

India's Policy for Scaling up Energy Efficiency Measures at the Local Level: City of Rajkot, India

CASE STUDY

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In 2015 the Government of India launched the Street Lighting National Program (SLNP) to reduce energy consumption and GHG emissions from the street lighting sector as part of its National Mission for Enhanced Energy Efficiency (NMEEE)¹. NMEEE is one of eight national missions under the National Action Plan on Climate Change (NAPCC) which aims to mitigate climate change through energy efficiency measures. Energy Efficiency Services Limited (EESL), a public sector energy service company (ESCO), is the lead agency working in coordination with the Bureau of Energy Efficiency (BEE) for SLNP implementation in India. As of end-January

2019², the states of Andhra Pradesh and Gujarat are leading in SLNP implementation; Rajkot is the first city in Gujarat to carry out street lighting retrofits through SLNP. This case study discusses how Rajkot overcame initial implementation challenges through a pilot project which retrofitted LED street lighting. This was later scaled-up to a city-wide program utilizing ESCO based financial and implementation models. The case study also highlights the co-benefits that the city continues to enjoy through this large scale intervention while leading the path of low-emission, green-growth development.

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I am proud to share that Rajkot Municipal Corporation (RMC) was the first local body in the State of Gujarat to implement this project for all of our street lights. RMC has successfully retrofitted all existing conventional lights with energy efficient Light Emitting Diode (LED) lights in 3 months using an ESCO model, where the entire upfront investment was made by EESL as part of Government of India's Street Lighting National Program. This has helped us achieve energy savings of 60% and GHG emission reduction of about 7,000 tCO₂e from the street lighting sector while also improving illumination levels, aesthetic appearance, enhanced public safety and security, and providing better livelihood to citizens.

Banchhanidhi Pani, IAS, Municipal Commissioner,
Rajkot Municipal Corporation, India

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1. NMEEE aims to strengthen the market for energy efficiency through implementation of innovative business models in the energy efficiency sector (<https://www.beeindia.gov.in/content/nmeee-1>)
2. As on 28/01/2019 number of street light retrofitted in Andhra Pradesh and Gujarat are 2,335,959 and 1,126,350 number respectively (<https://slnp.eeslindia.org/>)



Figure 1 Before Project - Illumination levels with HPSV lights on 150ft Ring Road, Rajkot

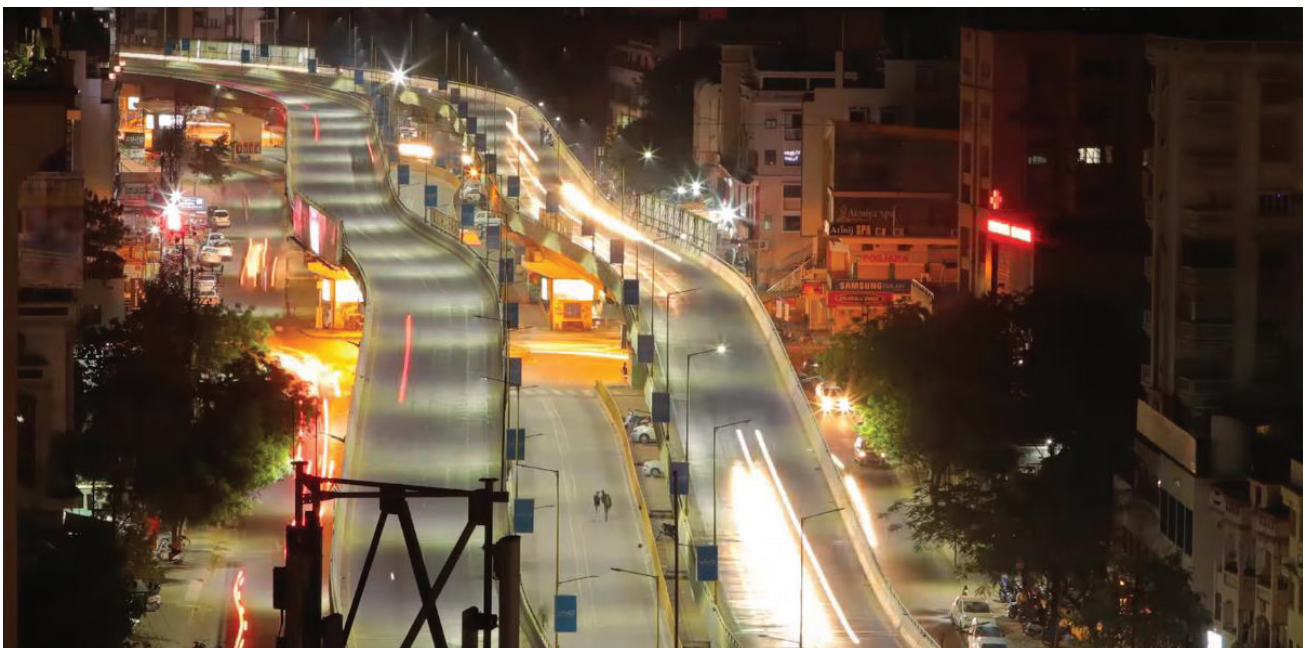


Figure 2 After Project - Improved Illumination levels with LED lights on 150ft Ring Road, Rajkot

Key Take-aways

- ESCO arrangements can help support local government attain low-emission growth path. In the ESCO model the investment costs are recovered from the energy/cost savings achieved by the retrofitting. This avoids the investment cost for the city and thereby reduces the financial burden. In absence of such financial mechanism it would have been difficult for Rajkot to trade-off with other social investment and would have pushed back its progress on the pathways of low-emission development. Additionally, the national level policy on Energy Efficiency and Street Lighting led to formation of ESCO institutions like EESL. Without such top-down approach, it is difficult to drive bottom-up actions and implementation.
- Multiple-objectives can be addressed through energy efficiency measures, like reducing energy consumption and electricity costs; reduction in green house gas emissions. Also retrofitting the street lights

helped achieve desired illumination levels in a uniform manner which led to a decrease in road accidents, enhanced livelihood opportunities for the street vendors and increased overall safety of the citizens. Thus, energy efficiency measures should be rated as per their ability to meet additional objectives beyond merely energy savings.

- **Bilateral and multilateral development grants can change the development landscape** and help attain Nationally Determined Contributions (NDCs) and Sustainable Development Goals (SDGs) at all level of governance. The grant initiative by the European Commission through the Urban-LEDS programme opened the space for transformation. The studies and the pilot commissioned under the grant were the essential stepping stones towards the large-scale implementation
- Thekeystakeholdersinanyinitiativecanmake or break it. Hence **multi-level coordination and partnership among the stakeholders is critical to its success**. An able leadership and commitment from top-down could drive better coordination. Therefore, for energy/ low-emission development practitioners, it is important to first get buy-in from the city leaders and then drive stakeholder engagement at all levels.
- **First thing first, define the problem statement and objectives to be met**. The ability of the city authorities to clearly articulate the problem statement and the multiple objectives of service delivery to be met made it easier for all stakeholders to find solutions. Additionally, the willingness of the city leadership to upgrade the street lighting and the commitment shown was the key motivating factor for city departments and the third party consultants;
- **Pilot projects at times, especially in retrofitting initiative is essential**. For the city of Rajkot, the pilot project was central to demonstrate the capability of the new technology to meet all the objectives and

municipal service delivery requirements for street lighting. The pilot project was also necessary to check the applicability of the new technology within the existing infrastructure. Thus, pilot projects are key success factors in retrofit initiatives;

Context

In 2016, Rajkot had 60,000 streetlights within its city limits which were owned and maintained by the Rajkot Municipal Corporation (RMC). Most of these streetlights either used fluorescent tube lights, high-pressure sodium vapor (HPSV) lamps, high pressure mercury vapor lamps, or metal halides. The streetlights were at least 10 to 15 years old and consumed significant amount of energy while delivering lower level of lighting than desired³. Given the age of the streetlights, they also required frequent maintenance. Rajkot's energy profile and GHG inventory prepared in 2015 showed that street lighting was the second highest contributor (24%) to overall GHG emissions from the municipal services sector, with the electricity consumption exceeding 15 million kilowatt hours (kWh) per year. The city government understood the need to reduce energy consumption from its streetlighting and had undertaken various measures such as installation of energy efficient streetlight control panels and switching off alternate streetlights during late night hours. While these efforts helped to reduce energy consumption to a certain degree, there was still a need to undertake extensive energy efficiency upgrades for the city's streetlighting system.

An on-ground survey was initiated by the city with ICLEI South Asia's support through the Urban-LEDS project⁴ to provide stakeholders with an enhanced understanding of the current conditions of the street lighting system in the city and the opportunities for improvements. The survey addressed topics such as power consumption, voltage and current levels, existing lighting levels, its quality in terms of

3. Lighting recommendations for average illuminance on road surface for different road types as per IS classification for Group A1: Important traffic routes carrying fast traffic is 30 Lux with 0.4 uniformity ratio and Group A2: other main roads carrying mixed traffic like main city streets, arterial roads and throughway roads is 15 Lux with 0.4 uniformity ratio.

4. ICLEI South Asia, with financial assistance from the European Commission and in partnership with UN-HABITAT, supported the Rajkot Municipal Corporation (RMC) in implementing the project - Promoting Low Emission Urban Development Strategies in Emerging Economy Countries (Urban-LEDS). This project was implemented in four emerging economy countries India, Indonesia, Brazil and South Africa in over 25 plus cities. Two model cities (Rajkot and Thane) and six satellite cities were part of this programme in India.



Figure 3: Central Control Monitoring System

uniform distribution, condition of the existing street lighting infrastructure and pole spacing. Without this information, the municipality had struggled to resolve the issue at hand.

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 c) improvements in illumination levels. The city decided to undertake a pilot project on LED retrofits to demonstrate the technology and impacts in the local context.

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. The pilot led to annual electricity savings of 70,000 kWh as well as helping to achieve desired illumination

levels and quality. The performance of the pilot LED streetlights were monitored for six months. Post-retrofit the illumination level was observed to have improved to 20-22 lux as against illumination level of 5-10 lux obtained with HPSV street lights.

Based on the successful implementation and positive results from this pilot intervention, the city government decided to scale up through a city-wide LED streetlight retrofit program. In May 2016, a detailed technical and feasibility study was undertaken to look into LED retrofits for the entire city. It estimated a capital investment of USD 5 million to achieve energy savings of 50% as compared to the baseline. Unfortunately, due to its limited resources and other pressing social development needs, the city government could not move forward with the requisite investment for city-wide LED retrofits. Thus ESCO model was suggested wherein the city was not required to invest any amount for initial capital expenditure and yet able to achieve the desired objectives. This then brought EESL into the picture.

The Gujarat State Government had nominated EESL as the nodal agency to implement LED street lighting projects in its cities as part of Government of India's SLNP program in October 2016. SLNP⁵ is world's largest energy efficient street lighting programme. The programme aims to replace a total of 1,340 million conventional street lights with energy efficient LED lights by March, 2019. This will enable peak demand reduction of 500 MW, an annual energy savings of 1,900 million kWh, and an estimated reduction of 1.5million tonnes of CO₂e.

As Rajkot Municipal Corporation had already shown leadership through the pilot run and detailed feasibility study, it was easy for EESL to steadfast the initiative from day one. Rajkot signed the agreement with EESL in December 2016 and within 3 months all poles of the city were retrofitted with LED lights.

High-Impact Activities

In any successful and high impact initiative, stakeholders play a key role with their ability to articulate the issue and objectives appropriately, along with their willingness to travel the extra mile to find sustainable solutions. The following section discusses the roles played by various stakeholders by making the best use of available resources and knowledge to overcome challenges.

Stakeholders

The key actor within the said initiative has been the **Rajkot Municipal Corporation (the city government)** under the able leadership of **the Mayor and the Municipal Commissioner** who were willing to make changes and try innovative low-emission green-growth development pathways. Without the willingness and development vision of the leadership, the transformation would not have been possible. Additionally, the technical ability of the city

departments to facilitate preparation of an investment ready techno-feasibility report was crucial to take the pilot to next level of scaled-up implementation.

The technical and financial grant from the **European Commission through the Urban-LEDS programme** was the key turning point. The grant brought in place **ICLEI South Asia**, an organization renowned for its credentials in facilitating cities' planning for sustainable development.

As part of the programme the city prepared GHG inventory. Street-lighting sector was identified as the energy intensive municipal sector in the city. Therefore streetlighting service was prioritized to cut down the emissions and the pilot project was launched - the success of the pilot project provided way for evidence-based decisions and the large-scale implementation. Citizens too participated by sharing their feedback on the pilot project. The positive feedback also led to confidence building among the city authorities and leadership.

The national policy on street lighting (i.e. SNPL), and therefore availability of funds through EESL came in at an opportune time. EESL not only brought in the monetary support as any other ESCO, but also technical knowledge and operational capability of retrofitting the entire city lighting within 3 months of period. All the above mentioned stakeholders were thus crucial in achieving success. **Overcoming Challenges**

The key actors to the initiative at various stages of project/ program life cycle were faced with many challenges. Convincing the city officials was the initial hurdle. This could be overcome through engaging with the city leadership and obtaining their buy-in. The next challenge was to prove that the new technology could fulfil all the objectives of service delivery for public street lighting. The baseline studies and the

5. Objective of SLNP program is not only to reduce energy consumption and mitigate related GHG emission from street lighting sector by implementing energy efficient LED based street lighting but also to provide sustainable service model that obviates need for upfront capital investment as well as additional revenue expenditure to pay for procurement of LED lights and enhance local government services at no upfront capital cost. (<http://www.eeslindia.org/content/raj/eesl/en/Programmes/SLNP/about-slnp.html>)

pilot commissioned under the development grants overcame this challenge and offered an opportunity for scaling-up. Financial innovation under the national scheme, the shared-saving ESCO model resolved the fiscal issues faced by the city. Additionally, there were 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. These issues were settled swiftly by EESL through their experience in dealing with large-scale projects and technology know-how.

References

- Detailed project report on Energy Efficient project of replacing conventional street lights by LEDs on ESCO basis (PWC, May 2016)
- Meetings and discussions with Rajkot Municipal Corporation Officials, December 2018

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