Whitepaper On
State Energy Efficiency Action Plan

Dadra and Nagar Haveli and
Daman and Diu

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. This significant move reaffirms India's dedication to sustainable energy and communicates the nation's forthcoming strategy in combating climate change. The Hon'ble Prime Minister announced following five major goals for India under 'Panchamrit' goals.

1. Achieving net-zero by 2070
2. Increasing non-fossil energy capacity to reach 500 GW by 2030
3. Reducing carbon intensity by 45% by 2030
4. Increasing renewable energy component to 50% of our total energy requirements by 2030
5. Reducing total projected carbon emissions by one billion tonnes starting now till 2030

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

The State/UT 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 0.372 million tonnes of oil equivalent (Mtoe) in a moderate scenario and 0.587 Mtoe in an ambitious scenario for UT.

Identification of the focus sectors

To facilitate the transition towards low-carbon development pathways, each state or union territory (UT) plays a crucial role. Identifying the focus sectors or areas is important because certain sectors within the UT tend to consume a significant portion of energy. To determine the focus sectors for DNHDD, a comprehensive study was conducted, considering 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 UT in prioritized sectors, and inputs from stakeholders.

Based on the **Total Final Energy Consumption (TFEC)** in the UT and its sectoral distribution, the following sectors have been identified as the focus sectors for devising energy efficiency strategies in DNHDD referring the fiscal year 2019-20 as a base year. Industries, Buildings, Transport & Fisheries are the identified focus sector for the UT.

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

Proposed Strategies with Implementation Methodology

The chapter discusses 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

The UT has aim to promote vibrant industrial growth and overall economic development to promote sustainable and inclusive industrial growth. In order to meet its objective UT Administration has identified priority sectors and thrust areas for investment. The following are the thrust are:

1. Chemicals & Petrochemicals
2. Electronic & Electrical industry
3. Automobile and ancillary sector
4. Manufacturing
5. Pharmaceuticals & Healthcare
6. Textiles
7. IT industry

Energy Efficiency Interventions in PAT Sectors in DNHDD

The PAT (Perform Achieve and Trade) Deepening scheme is inclusion of more units from already existing sectors of PAT like Textile, Iron and steel, Cement. Previously in UT there were two units in the PAT scheme under Textile sector but in PAT-VIII, eight more units were included from Textile sector. Now total 10 units are under PAT scheme from UT. This initiative, characterized by more rigorous benchmarks study and the adoption of cutting-edge technologies, seeks to elevate energy efficiency even further while concurrently curbing greenhouse gas emissions.

By offering incentives for the implementation of more profound energy-saving strategies, the PAT Deepening Scheme plays a pivotal role in advancing UT's sustainable development goals and its efforts to mitigate climate change.

- **Implementing Agency-** Bureau of Energy Efficiency (BEE) and UT SDA
- **Actionable Items & Implementation Methodology** - PAT Deepening Strategy:

a. **Awareness & Capacity Building** - Improving the competencies of Energy Managers and Energy Auditors in the Perform, Achieve, and Trade (PAT) sector goes hand in hand with the exploration of potential additional Designated Consumers (DCs) within the existing sectors.

This entails conducting a thorough examination to evaluate the possibility of lowering the current sectoral threshold for energy consumption.

b. **Energy mapping-** Performing benchmarking investigations and routinely gathering data at specified intervals to maintain precise and current information.

c. **Technology Intervention-** Encouraging the adoption of energy-efficient technologies in various industries through demonstration projects, with a comprehensive collection of these technologies readily available on the ADEETIE portal (Assistance in Deploying Energy Efficient Technologies in Industries and Establishments) supported by BEE (Bureau of Energy Efficiency).

Considering the implementation of the strategies detailed for the industrial sector, it is estimated that, in the moderate scenario, approximately 0.02 million tonnes of oil equivalent (Mtoe) in energy savings could be preserved. Meanwhile, the ambitious scenario holds the potential to generate roughly 0.04 Mtoe in energy savings.

The **PAT Widening Scheme**, an expansion of the Perform, Achieve, and Trade (PAT) program, is designed to further advance energy efficiency in diverse industrial sectors. Leveraging the achievements of the initial PAT initiative, this widening scheme extends its scope to include a more comprehensive array of industries, motivating them to enhance their energy efficiency by setting specific performance benchmarks. This strategy aims to promote enduring energy conservation measures and reduce carbon emissions, thereby making a substantial contribution to the country's overarching objectives of improving energy efficiency and environmental sustainability.

- **Implementing Agency:** Bureau of Energy Efficiency (BEE) and UT SDA

Actionable Items & Implementation Methodology- PAT Widening Strategy:

a. **Awareness & Capacity Building-** Enhancing the skills of Energy Managers and Energy Auditors in sectors outside the Perform, Achieve, and Trade (PAT) scheme is accompanied by an exploration of potential industries like Food processing, Plastic, Pharmaceutical, Paper and Metal etc., for potential integration into the PAT program, necessitating a thorough feasibility assessment to identify energy consumption and energy saving opportunities. Furthermore, this holistic strategy encompasses the execution of a benchmarking analysis and extensive data gathering at the cluster level.

b. **Technology Intervention-** Implementing pilot programs, incorporating digitalization and automation, and embracing energy-efficient technologies are integral elements of the strategy. A list of these energy-efficient technologies is readily available through the BEE's support center on the ADEETIE portal.

Considering the implementation of the strategies detailed for the industrial sector, it is estimated that, in a moderate scenario, approximately 0.009 million tonnes of oil equivalent (Mtoe) in energy savings could be preserved, whereas the ambitious scenario holds the potential to generate roughly 0.011 Mtoe in energy savings.

Strategy: Energy Efficiency Drive in MSME

The industrial sector plays a significant role in the GDP of the Union Territory of Dadra and Nagar Haveli and Daman and Diu (DNHDD), contributing approximately 32.78% to its economic output. Within the region, there are 39 Industrial Estates, housing a total of 3,292 Industrial Units, with the majority, 2,929, falling within the small-scale sector. Omnibus Industrial Development Corporation (OIDC) has developed two major industrial areas in Daman, while others are located in areas like Dabhel, Bhimpore, Kachigam, and Kadaiya. Notable sectors with a strong presence include polyester and cotton yarn production, accounting for a substantial

portion of India's polyester yarn output. Additionally, industries engaged in plasticizers, paper manufacturing, petroleum by-products such as lube oils, pharmaceuticals, plastics, electrical conductors, marble tiles, textiles (focused on cotton and micro-yarn spinning and processing), plastics (injection and blow molded articles), and paper products (corrugated paper boxes, sheets, rolls, and paper tubes) contribute significantly to the region's industrial landscape. These industries collectively form the backbone of the industrial sector in DNHDD, driving economic growth and production diversity.

Implementing Agency: Bureau of Energy Efficiency (BEE) and UT SDA

Actionable items & Implementation Methodology

a) To advance energy efficiency in DNHDD, a comprehensive action plan is essential. This plan involves sector-specific policy development to offer financial assistance for benchmarking Micro, Small, and Medium Enterprises (MSMEs) within industrial clusters.

b) Subsidies should be provided to facilitate energy audits and the execution of energy efficiency projects. Promoting Green Rating for Companies is integral to incentivizing sustainable practices.

c) UT should consider implementing energy-saving schemes tailored to the MSME industry, such as the upcoming **Perform Achieve and Earn (PAE)** program by the Bureau of Energy Efficiency (BEE). PAE represents a forward-looking initiative that aligns with UT's commitment to enhancing energy efficiency and sustainability in the region. Through the energy efficiency drive in MSMEs sector, estimated potential for energy savings are 0.043 Mtoe and 0.083 Mtoe in moderate and ambitious scenario respectively.

Taking into account the outlined strategies for the industrial sector, it is projected that the moderate scenario could yield energy savings of roughly 0.072 million tonnes of oil equivalent (Mtoe), while the ambitious scenario has energy saving potential of approximately 0.134 Mtoe in energy savings. Furthermore, the moderate scenario has the capacity to decrease greenhouse gas (GHG) emissions by approximately 0.232 million metric tons of CO2 (MTCO2), whereas the ambitious scenario may result in a reduction of around 0.415 MTCO2.

2. Building Sector

The buildings sector likely provides significant opportunity for reductions in energy consumption and GHG emissions. Currently, India’s buildings account for around one-fifth of total CO2 emissions and nearly 33 percent of the nation’s energy use. The buildings sector is also one of the largest consumers of natural resources. In the absence of peremptory energy efficiency improvements and policy measures, the buildings sector is projected to emit seven times more CO2 by 2050, as compared with 2005 levels. Meanwhile, the residential sector’s overall energy use could increase eightfold.

In UT, the domestic and commercial sector is the third largest consumer of electricity and second largest consumer of total energy consumption. Effective use of energy efficiency strategies in this sector paves the way to reduce the future energy consumption of the state. To address these challenges, it is essential for UT to notify and implement the Energy Conservation Building Code (ECBC) 2017 for commercial buildings and also implement ECO - Niwas Samhita for residential buildings.

The Energy Conservation Building Codes (ECBC) is an initiative introduced by the Bureau of Energy Efficiency (BEE) aimed at fostering energy efficiency within commercial buildings. Conversely, Eco Niwas Samithi (ENS) is a program intended to enhance energy efficiency within residential buildings. The significance of ECBC and ENS in the context of energy efficiency is underscored by their potential to curtail energy consumption and the associated greenhouse gas emissions, which are significant contributors to climate change. By advocating for energy-efficient practices within building design and operation, these programs have the capacity to diminish the overall energy demand and promote the adoption of renewable energy sources. This, in turn, aligns with the nation's objectives to reduce its carbon footprint

and mitigate the adverse effects of climate change. These measures are vital to reducing environmental impact, enhancing energy sustainability, and alleviating the growing energy demands of the region's building sector. Moreover, these initiatives can lead to cost savings for residents and businesses, promote the efficient use of natural resources, and contribute to the long-term energy security and sustainability of the UT.

It is worth noting that ECBC is nearing the final stages of gazette publication, while ENS is currently in the draft stage within the Union Territory.

Energy efficiency strategies in the buildings sector

Implementation of ECBC & ENS-Residential Sector

The implementation of the Eco-Niwas Samhita (ENS) in the residential sector stands as a pivotal component of UT's comprehensive energy efficiency action plan. ENS, a set of guidelines and standards aimed at promoting energy-efficient practices in residential buildings, presents a remarkable opportunity to address the growing energy consumption and environmental concerns within this sector. The integration of ENS into the residential sector not only aligns with global sustainability goals but also holds the potential to significantly reduce energy consumption, lower utility bills for residents, and contribute to a greener and more resilient energy future.

In UT, there is significant energy-saving potential for FY2030-31, both in moderate and ambitious scenarios, measured in MTOE. This potential is determined by calculating energy savings per building (in kWh per household) and multiplying it by the projected increase in households up to FY2030-31. Moreover, this strategy has the potential to reduce energy consumption by 0.0006 Mtoe in moderate scenario and 0.0014 Mtoe in ambitious scenario.

- **Implementing Agency:** UT SDA, Town planning department
- **Actionable Items & Implementation Methodology-**

a) To enhance energy efficiency in UT, a comprehensive action plan is proposed. This plan includes initiatives such as market outreach programs to promote ECBC/ENS compliant products through channels like radio jingles and social media campaigns.

b) A key element of the strategy involves the training of Home Energy Auditors to assess and recommend efficiency improvements. To incentivize compliance, a structured framework offering rebates on energy savings for initial projects is proposed.

c) The development and upkeep of an ECBC/ENS compliance portal will facilitate information dissemination and tracking. Investing in pilot projects that showcase Super ECBC buildings as case studies will demonstrate the feasibility and benefits of advanced energy efficiency standards.

d) Promoting green building ratings will encourage sustainable practices within the construction sector, collectively contributing to a more energy-efficient and environmentally conscious DNHDD.

e) Inclusion of sustainability and energy courses in schools and colleges.

Deepening of Standard & Labelling Programme

In India, the Bureau of Energy Efficiency (BEE) has launched an initiative centered on the utilization of standardized labels to promote energy-efficient household appliances. This program actively encourages the replacement of outdated and less efficient appliances with those that meet the minimum energy performance standards (MEPS) established by the BEE.

These informative labels empower consumers to make well-informed decisions when choosing appliances, resulting in decreased energy consumption and reduced electricity costs.

This initiative extends its benefits to domestic buildings by advocating for the use of energy-efficient appliances, lighting systems, and construction materials, thereby making a substantial contribution to the reduction of energy usage, greenhouse gas emissions, and consumer energy expenses. While the introduction of BEE's labeling has already steered consumer preferences towards energy-efficient appliances, it remains imperative to foster wider adoption to further enhance the overall efficiency of the building sector.

- **Implementing Agency:** UT SDA, Town planning department
- **Actionable Items & Implementation Methodology:**

In the action plan for energy efficiency in the UT, several key initiatives can be implemented to promote energy conservation and reduce greenhouse gas emissions. Firstly, the introduction of Demand Side Management (DSM) schemes through the local DISCOM can encourage the adoption of energy-efficient appliances like energy efficient fans and AC units.

Conducting comprehensive training programs for retailers in urban and sub-urban areas can raise awareness and promote the sale of energy-efficient products.

To ensure a significant impact, commercial buildings can be mandated to purchase a minimum of 4-star rated appliances, thereby driving energy efficiency practices within the business sector. These combined efforts aim to enhance energy efficiency in the UT, reducing energy consumption, and contributing to a more sustainable and environmentally friendly future. The estimated energy saving potential by 2031, through deepening of Standard and Labeling program is 0.003 and 0.004 in moderate and ambitious scenario respectively in the UT.

BEE Star Rating of Buildings, Green Buildings

The green building rating system in India encompasses a wide range of elements, including energy-efficient lighting, heating, ventilation, and air conditioning systems, as well as the utilization of renewable energy sources such as solar and wind power. This comprehensive rating framework also assesses various sustainability factors like water conservation, protection of natural habitats, and minimizing environmental impact during construction. Buildings with a green rating are required to adhere to the Energy Conservation Building Code (ECBC) and demonstrate a substantial energy efficiency advantage, typically achieving 20% to 30% greater energy efficiency compared to conventional buildings.

- **Implementing Agency:** Bureau of Energy Efficiency, SDA, Town planning department
- **Actionable Items & Implementation Methodology:**

a. Awareness & Capacity Building - Promoting green education involves two key strategies. Firstly, integrating modules on energy conservation into the school curriculum for students in grades 6 to 10 can foster environmental awareness and responsible practices from an early age. Secondly, establishing dedicated branches within engineering programs and offering specialized degree courses can provide higher education avenues for individuals interested in pursuing careers focused on sustainability and environmental stewardship. These initiatives collectively aim to nurture a generation of environmentally conscious individuals and professionals equipped to address pressing environmental challenges.

b. Subsidy - To promote the development of energy-efficient and environmentally friendly buildings, a comprehensive strategy can be employed. This strategy includes providing incentives such as property tax rebates, additional floor area ratio (FAR), reduced stamp duty rates, and expedited environmental clearance for upcoming projects adhering to green building ratings. Furthermore, a key aspect involves the transformation of government-owned buildings into BEE star-rated and green buildings, serving as exemplary models for sustainable construction practices. Additionally, fostering the growth of star-rated and green buildings through supportive policy incentives further reinforces the commitment to energy efficiency and sustainability in the construction sector.

Anticipating the implementation of the strategies delineated for the building sector, it is estimated that the moderate scenario has the capacity to save approximately 0.0001 million tons of oil equivalent (Mtoe) through energy efficiency measures, while the ambitious scenario holds the potential for significantly greater energy savings, estimated at around 0.0005 Mtoe.

The overall energy saving opportunities in building sector with strategies, Implementation of ECBC for commercial buildings and ENS for residential buildings, Deepening of Standard & Labelling Programme and BEE Star Rating of Buildings/Green buildings is 0.0037 Mtoe in moderate scenario and 0.0059 Mtoe in ambitious scenario.

3. Transport Sector

In the transport sector, there's a pressing need to prioritize and promote energy-efficient public transportation alongside policy interventions to encourage clean and efficient fuel vehicles. Some states and Union Territories have initiated incentives for Electric Vehicles (EVs), but there's a call for a more comprehensive state-level framework. Decarbonizing our societies is critical due to climate change, especially in the road transport sector, which contributes significantly to greenhouse gas emissions. To address this, various solutions such as biofuels, e-fuels, and low-carbon fuels are considered, but no single solution can fully tackle the emissions challenge. India, in line with its Nationally Determined Contributions (NDCs), aims to significantly reduce carbon emissions and shift towards energy-efficient transportation modes like rail, emphasizing a 45% rail share in land transport, electric vehicles, fuel efficiency enhancements, and biofuel integration for road transport improvements. This integrated approach is vital for decarbonizing the transport sector and combating climate change effectively.

Strategy: Transition of conventional 2W, 3W, 4W, Goods Vehicles, Heavy Vehicles, Buses into EV fleet by FY 2030-31

Electric vehicles (EVs) represent a significantly more energy-efficient option compared to their petrol or diesel counterparts. While EVs can effectively convert approximately 60% of electrical energy from the grid into usable power for propulsion, conventional petrol or diesel cars can only convert a mere 17% to 21% of the energy stored in their fuel into actual wheel power, resulting in a substantial 80% energy wastage. Therefore, the electrification of road transport stands as a compelling strategy for reducing energy consumption and emissions, especially as the grid becomes increasingly powered by renewable energy sources.

However, in Dadra & Nagar Haveli & Daman & Diu, electric vehicles constitute a mere 0.08% of the total registered vehicles (by Dec 2022), indicating a significant gap in transitioning from internal combustion engine (ICE) vehicles to EVs. Addressing this challenge necessitates raising public awareness and bolstering the charging infrastructure to foster greater EV adoption in the Union Territory.

- **Implementing Agency:** Transport Department, SDA

Actionable Items & Implementation Methodology:

a. **Awareness & Capacity Building -** Promoting energy efficiency and electric vehicle (EV) adoption can be achieved through a two-pronged approach. Firstly, raising awareness about high-energy lithium-ion traction battery packs and systems plays a pivotal role in educating stakeholders and the public about the benefits and advancements in energy-efficient technologies. Secondly, implementing a EV policy and also mandating the purchase of EVs within government departments to demonstrates a commitment to leading by example and driving the transition toward sustainable transportation solutions. Together, these initiatives contribute to a comprehensive strategy for enhancing energy efficiency and fostering the adoption of environmentally friendly electric vehicles.

b. **Technological Intervention** - The strategy encompasses the adoption of the Combined Charging Systems (CCS Standard) for electric vehicles, along with the establishment of charging stations designed for open access. It also includes the initiation of pilot projects focusing on Hydrogen Fuel Cell Vehicles and the implementation of pilot projects for Battery Swapping stations tailored for two and three-wheelers. These initiatives collectively aim to advance the infrastructure and accessibility of alternative fuel sources in the transportation sector, promoting sustainable and efficient mobility solutions.

Expanding the presence of electric vehicles (EVs) in the Union Territory (UT) to 26,411 EVs in the moderate scenario and 36,291 EVs in the ambitious scenario by 2030-31 is projected to yield significant energy savings of 0.032 Mtoe in moderate and 0.037 Mtoe in ambitious scenarios.

Strategy: Promotion of Non-Motorized Transport (NMT)

Silvassa Smart City Ltd., in partnership with ITDP India and UrbanMorph, has introduced a comprehensive Cycle2Work campaign designed to encourage businesses and organizations to embrace cycling as a primary mode of commuting and cultivate a robust cycling culture within the city. This initiative encourages employees to reconsider their transportation choices, advocating for the adoption of cycling to work as an eco-friendly and health-promoting alternative to automobiles and motorcycles. The campaign's marketing strategy encompasses four key elements: Onboarding, Engagement, Incentivization, and Monitoring, creating a holistic approach to promote sustainable commuting practices.

- **Implementing Agency:** State Transport Department, Urban development agencies

- **Actionable Items & Implementation Methodology:**

To enhance non-motorized transportation (NMT) in urban areas, local urban bodies (ULBs) can play a pivotal role by establishing dedicated cycling pathways. This initiative can be further bolstered by providing incentives to offices to actively participate in promoting cycling among their employees.

Additionally, mandating offices to allocate space for special cycle parking facilities and shower rooms for cyclists can significantly encourage the adoption of cycling as a sustainable and healthy commuting option, contributing to reduced traffic congestion and improved air quality in urban environments.

By expanding and replicating this campaign in other cities within the Union Territory (UT) and aiming for the participation of 15,000 and 20,000 riders in the moderate and ambitious scenarios, respectively, by

2031, the UT stands to achieve substantial energy savings. Specifically, it is projected that by 2031, the UT can conserve 92 tons of oil equivalent (TOE) in the moderate scenario and 123 TOE in the ambitious scenario. This underscores the potential for significant energy efficiency gains through the widespread adoption of such initiatives throughout the UT.

4. Fisheries Sector

Energy efficiency is paramount in UT's fisheries sector, offering a multitude of benefits. It fosters economic advantages by lowering operational costs and enhancing competitiveness, while also generating employment opportunities. Environmentally, it curbs greenhouse gas emissions, safeguards marine ecosystems, and promotes sustainable fisheries management. Resource conservation and energy security are bolstered, and compliance with regulations is ensured. Additionally, energy efficiency improves living conditions for fishery workers, enhances community resilience, and elevates the region's global reputation for responsible and sustainable practices, collectively reinforcing the vitality and sustainability of Daman's fisheries sector.

- **Implementing Agency:** Dept. of Fisheries, UT SDA

- **Actionable Items & Implementation Methodology: -**

a) **Awareness & Capacity Building-** Offering assistance for skill development while raising awareness about resource efficiency and various measures to save diesel consumption in boats.

b) **Technological Interventions**-

(i) **Energy-efficient fishing vessels** - Through the implementation of energy-efficient engines and the reduction of vessel weight, it is possible to achieve significant fuel consumption reductions. According to a study carried out by the Indian Council of Agricultural Research (ICAR), the utilization of energy-efficient engines in fishing vessels has the potential to slash fuel consumption by as much as 40%.

(ii) **Efficient fish processing-** By employing energy-efficient machinery, optimizing cooling systems, and integrating renewable energy sources, it is possible to lower energy consumption within the fish processing industry. According to research carried out by the Ministry of New and Renewable Energy (MNRE), the adoption of energy-efficient fish processing equipment can lead to a remarkable 30% reduction in energy consumption.

(iii) **Energy-efficient cold storage**- The implementation of energy-efficient cooling systems, insulation, and effective lighting can lead to a decrease in energy consumption within cold storage facilities. According to research conducted by ICAR, the adoption of energy-efficient cold storage equipment has the potential to cut energy consumption by as much as 25%.

(iv) **Renewable energy sources** - The adoption of solar-powered boats for fishing and solar-driven cold storage facilities can lead to a decrease in energy consumption within the fisheries sector.

The energy saving in Fisheries sector is estimated as 0.0046 Mtoe in moderate scenario and 0.0062 Mtoe in ambitious scenario.

Financing Mechanism

Energy efficiency has emerged as a critical strategy to address the increasing energy demand, reduce greenhouse gas emissions, and promote socio-economic progress. Unlocking the full potential of energy efficiency relies on strategic investments that stimulate technological innovation in the market and encourage the adoption of energy-efficient practices by consumers. Developed countries have successfully pioneered this transformation through innovative financing models, and India is following suit with initiatives like Energy Service Companies (ESCOs) to tap into the vast potential of energy efficiency financing. This study examines several noteworthy financing models that have the potential to revolutionize energy efficiency in commercial, residential, and industrial sectors. While India currently relies on established approaches such as financial institutions, microfinance institutions, dealer finance, and financial incentives, there is promise in exploring internationally recognized models like On-Bill Financing, ESCOs, Leasing, and Bulk Procurement for a sustainable and energy-efficient future.

Energy Efficiency Financing Models:

1. On-Bill Financing Model: The On-Bill Financing Model represents an innovative strategy that seamlessly incorporates energy efficiency investments into the utility bills of consumers. This innovative approach simplifies the repayment procedure by enabling consumers to gradually reimburse the expenses associated with energy efficiency enhancements, aligning with the concurrent reduction in their energy expenditures. By doing so, it lessens the initial financial strain on consumers while offering immediate monetary benefits for the adoption of energy-efficient technologies.

2. Energy Service Companies (ESCOs): ESCOs, which have gained international recognition, are now gaining attention in India too. In this framework, specialized firms (ESCOs) offer energy-efficient solutions to consumers, encompassing the initial expenses for equipment and installation. Consumers subsequently reimburse the ESCOs using the savings they accrue from reduced energy usage. This approach effectively removes the initial financial obstacle and establishes a mutually beneficial arrangement where consumers enjoy reduced energy costs while ESCOs profit from the resulting energy savings.

3. Leasing Model: The leasing model offers consumers a convenient means to acquire energy-efficient equipment without the necessity of a substantial initial capital outlay. Under this arrangement, consumers enter into leases with specialized companies, making periodic payments throughout the leasing duration. This approach holds particular appeal for businesses and industries seeking to enhance their energy infrastructure while preserving their financial liquidity.

4. **Bulk Procurement:** Bulk procurement entails consolidating the requests for energy-efficient products or services across multiple consumers, resulting in economies of scale. This approach facilitates the negotiation of improved pricing and contract terms with suppliers, ultimately enhancing the accessibility and affordability of energy-efficient solutions for individual consumers or organizations.

5. Green Finance: Energy efficiency-related green finance encompasses a variety of financial tools, including green bonds, energy efficiency funds, and sustainable loans. These mechanisms direct financial resources towards environmentally beneficial endeavors such as building retrofits and renewable energy projects. Supported by strategies like carbon pricing, incentives, and performance contracts, this approach encourages the shift towards a low-carbon economy by promoting investments in energy-saving technologies and methods. In doing so, it plays a pivotal role in global climate mitigation endeavors and the development of a more sustainable energy environment.

6. Carbon Credit Mechanism: The Carbon Credit Mechanism serves as a vital financing tool in the realm of environmental sustainability. This mechanism allows entities that successfully reduce their greenhouse gas emissions below established benchmarks to earn carbon credits, also known as carbon offsets.

These credits can then be traded or sold in carbon markets. Essentially, it incentivizes and rewards organizations, industries, and projects for their efforts to mitigate climate change by curbing emissions. By generating revenue through the sale of carbon credits, these initiatives can fund further emission reduction activities, renewable energy projects, and sustainability efforts. Overall, the Carbon Credit Mechanism plays a crucial role in driving investments in clean technologies, fostering carbon reduction, and contributing to global efforts to combat climate change.

Within the framework of the UT's energy efficiency program, a suggested approach involves the introduction of a financing scheme inspired by the Bureau of Energy Efficiency's successful endeavors within the National Mission for Enhanced Energy Efficiency. This envisioned initiative seeks to create a platform for constructive collaboration among the state government, financial institutions, and project developers. Its principal aim is to streamline the execution of energy efficiency projects aligning with the state's broader objectives and vision.

Summary

In close collaboration with a diverse array of stakeholders and the Daman Energy Development Agency, CII GBC, in consultation with the Bureau of Energy Efficiency and in partnership with the Daman Energy Development Agency, has formulated a comprehensive State Energy Efficiency Action Plan for the Union Territory (UT) of Daman. This meticulously crafted plan acknowledges the imperative, potential, and prospects for enhancing energy efficiency within the UT. It delineates a meticulous roadmap for implementing these strategies while underscoring the significance of robust monitoring involving various stakeholders.

In alignment with this forward-looking projection, the action plan identifies Energy, Industry, Buildings, Transport, Agriculture, and Fisheries as the primary focal sectors. Furthermore, it conducts a sector-specific analysis to delineate strategies aimed at realizing energy savings. In the moderate scenario, the successful execution of this plan is anticipated to yield a reduction of 0.358 million tons of oil equivalent (Mtoe) in total energy consumption by FY 2031. In the ambitious scenario, the reduction is even more substantial, projected at 0.570 Mtoe. In addition to these energy conservation gains, this plan aspires to cultivate widespread awareness and unlock a market potential of approximately INR 337 Crore in the energy efficiency sector. Moreover, it is expected to make significant strides towards curbing emissions, with an estimated reduction of 0.112 million metric tons of CO2 (MtCO2) in the moderate scenario and 0.183 MtCO2 in the ambitious scenario by FY 2031.

	Energy Saving potential by 2031		Emission reduction potential by 2031 (MtCO2)		Investment (Potential)
Sector	Moderate	Ambitious	Moderate	Ambitious	INR Cr
Industry	0.072	0.134	0.232	0.415	247
Transport	0.032	0.037	0.101	0.116	68
Building	0.004	0.006	0.010	0.019	11
Fisheries	0.005	0.006	0.014	0.019	11
Total	0.112	0.183	0.358	0.570	337