

1



ENERGY & GREEN BUILDINGS

01

LED STREET LIGHTING VIA ESCO MODE: THANE

Project Highlights

- Replaced 8000 High Pressure Sodium Vapour street lamps with LED Lights across Thane
- Annual energy saving of 5.33 Million kWh
- Avoiding Greenhouse Gas (GHG) Emissions of 4385 tonnes of CO₂ eq.

Background

Thane city, located near Mumbai, the financial capital of India in state of Maharashtra, is a rapidly growing city due to extensive immigration and urbanization. Thane Municipal Corporation is continuously undertaking environment-oriented projects to reduce GHG emissions from city and improve its municipal facilities. Considering the energy saving that LEDs can achieve, TMC was exploring options for assessing different financial models for scaling up the LED street lighting pilot initiatives across the city. TMC, with support from ICLEI South Asia, under the project Urban Low Emission Development Strategies, undertook feasibility assessment of its streetlight infrastructure to arrive at an ESCO mode of streetlight project implementation.



Project Objectives

- I. Establishment of baseline of 8000 plus street-lights
- II. Performance Contracting with shared savings
- III. Involvement of third party for measurement and verification protocol
- IV. Development of remote management system, highest lumen per watt LEDs, adoptive control panels to optimize power consumption of LEDs as per the requirement of the time etc.

Key Stakeholders

Thane Municipal Corporation, ICLEI South Asia

Approach of LED Street Lighting Initiative

TMC followed a systematic approach for execution of LED installation under ESCO mode wherein, stakeholders were consulted at every stage. The approach is summarized as follows:

1. Stakeholder Consultations: Numerous stakeholders including energy experts, lighting experts, techno-commercial experts, political and administrative heads to local residents etc. were consulted for execution of LED street-lighting projects across city
2. Site Selection: Numerous sites were selected across the city based on various parameters like electrical infrastructure, road type, road width, geographical location, project visibility etc.
3. Investment Grade Audit and Baseline Assessment: An investment grade audit was carried out at different locations to establish the baseline and electrical infrastructure assessment of the site
4. Identification of Technology and Energy Saving Potential: Market assessment for best available technology with upgradability and compatibility
5. Payback and Public Private Partnership Financial Modelling:

- Carried out financial assessment to arrive at a feasible payback
 - Developed PPP structure around the capital and operation expenditure estimated
 - A suitable transaction procedure was established
6. Tendering and Procurement: Bids were invited through public competitive bidding
 7. Retrofitting: The streetlight replacement was carried out panel by panel. Once the entire replacement on a panel was carried out, the reduction in demand was recorded and new baseline established
 8. Third-Party Verification: TMC has implemented a third-party expert to verify the energy saving and ensure transparent transaction to technology provider

Financial Structure of the initiative

The project was based on PPP arrangement with multiple stakeholders.

Achievements



Benefits and Co-Benefits

1. Energy Savings:
 - The LED ESCO project has achieved maximum energy savings in city, i.e., 5.33 Million kWh per year and energy consumption for street lighting reduced by more than 60%
 - Avoided GHG emissions of 4385 tonnes CO₂ eq. annually
 - On operational level, the share of GHG emissions from municipal services in Thane have reduced from 35% in 2012-13 to 11.7% 2017-18
 - Connected load of streetlight infrastructure reduced by 70%
2. Improved facilities for citizens:
 - The citizens have reported that white light provides better visibility and provides a sense of safety on roads
3. Enhanced Reliability:
 - Conventional technology was highly maintenance prone whereas higher life of lamp (50,000 hrs against 15,000 hrs) implies lesser downtime and higher reliability
 - Systems can be effectively controlled and monitored due to improved infrastructure and hence increasing the reliability
4. Better Light Quality:
 - The lighting optics as designed resulted in optimum lux levels with uniform spread across the roads and hence leading to improved visibility



Before (HPSV Settings)



After (LED Settings)

Are Thaneites happy with the new tech? We throw some light

“ I am elated to see that the Talaopali area has suddenly been illuminated. The area looks brighter and more clear.

Vikas Mishra

“ It’s a very good initiative taken by Thane Municipal authorities. As these lights consume less power. They should be installed all across the city.

Rohini Mandappwar

“ The old yellow eyes used to prick the eyes, however this light has a soothing effect and everything looks crystal clear.

Devappa Waze

Success Factors

- Determined Leadership
- Technical innovations for effective implementation of the LED street lighting project

Limitations

1. Nascent Technology: LED was a nascent technology and was constantly evolving. Parameters like color rendering index, lens optics, drivers used to fail frequently
2. Higher cost of LED in comparison to conventional street lights
3. Absence of Indian standards for LED lighting
4. Shortage of testing facilities for Led lighting in India and limited expertise on LED technology
5. Retrofitting on existing infrastructure

Future Prospects

TMC, plans to increase the LED installation to 100%. In addition to this, it plans to add individual addressability and Wi-Fi connectivity to the poles, in order to monitor individual lamp parameters and faults.

Source: As received from ICLEI, South Asia

For more Information

https://carbonn.org/uploads/tx_carbonndata/Invitation%20for%20expression%20of%20interest%20and%20request%20for%20proposal%20for%20ESCO%20model%20at%20TMC.pdf

http://www.districtenergyinitiative.org/sites/default/files/Thane%20Rapid%20Assessment%20Report_0.pdf

<https://egov.eletsonline.com/2018/02/thanes-transformation-into-a-smart-city/>

02

PROJECT GREEN LIGHT: NAGPUR

Project Highlights

- Largest environmental friendly LED (Light Emitting Diode) lights project ever undertaken by a city with an aim to replace 1,36,000 streetlights by 2020
- More than 1,20,300 specially designed programmed LED lights have been installed

Background

Nagpur is located at the geographical center of India at 21°8'47.88" N and 79°5'19.90" E. It is an important urban area in Vidarbha region and is known as the winter capital of Maharashtra State. The city has been divided into 10 administrative zones and has population of 24, 05,665 as per census 2011. Nagpur city has around 1,36,000 street lights installed in all 10 zones, thus, presenting immense potential of switching to energy efficient lighting system. Under Smart City Proposal all the street lights are proposed to be replaced with energy efficient & programmed LEDs under 'Project Green Light' which is also a convergence project.



Nagpur,
Maharashtra

2015-2018

(Not to scale)

Project Objectives

- I. Retrofitting the existing conventional street lighting system with LED lights to ensure energy savings
- II. The project aims to save more than 40% of electricity annually
- III. Produce environmental benefits in terms of reducing the carbon footprints

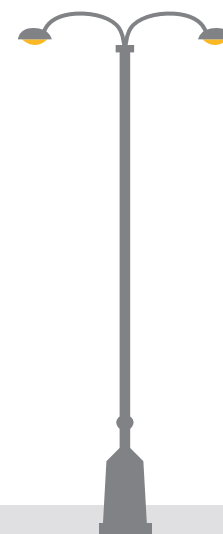
Key Stakeholders

Nagpur Municipal Corporation (NMC), Maharashtra State Electricity Distribution Company Limited, Residents of the Nagpur City

Approach of LED Street Lighting Initiative

The project has been initiated under the Smart Cities Mission and bidding has been undertaken in order to undertake the project. A Tender was floated to replace 1, 36,000 conventional lights (sodium lights) with specially designed energy efficient programmed LED lights.

- The work order has been issued to a private firm to procure to replace 1, 36,000 LED lights on PPP basis
- Till now 1, 20,300 programmed LED lights have been installed



Financial Structure of the initiative

The project was based on PPP arrangement with multiple stakeholders.

Achievements



Benefits and Co-Benefits

- Energy Savings: Energy bills arising from the street lights have been reduced by 40%
- Improved facilities for citizens
- Better Light Quality: The lighting optics as designed resulted in optimum lux levels with uniform spread across the roads and hence leading to improved visibility

Success Factors

- Technical innovations for effective implementation of the LED street lighting project
- PPP type of arrangement for the implementation of the project

Limitations

The project faced following challenges:

- Higher cost of LED in comparison to conventional street lights
- Retrofitting on existing infrastructure

Future Prospects

The project Green Light has built-in savings that will provide energy and maintenance savings for future years and has high replication potential.

Source: Case received from the city

For more Information

<https://timesofindia.indiatimes.com/city/nagpur/nmc-reduces-power-bill-by-52-after-led-street-lights-project/articleshow/69832664.cms>

<https://timesofindia.indiatimes.com/city/nagpur/30k-street-lights-converted-to-led-96k-more-to-go-by-dec/articleshow/63965032.cms>

<https://numerical.co.in/numerons/collection/58304c4d86bd0f881f9fecac>



03

GREEN BUILDINGS FOR COMPOSITE CLIMATIC ZONE-



INDIRA PARYAVARAN BHAWAN: DELHI

Project Highlights

- India's first energy-positive government building-integrates both energy efficiency and on-site renewable energy generation.
- Highest green- rated building: LEED platinum and GRIHA 5-Star
- 70% less energy use compared to conventional buildings with an Energy Performance Index of 44 kWh/m²/year

Background

This is a project of Ministry of Environment and Forests for Construction of New office Building at Aliganj, Jor Bagh Road, New Delhi. The Building was planned to be a state-of-the-art landmark building, with emphasis on conservation of natural areas and trees to reduce adverse environmental impact. Being the highest green rated building in the country, the project serves as a shining example of high performing government buildings.



New Delhi

Building Use
Office Building
Climatic Zone
Composite
(Not to scale)

Project Objectives

- I. Managed to achieve the reduction in embodied energy of construction and further reduction in the operational energy through the choice of sustainable natural construction materials
- II. Managed to minimize the contribution towards Urban Heat Island effects through passive design features and sustainable site practices
- III. Successfully utilized the Adaptive Thermal Comfort model and demonstrated innovative passive cooling technologies like geo-thermal cooling of condenser water to minimize cooling load
- IV. Onsite rooftop solar power has been used for meeting the operational energy demands of the building

Project Approach

- Building Integrated Photovoltaic (BIPV) system has been integrated for power generation from solar panels
- Building is north-south oriented, with separate blocks connected through corridors and a huge central courtyard
- More than 50% area outside the building is covered with vegetation
- 75% of building floor space is day lit, thus reducing dependence on artificial lighting
- Central courtyard helps in air movement as natural ventilation happens due to stack effect. Additionally, windows and jaalis add to cross ventilation
- Energy efficient lighting system (Lighting Power Density = 5 W/m²)
- High efficiency glass, high Visual Light Transmittance (VLT), low Solar Heat Gain Constant & Low U-value, optimized by appropriate shading
- 160 Tonnes of Refrigerant of AC load of the building is met through chilled beam system. Chilled beam are used from second to sixth floor. This reduces energy use by 50 % compared to a conventional system

- Variable Frequency Drives (VFDs) are provided in chilled water pumping system, cooling tower fans and AHUs
- Fresh supply air is pre-cooled from toilet exhaust air through sensible & latent heat energy recovery wheel
- Building Management System (BMS) has been integrated to monitor and control all building systems
- Solar PV system of 930 kW has been integrated to generate 300 kWh/day to meet the operational electricity demand of the building

Achievements



- The project has received GRIHA 5 Star and LEED Platinum
- The building has already won awards such as GRIHA 5-star of MNRE for exemplary demonstration of Integration of Renewable Energy Technologies

Indira Paryavaran Bhawan

Long term impacts

- The green building design strategies will help to maximize energy savings and minimize the operational cost of the buildings
- The green cover within the building premises will help to reduce the negative impacts of Urban Heat Island effects
- Water efficient design strategies will help not to impact the water resources of the locality in a negative manner

Source: As received from WRI

For more Information

https://cpwd.gov.in/CPWDNationBuilding/InaugurationPM25.02.2014/architectural_design.pdf

<https://nzeb.in/case-studies/detailed-case-studies-2/jpb-case-study/>

<https://www.nbmcw.com/tech-articles/case-studies/38475-indira-paryavaran-bhawan-first-on-site-zero-net-energy-building-of-india.html>

<http://terienvs.nic.in/index3.aspx?sslid=4177&subsublinkid=1362&langid=1&mid=1>

<https://mnre.gov.in/file-manager/akshay-urja/november-december-2014/EN/26-31.pdf>

04

ENERGY RETROFIT OF EXISTING BUILDINGS -GODREJ BHAWAN: MUMBAI

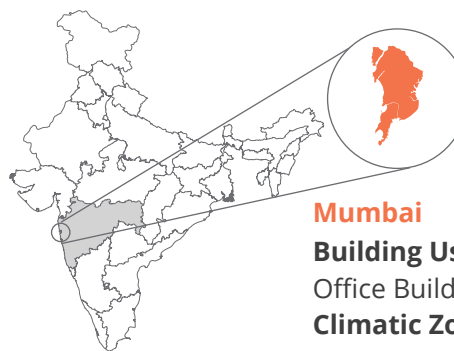


Project Highlights

- This case study highlights Godrej Bhavan, an iconic office building in South Mumbai, focusing on the strong business case for energy-efficiency upgrades or retrofits
- The Godrej Bhavan retrofit shows that greener, energy-saving retrofits are practical and profitable in India's rapidly transforming building market and provides replicable practices for cost and energy savings
- Just two years after the upgrade, Godrej Bhavan is already reaping cost and energy savings (12.5%) and is on track to recover the costs of installing energy-efficiency measures through lower electricity bills

Background

Godrej Bhavan, built by Godrej & Boyce in 1972, is a six-storey building that houses the company's chief management. After decades of high electricity consumption, Godrej & Boyce upgraded Godrej Bhavan in 2010 to include inclusive energy efficiency and sustainability features, such as efficient cooling and lighting systems. Because of the upgrade, Godrej Bhavan has now evolved to an energy efficient building that is achieving significant financial and indoor environmental quality benefits for its owner and occupants.



Mumbai
Building Use
 Office Building
Climatic Zone
 Hot and Humid
(Not to scale)

Project Objectives

- I. Demonstrated the low-hanging energy and cost-saving opportunities by upgrading HVAC, lighting, and building management systems through energy retrofits
- II. Managed to reduce electricity use, improves building systems, enhances occupant comfort, and increases environmental awareness through energy retrofits

Project Approach

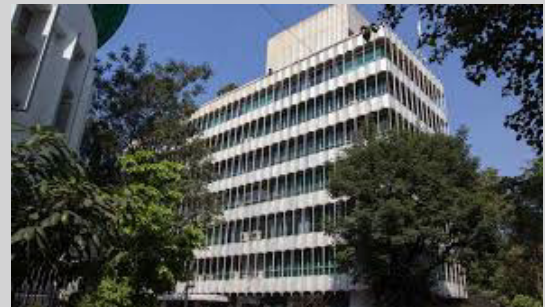
- Installed Building Energy Management System (BMS) dashboard display with digital energy meters that continuously monitor energy use, check and rectify energy-use discrepancies
- Upgraded the incoming and outgoing electrical systems for high-voltage electricity to a ring main unit system to provide an uninterrupted power supply
- Upgraded the chiller compressor-condenser unit from a 35-year-old HVAC system has been replaced with a new HVAC system with a screw chiller water-cooled condenser, electronic expansion valve, and a high coefficient of performance (COP) of 5.5 from a previous COP of 2.2.
- Installed dedicated Air Handling Units (AHUs) for each floor with VFDs and chiller water-modulating valves
- Installed double-glazed clear windows and shading devices to reduce heat gain through the windows while still providing light
- Conventional lighting fixtures are replaced with highly efficient lighting fixtures

- Developed the building's original green roof, which had a soil depth of nine inches, by removing the covering of the "tandoor" roof clay tiles. The Godrej team measured a reduction in the roof temperature by 10°C using thermal imaging.
- Planted trees around the building to maintain a cool microclimate and reduce the heat island effect.

Achievements



- First building in Mumbai and the sixth building in India to receive the LEED Gold certification from the United States Green Building Council under the Existing Buildings Operations and Maintenance category
- Energy-Efficiency Leader Award by Ingersoll Rand in recognition of demonstrated initiatives for energy optimization in the air-conditioning system



Godrej Bhawan

Long term impacts

- The energy retrofits will help to maximize energy savings and minimize the operational cost of the buildings

Highly efficient lighting fixtures and double-glazed windows



Challenges

- The retrofit required implementing new energy-efficiency technologies in an aging office building with ongoing operations
- The building's architectural design, façade, glazing, lighting, and HVAC system were already in use, limiting the opportunity to redesign these components

Solutions

- The retrofit focused on specific equipment and energy management upgrades instead of redesigning the building

05

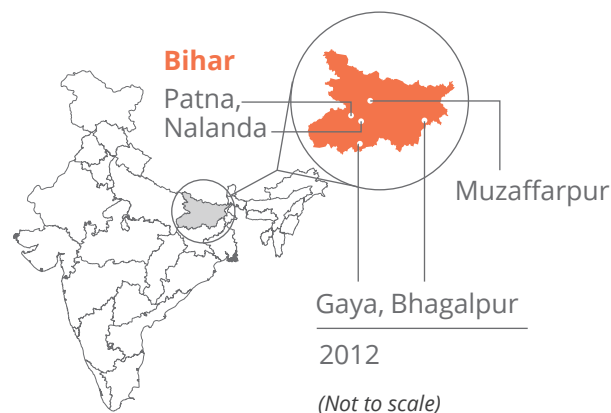
CASE OF FLY ASH BRICK (FAB) SECTOR IN CITIES OF BIHAR

Project Highlights

- Reduction of carbon emission through the utilization of cleaner bricks technology
- Utilization of waste material such as fly ash in fly ash brick technology
- Mass awareness and extensive stakeholders' engagement for the promotion of fly ash brick technology as a cleanest technology
- Technical support to fly ash brick enterprises

Background

In Bihar, the brick sector is the third highest emitter of CO₂ after agriculture and energy. This high rate of emissions is due to the present technology of clay brick firing using coal as a fuel. In manufacturing of these clay bricks agricultural soil is used. The high use of agricultural soil puts an immense pressure on the agricultural activity which is the backbone of Bihar's economy. To decrease the dependences on clay brick technology, over the last six years, Development Alternatives (DA), with support from Shakti Sustainable Energy Foundation (SSEF), has been working to promote cleaner technologies and increase the market share of resource efficient building materials in Bihar with various private and government stakeholders. During the period of DA's intervention from 2012-2018, the market share of fly ash brick (FAB) industry has improved from 0 to 17% at present; of the total brick industry. With current market trends and continued systemic interventions, this market share has potential to reach up to 6% in next 2 years.



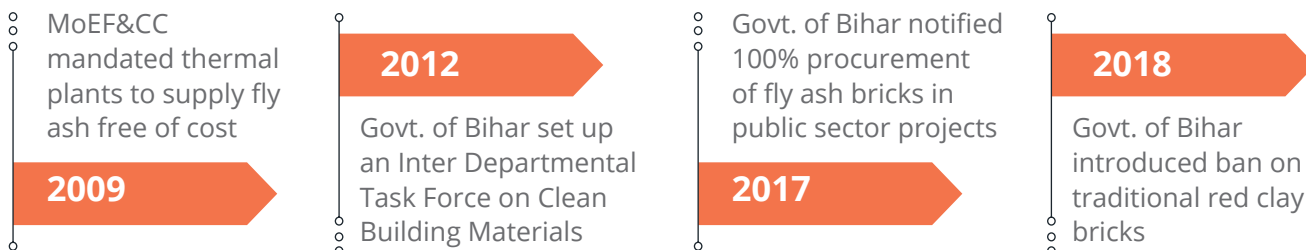
Project Objectives

- To create and sustain a favourable policy environment in Bihar for the promotion of fly ash brick technology as a cleaner brick production technology
- Implementation of Fly Ash Brick Quality Rating System (to overcome the issues of quality of fly ash brick in the state)

Key Stakeholders

Department of Environment, Forest and Climate Change, Govt. of Bihar, Bihar State Pollution Control Board, Building Construction Department, Fly Ash brick manufactures association and other govt departments

Key government Initiatives



Development Alternatives: Greening the Brick Sector in Bihar



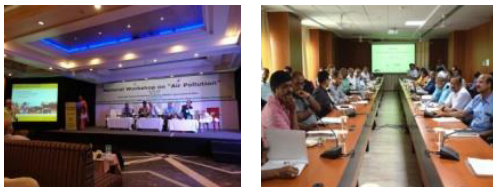
Technology Solutions Innovation & Research

- Technology know how Fly ash brick making
- Fly ash brick making machine



Enterprise Support Services-

Business Sustainability Providing Technology support; market linkage; credit linkage and capacity building service to existing and potential fly ash brick entrepreneurs



Policy Influence-

Favourable Policy Ecosystem

- Technical and advisory support to Govt of Bihar (GoB)
- Preferential procurement policy for green bricks
- Quality control through quality rating programme

Communication & Outreach Mass Promotion; Demand Stimulation



GIS mapping of fly ash enterprises to validate supply



Mass promotion through workshops like green enterprise mela and awareness workshops



Mass promotion through communication products

Achievements

- 31 enterprises were enrolled and service provided under FABQRS
- Improvement in the quality depicted after the technical training
- Rising public discourse towards FAB
- Building Construction Department, GoB reinstated procurement of 100% FAB in public sector projects



Strategy for Intensification

To catalyse transformative change towards cleaner brick technology through technology solutions , enterprise service and policy influence in Bihar

Focus Area



Uptake of Fly ash bricks



Technology support and research



1 stop FAB enterprise solution



Partnerships with CSOs, academia, government

Adoption of other cleaner technologies



Technical know how on cleaner technologies



Enterprise Support services to brick kilns units



Partnerships with CSOs, academia, government

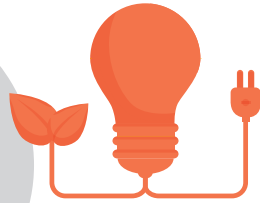
Source: As received from Shakti Foundation and Development Alternative

For more Information

[https://www.devalt.org/images/L2_ProjectPdfs/\(4\)FlyAshBrickIndustry.pdf?Tid=162](https://www.devalt.org/images/L2_ProjectPdfs/(4)FlyAshBrickIndustry.pdf?Tid=162)

<https://www.greeneconomycoalition.org/assets/reports/Cape-Town-Global-Meet-2019/India-Country-Posters-GM2019-FINAL-PRINT.pdf>

06



ENERGY EFFICIENCY IN STREET LIGHTING SECTOR: RAJKOT

Project Highlights

- Rajkot Municipal Corporation (RMC) was the first local body in the State of Gujarat to successfully retrofit all existing conventional street lights with energy efficient Light Emitting Diode (LED) lights within 3 months
- Energy Saving Company (ESCO) model has been applied to undertake this intervention
- Energy savings of 60% and GHG emission reduction of about 7,000 tCO₂ eq. from the street lighting sector was achieved
- Improvement in the illumination levels, aesthetic appearance, enhanced public safety and security, and providing better livelihood to citizens

Background

In 2016, Rajkot had more than 60,000 streetlights within its city limits which were owned and maintained by the Rajkot Municipal Corporation (RMC). The city had prepared a GHG inventory under the urban LEDs project, where street-lighting sector was identified as the energy intensive municipal sector in the city. Therefore, street lighting service was prioritized to cut down the energy consumption and GHG emissions. After assessing the conditions on ground and identifying the gaps in street lighting, Rajkot city government with ICLEI South Asia's support identified that the replacement of existing HPSV street lights with LED lights was a solution to serve multiple objectives, such as - a) improved operation and maintenance management of the technology, b) energy saving benefits, c) reduced GHG emissions and d) improvements in illumination levels. The city thus, decided to undertake a pilot project on LED retrofits to demonstrate the technology and impacts in the local context.



Rajkot,
Gujarat

October, 2016
– April, 2017

(Not to scale)

Project Objectives

- I. Retrofitting the existing conventional street lighting system with LED lights to ensure energy savings
- II. Reduction of 50% of energy consumption and related and related GHG emissions from street lighting sector without any upfront capital investment from Rajkot Municipal Corporation
- III. Achieve desired illumination levels in a uniform manner in order to reduce road accidents
- IV. Produce environmental benefits in terms of reducing the carbon footprints

Key Stakeholders

Rajkot Municipal Corporation, ICLEI South Asia, European Commission

Approach of LED Street Lighting Initiative

The project has been initiated under the Smart Cities Mission and bidding has been undertaken in order to undertake the project. The following steps were undertaken under the project:

- An on-ground survey was initiated by the city under the Urban-LEDS project to provide stakeholders with an enhanced understanding of the current conditions of the street lighting system in the city and the opportunities for improvements

- Through the development assistance available under the Urban-LEDS project, 291 existing HPSV lights were replaced with LED lights on a selected road stretch in the city
- Based on the successful implementation and positive results from this pilot intervention, the city government scaled up through a city-wide LED streetlight retrofit program
- Rajkot signed the agreement with EESL in December 2016 and within 3 months all poles of the city were retrofitted with LED lights

Financial Structure of the initiative

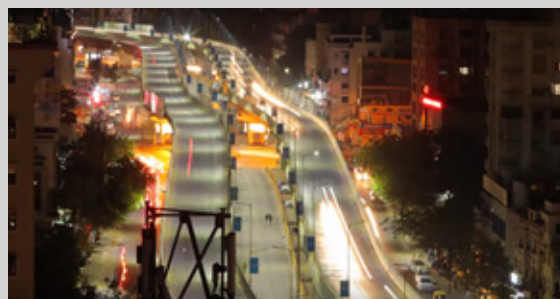
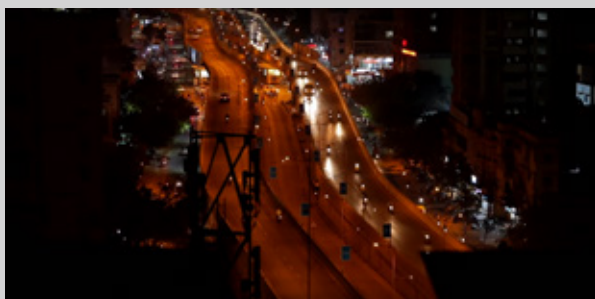
Financial grant from the European Commission through the Urban-LEDS program was provided for this project

Achievements



Benefits and Co-Benefits

- Improved illumination levels and uniformity has not only provided better aesthetic appearance but also reduced rate of accidents and improved quality of life of citizens
- Rajkot city government has saved more than **8.5 million kWh** conventional electricity (more than 60% of total electricity consumption from the sector before), which translates into savings of INR 50 million (\$ 0.75 million) and 7,000 tonnes CO₂ eq. GHG emission reduction through the project
- As Energy Efficiency Services Limited (EESL) is responsible for overall comprehensive operation and maintenance for 7 years, and all streetlights are managed automatically by Central Control Monitoring System (CCMS), not only enables maintenance without any delay but city government also saves INR 25 million (\$ 0.38 million) from the maintenance of old HPSV fixtures
- Online monitoring through CCMS and installation of smart panels enables city government to identify illegal theft from street lighting panels
- Project improved confidence level of city government and energy saving company with improved illumination level, uniformity ratio, benefit from energy savings and reduced maintenance costs
- Reduced rate of accidents, aesthetic appearance, improved working hours for road side vendors and enhanced public safety are added social impact through project



Before and After Project - Illumination levels with HPSV lights on 150ft Ring Road, Rajkot

Success Factors

- Technical innovations for effective implementation of the LED street lighting project
- Strong and effective leadership
- Multi-level coordination and partnership

Limitations

The project faced following challenges:

- Implementation challenges, such as removal of 10-15 years old corrosive fixture from poles as well as difficulties in fixing new LED fixtures on old lighting pole arms
- Approval of the technical innovations of the technology

Future Prospects

- The project has built-in savings that will provide energy and maintenance savings for future years and has high replication potential.

Source: Case received from the city

For more Information

<https://timesofindia.indiatimes.com/city/rajkot/LED-bulbs-to-light-up-Rajkot-streets/articleshow/52426551.cms>

<http://archive.indianexpress.com/news/rs-2.3crore-led-street-light-project-of-ruda-lights-up/1102626/>

https://mnre.gov.in/file-manager/UserFiles/Master-Plan-Solar-City/Rajkot_solar_city_master_plan.pdf

07

RENEWABLE ENERGY DEPLOYMENT FOR COMMON UTILITIES OF SOCIAL HOUSING SCHEMES: RAJKOT



Project Highlights

- 31.5 kWp grid connected solar PV system is installed under SDC funded CapaCITIES project at the Krantiveer Khudiram Bose social housing scheme for common utilities like pumps, lightings and elevators
- The solar PV system is generating ~3,780 units of electricity per month, which has the potential to reduce 37 tCO₂e GHG emissions per year.
- INR 12,000 is paid by the DISCOM to the members of the township after adjusting with the grid consumption by the social housing common utilities

Background

Rajkot is part of Swiss Agency for Development and Cooperation's (SDC's) Capacity Building for Low Carbon and Climate Resilient City Development project (CapaCITIES) project, which aims to enhance capacities of Indian partner cities (Rajkot, Coimbatore, Siliguri, and Udaipur) in planning and implementing climate mitigation and adaptation measures along with increasing awareness on low carbon and climate resilient city development. Rajkot Municipal Corporation decided to implement energy efficiency and renewable energy measures as pilot in one of their social housing scheme to see the results and replication potential. 31.5 kWp grid connected solar PV system for common utilities like common lighting, pumps and elevators is commissioned under CapaCITIES project funded by SDC.



Project Objectives

- I. To increase Renewable Energy (RE) integration among the residential buildings sector by implementing grid-connected solar PV system deployment for all common utilities pilot project in one of the social housing schemes as per Gujarat Solar Policy 2015
- II. To power the common amenities such as elevators, common lighting and pumps in a social housing complex through a solar PV system and showcase to create awareness on the carbon and economic benefits and to encourage its integration in the private residential buildings

Key Stakeholders

Rajkot Municipal Corporation (RMC); ICLEI South Asia; Residential Welfare Association

Approach

Project was targeted to create model project of introducing EE and RE measures reducing conventional electricity from residential sector, RMC decided to implement one pilot project on one of the social housing schemes which then can be replicate at city level.

- Feasibility study was conducted by ICLEI South Asia to identify feasible social housing scheme for the pilot project implementation. Key steps were to identify:
 - Conventional electricity consumption for common utilities,
 - types of common appliances,
 - Available shadow free open roof area for deployment of Solar PV and electricity sanctioned load etc.

- “Krantiveer Khudiram Bose Township” was identified as potential project location.
- Project was designed by ICLEI South Asia based on actual electricity consumption from all common amenities of township and discussed with Residential Welfare Association (RWA).
- 31.5 kWp grid connected solar PV system installed on rooftop consisting 462 poly-crystalline Photo Voltaic panels of 315 Wp capacity each.
- Training provided to RWA for maintenance of solar panels by ICLEI South Asia. The solar PV system will be operated and maintained by the contractor who set up the plant for a period of 10 years from installation.

Financial Structure of the initiative

Financial grant from the European Commission through the Urban-LEDS program was provided for this project

Achievements



- The solar PV system will generate 3780 units of electricity per month (45,360 kWh per year), which has a potential to reduce 37 tCO₂eq. GHG emissions per year.
- Since, the township is generating and utilizing solar energy from Solar PV system, approx. INR 12,000 is credited to their accounts by DISCOM every month.



Success Factors

- Feasible to structure a PPP project to install Solar PV systems for catering to the common amenities load in all upcoming social housing complexes
- RMC has proposed a 100kWp grid connected solar PV system for common utilities at Smart Ghar III affordable housing scheme.
- The residential sector of Rajkot will have a significant proportion of their electricity demand met by grid-connected solar PV systems considering the proposed interventions implementation.

Future Prospects

RMC plans to construct a total of 9,141 dwelling units by the year 2020. One of the main objectives of this solar PV project at the Krantiveer Khudiram Bose social housing complex is to encourage the adoption of solar PV in social housing.

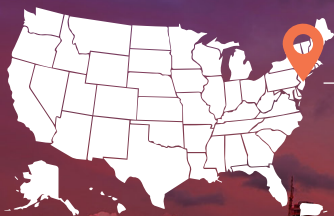
Source: Case received from the city

For more Information

http://capacitiesindia.org/wp-content/uploads/2018/08/Quickwin-Projects-Rajkot_Solar-PV-Social-Housing.pdf

<https://capacitiesindia.org/projects-rajkot/>

CLEAN ENERGY PROGRAM: NEW JERSEY



New Jersey, USA

Year of Initiation: 2003

Project Highlights

- Incentive based approach to transform the energy consumption pattern of New Jersey
- People centric approach to ensure energy savings
- Fosters technology driven transformation of energy marketplace of New Jersey

Background

Pressing challenges like congestion on the grid to energy efficiency and renewable source of power lead to the prioritization of energy issues for both consumers and businesses in New Jersey. NJCEP is one of the major initiatives undertaken by the city to ensure efficient utilization of energy and

existing resources. It is a statewide program offering financial incentives and services to various stakeholders of New Jersey to help them gain energy, economic as well as environmental benefits.

Project Objectives

The NJCEP complements the New Jersey Energy Master Plan and abides to the goals of the master plan. The three specific goals of the New Jersey Energy Master Plan to be achieved till 2020 are:



Reduce energy consumption by at least 20%



Reduce peak demand by 5,700 M



Generate 30% of the state's electricity needs from renewable resources

Key Stakeholders

NJCEP is an open stakeholder process and involves parties from various respects like energy efficiency & renewable energy businesses, public officials, electric & natural gas utilities, environmental groups, business organizations, state colleges and universities.

Approach of NJCEP

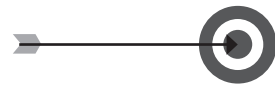
NJCEP targets the energy management sector of the city and aims to incentivize energy savings by providing financial gains to various stakeholders and consumers. The program has multiple avenues as indicated:

- The program undertook one innovative financing pilot program in 2007, Solar Renewable Energy Credits (SRECs)
- Transform the energy consumption patterns of the residents of New Jersey by providing tax credits, rebates and incentives on alternative sources of energy to consumers as well as business developers

Financial Structure of NJCEP

- Receives funding from New Jersey's System's Benefit Charge
- Small surcharge, i.e., Societal Benefits Charge (SBC) on all customers' electricity bills is the main source of funding for the New Jersey Clean Energy Program
- A total of \$1.227 billion was collected to support NJCEP between 2001 and 2008
- A total of \$1.213 billion was collected to support the program between 2009 and 2012

Achievements



Benefits

- Energy savings of over 22.6 million MWh of electricity; 70 million dekatherms of natural gas; 7.5 million MWh of renewable generation; and 1.5 million MWh of distributed generation from combined heat and power systems was achieved through the program activities between 2001 and 2008
- NJCEP had supported the installation of 4,719 renewable energy projects across the state, providing 153.9 MW of sustainable energy, including solar, wind, biomass and fuel cell projects their carbon emissions till 2009
- Natural gas consumption in approximately 500,000 buildings was reduced by the activities of NJCEP

Co-benefits

- Climate Change Mitigation
- Carbon-trading benefits to the low-income neighborhood cities

Success Factors

- Strong and stable Institutional and legislative capacity
- Innovative and integrated strategy targeting a large spectrum of stakeholders
- Adoption of Incentive based mechanism for promoting energy savings and shift to clean energy
- Consistent and regular monitoring and evaluation mechanism



Source: <https://www.reeep.org/sites/default/files/Compendium%20of%20US%20Best%20Practices.pdf>

For more Information

<http://www.njcleanenergy.com/>

https://www.energystar.gov/index.cfm?c=pt_univ.eeps_sites_njcep

CAPPING OF CLIMATE EMISSIONS FROM BUILDINGS CITY: NEW YORK



New York, USA

Year of Initiation: 2019

Project Highlights

- **First of its kind GHG emission cap for buildings of New York city**
- **Metropolis scaled version of a Green New Deal**
- **Innovative policy tool that provides targets as well as pathways to achieve the emission targets**
- **Most aggressive climate bill USA**

Background

The buildings of the New York City are a major source of GHG emissions and accounted for ~67% of the citywide GHG emissions released in the year 2015. The NYC is compliant with the Global

Covenant of Mayors for Climate and Energy and is strategically adopting aggressive initiatives like capping of climate emissions from buildings in order to meet its climate change goals.

Project Objectives

To reduce the GHG emissions being released from the buildings of NY city by 40% till 2030 and by 80% by the year 2050

Key Stakeholders

New York Council, Policy Makers, Real Estate Board of New York, Building Owners, Technology Developers, Architects

Approach of “Climate Emission Capping for Buildings” law

The measure targets the building sector of the NYC and ensures adoption of retrofits to reduce the GHG emissions being released in the city.

The measure mandates:

- Buildings with area more than 2500 square feet (2,300 square meters) to cut the GHG emissions by 40% by 2030 relative to the 2005 levels
- Owners of buildings with area of 2500 square feet or more to make energy-efficient upgrades
- Establishment of an office of Building Energy Performance to ensure efficient adoption of the proposed law

Financial Structure of “Climate Emission Capping for Buildings” law

- The total costs of upgrades is estimated to be around \$4 billion
- Heavy fines will be imposed on offenders. A penalty of \$268 per every assessed ton of carbon over the cap will be charged from building owners

Achievements

Benefits

- Minimize GHG emissions being released from the buildings of NYC
- Climate Change mitigation



- Development of a durable industry in energy retrofiting
- Development of replicable model for other cities across the world which aim to reduce their carbon emissions

Co-benefits

- Minimize GHG emissions being released from the buildings of NYC
- Climate Change mitigation
- Development of a durable industry in energy retrofiting
- Development of replicable model for other cities across the world which aim to reduce their carbon emissions

Success Factors

- Minimize GHG emissions being released from the buildings of NYC
- Climate Change mitigation
- Development of a durable industry in energy retrofiting
- Development of replicable model for other cities across the world which aim to reduce their carbon emissions

Limitations

- Unprecedented costs associated with the new emission targets of buildings of NYC



Source:

1. <https://www.reuters.com/article/us-usa-climatechange-new-york/in-first-new-york-caps-climate-emissions-from-buildings-idUSKCN1RV149>
2. <http://www.omanobserver.com/in-first-new-york-caps-climate-emissions-from-buildings/>
3. <https://insideclimatenews.org/news/18042019/new-york-city-climate-solutions-buildings-energy-efficiency-jobs-low-income-greenhouse-gases>
4. <https://www.cbsnews.com/news/new-york-city-carbon-emissions-from-trump-tower-and-other-buildings-80-percent/>