

## Host Utilities



TATA POWER



TATA POWER-DL

**BSES**  
BSES Rajdhani Power Limited

**BSES**  
BSES Yamuna Power Limited

## Co - Host Utilities



ORGANIZER

**ISGF**

India Smart Grid Forum



India  
**SMART UTILITY**  
Week 2024

## Supporting Ministries



MINISTRY OF POWER  
GOVERNMENT OF INDIA



MINISTRY OF NEW AND  
RENEWABLE ENERGY  
GOVERNMENT OF INDIA



नीति आयोग  
National Institution for Transforming India



MINISTRY OF JAL SHAKTI  
DEPARTMENT OF WATER RESOURCES,  
RIVER DEVELOPMENT & GANGA REJUVENATION,  
GOVERNMENT OF INDIA



MINISTRY OF HEAVY INDUSTRIES  
GOVERNMENT OF INDIA



MINISTRY OF POWER  
GOVERNMENT OF INDIA

# Session : Smart Grids for Smart Cities

Unlocking the Value of Street Lights for Multiple Smart Cities Applications

*Presented By*

**SAIRAM KUMAR, TEAM LEAD, ACCENTURE**

## Smart Streetlights: Illuminating Smarter Cities:

Smart streetlights are revolutionizing urban infrastructure, going beyond mere illumination. These intelligent installations leverage cutting-edge technology to enhance energy efficiency, safety, and sustainability.

### Key Aspects:

#### **1. Definition and Functionality**

- Smart streetlights integrate sensors and wireless connectivity.
- They monitor air quality, noise levels, traffic flow, and pedestrian movement.
- Adaptive lighting adjusts brightness based on real-time conditions.
- Interconnected with the Internet of Things (IoT), they create a dynamic urban network.

#### **2. Benefits**

- Energy Efficiency: LED technology reduces energy consumption.
- Cost Savings: Real-time adjustments optimize energy use.
- Safety and Security: Monitoring traffic patterns and facial recognition enhance safety.
- Environmental Impact: Lower carbon emissions contribute to sustainability.

#### **3. Additional Features**

- Weather Alerts: Detect adverse conditions.
- Dynamic Lighting: Adjust brightness dynamically.
- Traffic Management: Real-time feedback for better flow.
- Emergency Response: Automatic actions during incidents.

### Conclusion:

Smart streetlights illuminate not only our cities but also the path toward smarter, more efficient urban living.

Climate change, urbanization, and population growth are among the world's most pressing issues. These challenges necessitate innovative solutions that can improve people's well-being, reduce environmental impact, and optimize resource use. Transforming how cities function and operate is a critical component of addressing these challenges. Smart cities are urban development paradigms that use technology, data, and connectivity to improve efficiency, sustainability, and livability. Smart cities strive to enhance the quality of public services, infrastructure, and governance while also opening new avenues for economic development and social inclusion.

Smart streetlights are essential components of smart cities. Streetlights, which were previously only used for lighting, can now be transformed into multi-functional devices that improve urban living, sustainability, and operational efficiency. Streetlights are widely distributed in urban areas, making them an ideal platform for implementing smart city technologies. The combination of advanced sensors, communication networks, and data analytics presents an opportunity to increase the value of streetlights.

This paper investigates key applications in which streetlights can help to build smarter cities.

With India going towards a complete Digitization and the number of smart cities increasing rapidly there is a high need of utilizing energy efficiently and going to a true SMART City functionality. As part of SMART CITIES GOV Initiative because of which rapid urbanization occurs, the need to provide a clean and sustainable city access to the citizens is a necessary, hence, the need of providing abundant energy is also increasing rapidly. Streetlights form a major chunk of regular energy consumed by a city and it should be utilized in an efficient way.

With the help of the Smart Streetlights, which include dynamic dimming, auto-switch of lights and implementation of LED Lights would largely help in increasing the efficiency and livability of the citizens.

This paper discusses the various aspects of implementing smart street lights across the city by using reliable means including the selection of the right light bulb to the different solutions that can be implemented for the same.

# PRESENTATION ON THE TOPIC

## Selection of Lights:

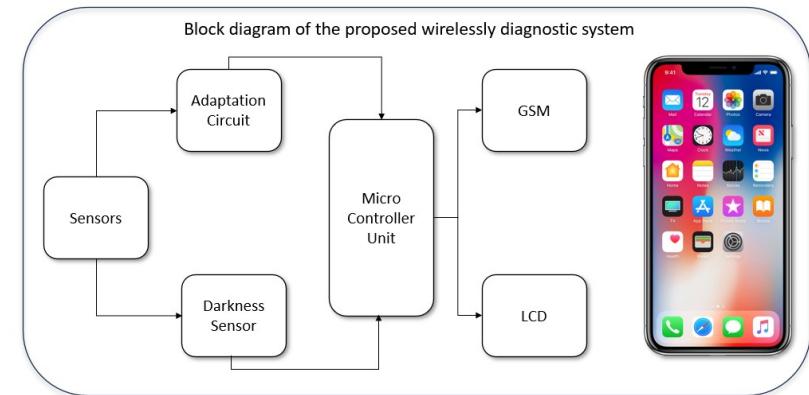
- Current lights are mostly either High Pressure Sodium (HPS) or Metal Halide (MH) bulbs.
- LEDs are to be made as part of the “Street Light Fittings” project by government of India because of higher working hours( 50,000-100,000 hours), 37-120 lumens/watt, human eye has decent dark adoption time

## Control Mechanisms:

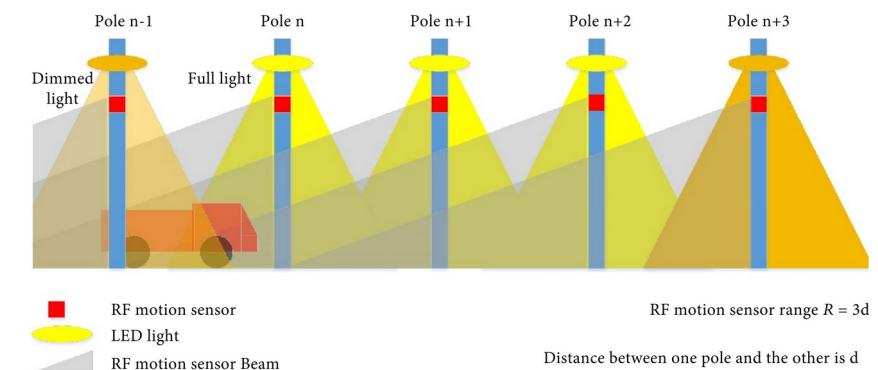
- Smart street lighting is defined as a network-based system of streetlights which is equipped with sensors and actuators, thus offering a wide set of capabilities and connectivity interfaces. In this section, we explain the different control mechanism for smart street lighting.
- Centralized control with the aid of short-range and long-range wireless communication in its lighting system was employed

## Connectivity:

- **Methods :** ZigBee Light Link, Visible Light Communication or LiFi
- Recent smart street light systems utilize Narrow Band IoT (NB-IoT) for connectivity, leveraging LTE cellular infrastructure and offering advantages such as larger coverage and penetration distances, as well as enhanced security with 256-bit 3GPP encryption, making it a preferred choice for industrial IoT solutions.
- Studies explore methods for energy efficiency, decentralized dimming systems, and diagnostic monitoring via GSM connectivity.
- IoT integration enables dynamic control based on traffic and weather conditions for efficient street lighting.



Sample Block Diagram to represent the system overall



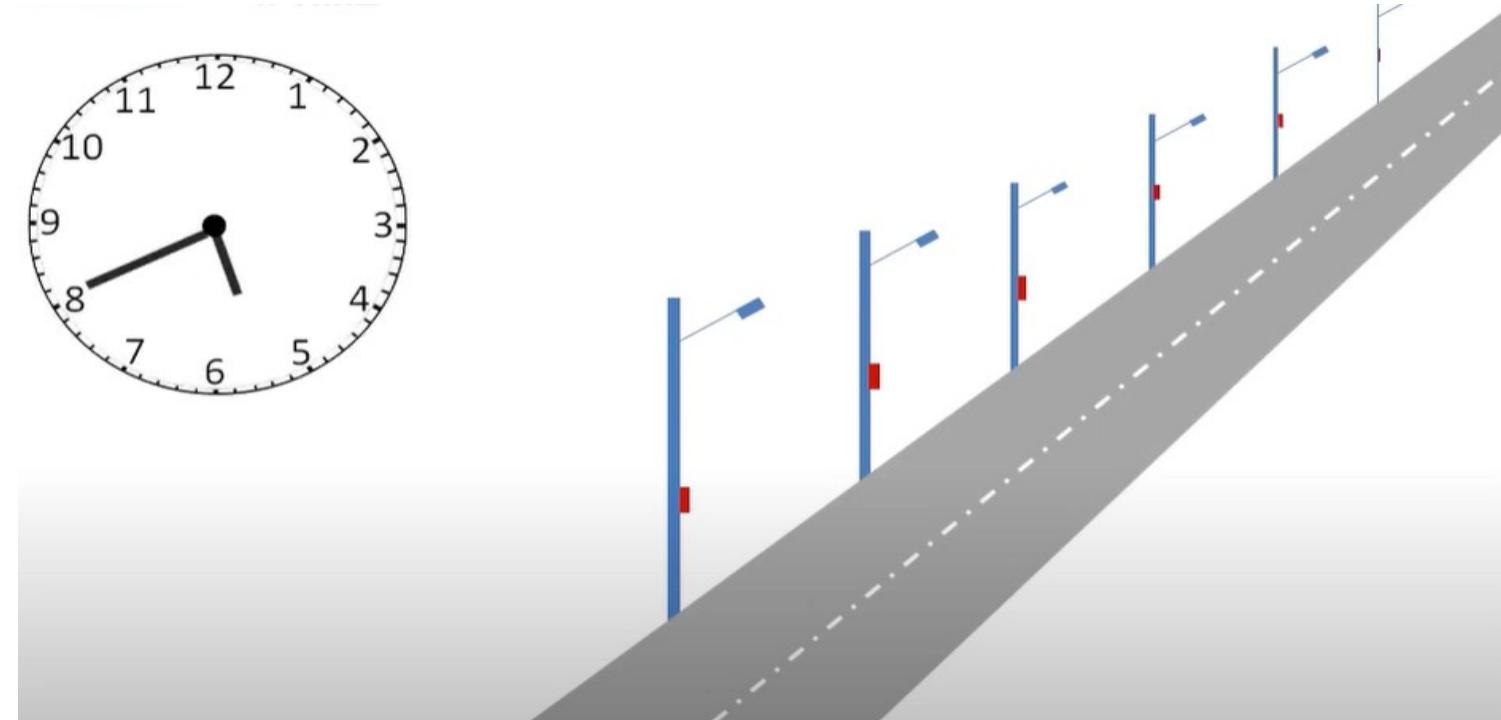
Proposed Dimming Approach

# PRESENTATION ON THE TOPIC (2/2 slides) (1 Mins each slide)

## Suggested Model

The use case depicts two proposed solutions that can actively and efficiently reduce the energy consumption,

- Solution 1:** Involving a connected PIR Sensor across the streetlights in a parallel connections with a master-slave relationship. Active sensors are placed in each streetlight which gets updated, and counter is increased when a motion change is detected.
- Solution 2:** Involving a direct sensor placement in each streetlight, which would identify the motion detection and each individually automatically dims and increases luminescence.



Generated Video indicating the working of smart streetlights in smart cities

## Future Considerations

Future trends in smart street lighting systems include integrating cybersecurity measures to prevent cyberattacks, utilizing artificial intelligence for traffic prediction, incorporating light poles for electric vehicle charging, and optimizing sensor technology for cost reduction and performance improvement. Additionally, selecting weather-resistant LED lamps, implementing continuous sensor-controlled dimming, and deploying LPWAN IoT communication networks are crucial. Integration of these features will be a key focus for future smart street lighting systems.

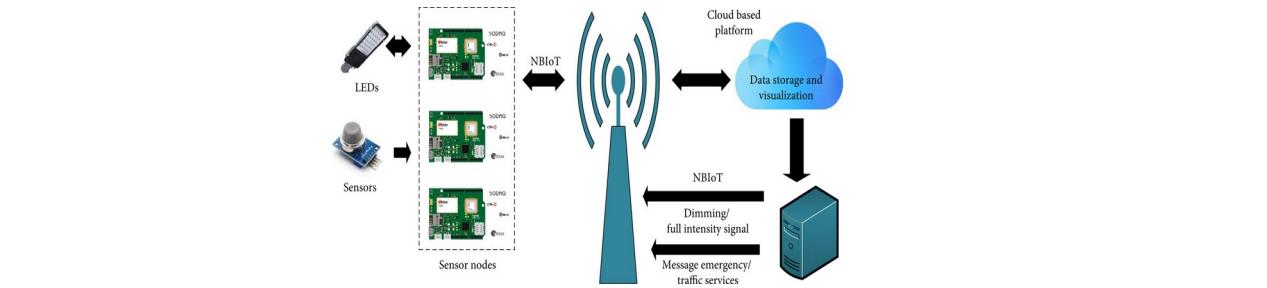
# USE CASE / CASE STUDY

**Project Name :** Largest Sensor-Based Seamless Integration with Cisco Kinetic Smart Lighting Project in India

Revolutionary smart street light sensors and versatile lighting controllers from Twilight enable the 'Pink City' Jaipur (India) to reduce energy consumption, lower maintenance costs, improve safety and quality of life of the citizens, and take a leap towards becoming one of the forefront smart cities in the country.

**Challenge** Jaipur, dubbed the "Pink City," boasts a cultural heritage spanning nearly 300 years. Its popularity as a tourist hotspot has surged, attracting over 40 million visitors yearly, both locally and globally. The city administration faced demands to enhance services due to the immense influx of tourists, aiming to improve public services and safety measures affordably and efficiently for residents and visitors alike.

**Solution:** Despite Jaipur's interest in implementing various smart city solutions, public lighting emerged as a major priority. Streetlights, the city's largest electricity consumers, contribute significantly to light pollution and CO<sub>2</sub> emissions. Yet, they also enhance residents' sense of security by illuminating dark pathways at night. Jaipur aimed to deploy a smart lighting system prioritizing citizen safety and well-being while addressing energy conservation and environmental concerns.



## Benefits

- 72% energy savings and thereby reduced costs, CO<sub>2</sub> emissions and light pollution
- Better maintenance and accountability, as it doesn't require around the clock manual intervention or night patrols
- User friendly web-application helps to remotely monitor, manage and control entire public lighting infrastructure
- Open API allow integration with other Smart City applications
- Automatic reports and diagnosis help tracking luminaire health and performance, thus saving time and achieving faster services ♣ Better electrical infrastructure extends asset lifetime
- Improved public safety perception as streetlights illuminate automatically to a higher level upon detection of human presence
- Enhances city aesthetics through better lighting quality

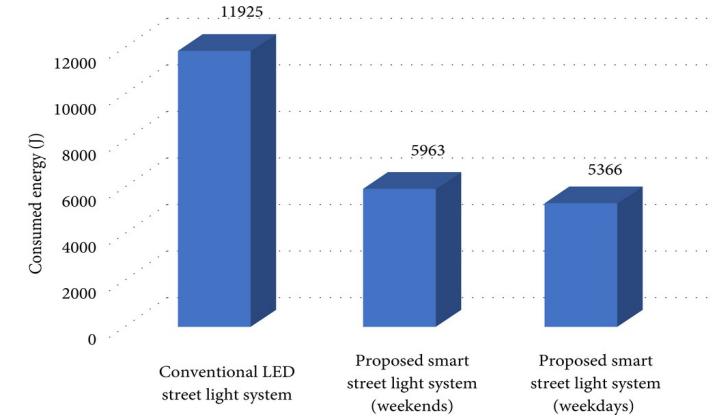
# KEY TAKEAWAYS / RECOMMENDATIONS

## Key Takeaways :

- At present, India's nights are illuminated by around 27 million streetlights. Most of them are metal halide, CFL, or sodium vapor lights. According to several reports, between 20 and 40 percent of India's energy production is used to power these streetlights.
- Smart streetlights offer extensive benefits, from adaptive lighting control and environmental sensing to supporting IoT devices and public safety features like facial recognition
- The proposed solution involving dynamic dimming and comprehensive system control showcases a practical approach to maximize benefits for smarter, more efficient cities

## Recommendations:

- With the inclusion of smartness in streetlights, the overall efficiency of electricity consumption can be reduced.
- With the inclusion of smart cities, it would be an ideal atmosphere/frame to implement the inclusion of Solar/Wifi-enabled panels to provide continuous uninterrupted supply and further increase the scope of usage.



Comparison of different types of lights

# THANK YOU

*For discussions/suggestions/queries email: [isuw@isuw.in](mailto:isuw@isuw.in)*

*[visit: www.isuw.in](http://www.isuw.in)*

*[Links/References \(If any\)](#)*

- Use Case : <https://tvilight.com/case-study/largest-sensor-based-smart-lighting-project-in-india/>
- Reference 1:  
<https://link.springer.com/article/10.1007/s12652-021-02970-y><https://www.hindawi.com/journals/js/2022/5249187/>
- Reference 2 :  
<https://www.rtinsights.com/iot-in-urban-evolution-why-smart-street-lights-illuminate-the-path-to-smarter-cities/>