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MINISTRY OF
POWER

Whitepaper on

State Energy Efficiency Action Plan for Andaman & Nicobar Islands

Prepared by CONFEDERATION OF INDIAN INDUSTRY

Confederation of Indian Industry

Contents

Background

India's rapid economic expansion and urbanization have paved the way for a huge increase in energy demand. As the nation continues to evolve and urban areas expand, the need for energy to power industries, transportation, and households has grown steadily. This burgeoning demand poses a complex challenge, as it requires a delicate balance between providing access to affordable and reliable energy for all while addressing environmental sustainability and energy security. In response to these challenges, India, in its updated Nationally Determined Contribution submitted during the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) in Glasgow, United Kingdom in 2021, unveiled a strategic framework for climate action. This framework, symbolized by the "Panchamrit" (five nectar) elements, signifies India's resolute commitment to achieve net-zero emissions by 2070 and secure 50% of its energy from renewable sources by 2030.

It is imperative to recognize the pivotal role that States and Union Territories (UTs) play in effecting a transition to low-carbon development pathways. To facilitate this vital transition, the Bureau of Energy Efficiency, operating under the aegis of the Ministry of Power, Government of India, has embarked on the development of State Energy Efficiency Action Plan (SEEAP). These plans are tailored to meet the distinctive requirements of each state, ensuring that resource allocation aligns with the state's sustainable development objectives. The SEEAP project aims to contribute to India's national targets and provide a comprehensive roadmap for enhancing energy efficiency across the state and the country.

For Andaman and Nicobar Islands, SEEAP was developed by the Confederation of Indian Industry (CII), under the guidelines of Bureau of Energy Efficiency, Ministry of Power, GOI, in consultation with the State Designated Agency viz. Electricity Department, NRSE Division with inputs & suggestions from various government departments and sector experts.

Identification of the focus sectors

The objective of this plan is to ensure that resource allocation aligns seamlessly with the specific requirements of the state, thereby fostering progress towards achieving state-specific goals related to sustainable development. Identifying the focus sectors or areas assumes a pivotal role in this process, primarily because certain sectors within a state exhibit higher energy consumption, necessitating targeted interventions to enhance energy efficiency and promote sustainable practices.

The process of identifying focus sectors for Andaman and Nicobar Islands' energy efficiency initiatives followed a comprehensive methodology. This involved several key steps, including analyzing the state's energy consumption patterns to identify sectors with significant energy use, emissions from different sectors, Gross State Value Addition (GSVA) analysis of the sectors contributing most to 's economy, while policy gap analysis helped identify challenges and areas requiring targeted interventions. Stakeholder input and feedback, including insights from government agencies, played a crucial role in shaping the selection of focus sectors. Furthermore, alignment with the state government's vision and

long-term development goals ensured that the chosen sectors were in accord with the state's strategic direction.

Based on the above parameters, Transport, Building, Industry, Water Supply and Fisheries are the identified focus sectors for Andaman and Nicobar Islands.

Proposed Strategies with Implementation Methodology

This 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 actionable measures and implementation methodology.

1. Transport

The Andaman and Nicobar Islands (A&NI), an archipelago separated from the mainland Indian transportation network, presents unique challenges for implementing energy efficiency strategies. The islands rely heavily on a complex web of roads, waterways, and airways for movement of people and goods. This has led to a rapidly growing vehicle population, dominated by two-wheelers (70%) but also including four-wheelers. This growth strains the limited road network constrained by hilly terrain and a small landmass, resulting in traffic congestion and potential environmental damage. As a long-term solution, the government is prioritizing the development of a robust public transport system. In the meantime, cleaner fuel options like CNG and LPG are being explored to mitigate the environmental impact of the existing vehicle fleet.

The maritime sector in A&NI is equally crucial, serving as a lifeline to mainland India and supporting tourism, fishing, and international trade. However, aging infrastructure and dependence on traditional diesel fuel contribute significantly to energy consumption and emissions. This not only increases operational costs but also threatens the ecological sensitivity of the islands. To address these concerns, plans are in place to expand port capacity, upgrade navigation systems, and improve inter-island connectivity. Additionally, promoting sustainable fishing practices, deep-sea exploration, and value-added processing are being considered. The tourism sector is also undergoing diversification efforts, with a focus on infrastructure improvements and responsible practices. Implementing energy efficiency strategies within this complex transportation landscape is crucial to ensure sustainable development for A&NI.

Strategy 1: Facilitating Electrification of Road Transport

The A&N Islands EV Policy 2022 offers incentives and has an ambitious aim for 30% of new registrations to be EVs by 2026, it seeks to accelerate EV adoption and improve air quality. This policy, combined with continued infrastructure development and public awareness campaigns, holds the key to unlocking the potential of EVs for a sustainable future. However, widespread adoption faces hurdles. High upfront costs, lack of public charging infrastructure, limited EV models suitable for the terrain, and inadequate after-sales support deter potential buyers. The union territory has 215 electric vehicles as on 31.03.2023, which makes its share less than 0.5% of the total number of vehicles. This strategy

proposes increasing the share of EVs in the vehicle stock of Andaman and Nicobar Islands with 19,099 EVs in moderate scenario and 30,513 EVs in ambitious scenario by 2031.

Implementing Agency: Directorate of Transport of Andaman and Nicobar Islands, Andaman Nicobar State Transport Services, Electricity Department, New & Renewable Source of Energy (NRSE), Municipal Corporations and Urban Development Authorities, Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO) for private charging infrastructure

Actionable Measures

1. Launch public awareness campaigns about the benefits of electric vehicles and the environmental impact of electrified road transport, following the model of Delhi's "Switch Delhi" campaign.
2. The government can establish target thresholds for ICE vehicles in different categories, such as two-wheelers, sedans, hatchbacks, buses, based on emission levels, fuel efficiency, or other relevant criteria.
3. Identify 2-3 model cities such as Port Blair, Havelock Island, for launching pilot battery swapping projects. Collaborate with EV manufacturers and service providers.
4. Allocate funds for the setup of battery swapping stations and ensure they meet safety and technical standards.
5. Offer incentives such as reduced swapping fees or subscription-based packages to encourage adoption.
6. Electrify the state government's fleet of vehicles, following the lead of Himachal Pradesh, which has announced electrification of all its official vehicles.
7. Encourage vehicle retrofitting by providing incentives for retrofit kits. For instance, in Rajasthan, 15% of the retrofit kit cost (including taxes) is reimbursed, up to ₹10,000 per vehicle. This can motivate individuals and businesses to convert their existing vehicles into electric ones, reducing the carbon footprint.
8. Establish a "Cash for Clunkers" program, modelled after Delhi's initiative, to provide incentives for replacing old, polluting vehicles with electric ones.

Strategy 2: Adequate Public Transport

The current state of the electricity grid dominated by diesel generator in the islands limits the immediate environmental benefits of widespread electric vehicle (EV) adoption. Therefore, in the short term, prioritizing improvement and expansion of public transport emerges as a more effective strategy for rapid emissions reduction. Enhancing the accessibility, efficiency, and reliability of public buses and integrated ticketing systems can deliver impactful and immediate decreases in per-passenger emissions. This approach requires lower upfront investment compared to EV infrastructure development and fosters social inclusion by providing mobility options for a wider range of citizens.

The State Transport Service (STS) offers efficient and cost-effective public transportation to the residents of the union territory. Given the dispersed nature of the islands and the logistical complexities involved in reaching all areas, ensuring a robust public transport system becomes essential. By facilitating accessible and reliable public transportation services through the State

Transport Service (STS), the union territory can effectively reduce reliance on individual vehicles, consequently lowering fuel consumption and emissions.

Implementing Agency: Directorate of Transport, A&N Admn., State Pollution Control Board, Municipal Corporations and Urban Development Authorities

Actionable Measures

1. Develop seamless integration between public buses and ferries through common ticketing platforms, coordinated schedules, and convenient transfer points.
2. Conduct a comprehensive assessment of the current public transport bus fleet's energy consumption, identifying energy-intensive routes.
3. Gradually replace older, less energy-efficient buses with newer models that comply with energy conservation standards and adopting hybrid or electric buses where feasible.
4. Implement measures to ensure optimal fuel usage, such as fuel-efficient driving practices, fuel quality monitoring, and exploring the use of cleaner alternative fuels.
5. Establish necessary infrastructure, such as charging or refueling stations for electric, hybrid, or alternative fuel buses.

Energy Efficiency opportunities in Maritime Transport

a) Onshore Power Supply for Maritime Transport

During port calls, ships rely on onboard auxiliary engines for power generation during port operations. These engines, typically running on heavy fuel oil (HFO) or marine diesel oil (MDO), emit air pollutants such as sulfur oxides (SOx), nitrogen oxides (NOx), and particulate matter (PM). These emissions negatively impact local air quality, affecting the health of port workers and nearby residents. Additionally, the amount of fuel consumed, and emissions generated are directly proportional to the duration of a ship's stay at berth.

OPS offers a cleaner and more sustainable solution. It involves connecting docked vessels to the local electricity grid, eliminating the need for onboard power generation and its associated emissions.

Implementing OPS in the Andaman and Nicobar Islands requires careful planning and consideration of several factors:

- Assessing the existing grid capacity to ensure it can handle the additional demand from docked vessels.
- Upgrading or expanding port infrastructure to accommodate onshore power connections for various ship types.
- Evaluating the economic feasibility of OPS considering initial investment costs, potential energy savings, and long-term environmental benefits.
- Ensuring compatibility between onshore power supply systems and the electrical specifications of visiting vessels.

b) Fleet Modernization:

a) Prioritize LNG-fuelled vessels: Explore the feasibility of transitioning to LNG-fueled ferries for inter-island and mainland-island routes. Consider bunkering facilities at Port Blair and key ports. Assess potential infrastructure investments and economic viability.

b) Hybrid/electric ferries for short routes: Implement hybrid/electric ferries for short routes like harbour ferry and fore-shore sectors, especially within sheltered harbors. Analyse feasibility based on charging infrastructure needs and route distances.

c) Variable-speed drives (VSDs) for propulsion systems: Reduce energy consumption by adjusting propeller speed to varying engine loads.

d) Waste heat recovery systems: Utilize engine exhaust heat for auxiliary systems like heating or desalination, improving overall thermal efficiency.

e) Energy-efficient lighting and appliances: Replace traditional lighting with LEDs and upgrade appliances to energy-efficient models.

f) Invest in advanced hull designs: When acquiring new vessels, prioritize designs with optimized hull shapes, low-friction coatings, and air lubrication systems to minimize drag and fuel consumption.

c) Operational Optimization:

a) Voyage optimization software: Implement advanced voyage optimization software considering wind, currents, and wave conditions to identify the most fuel-efficient routes.

b) Real-time weather routing: Integrate real-time weather data into voyage planning to adjust routes dynamically for optimal speed and fuel efficiency.

c) Just-in-time (JIT) arrival: Collaborate with port authorities and cargo handlers to implement JIT arrival procedures, minimizing waiting time in ports and reducing idling fuel consumption.

d) Trim and ballast optimization: Implement trim and ballast optimization software and train crew on best practices to ensure optimal vessel loading and minimize resistance.

e) Speed management: Encourage fuel-efficient cruising speeds based on route characteristics and cargo weight. Explore the feasibility of slow steaming initiatives where applicable.

d) Mandatory Rooftop Solar:

a) Implement a policy mandating all port buildings to install rooftop solar panels.

b) Offer subsidies or low-interest loans to incentivize adoption.

c) Conduct training programs for port staff on solar system maintenance.

e) Workshop Skylights:

a) Retrofit existing workshop buildings with skylight systems to maximize natural light and reduce reliance on artificial lighting.

b) Consider incorporating light sensors to automatically adjust artificial lights based on natural light availability.

f) Transformer Placement:

a) Conduct an energy audit to identify areas where transformers are located far from the primary load centers.

b) Develop a plan to relocate transformers closer to major power consumption points to minimize transmission losses.

g) Power Factor Improvement:

a. Install capacitor banks at strategic locations within the port to improve power factor and reduce reactive power losses.

h) Maintenance and Fuel Quality:

a) Implement a program for regular maintenance of ship engines and auxiliary equipment to optimize fuel efficiency.

b) Encourage the use of high-quality, low-sulfur fuels to reduce emissions and improve engine performance.

i) Hull Resistance Reduction:

a) Develop a program for regular hull cleaning to remove biofouling (sea growth) that increases drag and fuel consumption.

b) Explore technologies like hull coatings that inhibit biofouling growth.

j) Aerodynamic Improvements:

a. Investigate the feasibility of incorporating air cavity systems in new or existing hulls to reduce drag and improve fuel efficiency.

k) Propeller Optimization:

a. Analyze current propeller designs and explore opportunities for upgrading to more efficient models that offer better thrust with lower energy consumption.

l) Waste Heat Recovery:

a. Explore the potential of using waste heat from engines to generate electricity through tail shaft generators with clutch systems.

Implementing Agency: DSS, ALHW, PMB, ED, NRSE

2. Industry

In Andaman and Nicobar Islands, the industrial landscape is dominated by micro, small, and medium enterprises (MSMEs), with no large-scale industries present. While over 3,893 registered MSMEs employ over 15,000 individuals as of FY 2022-23, the islands' unique geography and demographics pose significant challenges to industrial growth.

Isolation from the mainland translates to limited infrastructure, including unreliable internet, transportation bottlenecks, and a lack of skilled labour. The scattered population across various islands makes market access difficult, further compounded by resource constraints like limited raw materials and insufficient local markets. Additionally, heavy rainfall seasons hinder progress for several months each year

Key industries include Agro-processing, manufacturing of paints, plastics, and beverages, and renowned wood and shell-based handicrafts.

With unreliable and expensive fuel sources, coupled with limited infrastructure for power generation and transmission, reducing energy consumption is not just an environmental concern but an economic imperative.

Strategy 1: Energy efficiency promotion and Energy audits in MSMEs

Energy audits are like checkups for a business's energy use. They find ways to cut back on wasted power. These audits look closely at how much energy the facilities use and identify areas for improvement. They can pinpoint places where energy use is really high, or where small tweaks can save a lot.

There are many ways to use less energy, like teaching employees, providing training on efficient practices, and even offering financial incentives to switch to better technology. These approaches can be especially helpful for smaller businesses that might have limited resources or know-how to make energy-saving changes.

Implementing Agency: Bureau of Energy Efficiency (BEE), Directorate of Industries, A&N Administration, NRSE

Actionable Measures

1. Conduct in-depth feasibility studies to assess energy consumption patterns, identify inefficiencies, and estimate potential savings across various industries. This data will guide tailored interventions
2. Organize industry-specific workshops featuring technology vendors showcasing cutting-edge solutions like:
   a) High-efficiency motors and variable speed drives for industrial processes.
   b) LED lighting with occupancy sensors and daylight harvesting systems.
   c) Renewable energy options like rooftop solar PV systems and biomass gasifiers.
   d) Advanced HVAC systems with demand-controlled ventilation and energy recovery.
   e) Industrial process optimization software and monitoring tools

3. Implement above technologies among others as pilot projects showcasing successful energy-efficient technologies in select MSMEs. This will provide tangible evidence of benefits and encourage wider adoption.
4. Encourage the use of Energy Service Companies (ESCOs) and performance contracts, where ESCOs provide energy-efficient solutions and are compensated based on energy savings achieved.

3. Residential & Commercial Buildings

The building sector has a significant contribution to electricity demand in the Andaman & Nicobar Islands. This is particularly important for the tourism industry, which is a major economic driver in the region. The major consumption in the domestic sector is from electricity & accounts for 72% of the total energy consumption.

Implementing various strategies like improved building envelopes, efficient lighting systems, high-performance HVAC systems, and utilizing renewable energy sources can significantly reduce energy consumption and associated costs. This not only benefits the environment by lowering emissions from diesel generators but also helps businesses save on electricity bills.

Strategy 1: Implementation of ECBC & ENS (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 include both commercial and residential buildings. Until the implementation of ECSBC in State/UT, the existing Energy Conservation Building Code (ECBC) and Eco-Niwas Samhita (ENS) will be referred to as ECSBC.

Recognizing the substantial energy consumption by the residential sector and its significant impact on the total electrical consumption, the star-labelling programme for all single and multiple-dwelling residential units has been initiated by the Bureau of Energy Efficiency (BEE) . It is a step forward from Eco Niwas Samhita 2018 launched by Ministry of Power in 2018. There is no minimum requirement for the area or connected load (kW) for a building dwelling unit to be covered under this labelling programme. This label is applicable for existing and new buildings.

The Energy Conservation Building Code (ECBC) is applicable to all new commercial buildings with a connected load of 100 kW or more, or a connected load of 120 kVA or more. This includes buildings used for office, institutional, healthcare, retail, and other commercial purposes. ECBC is also applicable to major retrofits of existing commercial buildings, where the total connected load is increased by 50% or more, or where the conditioned area is increased by 50% or more. ECBC is mandatory for all the states and union territories of India, and compliance with the code is a legal requirement under the Energy Conservation Act, 2001

Eco Niwas Samithi (ENS) is a program launched by the Ministry of Power to promote energy efficiency in residential buildings. The importance of ENS for energy efficiency lies in its potential to reduce energy consumption and greenhouse gas emissions, which are major contributors to climate

change. By promoting energy-efficient practices in residential buildings, ENS can help reduce the demand for energy and promote the use of renewable energy sources.

Implementing Agency: Bureau of Energy Efficiency; NRSE; Department of Housing & Urban Development

Actionable Items

1. Develop and maintain an Energy Conservation Building Code (ECBC) compliance portal. This portal can serve as a resource for builders, architects, and contractors to access information on energy-efficient and green materials and technologies.
2. Conduct market outreach campaigns to promote ECBC-compliant products. Utilize various communication channels such as radio jingles, social media, and awareness programs to educate the public about the benefits of energy efficiency.
3. Initiate pilot projects to showcase the of benefits of Net Zero (Energy) Rating. Select an initial set of 20 buildings as case studies to demonstrate the feasibility and advantages of higher energy efficiency standards.
4. Draft legislation to mandate BEE's Energy Efficiency Labelling for all new residential construction projects. Ensure that builders and developers comply with energy efficiency standards and obtain the appropriate label before occupancy permits are granted. Andaman and Nicobar Islands can consider a threshold of 300 m^2 and all residential buildings with a built-up area exceeding this threshold would be subject to mandatory labelling.
5. Mandate the integration of the Bureau of Energy Efficiency's (BEE) Energy Conservation Sustainable Building Code (ECSBC) and Energy Efficiency Labelling (EEL) for Residential Buildings into the building byelaws of Andaman and Nicobar Islands.
6. It is imperative to motivate construction builders to prioritize energy efficiency and this can be achieved with effective structure financial incentive. For example, the state can offer a 10% discount in property tax for three years for residential buildings with a five-star rating.
7. Collaborate with BEE to establish a network of accredited energy auditors and professionals. Provide training and certification opportunities to ensure a qualified workforce.
8. Introduce a rebate program for homeowners who obtain BEE's Energy Efficiency Labelling certification. The rebate could be a percentage of the energy-efficient equipment or building materials' cost, up to a predetermined limit.
9. Collaborate with local banks to provide low-interest loans for homeowners undertaking energy-efficient renovations. These loans can cover expenses related to insulation, energy-efficient windows, and high-efficiency appliances.
10. Offer incentives to builders who construct energy-efficient residential buildings. Incentives could include reduced permit fees, faster approval processes, or recognition for their sustainable construction practices.
11. Establish a dedicated financing program that provides affordable loans for homeowners looking to improve the energy efficiency of their homes. Offer financial mechanisms, such as low-interest rates and flexible repayment options.

12. Encourage local government departments to undertake energy efficiency upgrades in their residential buildings as demonstration projects. Share the success stories and cost savings to inspire homeowners to follow suit.
13. Develop and distribute educational materials and online resources about BEE's Energy Efficiency Labelling and its benefits in the local language.
14. Create a user-friendly online platform where homeowners can calculate potential savings and access information about energy-efficient products and services.
15. Conduct regular workshops and training sessions in collaboration with local authorities and educational institutions. Offer these workshops to builders, architects, and homeowners to educate them on energy-efficient building practices and the significance of BEE's Energy Efficiency Labelling.
16. Behavioural interventions have the potential to achieve energy savings of 5-15% in households. Applying this to A & N Islands residential sector could translate to substantial energy cost reductions and emission reductions. Implementing a BEEP program based on the BRPL model holds immense potential for reducing energy consumption and promoting sustainable behaviour in the union territory. By prioritizing affordability, localization, and community engagement, the program can empower residents, achieve energy savings, and contribute to the state's clean energy goals.

Strategy 2: Deepening of Standard & Labelling Programme

The Standards and Labelling (S&L) program is an important initiative of the Bureau of Energy Efficiency (BEE) under the Ministry of Power, aimed at promoting energy efficiency in various appliances and equipment. Under this program, minimum energy performance standards (MEPS) are set for different categories of products and appliances, which are mandatory for manufacturers to comply with before they can sell their products in the market. Additionally, the S&L program provides for labelling of these products with star ratings to help consumers make informed choices.

With the growth in the number of refrigeration and air conditioning (RAC) units in A & N Islands due to urbanization, there is a need to accelerate the ambition of MEPS and expand the scope of the S&L program. This will help to drive the adoption of energy-efficient RAC units and reduce the energy consumption and carbon footprint of the state

Implementing Agency: Bureau of Energy Efficiency (BEE); NRSE, Town planning Department, Department of Housing & Urban Development

Actionable Items

1. To promote energy-efficient fans, the government can initiate a bulk-purchase scheme for technologies like BLDC (Brushless Direct Current) fans. These fans are known for their energy efficiency and can save up to 50% of energy compared to traditional fans. This can significantly contribute to energy conservation efforts in U.T and reduce the energy consumption of fans.
2. The scheme can be implemented in partnership with manufacturers, promoted through awareness campaigns, and made easily accessible to consumers with the help of local distribution companies.

3. Additionally, the existing five-star rating for fans can be promoted to become the new one-star minimum. This will encourage manufacturers to produce more energy-efficient fans and drive down the prices of energy-efficient fans further.
4. To ensure the success of the scheme, the state designated agency (SDA) can collaborate with the Bureau of Energy Efficiency (BEE) to create awareness among the public about the benefits of energy-efficient fans and the importance of purchasing energy-efficient products. The SDA can also work with local distribution companies to ensure that energy-efficient fans are available and easily accessible to consumers.
5. This action plan can be modelled after Delhi's "BEE 5 star rated Super Energy Efficient Fan Replacement Scheme".
6. By adopting a multi-pronged approach combining policy, financial incentives, awareness campaigns, market development, and continuous monitoring, A & N Islands can effectively accelerate access to energy efficient ACs. With successful initiatives like BEE and CLASP, the union territory can pave the way for a future where efficient and sustainable cooling solutions are accessible to all.
7. Launch awareness campaigns highlighting the benefits of energy-efficient and low-GWP refrigerant-based cooling systems for public and private stakeholders. Introduce financial incentives, such as rebates or tax credits, for the purchase and installation of energy-efficient cooling systems. Enforce regulatory measures that mandate the use of low-GWP refrigerants in cooling systems to reduce environmental impact.
8. Establishing a certification process for service technicians to ensure proper installation and maintenance of cooling systems. Regularly update the Public Works Department (PWD) Schedule of Rates (SoR) to incorporate the latest energy-efficient materials and technologies in procurement projects.
9. Provide subsidies and financial incentives to consumers and businesses for the installation of heat pumps for space cooling and hot water supply. Collaborate with manufacturers to promote research and development in heat pump technology and offer market-based incentives for adopting this technology.
10. Enforce regulations requiring the use of 4-star rated appliances in all commercial and government buildings to reduce energy consumption and greenhouse gas emissions. Establish a monitoring and enforcement mechanism to ensure compliance with the mandatory rating requirements.

Strategy 3: Promotion of Green Building Ratings

This strategy recommends the adoption and promotion of green building rating systems as a key strategy for achieving energy efficiency and environmental goals within the state. Green buildings rating in India incorporates various features such as energy-efficient lighting, heating, ventilation, and air conditioning systems, and use renewable energy sources such as solar energy.

Implementing Agency: Certification Body, Town and County Planning, PBMC, Directorate of RD/PRIs/ULBs, Electricity Department NRSE Division

Actionable Items

1. Establish training programs for home energy auditors. Create a compliance structure that rewards residential projects for energy savings achieved through energy-efficient measures, such as insulation and lighting upgrades.
2. Issue directives to all government departments to conduct comprehensive energy audits of their buildings. Set specific targets for achieving BEE (Bureau of Energy Efficiency) Star Ratings for government-owned buildings. This will serve as a leading example for energy efficiency in the state.
3. Develop training and capacity-building programs for architects, building professionals, and developers focused on energy-efficient building design and construction practices. Encourage them to incorporate energy-efficient technologies and designs into their projects.
4. Identify and select iconic government buildings for transformation into Net-Zero energy buildings. Implement energy-efficient retrofits, renewable energy integration, and smart technologies to showcase the possibilities of sustainable construction and operation.
5. Mandate building management system (BMS) to centrally manage and monitor lighting, HVAC, and other building systems for optimized energy consumption.
6. Accelerate adoption of all lighting to LED fixtures. Utilize occupancy sensors in public areas and daylight harvesting strategies (e.g., light shelves) to further reduce lighting energy use.
7. Enforce a mandatory minimum set point of 24°C for air conditioners in all government buildings.
8. Mandatory cool roofing for all the government, government-owned, non-residential and commercial buildings irrespective of site area/built up area. Mandatory cool roof application for all the residential buildings that have a plot area of 500m^2 and above.
9. Implement a phased approach for mandatory rooftop solar installation on all new commercial and residential buildings above a specific size threshold (e.g., carpet area).
10. Existing buildings can be incentivized to install solar through subsidies, tax breaks, or low-interest loans.
11. Collaborate with architects, developers, and builders to integrate solar design considerations into new construction projects.
12. Enact a policy mandating manufacturers and retailers of inverters in the A&N Islands to provide after-sales service to customers for a minimum period (e.g., 5 years).
13. The NRSE division of the Electricity Department can support in:
    - Establishing a certification program for qualified inverter technicians and maintaining a registry of certified technicians readily accessible to customers.
    - Enforcing the after-sales service policy through regular inspections and consumer complaint redressal mechanisms.

4. Water Supply

Andaman and Nicobar Islands face a unique water challenge; despite the islands' rainfalls, major freshwater sources like rivers are absent, leaving saline and brackish groundwater as the main option. This poses a significant challenge for treating and protecting drinking water, especially in urban areas like Port Blair. Currently, rainwater harvesting in reservoirs and wells, alongside four treatment plants, serves as the primary source for domestic needs. However, demand outpaces supply, leading to alternate-day water availability in monsoon and every-third-day access in summer.

Diesel and electricity consumption for water supply operations remain significant, highlighting the need for exploring sustainable alternatives

Strategy 1: Implementation of Energy Audits

Implementing comprehensive energy audits across the public water supply sector in Andaman & Nicobar Islands is crucial to identify and prioritize energy-saving opportunities. Data from audits can be used to create targeted policies and regulations promoting energy efficiency in the sector.

Implementing Agency: Andaman Public Works Department, Port Blair Municipal Council, NRSE

Actionable Items

1. Replace aging and inefficient pumps with high-efficiency models equipped with VFDs, prioritizing critical infrastructure and high-energy-consuming locations like Port Blair. Consider submersible pumps with lower energy losses for deep wells.
2. Implement a comprehensive leak detection and repair program using acoustic leak locators and GIS mapping, focusing on areas with high Non-Revenue Water (NRW) levels. Upgrade aging pipelines with leak-resistant materials like polyethylene.
3. Conduct feasibility studies for integrating grid-connected and off-grid solar power systems at treatment plants and pumping stations, considering variations in solar irradiation across different islands. Explore battery storage options for nighttime and cloudy periods.
4. Conduct island-specific studies to map suitable areas for rainwater harvesting, including rooftop harvesting in urban areas and community-level systems in rural areas. Develop guidelines and incentives for rainwater harvesting infrastructure.
5. Implement tiered water tariffs based on consumption, incentivizing water conservation, particularly for high-volume users. Partner with NGOs for community awareness campaigns promoting water-saving practices.
6. Conduct energy audits of treatment plants to identify inefficiencies. Implement energy-efficient aeration technologies in activated sludge processes, optimize coagulation/flocculation procedures, and explore advanced filtration systems like membrane bioreactors.
7. Implement Supervisory Control and Data Acquisition (SCADA) systems for real-time monitoring of water levels, pressure, and energy consumption across the entire network. Develop centralized control centers for optimizing pumping schedules and minimizing energy losses.
8. Implement biogas generation plants at sewage treatment plants, utilizing biogas for internal operations or feeding into the grid. Consider advanced co-digestion technologies to increase biogas production.

5. Fisheries

The fisheries sector is an important contributor to the economy of the Andaman & Nicobar Island. In the fisheries sector, energy is mainly used for fishing operations, ice production, and transportation. The state government should promote the use of energy-efficient fishing boats, which are equipped with solar-powered lights and GPS systems. In addition, the government should also promote the use of energy-efficient ice-making machines and cold storage facilities for fish preservation.

Strategy 1: Energy efficiency across value chain of fisheries

Improving energy efficiency across all value chains in the fisheries sector can lead to significant environmental and economic benefits, including reduced greenhouse gas emissions, decreased energy consumption, and cost savings for fishers and processors. In the processing and packaging stages, energy is mainly consumed for cooling, freezing, and drying of fish products. The transportation and distribution of fish and fish products also require significant energy input, mainly in the form of fuel for vehicles and refrigeration systems. Overall, improving energy efficiency across all value chains in the fisheries sector in the state can bring numerous benefits, including reduced greenhouse gas emissions, cost savings for fishers and processors, and increased competitiveness in the global market.

Implementing Agency: Department of Fisheries, Directorate of Fisheries, NRSE

Actionable Items

1. Launch training programs for boat operators on fuel-efficient navigation through route optimization software, gear selection based on catch data and weather forecasts, and proper engine maintenance techniques.
2. Partner with ICAR to develop and deliver state-specific training modules on efficient fishing practices and gear selection for A & N Islands' diverse fishing grounds.
3. Conduct workshops in major fish processing centres focusing on energy-efficient equipment like variable-speed drives for compressors, LED lighting upgrades, and automated cleaning systems.
4. Develop and distribute technical manuals in Hindi detailing best practices for optimizing cooling systems, waste heat recovery, and water management in fish processing plants.
5. Offer subsidies for replacing traditional engines with Bureau of Indian Standards (BIS)-approved energy-efficient models.
6. Implement a "scrap and replace" scheme for outdated vessels, incentivizing lightweight fiberglass designs with higher fuel efficiency.
7. Collaborate with local fishing communities in Visakhapatnam and Kakinada harbours to pilot energy-efficient fishing vessels with advanced navigation systems and automated gear deployment.
8. In the islands, there are around 2,000 motorized fishing boats, which consume a considerable amount of diesel fuel. By adopting energy-efficient engines and reducing vessel weight, fuel consumption can be reduced. According to a study conducted by the Indian Council of Agricultural Research (ICAR), the use of energy-efficient engines in fishing vessels can reduce fuel consumption by up to 40%.

9. Promote the adoption of solar-powered accessories like navigation lights, bilge pumps, and onboard refrigeration units to reduce reliance on diesel generators.
10. Develop and disseminate guidelines for safe and efficient installation and operation of solar panels on fishing vessels, considering marine environment and safety regulations.
11. Develop and distribute state-specific guidelines highlighting the benefits and availability of BEE Star-rated equipment for fishing vessels, processing units, and cold storage facilities.
12. Organize awareness campaigns in fishing communities and processing centers to educate stakeholders on identifying and choosing energy-efficient equipment.
13. Collaborate with equipment manufacturers and distributors to promote and stock BEE Star-rated products in the A & N Islands.
14. Offer partial financial support or subsidies for conducting energy audits in fishing vessels, processing units, and cold storage facilities, similar to the program available for MSMEs.
15. Consider mandating ISO 50001 energy management system certification for larger processing units to ensure effective data collection and continuous improvement in energy efficiency.
16. Develop and maintain a state-specific database of standardized cold chain technologies for fisheries, covering investment costs, Return on Investment (ROI), energy specifications, vendor information, and operational benefits.
17. Regularly update the database with new technologies and best practices, disseminating information through industry workshops and technical manuals.
18. Collaborate with research institutions and industry experts to evaluate and endorse energy-efficient cold chain technologies.
19. Phase Changing Materials (PCM) Technology: Encourage the adoption of PCM coolers/freezers for transporting fish, reducing reliance on ice and maintaining consistent cool temperatures during transport.
20. Energy-Efficient Aerators: Promote the use of energy-efficient aerators in aquaculture farms to optimize oxygen levels and reduce energy consumption.
21. EV adoption: Collaborate with fisheries departments and EV manufacturers to explore expanding the use of electric three-wheelers or small cargo EVs for fish transportation within cities and urban areas.
22. Solar PV Systems: Incentivize the installation of rooftop solar PV systems for fisheries and cold storage facilities through subsidies, net metering policies, and technical assistance programs.
23. Ammonia/CO2 Brine Systems: Promote the adoption of efficient Ammonia/CO2 brine systems in cold storage facilities, offering higher cooling efficiency compared to traditional systems.
24. Evaporative Condensers: Encourage the use of evaporative condensers for cooling in processing units and cold storage facilities, utilizing ambient air and water evaporation for heat rejection.
25. Low Charge Ammonia Systems: Consider exploring the feasibility and safety of adopting low charge Ammonia refrigeration systems in suitable scenarios, minimizing refrigerant use and potential leaks.

26. Mobile Chilling for Reefer Trucks: Support the development and pilot testing of mobile chilling units for long-distance reefers, allowing pre-cooling of fish at landing sites and reducing energy consumption during transport.
27. PCM Swapping for Reefer Trucks: Explore the feasibility of implementing PCM-based temperature stabilization systems within reefers, reducing reliance on refrigeration units and maintaining consistent temperatures during shorter transport journeys

Financing Mechanism

Financial mechanisms are structured systems put in place to facilitate the funding and implementation of energy-efficient measures in buildings and industries. These mechanisms encompass a range of financial tools, including loans, grants, subsidies, tax incentives, and other instruments, aimed at providing essential financial support for energy efficiency initiatives. To achieve energy efficiency targets and significant cost savings, states must implement a diverse set of energy efficiency policies and programs. To secure the necessary funding for these initiatives, the Bureau of Energy Efficiency (BEE) has introduced several financial mechanisms that states can leverage for implementation. A notable program under the National Action Plan on Climate Change is the 'National Mission for Enhanced Energy Efficiency (NMEEE).' Within this framework, the following financial mechanisms have been initiated:

1. Energy Efficiency Financing Platform: Under the National Mission for Enhanced Energy Efficiency, this platform facilitates interactions between financial institutions and project developers. It serves as a crucial interface for the effective execution of energy efficiency projects, streamlining the flow of financial resources.
2. Framework for Energy Economic Development: This framework is designed to simplify the financing of energy efficiency projects through diverse fiscal instruments. It enhances stakeholder convenience by implementing schemes such as the 'Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)' and the 'Venture Capital Fund for Energy Efficiency (VCFEE).
3. PRGFEE (Partial Risk Guarantee Fund for Energy Efficiency): PRGFEE addresses credit risks and transaction structuring barriers. It engages financial institutions and strengthens their capacity to finance energy efficiency projects on a commercially sustainable basis. The guarantee period extends up to a maximum of 5 years, with the Government of India allocating approximately INR 312 crores for PRGFEE.
4. VCFEE (Venture Capital Fund for Energy Efficiency): VCFEE offers risk capital support for energy efficiency investments in new technologies, products, and services.
5. Revolving Funds: These financial tools are designed to support sustainable development projects across various sectors, such as agriculture, small businesses, and community infrastructure. These offer loans at favorable interest rates and are intended to support these sectors. Repayments from these loans replenish the fund, ensuring a continuous cycle of financing for new borrowers.
6. Green Bonds: Green bonds are financial instruments specifically crafted to fund projects and initiatives with environmental benefits. They are typically issued by governments, municipalities, corporations, or other entities to raise capital for endeavors that promote sustainability, renewable energy, energy efficiency, climate change mitigation, and other environmentally friendly goals.
7. Soft Loans: Also known as concessionary or subsidized loans, soft loans are financial instruments provided under more favorable terms compared to standard commercial loans. These loans typically feature lower interest rates, longer repayment periods, and flexible terms. Governments, international financial institutions, or development agencies often offer soft loans to support specific objectives such as economic development, social welfare, or sustainability.

Summary

The "State Energy Efficiency Action Plan" report for A&NI provides a roadmap for the UT to achieve its energy efficiency goals. It outlines opportunities for energy savings and greenhouse gas emissions reductions across multiple sectors, including industry, buildings, transportation, water supply and fisheries. The proposed strategies are designed to help the UT allocate resources to meet its targets in line with the NDCs. To successfully implement the action plan, it is essential to create a task force or working group comprising representatives from government, industry, NGOs, energy experts, and other stakeholders. This group should establish priorities, timelines, and progress monitoring. Adequate funding, including grants, loans, and public-private partnerships, must also be secured to support the plan. Additionally, innovative financing mechanisms, such as energy efficiency bonds, can be used to attract private investment in energy efficiency projects.

In light of this projection, the action plan identifies Transport, Industry, Building, water supply & Fisheries 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 15,986 toe in total energy consumption by FY 2031. In the ambitious scenario, the reduction is projected to be 25,258 toe. Additionally, this plan aims to generate awareness at a mass level and create a market potential of approximately Rs. 46 crores in the energy efficiency sector. Furthermore, it is anticipated to contribute to a reduction of 50,036 tCO_2 in the moderate scenario and 79,060 tCO_2 in the ambitious scenario in terms of CO_2 emissions by FY 2031.