Strengthening Audit Oversight of Public Private Partnerships

Case Study on Street Lighting National Programme (SLNP) of Energy Efficiency Services Limited (EESL)

A Scalable Public–Private Partnership (PPP) Model

Sector Context and PPP Rationale – Street Lighting

➢ Brief Overview of the Sector & Its Evolution under PPPs

- Street lighting is a **core urban public service**, essential for safety, mobility, and law & order.
- The sector involves **large asset base**, high energy consumption, and continuous O&M requirements
- Historically delivered through **ULB-owned assets and utility power supply**, with limited performance accountability
- Increasing focus on **energy efficiency, service quality, and lifecycle cost optimization** led to adoption of PPP/ESCO approaches.

➢ Why PPP Was Chosen over EPC / Traditional Procurement

- EPC models required high upfront capital expenditure by ULBs and did not ensure long-term O&M quality.
- Traditional procurement separated installation from maintenance, leading to asset deterioration over time.
- PPP enabled: No upfront capex for ULBs, Lifecycle responsibility (install–operate–maintain) with a single entity, Performance-linked payments instead of asset-based payments
- Risk transfer of technology, performance, and O&M to the private/implementing entity.

➢ Typical models include:

- **Energy Service Company (annuity – Cost Plus / savings-linked)**, **Design Build Operate Maintain**, and **performance-based O&M contracts**.

Street Lighting National Programme (SLNP): Overview

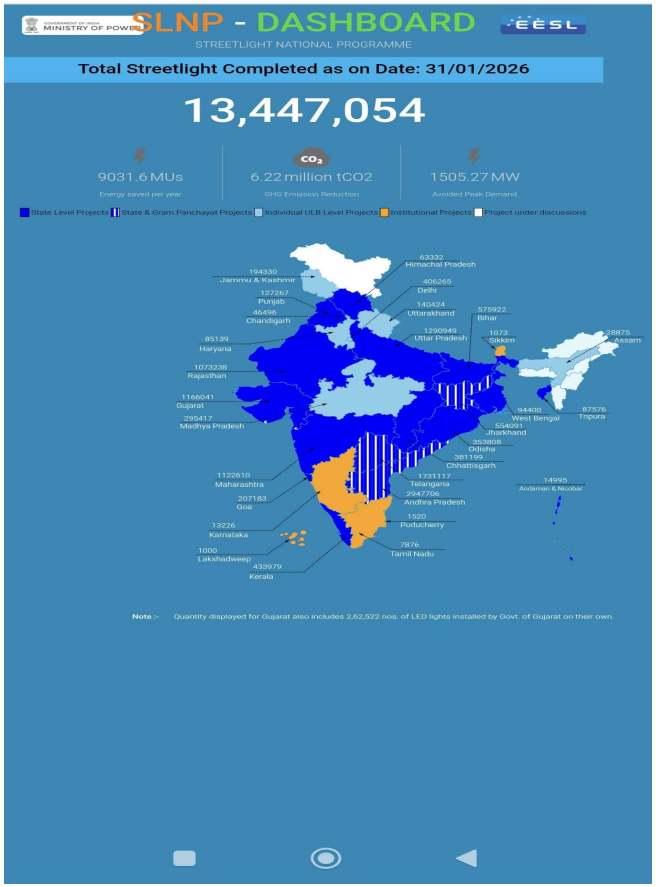
- Hon'ble Prime Minister, on **5th January 2015** launched the SLNP to replace conventional Street Lights with smart and energy efficient LED streetlights.
- EESL (ESCO) was appointed as a nodal agency from Ministry of Power. EESL is a joint venture of four PSUs, NTPC, Power Grid, REC & PFC.
- An **ESCO** is an entity that **designs, finances, implements, and maintains energy-efficiency projects**, and **recovers its investment from the energy savings achieved**, rather than through upfront payment by the public authority.
- Implemented at scale across States in ULBs and Gram Panchayats
- Programme designed with no upfront capital expenditure for ULBs and long-term service contracts.
- National scale makes SLNP systemically important from an audit and oversight perspective
- Impact: Enhances public safety, reduces energy costs, and lowers carbon emissions

- Progress Till Date:

No. of Street Lights installed	Capacity generation avoided	Annual Energy Saving	Total no. of ULB.s completed
- 1.34 crore	**- 1,505 MW**	**- 9.03 billion kWh**	**- 1559**

- The dashboard :
  - ✓ Gives an insight into the no. of streetlights replaced across the country
  - ✓ Country wide additional information on realization of- Total energy savings, Carbon emission reduction, and Peak demand avoidance

- Adopting “smart LED lights” deployment: “Smart Lights” connected through a web- based monitoring system enabling remote operations and efficient use of energy.



SLNP Dashboard

(https://slnp.eeslindia.org/**)**

SLNP as a Public – Private Partnership (PPP) Model

- Public Partner (Urban Local Body, Gram Panchayat /State Government)
  - Provides project area and approvals
  - Pays monthly charges from **deemed energy savings**, procurement & maintenance cost over a defined contract period.

- Private Partner (EESL – ESCO):
  - Invests upfront capital
  - Procures, installs, operates & maintains LED streetlights
  - Bears technology, performance & maintenance risks.

- Outcome:
  - No upfront capex for ULBs
  - Guaranteed service levels & energy savings
  - Simple, transparent, long-term sustainable urban infrastructure

SLNP: Benefits to Stakeholders

Municipalities:

- Reduced energy bills
- Improved streetlight infrastructure

EESL:

- Scale of operations and cost recovery

Public:

- Safer, well-lit streets
- Environmental benefits through reduced emissions

SLNP: Implementation Process

- Survey and Design: Assess existing streetlight infrastructure for baseline.
- Proposal: Develop a financing and implementation plan (ESCO/Annuity model – Cost Plus).
- Installation: Replace conventional streetlights with LEDs.
- Monitoring & Maintenance: Ensure performance and optimize savings.
- Savings Sharing: Municipalities repay based on energy savings, Procurement & maintenance cost

KPI for Service Delivery

- **Luminaire Availability (%)**
  Percentage of streetlights operational at any given time (typically ≥ 95%).

- **Deemed Energy Savings (%)**
  Energy Savings due to usage of energy efficient luminaire and components. (typically, ~40 to 60%)

- **Fault Rectification Time (TAT)**
  Average time taken to repair/replace failed lights (e.g., 24–72 hours).

- **Lighting Performance Standards**
  Compliance with illumination levels (National Lighting Code), uniformity, and glare norms as per approved standards.

- **Monitoring & Reporting Compliance**
  Accuracy and timeliness of data from the centralized control and monitoring system (CCMS), including outage reporting and savings verification.

Demand, Technology, and Design Assumptions

- **Demand Assumptions**
  Street lighting demand is largely **stable and non-discretionary**, linked to existing road length, number of poles, and standard operating hours (dusk-to-dawn).

- **Energy Consumption**
  Baseline established based on survey which includes existing fixture wattage, burning hours, and historical utility bills, forming the basis for deemed energy savings.

- **Technology Assumptions**
  LED luminaires assumed to deliver 40–60% energy savings, longer life (50,000+ hours), and lower failure rates compared to conventional lights.

- **Design & Standardization**
  Standardized luminaire designs selected based on road category, mounting height, and spacing, ensuring compliance with lighting and safety norms.

- **Smart Controls & Monitoring**
  Assumption of reliable operation of centralized control and monitoring systems (CCMS) for remote switching, fault detection, dimming, and performance measurement.

Commercial Risk Drivers

- Budgeting by UDD/ULB not sufficient

- ULBs/UDD not honouring their contractual part of the agreement
  - Opening of Payment Security Mechanism.
  - Payments within 30 days of invoicing.
  - Delayed/Late payment surcharge.
  - UDD/State Admin. Undermining State govt. assurance/ responsibility.

- Non-Payments over a prolonged period with ageing up to 03 years or more
  - The payments even does not cover debt, equity & tax repayments leave alone O&M payments.
  - Non payments to O&M vendors which are mainly MSME vendors, effects O&M services.
  - Material adverse impact on EESL
  - Additional borrowing, which is a financial strain on EESL.

Technical Risk Drivers

- **Technology Performance Risk (Technical)**
  Risk of LED luminaires or control systems not achieving expected life, illumination levels, or energy savings.

- **O&M and Asset Reliability Risk (Technical)**
  Higher-than-expected failure rates, vandalism, or delayed fault rectification affecting service availability KPIs.

- **Integration & System Risk (Technical)**
  Challenges in integrating CCMS, smart controls, and utility metering systems across diverse urban environments.

International and India Best Practices - PPPs in Street Lighting

- **Relevant Global Benchmarks**:
  - United Kingdom (Birmingham City Council), USA (Los Angeles), and Brazil (São Paulo) have implemented long-tenure ESCO / DBOM street-lighting PPPs with independent, actual M&V and utility- or ring-fenced revenue-backed payment mechanisms, resulting in improved bankability, payment certainty, and service performance.
- **Practices Improving Bankability & Performance**:
  - Strong payment security (escrow / utility deductions)
  - Performance-Linked Payments
  - Standardized Specifications & Contracts
  - Centralized Monitoring Systems
  - Risk Allocation to Best-Placed Party
  - Independent Verification & Transparency
- **Indian PPP Practice (SLNP Context)**:
  - India adopted a scaled ESCO model with centralized implementation; however, **payment security relies heavily on ULB/State budget discipline** rather than automatic deduction mechanisms.
- **Key Difference vs Global Models**:
  - Global PPPs ensure **predictable cash flows and enforceable payment mechanisms**, whereas Indian PPPs face **institutional payment risk**, delayed budgets, and weaker enforcement of state assurances.

Design, Technology, and Innovation Aspects

- **Role of Technology in Improving Service Delivery & Efficiency**
  - High-efficacy LED luminaires and **CCMS-based smart controls** improve energy efficiency, illumination quality, and service reliability.
  - **Data-driven O&M** enables proactive maintenance, reducing downtime and lifecycle costs.

- **Contractual Flexibility**
  - **Standardized yet flexible designs** allow adjustment of wattage, optics, and spacing based on road conditions.
  - **Future-ready architecture** supports technology upgrades and smart-city integration without major contract changes.

- **Risks of Rigid Specifications**
  - **Restrict adoption of improved LED technologies** during the contract period.
  - **sub-optimal illumination or energy outcomes** under varying local conditions
  - **higher lifecycle costs** and reduced performance efficiency.
  - **discourage innovation** and limit scalability with evolving urban infrastructure needs.

Common Failure Points in PPP Structuring

- **Weak Baseline Assessment**
  - Inadequate or inaccurate baseline data on existing fixtures, burning hours, and energy consumption leading to disputes on deemed savings.

- **Over-Optimistic Savings Assumptions**
  - Aggressive assumptions on energy savings and failure rates without adequate sensitivity analysis.

- **Misalignment between Contract Design and Ground Realities**
  - **Payment Security Gaps**
    Absence or weak enforcement of payment security mechanisms, resulting in delayed or irregular annuity payments by ULBs.

  - **Poor Risk Allocation**
    Transfer of policy or payment risks to the private partner, despite limited control, affecting project bankability.

  - **Insufficient Contractual Clarity**
    Ambiguity in O&M scope, replacement obligations, KPI definitions, and penalties leading to interpretation disputes during execution.

Regulatory and Policy Bottlenecks

- **Policy Uncertainty / Frequent Changes**
  - Lack of uniform policy adoption across States/ULB, on ownership, metering, and payment responsibility.
  - Tariff and billing policy uncertainty, affecting deemed savings calculations
  - Weak enforcement of State guarantees / tripartite agreements, reducing credibility of policy assurances

- Approval & Clearance Delays
  - Delays in budget approvals and fund releases, impacting timely annuity payments.
  - Approval and clearance constraints
  - Implementation delays and cost escalation

- **Impact on Project Viability**
  - Cash flows and financial sustainability of projects
  - Mismatch between contractual timelines and actual execution.
  - Uncertain payment and enforcement environment

Data, Monitoring, and Performance Metrics

- Availability & Reliability of Data
  - Performance assessment depends on the accuracy of:
    - ✓ baseline data
    - ✓ meter readings
    - ✓ CCMS system logs

- Monitoring & Reporting Quality
  - Centralized CCMS enables:
    - ✓ real-time monitoring
    - ✓ KPI-based reporting of availability
    - ✓ faults, energy use
    - ✓ Supports illumination compliance

- Certification & Verification Issues
  - **Independent / joint verification** of infrastructure and service levels is required before release of payments.
  - Verification is based on **CCMS data, field inspections, and baseline records**
  - **Robust MIS and audit trails** are necessary to link performance certification with payments

Relevance for Audit and Oversight

- **Typical Areas Where Audits Find Weaknesses**
  - Non-compliance with contractual KPIs for
    - ✓ Availability
    - ✓ fault rectification timelines
    - ✓ service standards
  - Payment security and annuity disbursement gaps
    - ✓ including delayed payments
    - ✓ weak enforcement of contractual safeguards

- **Indicators of Stress or Under-Performance**
  - Persistent payment delays and receivable ageing
  - Mismatch in risk allocation
    - ✓ Payment or policy risks placed on entities that cannot control payments or approvals
    - ✓ Responsibility not aligned with actual control, leading to delays and disputes

- **Importance of Documentation & Traceability**
  - Integrity of MIS, certifications, and approvals is critical for
    - ✓ establish linkage between performance, payments, and accountability
  - Complete audit trail (contracts, KPIs, certifications, payment records) for
    - ✓ transparency and defensible audit conclusions

Recommendations for Future PPPs

- **Strengthen Baseline & DPR Quality**
  Ensure robust baseline assessments, independent validation, and realistic savings assumptions before contract award.

- **Enhance Payment Security Mechanisms**
  Mandate escrow accounts, state guarantees, or utility-backed deductions to reduce payment default risks.

- **Standardize KPIs & Data Protocols**
  Adopt uniform KPI definitions, CCMS standards, and reporting formats across states to improve comparability and auditability.

- **Improve Risk Allocation & Contract Clarity**
  Align risks with the party best placed to manage them, with clear provisions on O&M, replacements, penalties, and force majeure.

- **Enable Innovation with Safeguards**
  Allow adoption of new technologies (adaptive lighting, analytics) while maintaining flexibility and safeguards against performance dilution.