



GLOBAL CONFERENCE ON ENERGY EFFICIENCY IN STREET LIGHTING: MARCH 19-20, 2014

NEW DELHI

CONFERENCE REPORT

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IIEC

International Institute for Energy
Conservation

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ACKNOWLEDGEMENTS

The Global Conference on Energy Efficiency in Street Lighting was organized in New Delhi on March 19-20, 2014, by the World Bank Group (WBG), in partnership with the Indian Bureau of Energy Efficiency (BEE) and Energy Efficiency Services Limited (EESL). The conference focused, among other things, on the key barriers and solutions to the development of the energy efficiency street lighting market in developing countries. Over 40 speakers and 100 participants from India, Kenya, Brazil, Mexico, Krygyz Republic, USA and Thailand, representing Government ministries, cities and urban local bodies, energy efficiency firms, financial institutions, public authorities and donors and development partners, attended this South-South-North knowledge exchange event.

The Conference was conceived, organized and managed by a WBG team of Ashok Sarkar (World Bank) and Neeraj Gupta, Harsha Khubchandani, and Aditya Dhar (International Finance Corporation, IFC). The team would like to thank Isabel Chatterton (IFC), Ajay Mathur (BEE) and Saurabh Kumar (EESL) for their overall guidance, and Jeremy Levin, Ari Skromme and many other WBG colleagues for their support and help in designing the program and in reaching out to various participants from across the globe. Ruchika Berry (IFC) provided support on the administrative and logistics fronts.

The team extends its gratitude to the distinguished plenary speakers, session moderators and participants for coming to the Conference, and for their important contributions in sharing their excellent insights and experience. Finally, special thanks to DevCo, Energy Sector Management Assistance Program (ESMAP) and the Public Private Infrastructure Advisory Facility (PPIAF) for their support to this Conference.

The International Institute for Energy Conservation (IIEC)- India team of Sanjay Dube and Amit Tripathi prepared this Conference Report under an ongoing World Bank-sponsored project on Energy Efficient Urban Street Lighting (under the India Urban Cluster AAA Program) being implemented in collaboration with EESL.

For further information about this Conference, please contact: Ashok Sarkar at the World Bank (asarkar@worldbank.org) or Neeraj Gupta at the IFC (NGupta@ifc.org).

ACRONYMS

BEE	Bureau of Energy Efficiency
BIS	Bureau of Indian Standards
DPR	Detailed Project Report
EE	Energy Efficiency
EESL	Energy Efficiency Services Limited
EPC	Engineering Procurement Construction
EPI	Energy Performance Insurance
ESCOs	Energy Service Company
ESMAP	Energy Sector Management Assistance Program
ESPC	Energy Savings Performance Contract
FI	Financial Institutions
FOTEASE	Fund for Energy Efficiency and Sustainable Utilization of Energy
GHG	Green House Gas
GIS	Geographic Information Systems
IFC	International Finance Corporation
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
M&V	Monitoring and Verification
MoUD	Ministry of Urban Development
O&M	Operation and Maintenance
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Public Private Partnership
PRGF	Partial Risk Guarantee Facility
PRGFEE	Partial Risk Guarantee Facility for Energy Efficiency
PRSF	Partial Risk Sharing Facility
PSU	Public Sector Undertakings
SEAD	Super-efficient Equipment & Appliance Deployment
SIDBI	Small Industries Development Bank of India
ULBs	Urban Local Bodies

1 EXECUTIVE SUMMARY:

The World Bank Group, in association with the Bureau of Energy Efficiency (BEE) and Energy Efficiency Services Limited (EESL), and with support from DEVCO, PPIAF and ESMAP, successfully organized a Global Conference on Energy Efficiency in Street Lighting on 19-20 March 2014 in New Delhi, India. This platform facilitated the sharing of South-South-North knowledge exchange and dissemination of best practices amongst the service providers and ESCOs, municipal bodies, lighting equipment manufacturers and suppliers, financial institution and multilateral agencies. The conference also focused on the key barriers and possible solutions to the development of the organized energy efficiency lighting market in developing countries. The conference had over 100 participants and 40 speakers, representing energy efficiency firms, financial institutions, public authorities and donors/partners (PPIAF, ESMAP, KfW, etc.). Attendees included government officials from over 20 public authorities including from India, Kenya, Brazil, Mexico, Kyrgyzstan, USA and Thailand and from both the World Bank and IFC. The aim of the conference was to showcase successful street lighting projects in emerging and developed markets and adapt experiences to the Indian context.

During the 2-day event, different models of the successful financing and implementation of large scale energy efficient street lighting projects were discussed. It was observed that in developing countries the municipal energy market is still largely untapped, on the accounts of the following issues:

Lack of financing opportunities – Due to limited understanding of the risks and the lack of appetite from the financing institutions;

Limited awareness – Amongst the industries, small and medium enterprise and particularly government agencies regarding the potential for energy savings;

Technical challenges – In instituting effective monitoring and verification systems to track energy savings and availability of inadequate infrastructure such as meters;

Capacity constraints – Among the ULBs to conceptualize, design and implement such initiatives;

Complexity in the coordination – Between multiple agencies including the ULBs, Government agencies, electricity utilities, etc.;

Lack of successful precedents – Street lighting services in particular, present immense opportunities for energy savings due to their scale and visibility in the public domain. They also present specific challenges with the little appetite on the part of municipal authorities to invest in baseline in baseline data and improve pole & cabling infrastructure. To overcome these challenges, newer implementation models, such as those based on fixed annuity payments, are being explored.

Despite having successful case examples, the urban street lighting sector across the world faces similar and multiple challenges. Lately, the shift towards formation of new regulations and legislations to promote energy efficiency has been observed in developing countries. During the event, the participants showcased various opportunities with immense potential for improvements given that fact that over 40-50 % of electricity consumption in municipal bodies goes into meeting the needs for street lighting. Also, with introduction of new control technologies and centralized energy management systems associated with new energy efficient technologies like LED street lighting; there are immense opportunities to reduce operation and maintenance (O&M) costs. With these modern systems, baseline data generation will become easier and accurate through point switch management system which will make street lighting as a whole more effective and efficient.

Major lacuna in the street lighting across the globe is the financing of projects, as efficient technologies like LED require higher upfront investment even though they are cost effective in the

long run, due to their higher efficacy, longer life and other advantages over conventional technologies (like mercury vapour and HPSV technologies). Majority of the urban street lighting systems are managed by the municipal bodies which have financial constraints and it is difficult for them to raise sufficient finance to fund these projects. As, market is perceived not to be large enough and uncertain (political risks & payment security risk), major private sector investors are showing apprehensions in financing such projects. Innovative models of financing and tools, including PPP-based models and Energy Service Companies (ESCOs) based performance contracting models were discussed during the conference where several Indian and global case studies were show cased during different sessions.

The Conference was opened by a high level panel comprised of Mr. Serge Devieux (IFC Regional Director), Mr. Onno Ruhl (World Bank Country Director), Mr. R N Choubey (Additional Secretary, Ministry of Power), and Dr. Sudhir Krishna (Secretary, Ministry of Urban Development). Senior officials from BEE (Dr. Ajay Mathur, Director General), EESL (Mr. Saurabh Kumar, Managing Director), World Bank (Ashish Khanna, Lead Energy Specialist) and IFC (Ms. Isabel Chatterton, Manager) closed the Conference.

A broad-based perspective of ESCOs, policy makers, financiers and other stakeholders were discussed at the Conference. The key points that emerged from the discussion are:

- Poor baseline data which acts as a hindrance in designing comprehensive management plans and performance contracts;
- Poor supporting infrastructure for installation and optimal utilization of urban street lighting facilities;
- Unrealistic and confound expectations on performance parameters;
- Large risk of theft and vandalism, political risks, poor standards and O&M practices;
- Projects not financially sustainable without active support from local governments;
- Not many large scale projects to attract sizable investment from the investors.

Broadly two main models of financing street lighting projects were show cased during the conference, a) the Annuity Model (based on EESL Initiative in India) and b) ESCOs Shared Savings Model (IFC initiative in India). EESL has designed the innovative annuity based model that could ensure that the retrofitting with best available technologies can bring good amount of cost savings to Municipal Corporations/ULBs. The model does not require periodical demonstration of energy and cost savings to get returns on investments resulting in easier and cheaper monitoring and verification of savings. The costs can be recovered from the combined expenditure of ULBs on electricity bill and operation & maintenance (O&M) charges. The ESCOs shared savings model as recommended by the IFC is designed in a manner that efficient street lighting upgrades would be paid for and maintained by the ESCOs, who in return receive payments through energy savings realized by the projects. Both the models were discussed and the case studies covering these models were presented.

2 CONFERENCE AGENDA

The forum of the Global Energy Efficiency in Street Lighting in New Delhi acted as the platform for sharing knowledge amongst the municipal authorities, ESCOs, equipment suppliers, financial institutions and multilateral agencies.

There is global thrust to harness energy efficiency as a viable and alternate energy sources. This is not easy task to accomplish as it requires regulatory and policy interventions to incentivize energy efficiency measures in the municipal bodies across the globe. For example, in India, street lighting consumed about 8,478 GWh of electricity in FY2013, about 1.5 % of total electricity consumption. This consumption can be substantially (i.e. 40-60 %) reduced through use of energy efficient LED technologies.

This conference provided the opportunity to initiate a dialogue amongst all the stakeholders to identify barriers and solutions to have robust institutional framework and regime for urban street lighting. The detailed agenda of the conference is attached as Annexure-1. All the presentations are attached as Annexure-2.

The main agenda of the conference are:

- Disseminate lessons from institution and regulatory frameworks in developed ESCO markets;
- Highlight good practices from such projects in emerging and developed markets;
- Recognize constraints to financing of street lighting projects and identify potential solutions;
- Showcase policy incentives to promote the development of energy efficiency projects

3 SUMMARY OF PROCEEDINGS OF DAY 1 (19TH MARCH 2014)

3.1 Welcome and Opening Remarks:



Speeches

Mr Serge Devieux- Regional Director (South Asia) IFC

Mr. Serge Devieux emphasized three basic pillars of the IFC and discussed two key strategic focal points for IFC engagement in the sector (i.e. inclusive growth & global and regional market integration) through positive sustainable private sector participation and engagement.

He urged all the stakeholders to develop sustainable business models for implementing street lighting projects. According to Mr. Devieux, there are many challenges and barriers to overcome in developing energy efficient solutions for urban street lighting project but he was optimistic to find this opportunity to find sustainable solutions in this sector.

Mr. Onno Ruhl, Country Director (India), World Bank

Mr. Ruhl in his opening remarks highlighted the importance of knowledge sharing and use of Global North-South and South-South platform for sharing such **learning's** and case studies for implementing cost effective and sustainable solution across the globe. He mentioned about the current power/energy deficit in India and how energy efficiency could become one of the major drivers in making India as an energy surplus country. He concluded by laying out the importance of the energy efficiency as a tool for the system improvisation.

Mr R N Choubey, Additional Secretary, Ministry of Power, Government of India

In his special address to the gathering at the event, Mr Choubey declared that every unit of energy saved is equal to energy produced. He declared that Ministry and Government of India is committed to have successful energy efficiency programs and policy to support programs like energy efficient street lighting in the country.

In his note he pointed out that if India needs to keep its growth trajectory up, the per capita energy consumption would increase. At present the per capita energy consumption is one third of the global

average. He also recognised energy efficiency as one of the major options to achieve the sustainable growth. During his address, he mentioned that there are not many successful case studies in the municipal sector on design and implementation of successful energy efficient measures. According to him, the problems are due to the poor infrastructure and availability of baseline data. The financial instability and lack of capacity of ULBs further complicate the issues.

He also suggested that the similar events should be organized at the state level to make sure that the representatives from municipal corporations and ULBs attend such events.

Dr Sudhir Krishna, Secretary, Ministry of Urban Development (MoUD), Government of India

In his inaugural address, Dr. Sudhir Krishna explained about the shift in the mind-set of the policy makers and how they are now focussing more on urban centric programs. But the city agencies are still ill equipped to handle the challenges of rapid urbanization. He mentioned that the empowerment of local agencies is important as they are the one who can best handle the city level issues.

For this to happen, it is important to build the capacity of municipal bodies so that they can handle the challenges of urbanization. Cities need to be safe with having proper mobility infrastructure and street lights. According to his observation city governance is not very strong to design and implement effective street lighting projects.

ULBs should be able to handle street lights and manage their resources to have efficient and sustainable cities. They should take these opportunities as the technologies are available and their adoption is easy.

Ministry of Urban Development (MoUD) is ready to assist local bodies for the preparation of model Detailed Project Reports (DPRs)/Monitoring & Verification (M&V) documents. The Ministry is also keen to establish dialogue with other ministries to leverage the resources, conducting joint workshops and events at the state level and implement innovative schemes to promote the implementation of energy efficient street lighting projects.

Mr Bhaskar Jyoti Sharma, Secretary, Bureau of Energy Efficiency, India

In the concluding speech, Mr Sharma proposed the vote of thanks to all the speakers, distinguished guests and participants for making this event a reality. He sensed the possible revolution in municipal street lighting space and shared his belief that future holds good if we set our priorities right. Like other speakers, he also endorsed the idea of conducting similar events at the local/state level for the active participation and engagement with municipalities and urban local bodies.

3.2 Setting the Context: Overview of Opportunities in the Urban Energy Efficiency Sector; Focus on Street Lighting

Panel Members for the session:

This session was moderated by Mr Bhaskar Joyti Sharma, Secretary, Bureau of Energy Efficiency, India. Speakers included:

- Ms Martina Bosi, Senior Energy Specialist, Energy Sector Management Assistance Program, World Bank, Washington, DC, USA
- Mr Normad Michaud, Econoler, Canada
- Mr Satheesh Sundarajan, Public-Private Infrastructure Advisory Facility

This session focussed on the following **key themes:**

- Global trends & sector evolution
- Street lighting energy efficiency projects vis-à-vis climate change
- Barriers to street lighting energy efficiency projects
- Opportunities in the sector

All the speakers focused on the importance of managing the growth of urbanization in the developing world. As cities are responsible for the two thirds of global energy consumption and the associated Green House Gas (GHG) emissions, it is important for the policy makers to ensure that the cities grow in a sustainable manner. Energy efficiency is recognised as one of the most cost effective tools to ensure sustainable growth and address the challenges of climate change.

All the panel members agreed that the key barriers to the urban energy efficiency initiatives are the presence of poor infrastructure, financial constraints of the ULBs, poor baseline data to support the design of effective Demand Side Management (DSM) and other programs and the capacity of municipal bodies to implement large projects.

But there lies immense potential in making cities more efficient through energy efficiency programs particularly in the space of the street lighting. Public lighting accounts for up to 40% electricity consumption in most municipal bodies and offer the opportunity to introduce various innovative tools and technologies to enhance the quality of lighting and energy efficiency in the sector. Ms Bosi introduced TRACE tool for developing energy efficiency roadmap for the municipal sector. Currently 27 cities across the globe are implementing this tool for integrating energy efficiency in their urban planning. This could have multiplier effect on the global fight against climate change and poverty.

Mr Michaud showcased some of the successful case studies implemented by his organization to demonstrate the benefits of energy efficiency in street lighting. He demonstrated that in Bangladesh and Pacific Islands they were able to achieve 28-43% savings with improved lux levels of 12-77%. He also discussed the key barriers that they faced while designing and implementing such projects. He emphasised on having the robust M & V protocols for the success of the projects. He pointed out that there could be no single solution to the financing of such projects and we should have localized solutions as the requirements at each municipality could be different.

Mr Sundarajan added that the focus should be more on leveraging the private sector investment in urban energy efficiency projects. He suggested strengthening the capacity of ULBs to mitigate the risk

of financing energy efficiency projects. Government support is required in developing enabling environment to support private sector participation.

Key Takeaways of the Session:

- Requirement of co-ordinated processes amongst the stakeholders;
- Stable policy and regulatory framework to support the market initiatives;
- Firm political leadership to mitigate any political risk to the investment;
- Better and innovative funding and financing resources for the projects to be self-sufficient.

3.3 Implementation Models and Challenges in Street Lighting Energy Efficiency Projects-India

Panel Members for the sessions:

This session was moderated by Mr Saurabh Kumar, Managing Director, Energy Efficiency Services Limited, India. Speakers included:

- Mr Sanjib Kumar Mishra, Director, Municipal Administration, Government of Odisha, India
- Mr D Ravi, Superintending Engineer, Electricity Department, Puducherry, India
- Mr S P Singh, Ludhiana Municipal Corporation, Punjab, India
- Mr S K Goyal, Chief Engineer, Jaipur Municipal Corporation, Rajasthan, India

This session focussed on the following **key themes:**

- Challenges faced in designing and implementing street lighting projects
- Implementing models- Shared savings/ Guaranteed Savings/ Annuity
- Optimal risk allocation
- Monitoring & Verification methodologies
- Dealing with the political economy and multiple institutions

Two main models were presented during the session using different case studies. First is the Annuity Based model (Deemed Savings) which is being implemented in Puducherry and Ludhiana in India with support from EESL. The second is the Guaranteed Savings Model, which is being implemented in Bhubaneswar and Jaipur in India, with support from IFC.

These projects are seen as the game changer in the public street lighting pace as the size of the projects is substantial to attract the investments. The success of the projects will build the confidence of both local bodies and the investors.

During his presentation, Mr Sanjib Kumar Mishra shared his experience of design and implementation of street lighting project in Bhubaneswar Municipal Corporation. He shared that the project faced numerous amount of challenges right from the conceptual stage to the implementation stage. The challenges were due to the lack of awareness about the benefits.

The Puducherry Electricity Department also faced issues like the availability of poor baseline data. Jaipur Municipal Corporation also faced similar challenges during the design and implementation of such projects. Mr Goyal from Jaipur Municipal Corporation mentioned that it is important to have administrative and political mandate to achieve the objectives of these kinds of projects. There is a

need to educate stakeholders about the potential benefits from the implementation of these projects. Mr. Goyal also mentioned that customer grievances mechanism should be made strong in the cities where the programs are being implemented. This will ensure credibility and make the system more accountable.

Table 1: Key Observations from four Indian case studies

Key Areas	Bhubaneswar	Puducherry	Ludhiana	Jaipur
Challenges Faced	<ul style="list-style-type: none"> ▪ Financial constraints ▪ Poor in-house capacity ▪ No past experience ▪ Poor baseline data ▪ Weak M&V mechanism 	<ul style="list-style-type: none"> ▪ Financial constraints ▪ Poor in-house capacity ▪ No past experience ▪ Poor baseline data 	<ul style="list-style-type: none"> ▪ Financial constraints ▪ Poor in-house capacity ▪ No past experience ▪ Poor baseline data ▪ Weak M&V mechanism 	<ul style="list-style-type: none"> ▪ Financial constraints ▪ Poor in-house capacity ▪ No past experience ▪ Poor baseline data ▪ Weak M&V mechanism
Implementation Models	Guaranteed Savings	Annuity/Deemed Savings	Annuity/Deemed Savings	Guaranteed Savings/Shared Savings
M & V Methodologies	Point Switch Based Verification	Demonstrable Project with pre and post installation data	Demonstrable Project with pre and post installation data	Point Switch Based Verification
Dealing With Political & Multiple Institution	Political institutions were lacking capacity to first undertake the project. Lot of issues were raised before the project was initiated.	Multiple institutions didn't have many issues. The decision making authority didn't offer much resistance.	The project is being seen as a test.	Political influence was major consideration due to multiple decision making authorities

3.4 Financing Street Lighting ESCO Operations- Transaction Risks, Structuring Modalities and M&V Issues

Panel Members for the sessions:

This session was moderated by Mr Neeraj Gupta, Principal Investment Officer, International Finance Corporation. Speakers included:

- Mr Michael Schrempp, Munich Re, Germany
- Mr Pankaj Sindwani, Tata Cleantech Capital Limited, India
- Mr R K Das, Small Industries Development Bank of India

This session covered the following **key themes:**

- Funding vehicles and instruments which are available for street lighting ESCOs
- Experience in appraising street lighting projects and associated financing risks and challenges
- Role of the different stakeholders in enabling project finance in the sector.

Mr Gupta described about the increased maturity level of the sector and sector is being evolved at a rapid pace. This should encourage investment and confidence amongst the stakeholders. He mentioned that with changed scenario where ULBs are planning to design and implement large projects, the financing institutions are showing higher amount of interest in making the finance available for the street lighting sector. He also stressed that in the past lenders or bankers have failed to understand the M&V and other procedures and there is a need to build their capacity to better understand the energy efficiency sector.

Mr. Michael Schrempp in his presentation talked about the role of insurance companies in promotion of new technologies and methodologies to overcome the risk barriers as perceived by the potential investors in the industry.

The other panel members, including Mr RK Das and Mr Pankaj Sindhwani, shared similar experiences and the difficulties related to financing and implementing the street lighting projects in India. The project size being small is one of the major barriers in attracting the finance. It is important to follow proper due diligence and detailed documentation at the project design phase to plug any holes in the program. Financial health of the ULBs in India is the major concern for the investors and financial institutions involved in this sector.

Key **Challenges** as faced by Industry:

- Lack of the sizable projects to make industry and investor interested in the sector
- Smaller loan size
- High transactions cost results in high project development cost
- Perceived high risk
- Lack of bankable contracts
- Limited energy efficiency project evaluation understanding

Key **Recommendations** for the stakeholders from the presentations:

- While making the projects economical to protect the public money, it is important to also accommodate the concerns of financing institutions;
- ULBs could consider starting with annuity based projects till the time market gets mature;
- Instruments such as Partial Risk Guarantee Fund (PRGF) needs to be rolled out quickly and promoted well within Financial Institution (FI) and ESCO community.
- Technology Companies should take a long term view; offer superlative after-market product support.
- **EESL's** role in early years of energy efficiency program implementation for setting the right tone is crucial.

Key **Takeaways** for the session:

- Concerns of bankers and lenders should be incorporated in the design of projects
- ULBs should focus on annuity based projects
- Instrument such as PRGF needs to be rolled out.
- Technologies should take long term view, offer superlative supports.

3.5 Evolution in Public Lighting Technologies- New Development, Innovation, Costs and Prospects, Control Systems

Panel Members for the sessions:

This session was moderated by Mr Chandrasekhar Govindarajalu, Senior Energy Specialist, International Finance Corporation (IFC). Speakers included:

- Mr Praveen Baderia, GM-LED, H P L India
- Mr Sudeshna Mukhopadhyay, Head- Centre of Competency, Philips Lighting
- Mr Kutsuzawa Nawaru, Itochu India Private Limited
- Ms Karin Anna Maria Lerner, Technical Specialist, World Bank
- Ms Graziella Siciliano, Chair of the SEAD Procurement Working Group, US Department of Energy

This session covered the following **key themes**:

- Evolution of technology in the public lighting space and recent trends
- How has evolving technology affected costs?
- What role do control systems play in energy efficiency?

There were different distinguished players from industry who demonstrated that public lighting and control systems can be cost effective and lots of exciting development and innovations are happening to make this sector mature and sustainable.

Industry players highlighted the use of new technologies with combination of LED lights and renewable energy supply sources (i.e. Solar panels, etc). Along with the LED street lights, efficient and centralized management/control system is also very important to reduce the wastages and improve the overall efficiency of the systems. This gives the option of generating baseline data in real time to enable agencies to implement the projects efficiently.

Ms Graziella Siciliano highlighted the key barriers and best practices for the procurement practices in street lighting space.

Key barriers:

- Information Barriers
- Procurement process do not integrate energy efficiency criteria
- Higher initial investments.

Best Practices:

- Creating strong municipal network to address the information barriers. Communication and collaboration through municipal networks can help in accelerating the energy efficiency street lighting space.
- Peer Learning/Integrated energy efficiency tools
- Super-efficient Equipment & Appliance Deployment (SEAD) street lighting product evaluation tool

Key **Takeaways** of the Session:

- Increase transparency to promote investment in the sector
- Dissemination of best practices in the sector
- Integrate holistic approach towards public street lighting practices in the urban planning

4 SUMMARY OF PROCEEDINGS OF DAY 2 (20TH MARCH 2014)

4.1 Street Lighting EE projects- Global Perspective on ESCO-PPP based Implementation Practices and Procurement, and Lessons Learned

Panel Members for the sessions:

The session was moderated Mr Ashok Sarkar, Senior Energy Specialist, World Bank. Speakers included:

- Mr Piyachart Srikaew and Mr. Rungsiwut Muenya, Provincial Electricity Authority, Thailand
- Mr Andreas Thermann, Senior Project Manager, KfW India
- Mr Julio Morandi, Chief of Cabinet, Riolut Presidency, Brazil
- Mr Luiz Maurer, Principal Industry Specialist, IFC

This session covered the following **key themes**:

- Global experiences and initiatives in street lighting project implementation
- Aligning stakeholders to ensure project implementation
- Best practices & lessons learned

This session was dedicated to the global lessons and successful case studies for implementing street lighting projects around the world. Mr Srikaew and Mr. Muenya from Provincial Electricity Authority **showcased Thailand's** national level program to upgrade highway street lighting in Thailand. The Program is strategically aligned with Thailand's 20 Year Energy Efficiency Development Plan (2011-2030), also Alternative Energy Development Plan 2008 – 2022, as well as the World Bank Group's Country Partnership Strategy for Thailand. This program is designed to replace 450,000 High Pressure Sodium lamps with LED lamps. This program is linked with the Carbon Finance to make it financially sustainable. For the pilot program, 16,000 Lamps have been approved under the Cabinet-Council's conclusion. The implementation of the program faced many challenges like management of the different institutions and stakeholders, correct marking of the lamps through GIS mapping tools and coordination between different partner agencies at all levels. The Thai Provincial Electricity Authority is confident that the program once complete, will achieve substantial savings through reduced energy bills (approx. 63% Energy Savings) and reduction in GHG emissions (approx. 0.825 million tCO_{2e}).

Mr Thermann from KfW highlighted the challenges and success stories of street lighting projects in Germany. He presented the unique perspective covering **developed country's experiences** in implementing energy efficiency street lighting projects. Municipalities generally are burdened with critical budget situations and high power consumption along with the high electricity tariffs which makes this situation worse. Most municipalities are grappling with the issues of low penetration of retrofits. But things should improve in future as technology has matured along with the EU Commission regulation to replace all the inefficient public lightings till 2015. For this purpose KfW and other agencies have developed low interest programs for municipal bodies to upgrade their street lighting systems. These loans can be applied directly with maximum tenure of 10 Years and fixed interest rates for tenure. He showcased case study from City of Norden, Germany where municipal body implemented and they were able to achieve substantial savings (approx. 50% energy savings) from replacement of street lights.

Mr Luiz Maurer presented the **learning's** from Brazil and other Latin American countries on implementation of urban street lighting projects. Throughout the region new institutional and business models are being tested with some success.

Key Features of the energy efficient street lighting market in Latin America & Brazil:

- Good physical inventory – but in most cases deemed consumption
- Relatively reliable revenue source – street lighting levy charged through electricity bills
- Functional power sector is able to transfer funds to municipality – and get paid for electricity delivered
- In most cases, funds are earmarked and cannot be used to pay for other expenses of the **municipalities'**
- Somewhat robust legal arrangements to ring fence financial flows to private operators
- Diverse possibilities for operators to retain operational and energy savings

Currently the majority of urban street lighting infrastructure in Brazil is managed by the utilities. In large cities like Sao Paulo and Rio, the municipalities are now responsible for the O&M of the street light infrastructure. The new legislation in Latin America requires the transfer of street light assets to respective municipalities but this is not going to be easy and may face the challenges due to the lack of capacity at municipal bodies.

Key Takeaways from the session:

- Attracting private sector capital into street lighting sector requires a robust and transparent regulatory framework
- Addressing, inter alia, economic and quality of service regulations, criteria for granting concessions/ESCOs
- In Brazil, currently, no framework exists today and power sector regulator will have no jurisdiction after December 2014 – but experience from other countries in the region could be helpful.

4.2 Global Review of Policy Interventions and Incentives to Promote Energy Efficient Street Lighting

Panel Members for the sessions:

This session was moderated by Mr Ari Skromne, Senior Investment Officer, IFC. Speakers included:

- Ms Vineeta Kanwal, Assistant Energy Economist, Bureau of Energy Efficiency, India
- Mr Sabin Basnyat, Technical Specialist, IFC
- Mr Santiago Creuheras Diaz, Director General de Eficiencia Energetica e Innovacion Tecnologica, Mexico
- Mr Srinivasan Padmanabhan, Energy, Water & Environment Expert, India.

This session covered the following **key themes** as followings:

- How have policy incentives in different regions succeeded in promoting energy efficiency in municipal street lighting?
- Which countries have been most successful in empowering municipal authorities to take up energy efficient street lighting projects?
- How should policies focus on urban local authorities, financiers and investors?
- Best practices and financing mechanisms to overcome market barriers

Key challenge among policy makers across the globe is how to design and develop policy incentives to promote energy efficiency in municipal street lighting sector. While making their presentations, the distinguished speakers spelled out various policy models for energy efficiency incentives. Ms Kanwal described about Bureau of Energy Efficiency's proposed Risk Sharing Mechanism - Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE), which provides partial coverage of risk involved in extending loans for energy efficiency projects.

Mr Basnyat from IFC explained about a new innovative financing instrument, Energy Performance Insurance (EPI), designed to address the major financial barriers in the sector, which are:

- Small project size
- Operating expense versus capital expense
- Implementation risks

EPI can help service provider or end-user beneficiary to hedge against underperformance of energy efficiency installations. EPI indemnifies energy efficiency project owners if the expected energy savings are not realized. If the guaranteed energy efficiency savings are not met, the insurer compensates the end-user beneficiary for the shortfall.

Key advantages of EPI are as follows:

- Strong & reliable guarantee
- Facilitates financing by mitigating performance risk
- Removes contractor balance sheet liabilities and other obligations

- Third-Party confirmation of savings projections: **In-house engineering review and “stamp of approval” on project design**
- Insurance stands behind contractors guarantee
- In the event of shortfall, insurance covers contractors liability for repayment

Mr Santiago Creuheras Diaz presented the case study on National Project for Energetic Efficiency in municipal street lighting in Mexico. The objective of this project is to boost the energy efficiency through the replacement of inefficient municipal street lighting systems with efficient systems. Under this program municipal bodies can get Technical Assistance from BANOBRAS and at later stage Financial Assistance from CONUEE. With this program, municipalities do not have to spend its own money or commit resources that had earmarked for other areas. Other key aspect of this innovative model is the possibility that the projects benefit with an incentive from the Fund for Energy Efficiency and Sustainable Utilization of Energy (FOTEASE) by 15% of the total investment in the renovation of the street lighting of the municipality and up to \$770,000 USD to be used in social development programs. This provides incentive to municipal bodies to implement these models and have extra social benefits and funds to invest in cities infrastructure. The above policy and financial incentive model have been successful and role and scope is being increased by including social and development goals. It was informed during his presentation that now 32 cities in Mexico are in the process to implement TRACE tools for holistic and 360 degree program for developing energy efficiency roadmap in the municipal sector in the country.

Mr Srinivasan Padmanabhan during his presentation explained that institution building is must for creating awareness and building capacity to manage issues of energy efficiency. In addition to this he laid importance in having strong regulatory framework & support to foster technology change and encourage investment in the sector.

Key **Takeaways** from the Session:

- Increase the project size to make projects financially viable
- Reduce the implementation risk by upgrading infrastructure and strengthening the institution
- Have holistic approach for integrating energy efficiency in urban planning

4.3 The Private Sector Perspective – Dealing with Municipal Authorities, Challenges and Potential Business Models

Panel Members for the sessions:

The session was moderated by Mr Jeremy Levin, Senior Energy Specialist, International Finance Corporation. Speakers included:

- Mr Narasimhan Mohan, Philips India Private Limited
- Dr Satish Kumar, Schneider Electric India
- Mr R Sharma, Citelum India Private Limited
- Dr Datta Roy, Development Environergy Services Limited, India

This session covered the following **key themes**:

- Shared Saving Models vis-à-vis Annuity Model
- Dealing with the municipal risk and implementation challenges
- Perspective on mobilizing debt
- State of the industry

This session was devoted to understand the perspective from the private sector. Various manufacturers and service providers shared the insights about the challenges and issues faced by them while implementing the energy efficiency projects. Dr Satish Kumar from Schneider Electric India Limited raised his concern about not following the right process to achieve better performance from street lighting projects. He stressed that all round participation from various stakeholders is required to achieve the success in the sector.

Dr Satish Kumar also laid importance on developing partnerships between ESCO-Customer-Financial Institutions-Government. Roles and responsibilities should be articulated to have meaningful partnerships to achieve good results. He also shared his views on the failures of pilot projects. According to him most of the pilot projects are ill-conceived, redundant and have unsustainable project lifecycle. This makes industry lose interest in the process.

Mr R Sharma from Citelum India Private Limited also shared similar views as Dr Satish and added that technology should be neutral and futuristic. As technology is evolving at a rapid pace, it is important to bring the aspect of adaptability and up gradation of the system in consideration to the technology change. During his presentation he asked to change the way we look at the street lighting. According him, policy makers should bring entire gambit of public lighting system and should be holistic in its approach to achieve the goals.

On the similar note, Mr Narasimhan Mohan also shared similar views on the challenges faced by the industry. He added that due to the poor infrastructure, institutional issues and lack of the bankable projects has led to the loss of interest from financial institutions. To improve the prospects of the sector he suggested the following:

- Government as an early adopter;
- Accord infrastructure status for energy efficiency street lighting upgrade projects;
- Introduction of concessional tax;
- Dedicated fund for accelerated street lighting upgrade programs;
- State guarantee to protect and insure ESCO investment;
- Policy directive to Financial Institutions to support ESCOs in large scale LED upgrade projects with concessional and long term finance;
- Tender conditions addressing execution and M & V challenges;
- Dedicated fund / budget support for infrastructure improvement;
- Selection of successful bidder based on field validated performance claims;
- Insistence on compliant products and systems from Bureau of Indian Standards (BIS);
- Contract based on connected load and annuity mode repayment.

At the end, Dr Datta Roy shared his frustration over lack of urgency among the stakeholders to make this sector viable. In his speech he commented that since last 15 years we all are discussing about same issues but made no progress. He suggested we should modify and simplify both pre and post bid stages of such projects. According to him, it is important to involve and have positive ownership from the project proponent and requires stable regulatory environment. He provided way forward and his perspective of improving the health of the sector as follows:

- Better preparation of projects before bidding-equipment replacement v/s service delivery;
- Draft contract should be part of bid document
 - Major issue of changing baseline-inevitable in case of municipal services-increasing coverage and improving quality of services-should be adequately addressed in the draft contract
- Project management
 - Time taken for getting endorsement of all ULBs proposed to be covered
 - Roles & responsibilities of stakeholders
- Private sector would succeed only when the business practice has been established

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- Role of PSUs such as EESL would be critical in establishing the business practice.

Key **Takeaways** from the session:

- Identify the champions and facilitators
- Ensure procurement and contracting is fast, fair and should use standard procedures
- Clear cut processes for baseline, audits, benchmarking performance
- Measure and verify (e.g. develop local application of IPMVP based on simple metering/EMS framework)
- Make payments within stipulated time specified in the contract

4.4 Closing Session



Speeches

Dr Ajay Mathur, Director General, Bureau of Energy Efficiency (BEE), India

Dr Mathur in his speech declared about his mission and vision to replace all the 33 million street lights in the country. He mentioned that there are various technical and financial risks associated with the street lighting projects, but BEE along with other organizations is looking for feasible solutions (i.e. performance contracting) and models to make this sector sustainable. He reiterated that LED street lighting technology is now mature enough to offer a superior option. According to Dr Mathur we should have certain level of agreement among the stakeholders with respect to the specifications to achieve standardization of LED procurement. On the issue of BEE supported ESCOs rating, he supported the idea but as the current pool of the ESCOs is small and this market is still evolving, he suggested that we should be careful and should not create barriers for new entrants and should encourage healthy competition. With this note he expressed his satisfaction from the learnings from this conference.

Mr Saurabh Kumar, Managing Director, Energy Efficiency Services Limited, India

Mr Saurabh Kumar in his address mentioned about the importance of having different implementation models for street lighting, as it is difficult to cover the entire municipal energy efficiency street lighting sector with a "one size fits all" type solution. Also the sector is still evolving and it is important to have few big success stories to encourage and attract private investments. He emphasized that standardization of the procurement process is necessary to achieve the scale and deepen the engagement with municipalities, BEE, Ministry of Urban Development and Ministry of Power.

He also requested to have some form of support from Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and advocated to include urban street lighting program under this mission. He also suggested industry needs transition and model should change from supplier based to service provider based model.

Mr Ashish Khanna, Lead Energy Specialist, World Bank

Mr Ashish Khanna informed that national policy structure is more or less in place but now requires trickling down to state level to facilitate the design and implementation of effective large scale energy efficiency programs. Mr Khanna also made his point about building the capacity of financial institutions to understand and support this sector, as this sector is still complex and fragmented. He talked about the initiatives taken by World Bank in India to enhance viability of the **sector's**.

- World Bank has proposed a Partial Risk Sharing Facility (PRSF) to be housed with SIDBI which will help cover financing risks and scale up implementation of energy efficient street lighting projects;
- World Bank is providing a technical assistance line to EESL under the PRSF activity;
- The technical assistance to EESL will include the critical component of standardization of baseline and M&V procedures.

Ms Isabel Chatterton, Regional Manager (South Asia), PPP Advisory, International Finance Corporation

Ms Isabel Chatterton in her closing remarks thanked to all the speakers, guests and participants in making this event a success and hoped that this Conference will be a good way to encourage participants to think about the challenges and solutions. On behalf of IFC, she also offered her support to the World Bank, Energy Efficiency Services Limited, Bureau of Energy Efficiency in solving the problems and overcoming the barriers in energy efficient street lighting sector.

5 CONCLUSIONS AND KEY RECOMMENDATIONS

Street lighting services present immense opportunities for energy savings due to their scale and visibility in the public domain. Public Private Partnership (PPP) based models such as energy savings performance contracting (ESPC) models – offered by energy service companies (ESCOs) or other energy service providers – have become common tools to enhance the sustainable use of energy through energy efficiency measures and have been used by municipalities and cities to implement street lighting programs in many parts of the world. The performance contracting structure has proved successful with municipal authorities in many developed markets such as France, Germany, UK and USA, as well as emerging economies such as Chile, Thailand, Brazil and Mexico. But actual project implementation and scalability of such projects is yet to be achieved. As, during the conference all the speakers from different backgrounds reiterated that until basic institutional development and capacity building is achieved, most potential in this sector will remain untapped. During the Conference, key common denominators for the failure of this sector were identified as follows:

- Non-development of reasonable and proper baseline data
- Improper Measurement and Verification Protocols
- Unrealistic terms and conditions of ESCO/PPP contract or tender bids

Though all the stakeholders identified key barriers and possible solutions to overcome, but the financing institutions and ESCOs still believe that the market is small and not very lucrative for investors to make investments. The small projects do not ensure adequate returns on their investments. Also, poor infrastructure and unrealistic expectations were seen as barriers by the investors and ESCOs during the Conference.

Project executions face political and institutional risks and uncertainties due the absence of defined procedures and protocols. The current capacity of municipal corporations and ULBs are also a matter of concern, and not enough to create solid baselines and follow proper O & M measures. These poses extra risk for stakeholders to under or overestimate the costs and savings. Financial constraints of the municipalities to handle these projects and the risks may also make these projects commercially unviable and non- bankable.

During the two days of deliberations at the Conference, it became clear that Government support in creating a policy and market environment for the design and implementation of meaningful energy efficiency programs is very important. It was also emphasized that number of participants from the municipal sectors should be encouraged to attend the meetings and conferences like this to develop an understanding about various models and learn from the case studies presented and discussed during the meetings and conferences. This is important for building the capacities of Municipal Corporations and ULBs. Summarized below are the key takeaways from the Conference to make the energy efficient street lighting sector more conducive for investments and to deliver on the promise to provide sustainable and energy efficient solutions to street lighting:

- There is a requirement to have concrete planning and design of energy efficiency programs after aligning with all the stakeholders;
- There is a need to investment in awareness creation, capacity building and handholding of city Governments;
- Government should be committed to reform of municipal street lighting management & practices
- Standardization of procurement methodologies, baseline setting methods, M&V protocols, etc;
- There is a need to introduce simplified and stable Standard Offer Programs (SOPs) for municipalities to design and implement street lighting projects;
- Capacity building at all levels of ULBs and municipal corporations;
- To fast track the knowledge transfer, the similar conferences/meetings should be organised in different parts of the country. This will also ensure higher involvement of ULBs and municipal corporations;

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- Documentation of process followed under different projects to learn from the good and bad examples;
 - Develop and make available design manuals and guidebooks for ESCOs, State agencies, ULBs, vendors, financing institutions and technology providers;
 - Partnerships with international agencies and multilateral agencies to ensure knowledge sharing from international examples to add value to the projects in India.

ANNEXURE I & II