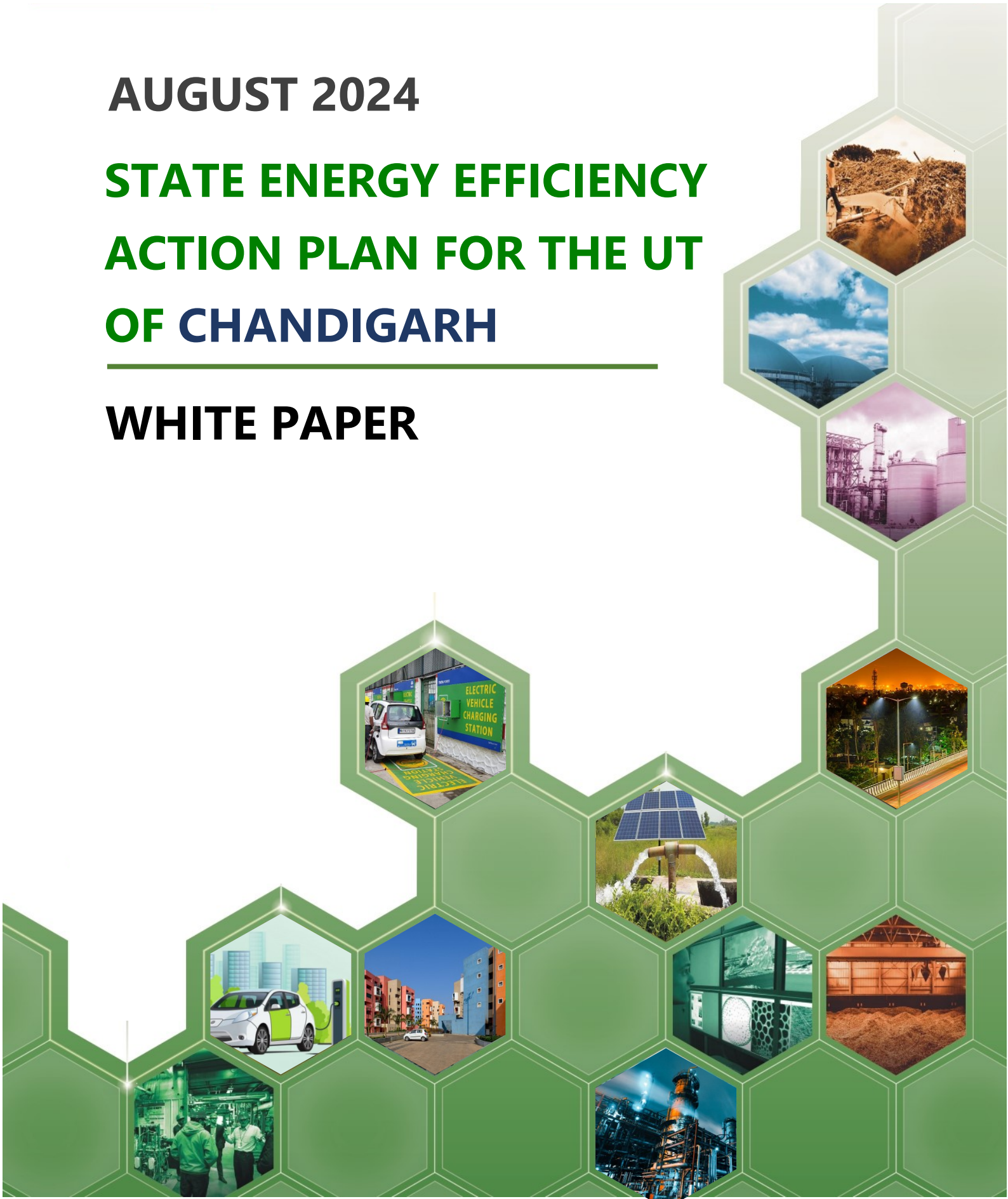
GOVERNMENT OF INDIA
MINISTRY OF POWER

AUGUST 2024

STATE ENERGY EFFICIENCY ACTION PLAN FOR THE UT OF CHANDIGARH

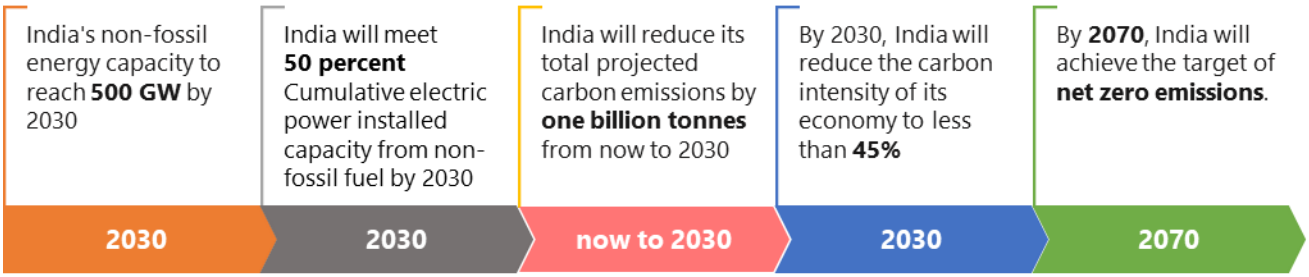
WHITE PAPER



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. This action plan aligns with the Nationally Determined Contributions (NDCs), also known as *Panchamrit*. For Chandigarh, 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 2031. The implementation of the proposed action plan is expected to result in estimated energy savings of **0.091** million tonnes of oil equivalent (Mtoe) in a moderate scenario and **0.1630 Mtoe** in an ambitious scenario by FY 2031.

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 Chandigarh and knowledge partner ASSOCHAM has developed

state-specific energy efficiency action plan to ensure that resource allocation aligns with the state/UT'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/UT tend to consume a significant portion of energy. To determine the focus sectors for Chandigarh, 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 in prioritized sectors, State Designated Agency (SDA), and inputs from stakeholders.

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

Buildings

Transport

Industries

By targeting these focus sectors and implementing energy efficiency measures, the 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. Buildings Sector

Chandigarh, with 97% of its population residing in urban areas, faces a significant challenge in managing its increasing energy consumption, particularly in the building sector. To address this issue, the UT Administration is in the process of implementing the Energy Conservation Building Code (ECBC) for buildings meeting certain criteria. The Bureau of Energy Efficiency (BEE) has introduced the Eco-Niwas Samhita (ENS) for residential buildings to promote energy efficiency. Despite the commercial sector supporting urbanization, the domestic sector consumes 61% of the electricity in the building sector, indicating a need for policies to encourage energy efficiency in residential buildings. Implementing energy efficiency measures in the domestic sector could lead to substantial reductions in electricity consumption. The suggested strategies for the building sectors are:

1. Effective Implementation of ECSBC

Chandigarh is in the process of adopting the Eco-Niwas Samhita (ENS) for residential buildings, while the Energy Conservation Building Code (ECBC) is yet to be notified. However, the recent EC Act Amendment 2022 introduces the unified "Energy Conservation and Sustainable Building Code" (ECSBC), which will cover both commercial and residential buildings. Until the implementation of ECSBC, ECBC and ENS will serve as energy efficiency building codes. To achieve energy savings in the building sector, the effective implementation of ECSBC is proposed for upcoming commercial and domestic buildings in Chandigarh.

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.
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 Schools & Colleges

Implementing Methodology:

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

2. 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 UT of Chandigarh 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.
e. Transition of electronic metering to smart metering.

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

3. 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 (5 years) 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.
g. Promotion of installation of Rooftop Solar Systems on 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 **0.0038 Mtoe** in energy savings can be achieved under the moderate scenario. Under the ambitious scenario, the estimated energy savings increase to approximately **0.0049 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.

2. Transport Sector

The transport sector in Chandigarh is experiencing rapid growth, with a significant increase in the number of registered motor vehicles over the years, particularly in the private vehicle categories of two-wheelers and four-wheelers. Two-wheelers account for the largest share of registered vehicles at 52%, followed by four-wheelers at 45%. This presents an opportunity for a positive transition towards electric vehicles (EVs) in Chandigarh, aligning with the long-term strategy of achieving sustainability goals such as the desired target of *Panchamrit*. The

steady growth in vehicle registration, with an Average Annual Growth Rate (AAGR) of 5.80%, indicates the need for proactive measures to curb primary energy consumption in the transport sector. Targeting the transition of two-wheelers and four-wheelers to EVs could lead to significant reductions in energy consumption and emissions in Chandigarh. The following is the strategy proposed for Transport Sector:

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

The transition to Electric Vehicles (EVs) across all segments of vehicles will be instrumental in decarbonization of the sector and in bringing significant savings in fossil-fuel based energy consumption. In this strategy, it is proposed to convert new vehicles registered in the UT till FY 2030 to electric vehicles along two different scenario trajectories, namely moderate scenario and ambitious scenario. The highest EV conversion rate is proposed for 2-wheelers because of it having the highest share in registered vehicles and taking into consideration the availability and affordability of 2-Wheeler electric vehicle.

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).

Implementation Methodology:

e) Identification of target areas.
f) Selection of charging technologies.
g) Procurement and installation of charging stations.
h) Operations and maintenance.
i) Incentives to consumers.
j) Awareness campaign.
k) Monitoring and evaluation.

2. 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 2030, 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)

Implementation Methodology:

a) Develop a UT level policy on bioenergy which will encourage the production of biofuels in UT and use of biofuels with conventional fuels.

3. Promotion of Standard and Labelling program of Tyres for Fuel Efficiency in Vehicles

The Bureau of Energy Efficiency (BEE) in India has implemented a standard and labelling program for tyres to promote fuel efficiency in vehicles The promotion of a standard and labelling program for tyres with regard to fuel efficiency in vehicles can be an effective way to encourage the adoption of more fuel-efficient tyres by consumers.

Actionable Items:

a) Awareness campaigns

Implementation Methodology:

a) Various awareness programs are conducting by SDA Chandigarh.

By implementing the above-mentioned strategy, it is estimated that significant energy savings can be achieved. Under the moderate scenario, approximately **0.086 Mtoe** can be saved, while the ambitious scenario has the potential to save around **0.156 Mtoe**. These savings indicate the reduced energy consumption resulting from the transition to electric vehicles, contributing to a more sustainable and efficient transportation sector.

3. Industry Sector

The Industrial Area in Chandigarh spans across 1,200 acres in two phases, with Phase-I covering 776.14 acres and Phase-II covering 486 acres, while Phase-III, spanning 153 acres, remains undeveloped. However, the city's industrial growth is constrained by limited space, with only 1,450 acres allocated for industrial development. Approximately 40% of the

industries are ancillary units, supplying components to major tractor industries. The estimated total output of industries is around 650 crores. Chandigarh faces land constraints and high prices for commercial land, hindering significant industrial investment. The administration is shifting focus towards promoting non-polluting Information Technology (IT) industries due to their space efficiency. The focus industries include Automotive & Electronics Manufacturing, IT/ITES/Biotech, Light Engineering Goods, and Handlooms/Handicrafts. Additionally, energy efficiency targets aim for substantial savings in the industrial sector by FY 2030.

The proposed strategy for the industrial sector is:

Energy Efficiency Interventions for MSME Clusters

The strategy is proposed for the Small and Medium Enterprises (SME) sector industries which consist of MSMEs in identified prominent sectors. The strategy would involve the implementation of energy efficient technologies and new & innovative decarbonization technologies in the market to enable SMEs to meet their energy saving targets. It was assumed that 50% of industries will be able to adopt the strategy in a moderate scenario and 70% industries will be covered in the ambitious scenario.

Actionable Items:

a. Workshops on technology interventions for energy conservations in MSMEs.
b. Demonstration projects offset Energy Efficiency Technologies in SME clusters.
c. Periodic standardized energy audits for MSMEs on load basis and reimbursement of energy audit cost with a maximum cap.
d. Sector-specific policy development for financial assistance on implementation of ECMs suggested in energy audit.
e. Issuance of directives for implementation of ISO 50001, Energy Management System in organizations on load basis.
f. Phase wise plan to implement DSM scheme for replacement of existing inefficient (non-star rated) pumps through DISCOMS.
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 the strategies in the industry sector, it is estimated that approximately **0.0013 Mtoe** energy savings can be saved under the moderate scenario and **0.0021 Mtoe** under the ambitious scenario by 2031.

Other Strategies

1. Replacement of inefficient sewerage and water pumps with BEE 5-star rated pumps under all municipal corporations and rural areas:

The strategy entails the substitution of inefficient sewerage and water pumps with energy-efficient alternatives, particularly the BEE 5-star rated pumps, within municipal corporations. Moreover, any new pump installations must adhere to the BEE 5-star rating or the highest available star rating based on the pump's capacity. By embracing these pumps, Chandigarh aims to streamline energy consumption, mitigate wastage, and curtail operational expenses.

Actionable Items:

1. Assessment of existing pumps.
2. Replacement planning.
3. Implementation of Replacement Scheme.
4. Testing and monitoring.
5. Training and capacity building.
6. Performance evaluation and optimization.

2. Development of energy efficiency curriculum for school & college students:

Creating an curriculum on energy efficiency for schools, universities, ITI colleges, and other technical institutes plays a crucial role in promoting energy conservation. The Department of Education in Chandigarh, along with Chandigarh SDA, can collaborate to develop this

curriculum, covering a wide range of topics such as fundamental energy concepts, environmental impacts of energy usage, principles of energy efficiency, benefits of energy conservation, and the latest advancements in energy-efficient technologies. The curriculum should be tailored to suit different age groups and be designed to captivate students' interest at all levels. It should also be contextualized to address local energy challenges and opportunities, enabling students to grasp the significance of energy conservation in their surroundings. By imparting knowledge about energy conservation, students can make informed decisions regarding their energy consumption, contributing to the Chandigarh's efforts in reducing overall energy usage.

Actionable Items:

1. Curriculum design.
2. Interactive learning materials.
3. Real-world examples.
4. Interactive discussions and debates.
5. Field trips and guest lectures.
6. Awareness campaigns.

3. All new transformers in Residential-Commercial Buildings and Industrial Buildings shall be BEE 3 Star Rated.:

The strategy aims for the replacement of old and inefficient transformers with energy-efficient transformers across various sectors which includes Industries, Commercial and Domestic Buildings, Transport, Agriculture, Distribution Companies, Power Generation Plants etc. This strategy would be beneficial for reducing energy consumption, minimizing greenhouse gas emissions, and helping in reducing T&D losses. It would be a great initiative in strengthening the resilience of electrical distribution systems and in supporting the sustainable goals.

Actionable Items:

1. Carrying out audits.
2. Cost-Benefit Analysis.
3. Installation of energy efficient transformers

4. Maintenance and Monitoring

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 UT 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 UTs 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.

4. Net-Zero Chandigarh

Chandigarh has a very small fraction of share in national energy and emission scenarios. Chandigarh has witnessed an increase in the emissions with a CAGR of 3.44% from 0.71 $MtCO_2e$ in the year 2005 to 1.10 $MtCO_2e$ in 2018. The per capita emissions of Chandigarh remained very low throughout the reference period. They increased at a compound rate of 2.60% from 0.67 t CO_2e/capita in 2005 to 0.94 t CO_2e/capita in 2018.

The UT of Chandigarh demonstrates a great potential in emission reduction of approximately 0.2848 $MtCO_2e$ and 0.5101 $MtCO_2e$ in moderate and ambitious scenario by the year 2030.

These reduction targets represent a decrease of 17.36% and 31.10% in moderate and ambitious scenario, respectively, compared to the total emissions of 1.64 $MtCO_2e$ expected by 2030.

Additional provisions will be incorporated into the State Energy Efficiency Action Plan (SEEAP) to advance Chandigarh's journey towards achieving Net Zero status by 2030.

Renewable Energy

Chandigarh aims to meet its peak energy demand of approximately 400 MW in summer through widespread installation of rooftop solar PV systems and solar parks, with a current capacity of 53.45 MW set to increase significantly soon.

Public Transportation

Chandigarh is actively promoting public transportation, cycling, and walking while transitioning conventional fuel vehicles to electric ones, aiming to convert the entire bus fleet to electric vehicles and establish renewable energy-based EV charging stations for a cleaner transport system.

Waste Management

Implementing waste reduction, recycling, and composting programs to minimize landfill emissions and will promote the circular economy in the UT.

Reforestation and Green Spaces

Increasing green cover and creating urban green spaces to enhance carbon sequestration and improve air quality.

Climate Resilience

Developing plans to adapt to the impacts of climate change and enhance resilience in areas such as water management and disaster preparedness.

Engaging the Community

Engaging the local community, businesses, and stakeholders to raise awareness and gain support for emissions reduction initiatives.

Environment, Tower & Heritage Preservation

The city aims to become "Resilient to climate change" by adopting circularity principles focused on restorative and regenerative economic systems, renewable resources, resource optimization, and sustainable livelihoods.

Summary

Through extensive research and collaboration with various stakeholders, the Chandigarh SDA, and ASSOCHAM in consultation with Bureau of Energy Efficiency has developed a comprehensive State Energy Efficiency Action Plan for the UT of Chandigarh. This plan recognizes the necessity, potential, and opportunities for energy efficiency. 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 UT's total final energy consumption (TFEC) based on energy consumption and economic growth, it is estimated that Chandigarh's TFEC will reach 0.97 Mtoe by FY 2031.

In light of this projection, the action plan identifies Buildings, Industry, and Transport 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 **0.091 Mtoe** in total energy consumption by FY 2031. In the ambitious scenario, the reduction is projected to **0.1630 Mtoe**. Additionally, this plan aims to generate awareness at a mass level and create a market potential of approximately Rs. 299.89 Crore in the energy efficiency sector. Furthermore, it is anticipated to contribute to a reduction of 0.2848 $MtCO_2e$ in the moderate scenario and 0.5101 $MtCO_2e$ in the ambitious scenario in terms of CO_2 emissions by FY 2031.

Table 1: *Energy Savings Summary and Market Potential*

Sector	Energy Saving Potential (Mtoe) - FY2031		Emissions Reduction Potential ($MtCO_2$) - FY2031		Market Potential (INR Crore)
	Moderate	**Ambitious**	**Moderate**	**Ambitious**	
	Mtoe	Mtoe	$MtCO_2e$	$MtCO_2e$	
Buildings	0.0038	0.00495	0.0118	0.0155	9.10 Cr
Industry	0.0013	0.00214	0.0042	0.0067	3.93 Cr
Transport	0.086	0.156	0.2688	0.4879	286.85 Cr
Total	**0.0910**	**0.1630**	**0.2848**	**0.5101**	**299.89 Cr**

Table 2: *Energy Savings (Year-Wise)*

	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																
Energy efficiency in MSME Clusters	0.00021	0.00067	0.00054	0.00168	0.00080	0.00250	0.00097	0.00305	0.00119	0.00371	0.00145	0.00452	0.00176	0.00551	0.00214	0.00671
Transport																
Transition to electric vehicles	0.005	0.017	0.008	0.025	0.021	0.06573	0.025	0.07920	0.030	0.09544	0.037	0.11500	0.044	0.13858	0.053	0.16699
Ethanol blending	0.002	0.005	0.004	0.012	0.015	0.04695	0.018	0.05481	0.020	0.06400	0.024	0.07472	0.028	0.08723	0.033	0.10185
Building																
Effective implementation of ECSBC	0.0000093	0.00003	0.000014	0.00004	0.000037	0.00011	0.000044	0.00014	0.000053	0.00017	0.000064	0.00020	0.000077	0.00024	0.000093	0.00029
Replacement program for inefficient appliances	0.00049	0.00153	0.00074	0.00230	0.00187	0.00585	0.00227	0.00709	0.00275	0.00860	0.00333	0.01043	0.00404	0.01265	0.0049	0.01534
BEE Star Rating and Shunya Rating of Buildings	0.00000025	0.00000	0.0000004	0.00000	0.0000011	0.00000	0.0000013	0.00000	0.0000015	0.00000	0.0000018	0.00001	0.0000021	0.00001	0.0000025	0.00001
Total	**0.008**	**0.024**	**0.013**	**0.041**	**0.039**	**0.121**	**0.046**	**0.144**	**0.055**	**0.172**	**0.065**	**0.205**	**0.078**	**0.244**	**0.093**	**0.291**