Building Component

To improve the self-sufficiency of passive solar space heating, integrating phase change materials into building components can significantly increase their thermal capacity. Consequently, this integration will greatly enhance the autonomous heating capabilities of the future buildings in Ladakh.

By implementing the aforementioned strategies in the building sector, it is estimated that approximately 0.0062 Mtoe in energy savings can be achieved under the moderate scenario. Under the ambitious scenario, the estimated energy savings increase to approximately 0.0114 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. Industry Sector

Union territory of Ladakh has picked the exponential growth in industrialization after the reorganization of Jammu Kashmir state in year 2019. Ladakh has majorly micro and small scale enterprises. There are no large industries present in the UT. Agriculture has been mainstay of the Ladakhi economy even when the cultivated land is nearly about 10% of the total land. There are about 900 industries in the UT. Some of the prominent and leading industrial sectors in the state are Woolen and Silk based clothes, metal fabrication, wooden/furniture based and food processing. The following are the potential new MSMEs in the UT are ceramic bricks, cement bricks and blocks. The proposed strategies for the industrial sector are:

# Energy Efficiency Interventions for MSME Clusters.

The strategy is proposed for the Small and Medium Enterprises (SME) sector, which consist of MSMEs in identified prominent sectors such as food processing, metal fabrications, cement bricks and blocks. A PAT-like scheme is proposed under this strategy for the unorganized and small industries sectors, which would not meet the threshold energy consumption under the conventional PAT scheme. The strategy would involve the implementation of energy efficient technologies and new & innovative

decarbonization technologies in the market in order to enable SMEs to meet their energy saving targets.

Implementing Agency: Bureau of Energy Efficiency (BEE), Ladakh PDD

## Actionable Items:

- a. Carrying out of energy and resource mapping studies MSME cluster.
- b. Implementation of demonstration projects on energy efficient technologies in SME cluster.
- c. Workshop on technology interventions for energy conservations in MSMEs
- d. Periodic standardized energy audits for MSMEs on load basis and reimbursement of energy audit cost with maximum cap.
- e. Issuance of directives for implementation of ISO 50001, Energy Management System in organisations on load basis.
- f. Sector-specific policy development for financial assistance on implementation of ECMs suggested in energy audit.
- g. Phase wise plan to implement DSM scheme for replacement of existing inefficient (non-star rated) pumps through 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 the mentioned strategies in the industry sector, it is estimated that approximately 436 Toe energy savings can be saved under the moderate scenario and 978 Toe under the ambitious scenario.

# 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 environmental 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 and the Ladakh Power Development Department, ASSOCHAM in consultation with Bureau of Energy Efficiency and in association with Ladakh Power Development Department has developed a comprehensive State Energy Efficiency Action Plan for the UT of Ladakh. This plan recognizes the necessity, potential, and opportunities for energy efficiency within the UT. 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 Ladakh TFEC will reach 0.40 Mtoe by FY 2030.

In light of this projection, the action plan identifies Transport, Buildings and Industry 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 0.049 Mtoe in total energy consumption by FY 2030. In the ambitious scenario, the reduction is projected to be 0.093 Mtoe. Additionally, this plan aims to generate awareness at a mass level and create a market potential of approximately Rs. 171 Crore in the energy efficiency sector. Furthermore, it is anticipated to contribute to a reduction of 0.15 MtCO<sub>2</sub> in the moderate scenario and 0.29 MtCO<sub>2</sub> in the ambitious scenario in terms of CO<sub>2</sub> emissions by FY 2030.