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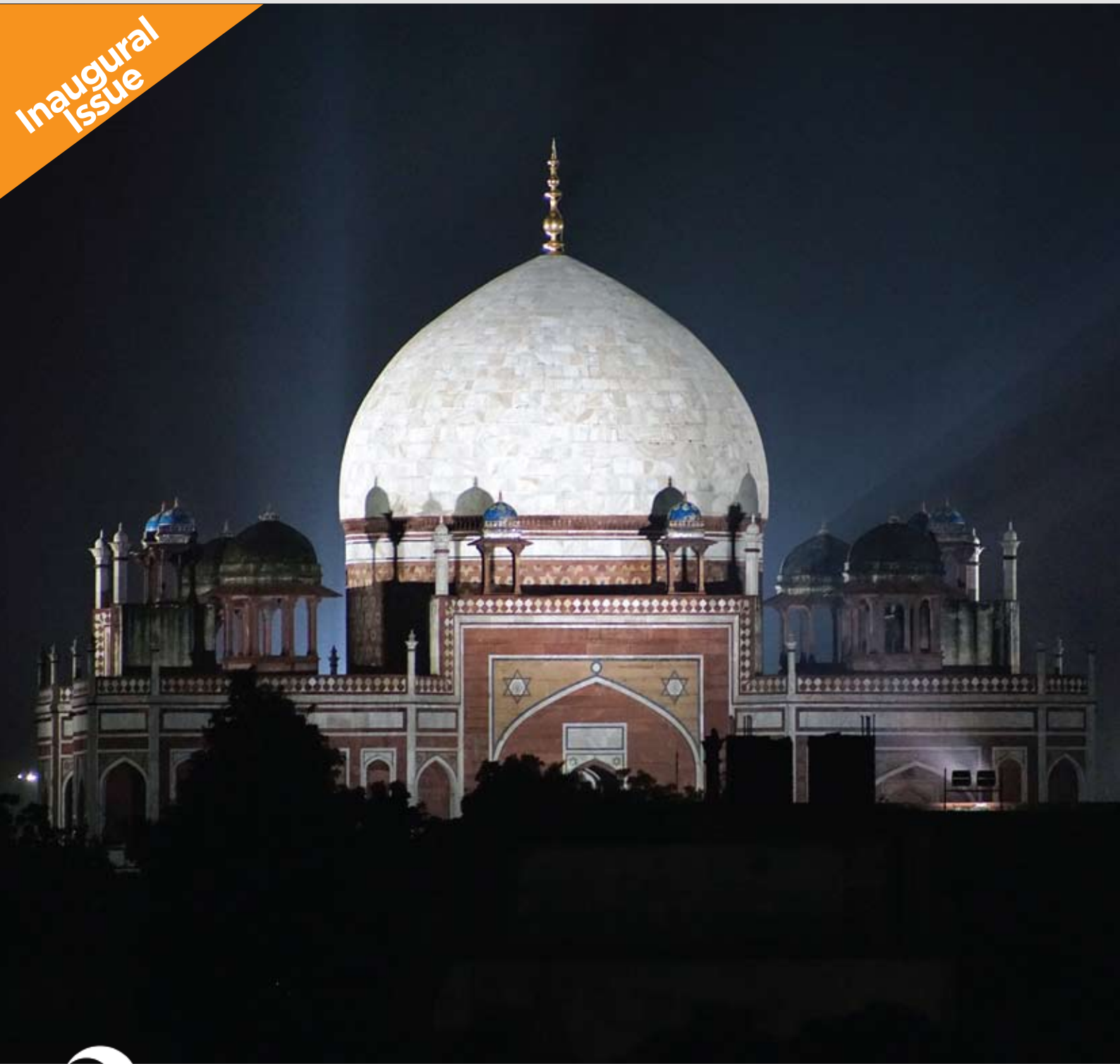
IllumiNation

OCTOBER 2018

THE LIGHTING MAGAZINE

Inaugural Issue



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OCTOBER 2018

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THE ELCOMA STORY

ABOUT ELCOMA

On 29th June, 1970, the electric lamps and components manufacturers in India founded "Electric Lamp and Component Manufacturers Association of India" (ELCOMA), representing the entire lighting industry. The main purpose founding members had in mind was to establish liaison with government bodies and to support each other in matters connected with lighting industry.

ELCOMA, representing the Indian lighting industry aims to act as an important link to support each other in matters connected with lighting industry, to promote and develop co-operation among the manufacturers of electric lamps and components and to further facilitate the overall interests of its members. The association has been helping upgrade the knowledge and technical capabilities of its members through liaison with other relevant organizations both in India and abroad. In earlier years, ELCOMA successfully drew attention of the government to the difficulties faced by the members and highlighted developments in new light sources and energy saving solutions to the customers. During 80's and 90's extensive development and introduction of various types of energy saving lamps offered wide range of choice to the customer and offered indigenously manufactured lamps for all type of applications, thereby saving precious foreign exchange when the country needed it most. ELCOMA can be proud of the fact that inspite of inflation, energy price increases and other price rises, the price of lighting products have become more cost effective. With the success achieved by the Association, new entrants to the lighting industry from organized as well as small sector readily became members and took active interest in the growth and development of the lighting industry.

FUNCTIONS AND SERVICES

The main objectives of ELCOMA and its functions and services are as under:

- To enable manufacturers of lamps and components to federate or cooperate by becoming members or associates of the Association, either by themselves or their nominees or act as their representatives or spokesmen for such manufacturers.
- To promote and develop co-operation among the manufacturers of electric lamps and other ancillaries and business and to further facilitate the manufacture of products in particular.
- To promote the consideration and discussion of all questions affecting lamp industry and all ancillary and allied trades, and every branch of such trade and to generally watch over and protect the interest of persons engaged in the manufacture of such products.
- To diffuse among its members information on all matters, affecting the lamp manufacturers to print and publish, issue and circulate such papers and periodicals, circulars and other material relevant as may be seen conducive to any of these objects.
- To promote the distribution of products to all consumers throughout India by the members of the Association and with the object of fostering and promoting espirit de corps among the lamp manufacturers in India.
- To collect information and circulate and publish the policies and activities of the Association from time-to-time by pamphlets, circulars, or news bulletins.
- To organize exhibitions, conduct seminars, conferences, symposia, lectures and publish its official bulletin, 'ELCOMA' News Letter and make known to public the activities of the Association.
- To provide to its members statistical information pertaining to lamp industry and keep the members informed regarding latest technical development, quality control and achieve standards and specifications.
- To be in close touch and establish liaison with various institutions and organizations and government bodies connected with the development of Electric Lamp and Component Industry and to carry continuous dialogue with the govt.
- To make representations and to deal with the subjects that affect the Electric Lamps and Component Industry and find ways and means of solving the problems and difficulties relating to subjects like finance, import-export, supply of raw materials, machinery and spares, taxation (all types-customs, excise, octroi, sales tax and GST etc), industrial relations, procedural delays, factory enactments, power, transportation etc.
- To carry out such acts as maybe required for the benefit of the industry to upgrade themselves in terms of knowledge/technology etc.
- To educate and inform the consumer on the developments in the industry and help the nation to save energy and costs through introduction of better products and applications.
- To act as a link between lighting and other industry association in India and worldwide in matters concerning common interest.

FROM THE EDITOR'S DESK

Since ELCOMA has spread its wings in various new activities like introduction of new technology, preparing India centric standards, interacting with International stake holders, coordinating with government on issues of taxation, policies and orders, undertaking trainings on streetlights, appliances, soft skills, safety and security etc, it was thought it is imperative to start a communication platform to disseminate such information among stake holders.

We therefore decided to publish a bi-monthly magazine for sharing all information related to the Lighting Industry in India and abroad.

I am proud to say that the idea of printing this magazine was conceived on 24th September 2018 and it was decided to launch it on 12th October. During this short period of 2 weeks, we had to mobilize experts on Lighting, assemble specialists in magazine publishing, print media design, copywriting, motivate ELCOMA members to share their information and articles on relevant events and projects, arrange for advertisers etc., and many more activities than we had ever imagined.

I am thankful to the entire team of ELCOMA and our consultants, without whose unstinted hard work of 2 weeks, we would not have been able to complete and print the magazine in the given timeline. The final product is in your hands today.

I will be happy to receive feedback from the readers at shyamsujan@rediffmail.com and as always will strive to ensure that the best of Indian Lighting industry and its achievements are made available to you through this medium in successive issues.

Hope you will enjoy reading this magazine and also contribute your ideas to enrich this publication.

SHYAM SUJAN
Secretary General, ELCOMA

HIGHLIGHT OF THIS ISSUE

In an endeavour to glamorize the skyline of historic Delhi, Havells India Ltd has partnered with the Aga Khan Trust for Culture and Archeological Survey of India. As part of this initiative, Humayun's Tomb has been illuminated with Havells' energy efficient Projector lights from its Colorscape range of Architectural RGB lighting. Projector lights are ideal for long distance illumination with high accuracy, fitted with high precision lenses offering best-in-class beam angle of 4.5 degrees. Each light is 316 W providing a saving of around 90% energy usage when compared to conventional products installed at Humayun's Tomb since 1999.

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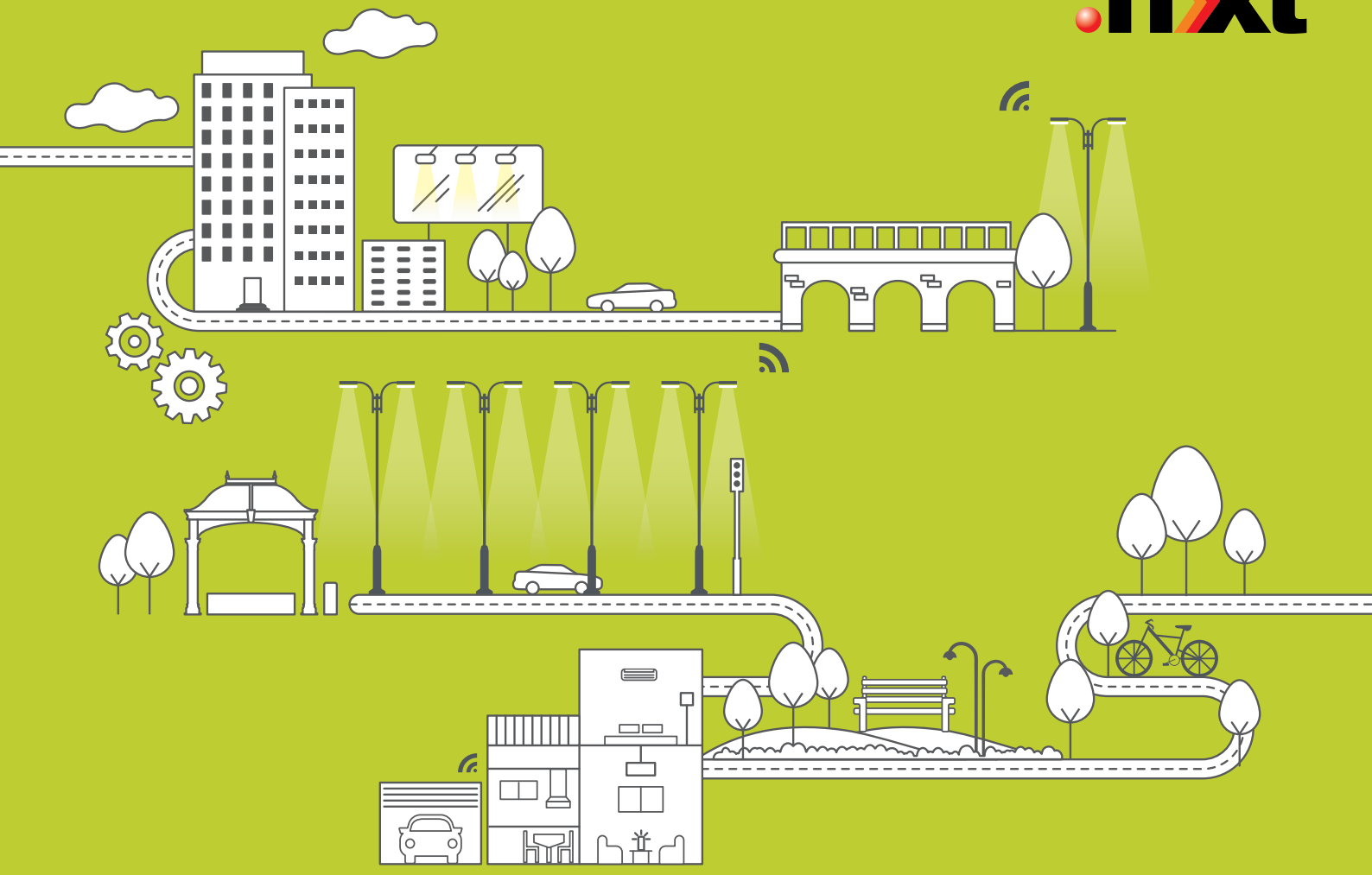

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Bajaj Electricals Limited is at the forefront of IoT innovation, delivering integrated digital offerings based upon Smart Luminaires. The smart lighting system allows remote and central management of floors or groups of buildings. Operators can view lighting schemes, energy consumption, room occupancy on a dashboard and then decide whether and how to alter lighting schemes or even reassign building space. Meaningful data travels between the lights and the cloud server through a combination of wireless and wired internet hops, assisting commercial and residential properties to streamline operations and costs.

By paving the way for convenient and futuristic lighting system, our Outdoor Lighting Solutions have developed the latest technology, creating smart, secure and connected areas; that not only increase the visibility at night but also keep a city looking picturesque. The wide range of street, area and landscape lights have features like smart streetlights, real time clock (RTC), dimming, remote diagnosis and many more.

Moreover, Bajaj Electricals has leveraged technology and further enhanced its streetlight offering to club this with city surveillance, parking management, traffic management, environmental monitoring and e-governance modules.

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ELCOMA PRESIDENT'S MESSAGE

LOOKING BEYOND LED

I am pleased to release the inaugural edition of "IllumiNation - The Lighting Magazine of ELCOMA" which is being launched on 12th October 2018. ELCOMA Secretariat has put in lot of efforts in compiling this magazine and has prepared this volume within record 2 weeks time. Lighting industry in the last few years, has been undergoing a massive change as LED is penetrating at Lightning speed, while, all other conventional lighting sources are getting marginalized and extinct. This is happening all over the world. In India, however, pace seems to be faster than most of the other developing countries as the Central Government is proactively supporting replacement by creating a public distribution system for LED retrofit lamps through EESL. While this initiative of Central Government, has helped the industry to scale up the business operation faster and bring down the input cost, resulting into reduction of selling price but on the flip side, the market has become more competitive due to reduced consumer price making LED products more affordable. This in turn, reduces manufacturing margins which industry is trying to consolidate.

ELCOMA prepared a Vision 2020 document which programmed to reduce power consumption in lighting sector from present 18% to 13% thus saving more than 27000 Megawatt power. The government in 2014 adopted this plan and appointed Energy Efficiency Services Limited (EESL) to execute the same. Owing to better performance, existing street lights are being replaced with LEDs. Many states are joining hands with EESL while industry is opting such replacement. This would not only reduce power consumption but also improve longevity and improved lighting level at night. It is challenging and competitive time for the industry and existing lighting companies and new players are entering this arena with newer competencies and more cost-effective business models. ELCOMA is looking at Futuristic Intelligent Lighting which is a challenging segment and we are preparing to face this. ELCOMA, as usual, shall keep playing its pivotal role of bringing awareness on energy conservation by organizing various workshops, seminars and exhibitions to promote efficient lighting. No publication can be successful unless it meets with the requirements of the industry. I request you to please interact with the ELCOMA Secretariat with your suggestions and ideas to improve the magazine and make it more informative in future. I thank all ELCOMA members, advisory board and editorial board members, advertisers, contributors of articles, printer whose support has enabled us to bring out this magazine for all stake holders.

RAJU BISTA
President, ELCOMA

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WORDS OF ENCOURAGEMENT

"I am glad to know that ELCOMA is publishing its own house journal IllumiNation". The magazine will focus on lighting industry, new technology and various events happening around the world. I hope that the magazine will be helpful to all stakeholders equally including the government. I am also taking this opportunity in releasing the first inaugural copy of the magazine today. My best wishes to the entire lighting industry."

— Meenakshi Lekhi, Member of Parliament, Lok Sabha

"I would like to congratulate ELCOMA for starting the Lighting Magazine in October 2018. I hope that a journal like this is very informative and useful for the stakeholders in Lighting industry globally. ISA will be willing to contribute information on technology and other events happening around the world. We wish the best for a great success for this publication."

— Dr. Jianlin Cao's, President, ISA

"The lighting industry continues to experience huge challenges and opportunities as it undergoes substantial technological change. ELCOMA's new Lighting Magazine publication will assist in informing the industry of these developments. I warmly congratulate ELCOMA on its initiative and wish the publication every success."

— Russell Loane, President, Global Lighting Association

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LED FILAMENT BULBS – THE NEXT GENERATION OF LED LIGHTING

With aesthetic appeal and significant performance advantages, LED filament bulbs represent a flawless intersection of form and function

An LED filament light bulb is an electric light bulb which produces light with an LED that is shaped to look like the filament of an incandescent light bulb. The light bulb is supplied with electric current by feed-through terminals or wires embedded in the glass.

An LED filament type design light bulb was first produced by Ushio Lighting in 2008, intended to mimic the appearance of a standard Edison light bulb (Incandescent Lamp).

The most common use of filament style lamps is in retro lamps, i.e., clear glass lamps that allow the "filaments" to be seen.

THE FILAMENT BULB MARKET

The worldwide LED filament bulb market size is expected to exceed 600 million bulbs by 2018 (Epistar Market Analysis Report) and has immense potential in the LED lighting market in European markets.

The LED filament bulb has become popular in the lighting market mainly because buyers and consumers in decorative lighting, art lamps, chandeliers and classical luminaires are replacing conventional light sources (including filament bulbs and halogen light sources) with LED lights. Traditional LED bulbs have failed to meet the aesthetic demands of traditional luminaire manufacturers, which is paving the way for the emergence of LED filament bulbs in the market. Ideal applications of LED Filament bulbs include Hotel & Restaurant Lighting, Residential Lighting, Retail Lighting and Accent Lighting.

Currently in India the demand for LED filament bulbs is for C, A and G Type bulbs. Most consumers for LED filament bulbs in the decorative lighting market are looking for aesthetics rather than performance. The look of the bulb is more important than the performance. Except for a couple of large brands that have initiated pilot manufacturing of such bulbs, most LED filament bulbs are being imported into India.

BEE in its recent clarification to ELCOMA dated 2 Aug 2018 has confirmed that LED Filament Lamps are presently excluded from the scope of BEE's S&L program for LED Lamps, which paves the way for larger adoption of these energy efficient lamps into consumer homes.

With aesthetic appeal and significant performance advantages, LED filament bulbs represent a flawless intersection of form and function — vintage look and advanced engineering. Coupled with the market projections for the coming years, LED Filament Bulbs are surely the next generation in the evolution of LED Lighting.

Editor's note:
ELCOMA has, for a long time, been striving to find a solution to replace Incandescent Lamps with a suitable alternative. Due to price parity, CFL or LED Lamps are not suitable as a replacement for Incandescent Lamps. But ELCOMA is working with several manufacturers and design houses to design LED Filament Bulbs with lifespan of 5000 hours (5 times the life of an Incandescent Lamp), which can be manufactured at present automated factories. If successful, this Lamp will be available to consumers at an affordable price. Calculated on the basis of value for money, the proposed new LED Filament Lamp would have be 5 times the life at 2 times the price of present Incandescent Lamps. Energy wise, such lamps have an ability to save more than 90% power and provide efficacies greater than 120 lumens per watt.

Author: Krishan Sujan is COO, MLS India Pvt. Ltd. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

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ISA "GLOBAL SSL SHOWCASE TOP 100"

Presenting the most outstanding, award winning applications of the Solid State Lighting (SSL) field over the last few years, including Indian winners at Global SSL Showcase TOP 100

Solid State Lighting is developing and applying globally with an unprecedented speed and it keeps bringing surprises for us: saves more energy, better illumination, easier control, better reflected the objects being lighted, expanding and widely application areas etc.

International Solid State Lighting (SSL) Alliance (ISA) is an international not-for-profit organisation. It is an alliance of international, national and regional alliances and associations, renowned universities and institutions and leading companies in the SSL field. It is an independent legal entity which aims to enhance public-private partnership and intensify global cooperation to accelerate and foster the sustainable development of SSL. ISA's members comprise not only large and small companies, but also relevant academic institutions, professional societies and associations.

ISA aims to promote the sustainable development of Global Solid State lighting (SSL) industry, demonstrate the R&D achievements, the application of technology innovation, as well as the comprehensive results of best design, reliable products and best installation, to increase the influence and visibility of SSL products and public awareness.

Each year ISA organizes a Global SSL Showcase Top 100 which awards the best SSL application projects worldwide. The award of TOP100 was launched in 2012 and till date 58 extraordinary and influential SSL showcases have been selected as the winners.

TOP100 aims to recommend and manifest the best SSL application projects worldwide by demonstrating the SSL R&D achievements, the application of technology innovation, as well as the comprehensive results of best design, reliable products and best installation to promote the characteristics and advantages of SSL, and help people acquire more feel and experiences, and increase the influence of SSL to speed up the promotion and application of SSL in depth and width around the world.

In TOP100, companies present their exquisite design, or reliable products, or high quality installation, improve their global visibility and influence, and add credibility for the development of the companies to open up broader markets.

This year 18 applications in the fields of Agricultural Lighting, Health Lighting, Smart Lighting - Indoor and Smart Lighting – Outdoor were received and shortlisted for the award which was adjudicated by ISA members across the world.

The Indian entry by Osram Lighting Private Limited which showcased their Smart Lighting project for the Jaipur Walled City won an award at this prestigious international forum.

Indian manufacturers that have been awarded in previous editions of ISA Global Top 100 are Crompton, Wipro and Surya Roshni.

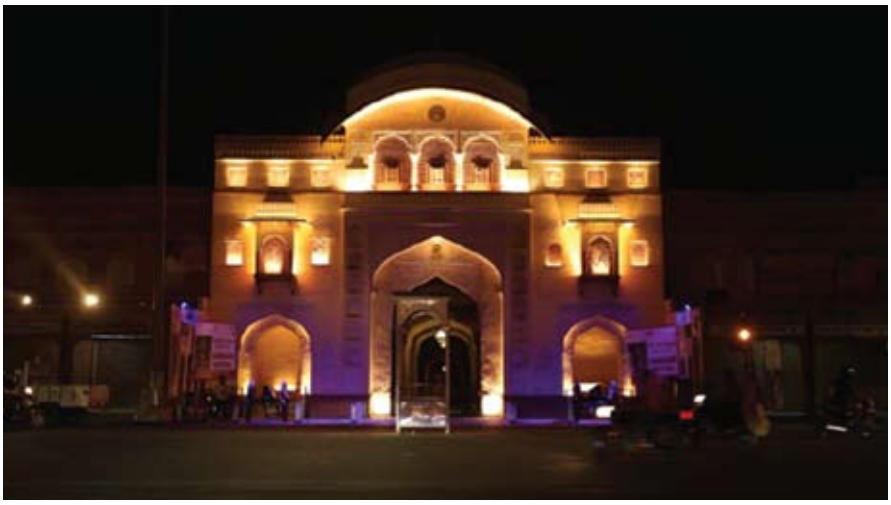
HOW TO APPLY FOR "ISA GLOBAL SSL SHOWCASE TOP 100"

- Any organization in the SSL industry can apply
- Applicant must be from SSL companies, or designers, installers that mainly related to SSL
- Fill out application forms, attach high resolution showcase photo, email to ISA secretariat (mingli@isa-world.org) or contact ELCOMA India Secretariat (nikita@elcomaindia.com)

PROJECT SHOWCASE: JAIPUR WALLED CITY BY OSRAM LIGHTING PRIVATE LIMITED

Project Overview

The historic City of Jaipur has always been a major tourist attraction and under the Union ministry of tourism's Swadesh Darshan scheme, the Walled City has now been lit up to make night tourism attractive. The aim of the project carried out by Osram Lighting is to enhance the urban quality of



Walled City and create an opportunity for visitors to enjoy the streetscape and bazaars well into the night.

The entire façade lighting of major arterial roads of Chaura Rasta, Tripolia Bazaar and Johri Bazaar along with the major urban nodes of Badi Chaupar and Choti Chaupar and all private and government buildings were thematically illuminated to enhance night tourism.

The success of this project transforms Jaipur city into an iconic site at night as it is during the day.

Technical Information

In order to rejuvenate the ancient city with modern technology in a 5.7 km stretch of the city comprising 425 heritage monuments, a total of 6613 pieces of lights were used. 30 different type of lights were designed in 15 different variants of beam angles and 8 different color temperatures to restore life to the architecture.

The project used high-output and energy-efficient dynamic LED light sources with superior performance on energy saving. The lighting solution in the project achieved an energy saving of at least 50% (0.3 kW/Building or 0.02kW/Meter) when compared to the solution outlined in the initial design proposal.

PROJECT SHOWCASE: NIGHTSCAPE LIGHTING PROJECT OF CHIYOU JIULI CITY, PENGSHUI COUNTY, CHONGQING

Project Overview

The buildings of Chiyou Jiuli City are uniquely stilted buildings built on the footsteps of mountains. There are seven pavilions at the highest point of the project, known as the Seven-star Pavilion, serving as the skyline of the entire project. Besides keeping a unified color temperature selection and representation techniques with other buildings, the Pavilion adds to the dynamic effect and increases the visibility of the project from a distance. In the center of the square, through the prominent lighting of the buildings around the square, the effect of a theater full of levels and light and shade transition has been created.

Technical Overview

In order to achieve the effect of night landscape, golden LED floodlights with a wavelength of 585nm were used on the top tile surface. The building facade uses 3000K color temperature LED line type wall washer lights, to enable clearer and crisper hierarchies of the buildings within the complex. The exterior of the LED luminaries is painted according to the facade of the building so that they can be integrated with the building during the day.

LED lamps, owing to their low-temperature characteristics, were specifically selected in order to prevent fire of wood materials used extensively in the construction of these buildings.

The total electricity consumption of this project is 258.5kW, and the overall power density value is 1.68W/m2.

PROJECT SHOWCASE:

THE MANGROVE SANYA HAITANG BAY

Project Overview

Haitang Bay is rich in primitive beauty, making it a unique attraction on the south China map. The Mangrove Sanya hotel building is located right by the Haitang Bay, with unique natural conditions.

The special requirement from the hotel owner was to preserve the architecture's aesthetic integrity, concealing all lighting products and making them invisible to the human eye. The architectural plane from ground to the 17th floor expands gradually by storey, and diminishes immediately starting from the 18th floor up to the 31st, offering unique confidentiality and exclusive enjoyment. Arc-shaped terraces stretch at one floor after another, with RGB-LED lighting tubes concealed between structural gaps outline the silhouette of overall architecture. RGB-LED intelligent control system has been adopted to manage content generating and video mapping, creating a visual feast at night together with surrounding lighting environment.

The lighting design focused on beautifying the main building using luminaires to outline its structure with a touch of art painting and green awareness. The lighting effect echoes with the surrounding and has been become part of the environment, as if it was a local born who breathes and dreams with the ocean.

Lighting design of the Mangrove hotel now lights up the coast with marvelous effects, and turns the building into an embodiment of art and fashion, redefining luxury in architectural design. The architects used the light as a paintbrush, turning the façade of the building into a shining sail. The design absorbs local elements, including waves, waters and clouds, and local distinctive culture, establishing a symbolic site full of art and style.

Technical Overview

About 20,000 OSRAM and Traxon luminaires have been used in the 31-storey architecture. All luminaires have been incorporated into the structure of the building. The products, pipes and wires have been all concealed and invisible to the human eye without sacrificing on lighting brightness and the magnificent effect.

PROJECT SHOWCASE:

EESL STREETLIGHT RETROFIT PROJECT, BHILWARA, RAJASTHAN, INDIA BY SURYA ROSHNI LIMITED

The project was initiated by the Government of India Institute under EESL to reduce the carbon footprint and to align with the Vision 2020 document propagated by ELCOMA in 2016. The objective was to reduce the high demand of electric energy by introducing energy efficient streetlights.

Surya Roshni retrofitted over 31,000 streetlights in the city of Bhilwara by replacing the existing conventional lights with energy efficient LED Streetlights providing same or better Lux Levels with over 50% reduction in power consumption

Since it was one of the first such projects of its kind in India, project design had to consider the adverse Indian climatic conditions and less than ideal power conditions. The ambient temperature in India ranges from -10°C to extreme temperature of 50°C. India also sees drastic changes in humidity and precipitation across the country not to mention large amounts of dust that are always present in the atmosphere.

Special all-weather products were designed to withstand the most extreme environmental and electrical power conditions as well as thermal/endurance testing was done in addition to Ingress Protection to prevent entry of humidity and dust.

Special features of the products deployed included implementation of a Surge Protection Device which was designed to protect the devices from voltage spikes. The driver or electronic control gear was designed with Active Power Factor Correction circuit which maintains input and output parameters such as THD, Power factor, voltage and current constant for a wide voltage range of 140 – 270V without effecting the light output of the luminaire. For additional safety, overvoltage shutdown feature was added which switched off the light if input voltage was greater than 300V and resumes operating condition once input voltage becomes normal.

Surya also designed and implemented CCMS (Central control and smart monitoring system) which is aimed at providing remote fault detection and preventing power theft

The CCMS provides ability to communicate securely with via cellular network with each installed device and to schedule or switch ON/OFF each device remotely. It also helps in determining faults at switching point level and provides data accessibility to stake holders through a cloud server.

PROJECT SHOWCASE: CROMPTON GREAVES CONSUMER ELECTRICALS LTD - SSL LIGHTING FOR GMR-RAJIV GANDHI INTERNATIONAL AIRPORT HYDERABAD

GMR Hyderabad International Airport Ltd (GHIAL) has become south India's first and India's second airport having complete apron lighting with energy efficient LEDs as a result of the project. The scope of the project was to change its existing conventional lighting with SSL for entire main apron area, supporting apron area, taxi bay, service road at air side and parking areas. Previously the apron area and parking area was illuminated by MH lamps which were retrofitted with high end LED floodlights.

The biggest challenge of the project was to provide uniform, glare free lighting with minimum wattage luminaire for a critical application at a busy International Airport in India.

A total of 449 LED floodlights have been installed for this project.

For Apron area, there 22 numbers of 30 meter High Mast we installed. The maximum distance covered with one Highmast was 150 metres. Illumination level was provided as per ICAO standards. To provide adequate illumination levels, higher efficacy LED chip was used and the luminaire was designed

in such a way so that maximum lumens emitted from chip was used in the right direction.

Since the project was a retrofit solution, the number of Highmasts remained the same but the wattage of the total fixtures was drastically reduced. Total energy saving of almost 75% has been achieved with annual consumption down to almost 0.6M KWH from previous level of 2.4M KWH.

Compiled by IllumiNation editorial board with the help of information provided by ISA.

NATIONAL INSTITUTE FOR TECHNICAL SKILLS

ELCOMA has appointed National Institute for Technical Skills as its authorized training partner to offer various programs designed by ELCOMA

ELCOMA offers various technical skill development training programs for government and industry for products and services in lighting and electrical appliances domains.

Currently we offer technical training programs for LED Streetlights, Solar Streetlights, Domestic Electrician, Health & Safety and Refrigeration & Air Conditioning. These programs have been developed along with Power Sector Skills Council (PSSC) and Electronic Sector Skills Council (ESSCI) based on National Occupation Standards (NOS) of National Skills Development Council (NSDC). We are also developing two new programs in Lighting Design and Intelligent Lighting.

ELCOMA has appointed National Institute for Technical Skills as its authorized training partner to offer various programs designed by ELCOMA. Under the supervision of ELCOMA, NITS is being mentored by Industry to nourish the skill of people working in lighting and related industries.

We have trained over 1500 field personnel for EESL in Street Light National Program (SLNP) across India in the past 2 years and have also conducted Occupational Health and Safety (OHS) programs for EESL and industry personnel.

ELCOMA/NITS have already published three training guides for candidates attending these programs.

PROGRAMS OFFERED:

1) **Streetlight Installation and Maintenance Training Program for Streetlight Technicians/Supervisors:**
   Introduction to Lighting and Lighting Industry
   - Basics of Road Lighting and Design
   - Installation and Commissioning
   - Operation and Maintenance
   - Site Safety
   - Health and Safety
   - Field Demonstration and Practical Training

2) **Solar Streetlight Installation and Maintenance:**
   Introduction to Energy

   - Overview of Solar Power and Lighting
   - PV Technology
   - Battery Technology Lighting and its Design
   - Installation and Commissioning
   - Operation and Maintenance
   - Health and Safety
   - Field Demonstration and Practical Training

3) **Domestic Electrician (+ Home Appliances) Certification Program:**
   Introduction to Energy and its sources
   - Electricity and Power
   - Installation of Domestic appliances and Electrical Equipments
   - Repairing and Troubleshooting
   - Safe Operating Methods and Safety at Work
   - Hands on Assembly and Repair of Appliances

4) **Refrigeration and Air Conditioning:**
   Introduction to Energy and its Sources
   - Electricity, Thermodynamics and Power
   - Heat Management Installation of different types of Refrigerators and AC & their Commissioning
   - Operation, Repair and Maintenance
   - Site safety and safe operating procedures
   - Practical Site Installation

5) **Health and Safety Training:**
   Safety and its overview
   - Occupation Health and Safety
   - First Aid
   - Fire Safety
   - Job Safety Analysis Documentation and policy making
   - Safe working practices
   - Handling Emergency

6) **Lighting Design:**
   Introduction to Lighting Theory
   - Overview of Lighting Design Standards
   - Understanding Lighting effects
   - Lighting Applications
   - Lighting Designing Software and introduction to DAILux
   - Lighting Planning and Schematic Designing
   - Development of Lighting Design
   - Photometery and its analysis Post Occupancy Evaluation
   - BOM calculation
   - Case Studies

7) **Smart Lighting and CCMS:**
   Introduction to Lighting
   - Lighting technology and its integration with IoT
   - Smart Lighting trendsSoftware and Hardware Architecture
   - Introduction to Communication technologies (Zigbee, LoRaWAN, RF based, GSM, GPRS)
   - Introduction to Li-Fi
   - CCMS (Centralized Control and Monitoring System)
   - International and National Case Studies
   - Health and Safety.

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SMART LIGHTING - LEAPING INTO "WIRELESS FUTURE"

Future of lighting is Smart lighting and undoubtedly wireless solutions will be the sought-after platform

The lighting industry, over the past three decades, has witnessed several "innovations", at a regular pace - incandescent to low voltage halogens, fluorescents to compact fluorescents, high pressure mercury vapour to high pressure sodium vapour to ceramic discharge metal halides, induction lamps, inductive ballasts to electronic drivers. However, the end result and effect was very straightforward – improvement in energy efficiency, and at best, some enhancement in colour quality. Even dimming was not possible with all lamp types. The user had to be satisfied with "fixed lighting" system- fixed lumen output, colour temperature, and fixed configured lighting system. No matter what your mood or décor or activity is, lighting was always same everyday and for every occasion.

Lighting controls, was possible only with dimmers, and with incandescent lights and major application was in stage lighting. With miniaturisation, dimmers became popular in homes, hotels, banquets etc. With introduction of 1-10 V analog dimming fluorescent ballasts, followed by DALI digital ballasts, lighting control systems moved into commercial application. Users could "dim" the light to lighting levels of their choice, with remote/wall mounted hand-held devices. Automatic controls with sensors (occupancy /daylight/timers), allowed users to configure lighting systems and automatically switch ON/OFF or dim as per the situation. Such wired control systems called for detailed pre-installation design and engineering, complicated control wiring, arduous commissioning, expert maintenance. This gave limited flexibility to users for any changes/alteration, as they could not add any additional light fitting at a later stage. The protocols for controlling were mostly proprietary, making the systems closed and rigid. Lighting Control market did not really "grow" to that extent in India, for reasons as stated above

LED IN GENERAL LIGHTING – INITIATING THE DIGITAL DISRUPTION

With introduction of LEDs in general and architectural lighting, the world of lighting experienced a overwhelming transformation. LEDs produce light "electronically", is compact, has sharp, collimated beams, generates primary colours which can be combined to shades of white and millions of colours, is controllable, can be integrated

in building materials …and all this at very low power. LED lighting quantity and quality specifications improved significantly year on year, paving way for faster adoption. There are more options in controlling lights. RGBW LEDs along with DMX controls changed the fabric of Architectural lighting. In Indoor spaces, spectral tuning with shades of white became an option, paving way to innovative lighting solutions which are more human centric. However, the wired control systems still remain quite complex to engineer, install, commission and maintain.

SMART LIGHTING - EMPOWERING USERS, ENABLING WELL BEING.

The world around us is changing rapidly. Users look beyond functional needs and demand greater comfort, ease of use, higher speed of response, frequent design renewal, tremendous flexibility and look for features to enhance their image, style and quality of life. Further, the speedy proliferation of the Smart phones in our lives and affordable data communication, started driving significant behaviour change and offered users simple tools to meet their aspirations of a better quality life. Smart technology is user centric, simple to use, responsive, and getting affordable. Smart technology has changed the way we communicate, shop, watch movies, or a cricket match, make our daily purchase, order food, or book a cab. Smart technologies in every sphere is being driven by mobile based App and becoming wireless.

Thus the Lighting world is seeing a silent second renaissance. The disruptive technologies which initiated a few years ago, is seeing greater momentum and ushering a new age in lighting industry. This combined with the rapid growth of wireless communication technologies, mobile based Apps and innovations in LED chips and peripheral electronics make App controlled Wireless Lighting a practical and affordable solution. This is allowing the industry to produce unthinkable control over lighting environments and integrating into larger eco-space of Internet of Things, with other tools like HVAC, security, etc. Such lighting and such systems not only give control over the lumen output, they can control light colour. Smart lighting systems also allow dynamic and responsive recalibration of lighting zones, and regrouping and grant insight into how buildings and spaces are utilized. Additionally, systems can be integrated with other tools, such as security and HVAC, to create a well balanced ecosystem within each facility. While the total integration in a wireless environment may not be ready yet, but rapid progress in this field, quite establishes this trend especially in indoor spaces. The growing momentum behind these new technological developments are pushing us into a world where not only can light be controlled, but delivers value beyond lighting

SMART LIGHTING – TECHNOLOGY OVERVIEW

Simply put, smart devices and lights have inbuilt brains and processors, They talk to each other in specific languages and protocols and can integrate into other non lighting ecosystems. The commands are given through Mobile based App which can also be transferred into other wireless interfaces.

The common wireless communication protocols (currently being used mainly in indoor spaces) in lighting, are

a. **Bluetooth –** a global 2.4 GHz personal area network for short-range wireless communication. Device-to-device file transfers, wireless speakers, and wireless headsets are often enabled with Bluetooth
b. **BLE -** a version of Bluetooth designed for lower-powered devices that use less data. To conserve power, BLE remains in sleep mode except when a connection is initiated. It hardly consumes any energy but has low range of reach
c. **BLE Mesh –** overcomes the shortcomings of BLE by using a flood network. It is based on the nodes relaying the messages to other nodes. This is the latest introduction and is gaining to be the most accepted protocol especially in Industrial ioT and lighting applications, It is forecasted that BLE mesh will be the strongest contender in indoor spaces
d. **Zigbee -** a 2.4 GHz mesh local area network (LAN) protocol. It was originally designed for building automation and control—so things like wireless thermostats and lighting systems often use ZigBee. It requires additional devices like a router hub to set up the network
e. **WiFi –** a star network where there's one central hub and all nodes or devices connect to it. This star topology makes it easy to add or remove devices without affecting the rest of the network most popular for remote access. The network consumes a lot of power and needs repeaters to improves signal strength and **Zigbee, WiFi and now BLE Mesh** are the most common platforms being used in wireless lighting automation. In the coming days, we expect to see promoters and detractors of each platform just as we see between Android and iOS.

The attractiveness of Wireless App operated system is because of the following

1. **User centricity –** Simple to configure, easy to use. In such systems, no expert pre engineering, wiring and complex distribution boxes are needed. Most wireless systems are plug and play. Time required to commission a wireless control system is fraction of what an wired control system require. This is also the easiest way to upgrade existing LED lighting installation
2. **Flexibility -** User can create their own group and change it as per requirement. It is easy to add new light fitting to the smart network, or remove a lighting fitting from a network
3. **Affordability –** No expensive wiring, panels, expert installation, commissioning and maintenance are required especially for small and medium spaces. No additional interface are required to control the light, the Mobile phone is sufficient.

The benefits are many, and still unfolding.. You can now use light in the manner you deem fit, and it not be pre fixed, without allowing any changes

a. Users can set lighting levels as per functional requirement and user preference to improve visual acuity and direct glare
b. Users can set light colour temperature to match interior décor, time of the day and enhance ambience and boost performance
c. Users can play with light colours in tune with your emotions, to improve well being.

When a mobile based App is used to control, it adds more value than only meeting functional requirements. It offers immense flexibility to users, and that too without additional wiring.

a. Virtual grouping and regrouping of lights, without need of changing wiring
b. Ability to create preferred lighting scenes and save them for easy recall
c. Ability to control lights remotely,
d. Schedule lighting events, including switching ON /OFF
e. In cities or offices, lights can get fitted with sensors that monitor air quality pollution, noise and footfall / occupancy and adjust lighting level accordingly
f. Users can sync daylight with artificial light
g. Check the health of the lighting hardware
h. Monitor energy consumption.

The devices, in conjunction with App can also be triggered by virtual assistants and voice services enabled platforms like Amazon Alexa, Apple Home Pod, Google Home etc.

Besides the above, the smart lighting devices can be part of universal Home systems like, Google Home, Apple Home Kit. Along with IFTTT, the whole system becomes much more universal, with different devices talking to each other.

App based Wireless lighting systems are the most preferred solution in homes, showrooms, banquets, hotels, conference rooms, receptions, social spaces. With rapid strides in wireless communication platform, especially in BLE Mesh, it is a matter of days, that they can easily be used in offices retail, industry.

The foundation for an IoT enabled Lighting system has now been well laid.

Lighting and Digital communication : In the past few years, a lot of research has been done on using the visible light spectrum, for non lighting application and especially for data communication. This is still an evolving subject, Hence the article outlines two of the most commonly discussed platforms.

Visible Lighting Communication - VLC: A data communications variant which uses visible light between 400 and 800 THz (780–375 nm). VLC is a subset of optical wireless communications technologies.The opportunity to send data usefully in this manner has largely arisen because of the widespread use of LED light bulbs. LEDs are semiconductor devices similar to silicon chips. Consequently we can switch these bulbs at very high speeds that were not

possible with older light bulb technologies such as fluorescent and incandescent lamps. The rapid adoption of LED light bulbs has created a massive opportunity for VLC. The problem of congestion of the radio spectrum utilised by Wi-Fi and cellular radio systems is also helping to create the market for VLC. Good application of VLC is in position tracker especially in large retail and healthcare spaces.

LiFi : LiFi uses part of Visible light spectrum in order to deliver high speed communication like WiFi uses radio waves. Lifi specifications are defined in IEEE 802.15.7 standard. LiFi t uses visible light (presently LEDs) to transmit information.... In other words, LiFi works by using visible light, like the light that is emitted by any regular lamp or bulb. Instead of Wi-Fi modems, Li-Fi would use transceiver-fitted LED lamps that can light a room as well as transmit and receive information. Since light cannot penetrate walls, it provides privacy and security that Wi-Fi can Can be used in RF restricted environments where EM waves are restricted. By not using radio and serving same use case, it eases out interference and congestion of highly occupied radio bands i.e. ISM band used popularly in WPAN technologies. LiFi delivers better bandwidth, efficiency, connectivity and security compare to Wi-Fi system. Commercial pilots have been started using LiFi. The industry will follow this evolution with great interest and anticipation.

CONCLUSION

With "Smart Technology" making its way into the lighting world, the matured industry of lighting has suddenly become a bubbly, young, vivacious new and refreshed industry. It is collaborating and integrating with communication, software, industry and data service providers. For the designers and users, digital and smart technology has opened up a new world altogether.

The potential in Indian market is huge. Besides new points, there is already a large base of LED lights esp in professional spaces. Wireless systems can make them smart, there by delivering easy dimming, grouping, scheduling etc.

There are still many challenges to overcome. The technical performance of smart lighting is also based on the maturity of wireless protocols, esp BLE Mesh, Wifi and Zigbee and is ability to address current issues of control range, parasite power or scaling up to larger node bases. This will pave way for quicker adoption of wireless lighting controls as a primary standard in lighting industry in most application areas. Interoperability, smart lighting standards and common protocols may assist in faster growth of the Wireless App operated lighting systems.

On the lighting hardware front, we will need more number of LED chip manufacturers offering value added LED chips, for eg, tunable COB, RGB +Tunable COB with greater efficacy and performance, RGB and tuneable integrated COBS etc.

Lastly, the lighting industry in India needs influx of a huge talent base with new skill sets. App developers, software/firmware experts, database managers, cloud service managers are new job roles which the Lighting R&D industry will need to collaborate. We may need VR experts and graphic designers that lighting computation experts,

It is indeed an disruptive and exciting times for the Lighting industry in India. With consumers having increased awareness and access to technology, it is a necessity and not a choice to accelerate the Smart Lighting revolution in India. It is heartening to note that there are Indian manufacturers who have taken lead in this field, with local innovation and manufacturing, making such solutions affordable.

Future of lighting is Smart lighting and undoubtedly wireless solutions will be the sought after platform.

Author: Sudeshna Mukhopadhyay is Chief Design Officer, iBahn Illumination Pvt Ltd. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

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POWER OVER ETHERNET LIGHTING

Power over Ethernet (PoE) helps to build innovative lighting solutions

Power over Ethernet (PoE) lighting is being talked about a fair bit lately. Many new mega building contracts are specifying PoE lighting in their Tender documents. Power over Ethernet means the lighting works on Ethernet cables, and not the usual 230V mains cables. Ethernet cables, CAT5/6 cables used for computer networking, are of low voltage DC, but are capable of carrying power to light up LED luminaries up to 50W, which covers most of the indoor lighting requirements.

In the past, with fluorescent (FL) and Incandescent lighting the wattage requirement of lights was much higher – a typical FL office light fitting would be around 80 W. FL works on high frequency AC. AC currents limits length of the cable between luminaire and driver. The inductance in cable increases losses in the system. FL requires High voltage for lamp ignition which is again limits the cable length. For FL system ideally max 2 meter cable length is suggested except some exceptional requirements. Considering all these criteria, supplying power over an Ethernet cable to a FL lighting system was not feasible. However LED works on DC, there is no ignition voltage requirement for LED.

LED system can be made lower than 63VDC, which is safe for human contact. LED has unidirectional light source and much better efficiency of reproduction of light as compared to FL system. For example FL luminaire has around 60 to 80 lumen per watt while LED have 120 ~ 140 lumen per watt. Due to this the wattage of an equivalent LED luminaire has come down significantly, and the same FL luminaire which consumed 80 W in the past would now be just 35 W with an LED luminaire. So this amount of power can be supplied through an Ethernet cable.

ADVANTAGES OF USING POE

The reason supplying power through an Ethernet cable is attractive because then the lights can also be operated using the same network of cabling that is used for the computer networking. And not only that, the light can also be attached to the same network controller on which computer and other systems like security cameras, phones, printers etc. are attached. So in turn controlling of lighting also becomes like controlling these devices and from the same setup, without needing installation of separate controllers for lighting system.

PoE system enhances safety level of lighting system to a great extent. The power is transmitted to luminaire through Cat6 cables at low voltage this eliminates risk of electrical shock to end customer. This system also eliminates risk of fire due to short circuit, as the wires are supplied

with low voltage and there is current limit and short circuit detection circuit equipped in PoE supply server. Maintenance of PoE system is an easy Job as all the electronic control is centrally located and easily accessible. In some PoE systems the luminaire contains just the LED module (LED chips on a PCB), and no other electronics. Due to this the failure of the luminaire itself becomes negligible. This in turn avoids needing access to luminaire, in case of a failure, which are generally situated high up in the building ceiling. Most of the failure would be attended at the PoE centralized driver, which is generally located at more convenient places. The repair process also becomes quicker, by way of replacement of the whole unit.

Above advantages may not look so great in case of a smaller buildings; but in case of large buildings they become quite significant and cost effective. From a central place, all the lights can be controlled using a common system as that of security cameras, computers, air-conditioning etc. No one has to go down to each room to switch the lights on or off – even though local switches will still be installed for use by the users of the room. But if the users forget to switch off, then no one has to run around.

The lights can also be automated and controlled through sensors or remotely. Information about the amount of usage, about their status of operation etc can be collected by the central server.

Usually a PoE lighting system has a central Driver to supply power to a number of (about 24 to 36) lights simultaneously using the Ethernet cables. This central Driver connects to the network controller, or building management system of the building. The central Driver and subsequently the lights get an IP address assigned to them, which is used to control the individual lights. Shown below is a schematic of PoE lighting system, and the PoE infrastructure system containing other elements apart from lighting.

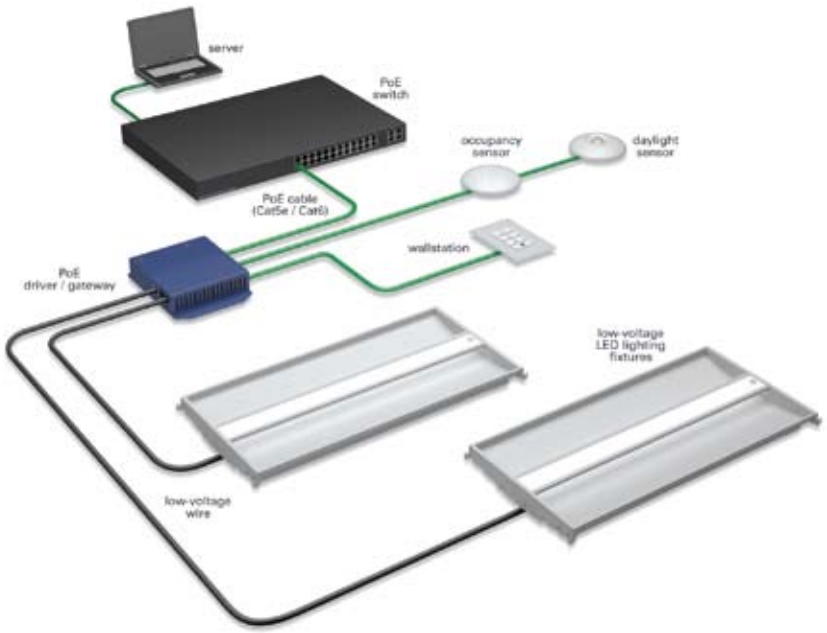

Figure 1: PoE connected lighting system [Picture source Eaton Lighting Website]

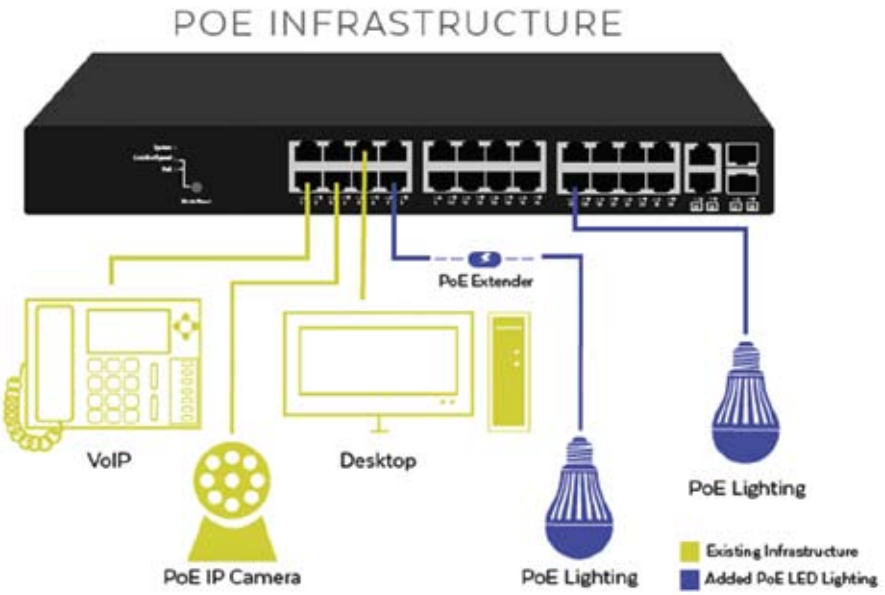

Figure 2: PoE Infrastructure [Picture source Versa Technology Website]

CONSTRAINTS OF USING POE

There are certain constraints of using a PoE system. The volume of cables running between the PoE driver and the luminaires is considerably high, compared to conventional lighting systems. Also there is no looping possible in PoE lighting, almost each luminaire needs to be directly connected to the Centralized PoE driver. However, there are certain new designs coming up to overcome this disadvantage.

As the lighting system is also now IP based, with PoE systems, they too become vulnerable to external hacking. In such an event not only the other systems, but even the lighting may go. However, while designing a PoE system this aspect needs to be kept in mind, and accordingly certain level of adequate emergency lighting arrangement needs to be put in place.

In case of needing any additional fixtures after the completion of the building, it will not be as straightforward as with conventional lighting systems. However, in modern day large buildings, this is a very rare occurrence.

Author: Kaushik Shendye, Product Manager, BAG electronics. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

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ENABLING URBAN LOCAL BODIES REALISE THE POTENTIAL OF ENERGY EFFICIENCY

To bring in mass-scale transformation, EESL has adopted a unique strategy of partnering with states, municipal bodies and urban local bodies

Energy efficiency is an important pillar of India's efforts towards energy security. The multifold benefits of energy efficiency programmes and interventions – reduction in costs of both consumption and supply of energy, decarbonization and mitigation of air pollution, facilitation of wider energy access – make a strong case for this sector to be a key component of energy development strategy in developing and developed countries alike.

In recent years, India has set milestone after milestone in energy efficiency, soon taking a hard-won global leadership position. Today, India delivers the world's largest energy efficiency portfolio and has successfully incentivized stakeholders as diverse as the building sector, the manufacturing sector, homeowners, and municipalities to participate at scale.

India's energy efficiency programmes have saved approximately 13 GW of annual generation capacity, translating to savings of over USD 10 billion in the form of avoided capacity generation and reduced energy bills. This achievement is a testament to over four decades of dedicated effort involving enabling legislations and extensive collaborations by domestic and international stakeholders in the public and private sectors.

Implementing the Government of India's Street Light National Programme, till date EESL has replaced over 69 lakhs conventional street lights with LED lights, leading to an annual energy saving of more than 4663.07 MUs, and reducing over 3.21 million tonnes of CO_2 emissions and peak demand of over 777.18 MW.

The programme is being implemented across 23 states and union territories; seven states have already been saturated including Himachal Pradesh, Tripura, Rajasthan, Andhra Pradesh, Telangana, Gujarat and Jharkhand, and almost 70 per cent of UP has already been covered. Besides the savings, there has been an enhanced illumination leading to better visual comfort, enhanced safety and security of people. In addition, EESL is also implementing a special heritage lighting project, wherein over 4000 LED street lights have been installed in Kashi region of Ut-

tar Pradesh, making the heritage city more vibrant. The South Delhi Municipal Corporation bagged the prestigious first prize for the conservation of energy through its LED replacement programme in the municipal sector on the 14th of December 2017.

Implementing the Government of India's Street Light National Programme at this scale, EESL has become world's largest street light management company. This has been possible due to full support from the Government, urban local bodies (ULBs) and industry which realised the importance and the potential of energy efficiency and continues to support the Government of India's mission to mitigate climate change.

AN INNOVATIVE MODEL THAT ENABLED MARKET TRANSFORMATION AND ENHANCED SERVICE DELIVERY

EESL aims at creating market innovations through solutions-driven approach and novel business models of Zero-Subsidy, Zero-Capex, and pay-as-you-save.

To bring in mass-scale transformation, EESL has adopted a unique strategy of partnering with states, municipal bodies and ULBs. Under the programme, EESL replaces conventional street lights with LEDs at its own costs with no upfront investment by the municipalities, thereby making LED adoption even more attractive.

EESL recovers its investment over time by monetizing the savings occurring due to consequent reduction in energy and maintenance cost of the municipality. A seven-year contract with the local bodies guarantees a minimum energy saving of typically 45-50% and provides free replacements and maintenance of lights at no additional cost to the civic partners.

EESL's business model has enabled a new paradigm that is attractive, scalable, and has overcome barriers preventing the replacement of street lights. For instance, the Centralised Control and Monitoring System (CCMS) for remote operation and supervising has mitigated the lack of monitoring mechanism and warranties against technical defects.

STRINGENT AND TRANSPARENT PROCUREMENT PROCESS ENABLING QUALITY

EESL follows a stringent and transparent process in the procurement of LEDs. The procurement procedure ensures high quality of bulbs and effective inventory management. The LED street lights conform to BIS standards, which are at par with the international standards, also approved in India. Quality checks are done at bidding stage, pre- shipment stage and then again at the field level. This has resulted in the LEDs' overall technical fault being less than 1% in the 69 lakh lights installed by EESL across India under the SLNP programme.

The procurement norms for the LED programmes allow only those bidders who have manufacturing facilities in India. As a result, almost all LED lights are being assembled in India and the manufacturing capacity has risen to about 3-4 crore LED lights every month from about 1-2 lakh bulbs three years ago.

The procurement price of the LED street lights has been reduced from Rs. 135/watt to Rs. 85/watt due to mass procurement by EESL, making the LED lights affordable and accessible.

MAKING PUBLIC LIGHTING SMART

While LED usage addresses the need for affordable energy-efficient infrastructure, the vision to enable future-ready lights on the streets of India made EESL adopt "smart lights" under SLNP. These "smart lights" are connected through a web-based monitoring system, Centralised Control & Monitoring System (CCMS), that enables remote operations and additional operational savings. Dedicated CCMS enable automated switching (On and off) of street lights and remote identification of faults with an integration of IT Technology. It is helping in attending to the complaints of faulty street lights in less than 48 hours. The system triggers an alarm to maintenance staff and power cut-off in case of any power theft from or tampering of street light phase.

BRINGING LED PUBLIC LIGHTING TO VILLAGES

After the success of LED public lighting in the urban areas, both central and state governments are gearing up to take the benefits to the villages. In June 2017, Government of India announced that EESL would be retrofitting 10 lakh conventional street lights with LED lights in Gram Panchayats of 7 districts in Andhra Pradesh. As the first project for rural LED street lighting in the country under Street Light National Programme, EESL has retrofitted 10 lakh LED lights in gram panchayats in Andhra Pradesh under the first phase and is preparing for installing 13 lakh LED lights in the second phase.

Further, the Andhra Pradesh government, for the first time in the country, is going to initiate quick and efficient complaint handling mechanism — the Alert Management System (AMS) — giving equal priority to implementation and maintenance of LED street lights.

EESL is in discussion with other states and with the success of Andhra Pradesh, more and more states will come forward.

INTEGRATING RENEWABLES

India has firmly established solar energy as its leading pathway to a sustainable energy future. Bringing solar to the grid can provide an affordable, renewable, and low-carbon source of energy that can power India's underserved regions. Towards this goal, the Ministry of New and Renewable Energy (MNRE) launched the Atal Jyoti Yojana (AJAY) to illuminate dark regions across five states through solar power with high mast solar LED street lights. These lights are being installed on major roads, markets, and public places, thereby contributing to safety, and enabling a better quality of life. The programme is being implemented by EESL in rural, semi-urban, and urban areas that face less than 50% grid connectivity in states of Uttar Pradesh, Assam, Bihar, Jharkhand, and Odisha with 300,000 high-mast solar LED street lights.

FUTURE LIES IN INNOVATION

Combining demand aggregation with procurement, EESL, under Unnat Jyoti by Affordable LEDs for All (UJALA) and SLNP, brought down LED prices to almost a tenth of market prices. Suddenly an LED movement was born with affordable bulbs that were durable, provided better light output and lower energy bills, all of which appealed to the masses. Today, both these programmes are world's largest till date; as households and municipalities saved over 39 billion kWh of energy by LEDs for domestic, commercial and street lighting. In sum, India energy intensity declined by 58 percent between 2005-06 and 2015-16, and is projected to decline further by 37 percent in the next 20 years.

Today, India's energy efficiency programs invite global interest from countries seeking to replicate them. The solutions that work in India, a challenging, highly complex market, would definitely work in many other geographies. And there is abundant potential to tap. At the moment, India has only realised the potential of just a fraction of its total energy efficiency market, which is valued at an annual USD 12 billion. Marching in momentum with the world's energy transition and its own sustainable growth aspirations, India is progressively finding opportunities to deploy new technologies. These technologies are not stand-alone pieces, but part of a vision that focuses on cohesively transforming the energy value chain to become both sustainable and accessible for all.

Author: Venkatesh Dwivedi is Chief Operating Officer (COO), Energy Efficiency Services Limited (EESL). Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

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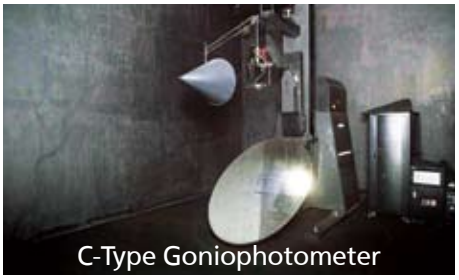
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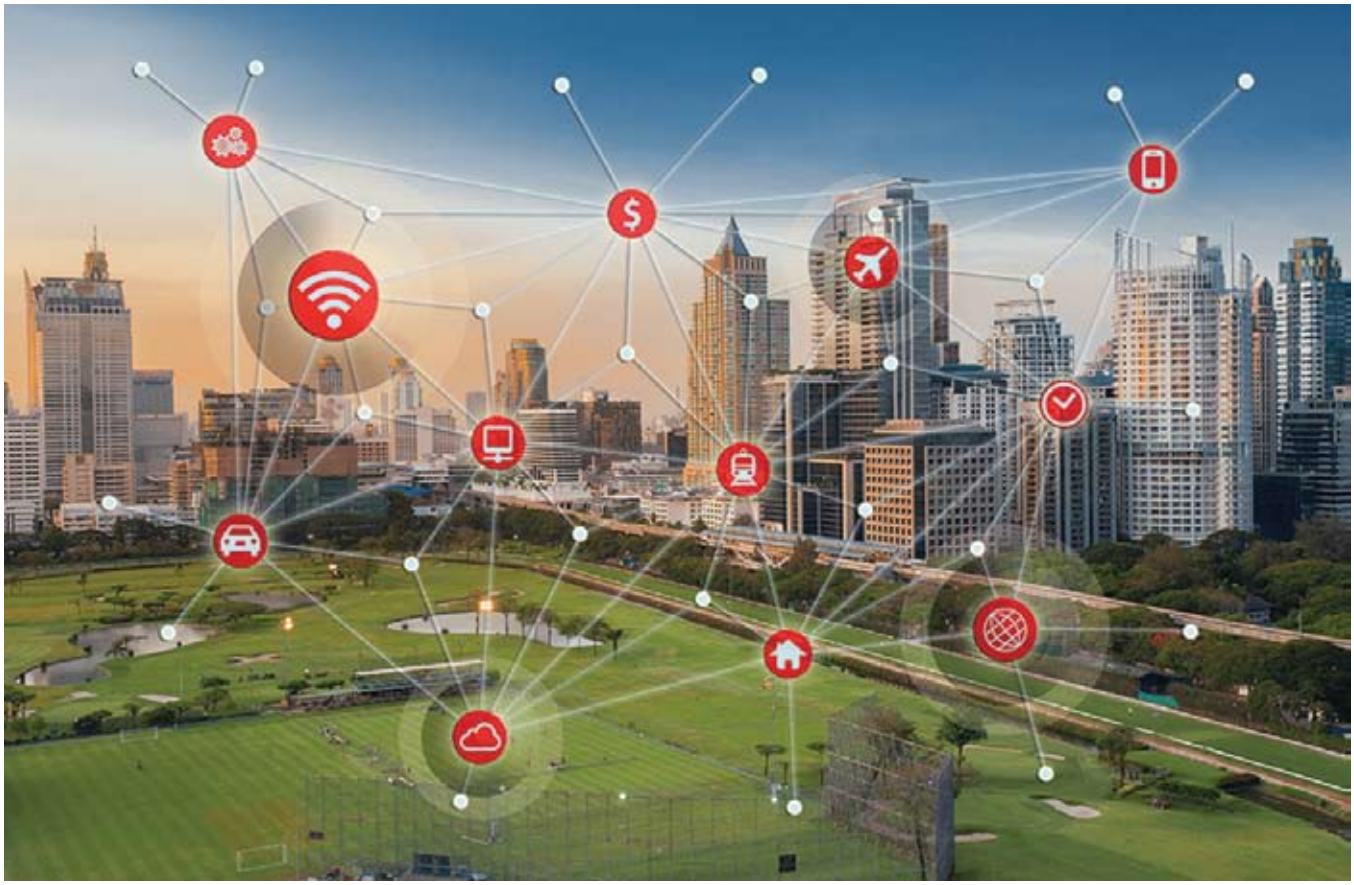
JOURNEY OF LIGHT: FROM INCANDESCENT BULB TO IOT BASED SMART SOLUTIONS

With the invention of blue LEDs, we are stepping into the era of "smart and intelligent lighting" that is human centric!



Since the emergence of civilization, we human beings have been mesmerized and spell bounded with light. In their chase to possess the magic of light, they discovered fire and ushered in the concept of illumination post the sunset. Soon, the fire turned to candles and then to gas lights. In their quest for light, they discovered electricity, and along with it came Sir Thomas Elva Edison's incandescent electric bulb! A single light source could easily light up a room.

Things were going well, but then mankind realized that the electric bulb is an energy feeder. The need of the hour was to have an energy-efficient light source that will also provide a relatively longer life. Next came the era of the fluorescent tube lights, which converted the UV radiation to visible white light. Subsequently, the incandescent bulbs were replaced by the compact fluorescent lamps or CFLs. After this, came in various sensors and lighting controllers which gave us enough flexibility to create various lighting ambiances.

With the above sources and accessories in place, mankind entered the phase of having the right light at the right place and at the right time. Discovering various lighting parameters like lux, uniformity, minimum glare for a soothing ambiance, mood lighting, and appropriate lighting for better productivity became the objective. We were now in the era of energy-efficient lighting solutions.

In the recent years, we invented blue LEDs, thus stepping into the era of "smart and intelligent lighting" that is human centric!

WHAT IS SMART AND INTELLIGENT LIGHTING?

Smart lighting is a layout of smart luminaries. Smart luminaries are those luminaries, which have standard accessories such

as dimmable drivers, sensors etc. with a communicable device which is basically a controller such that each luminaire can "talk" to the other and to the other allied and peripheral devices.

Smart lighting brings –

1. **Lighting on command -** Cloud connectivity gives users the ability to remotely control lighting and monitor energy usage through smartphones, anywhere and anytime
2. **Getting in sync -** Technology enables efficient switching between different wireless protocols
3. **Lots of data -** IoT comes with lot of data which can be turned into useful information thereby help in making better decision
4. **Growth and Future -** Worldwide lighting & IoT market to grow to approximately $159 billion by 2020. 12 billion 'end-points' in homes, enterprises, industrial facilities and retail locations

It can be further categorized into Smart Indoor and Connected Outdoor which brings in the combination of multiple solutions that turn lighting into IoT endpoints with control, communications and sensing services and thus make LIGHTING-AS-A-SERVICE.

If we take street lighting as an example, the otherwise passive luminaries and poles, if made smart by using controllers compatible to either RF mesh or ultra-narrow band (UNB), can collate various data and send them to cloud server where they will be processed and analyzed and necessary feedback will be provided to the respective devices. Thus, we could have real time dimming and / or switching on or off luminaries from a touch point device. We could also have a smart camera either integrated with smart poles or separately attached to the luminaire with video analytics, which can help in real time traffic control at major street junctions. One could even have RFID based smart garbage bin control.

One can integrate various other sensors like parking sensors in parking lots, weather monitoring or pollution sensors on lighting architecture and get various information which could be used to the advantage of the public. This can lead to saving a huge amount of energy, taking care of proactive maintenance as well as capture a lot of information. Similar smart concepts can also be applied for indoor applications, where along with lighting the other allied services like HVAC, fire detection systems, CCTV cameras, access controls etc. can also be managed. Smart solutions also include customized experience wherein lighting acts as an architecture for sending promotional push notification to the customers and thereby motivating them to purchase more.

Brands and people have slowly but surely wakened up to the smart lighting phenomenon. In recent times, Bajaj Electricals is one of the few companies who has not only made advancements in the world of smart lighting, but has also made its mark in Smart City and Smart Building projects.

Author: Raja Mukherjee is the President & Country Head of Illumination BU at Bajaj Electricals Ltd. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

MAKE IN INDIA: SUSTAINING THROUGH SKILL DEVELOPMENT

ESSCI is striving to build a robust skill development eco-system with a holistic approach to skill based training

The "Make in India" programme launched by the honourable Prime Minister of India on 25 September 2014 seeks to establish India as a hub for global Manufacturing and leverage its demographic and intellectual dividend to increase the manufacturing footprint with the objective of job creation and skill enhancement in 25 sectors of the economy, this is expected to transform India into a global design and manufacturing hub.

The government is promoting manufacturing in a big way and has also made doing business easier for foreign entities and this has been seen to be effective as India jumped to 100th place out of 190 countries in the World Bank's 2017 Ease of Doing Business Index, from 130th in 2016. In February 2017, the government appointed the United Nations Development Programme (UNDP) and the National Productivity Council "to sensitise actual users and get their feedback on various reform measures".

The Expected market size for major electronics sub-sectors in India by 2020 are:

- Telecom Equipment (USD 34 Billion)
- Laptops, Desktops, Tablets (USD 34 Billion)
- LED (USD 35 Billion)
- Consumer Electronics (USD 29 Billion)
- Set Top Boxes (USD 10 Billion)
- Automotive Electronics (USD 10 Billion)
- Medical Electronics (USD 8.5 Billion)

As one sees the LED segment is expected to experience exponential growth going forward and with technological advances, deeper market penetration, lowering of prices and reduction in power consumption will become the preferred source of domestic lighting also.

The National Policy on Electronics- NPE's vision is to create a globally competitive Electronics System Design and Manufacturing (ESDM) industry to meet the country's needs as well as cater the international market. It

seeks to develop an ecosystem for a globally competitive ESDM sector in the country by attracting investment in excess of USD 100 Billion and generating employment for 28 Million people at various levels.

Building a strong supply chain of raw materials, parts and electronic components to raise indigenous availability to over 60% by 2020, it seeks to Increase exports in the ESDM sector to USD 80 billion by 2020 through the Constitution of nine (9) Working Groups for prior sub-sectors:

- Mobile Handsets and related parts/ components ecosystem
- LED Products
- Medical Electronics
- Consumer Electronics and Appliances
- Automotive Electronics (including Electric Vehicles)
- Solar Photovoltaic
- Fabless Chip Design
- Electronic Manufacturing Services (EMS) including population of PCB
- Components, Semiconductors, Displays, PCB, LED, Set Top Boxes, IT products, Telecom equipment, Lithium Ion Batteries, Strategic Electronics, Industrial Electronics, Others.

According to TechSci Research report "India LED Lighting Market Forecast & Opportunities, 2020", the country's LED lighting market is projected to grow at a CAGR of over 32% during 2015-20. Presently, the outdoor LED lighting segment is the

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STREET LIGHT NATIONAL PROGRAMME (SLNP)

Launched by Hon'ble Prime Minister on January 5, 2015, this programme aims to replace 13.4 million conventional street lights in India with energy efficient LED lights by 2019

- Smart LED street lights connected through web based Centralised Control and Monitoring System (CCMS) to enable remote operations and additional operational savings
- No upfront cost to the State/Municipal Bodies/Urban Local Bodies; 50% deemed energy savings

6.9 million LED street lights installed

Annual energy savings of 4.66 billion kWh

Avoided peak demand of 777 MW

GHG emission reduction of 3.21 million tonnes CO_2 per year

Follow the impact of this programme real time on the dashboard - *slnp.eeslindia.org*

For more information, log on to www.eeslindia.org | Tollfree Number for complaint registration- 1800 1803 580

largest revenue generator on account of growing demand for LED installations in parks, streets, railways, metro stations, parking lots and other public places. However, the indoor segment is anticipated to witness strong growth in future owing to rising awareness about LED technology and various government initiatives to subsidize cost of LEDs.

ESSCI has developed the following Qualifications Packs for the LED industry and is ready to meet the challenge of developing QPs to meet the requirement of new job roles emerging in the sector.

- LED Light Design Engineer
- LED Light Design Validation Engineer
- Mechanical Assembly Operator
- LED Luminaries Testing & Measurement Technician
- LED Light Repair Technician

ESSCI is committed to provide skill development across the LED product life cycle and sees a bright future in the segment.

The availability of skilled manpower is the need of the hour and the Electronics Sector Skills Council of India (ESSCI) has aligned its skilling capability to the industry requirements and is making an all-out effort in ensuring the industry requirements for skilled manpower with relevant technical capabilities are met and thus giving a boost to the growth of the sector along with creating employment opportunities for the youth of the country.

Electronics Sector Skills Council of India (ESSCI) is a Not-for-Profit Organization, registered under the Indian Companies Act, 1956. The Council has been promoted by six Associations i.e. CEAMA, ELCINA, IESA (formerly ISA) , IPCA, MAIT & ELCOMA, with financial support by National Skill Development Corporation (NSDC).

The ESSCI's focus is on establishing an effective and efficient ecosystem for developing and imparting of outcome oriented skills for the Electronics Systems, Design and Manufacturing Industry (ESDM).

ESSCI's mandate comprises plethora of deliverables including development of curriculum, courses, information database, and delivery system. ESSCI is responsible for standardization, accreditation and certification processes to enhance the employability of the Indian workforce globally. It envisions to enable a world class electronics manufacturing industry with an ecosystem for skill development and enhance employability of the large number of Indian human resource.

ESSCI strives to establish a structured mechanism wherein ESSCI will facilitate & collaborate with NSDC in strengthening the existing vocational education system for skills development in electronics sector & upgrade vocational training system for the industry to achieve global standards in manpower productivity.

The approach of ESSCI is to build a robust eco system of partners and knowledge contributors leading to research and analysis and developing a training mechanism leading to accreditation and certification of trained resources.

ESSCI has over 1100 training partners having over 4000 training centres across the country, that are well equipped to undertake skill development across job roles in all segments of ESDM. ESSCI has developed 160 Qualification Packs (QPs).

ESSCI is striving to build a robust skill development eco-system with a holistic approach to skill based training. There is a need to cover the complete spectrum of Electronics Sector along with the reaching out to the complete geographical coverage. Certain segments need a more focussed attention due to the fast changing technologies, market dynamics and potential to develop the rural landscape of the country. LED and Solar being one of them.

Author: N K Mohapatra is Chief Executive Officer, Electronics Sector Skills Council of India (ESSCI). Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

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MILLION-PLUS SOLAR LED LIGHTS TO BOOST CONSUMERS' CONFIDENCE ON THE LED TECHNOLOGY

Solar LED lighting solutions augment livelihoods opportunities, accelerate green entrepreneurship and improve the quality of lives

After the liberalization and globalization policies that were introduced in India during the early 90s, the country gradually began to emerge as a manufacturing and services hub. Also, immediately after the dot-com boom, the country, which was earlier recognized as the land of snake charmers, gained a much wider popularity as the land of information technology geeks. Even while all of these were happening, over 500 million people in the country remained aloof from the electricity network. A majority of this population lived in rural areas and used traditional kerosene wick lamps for basic lighting. Consequently, this chunk of the population was directly exposed to household air pollution emanating from the burning of kerosene fuel. As per estimates from an article entitled "Evaluation of various energy devices for domestic lighting in India: Technology, economics and CO2 emissions", which is published in the journal "Energy for Sustainable Development", net carbon dioxide emission from a single kerosene wick lamp is 0.728 gram/lumen-hour which aggravates the challenge of climate change.

BEGINNING OF THE LIGHTING A BILLION LIVES (LABL)

Realizing the aforementioned challenges and as an early proponent for poor people's access to clean lighting, The Energy and Resources Institute (TERI), a research institute

based out of New Delhi, took up the mission for translating these challenges into opportunities for the energy poor. A journey of thousand miles begins with the first step and TERI set its first foot forward in this direction in 2007 by committing to facilitate sustainable development of communities and enable a million people in rural areas of India to access light from solar technologies during the Annual Assembly of the Clinton Global Initiative (CGI). Later, in 2008, TERI launched its flagship initiative — the Lighting a Billion Lives (LaBL) to address energy access challenges of the world's energy poor people through solar technology.

During the early years after the inception of LaBL, TERI worked with technology manufacturers, grassroots institutions, communities, and the government agencies for the design of a village entrepreneurship based model that could trigger the shift of households and villages from kerosene wick lamps to solar lighting products. At this time, TERI's technical team worked closely with the very few solar product manufacturers for the introduction of LED bulb based solar products, and product features such as battery indicators and dimming options. Later, the introduction of the LaBL sticker on solar LED-based lighting products that were approved by TERI's lighting laboratory in New Delhi made it easier for rural consumers to distinguish between quality products and the locally available poor quality products. Throughout, the technical team made conscious efforts for improvements in products and procedures to ensure enhanced service delivery, low costs of installation and high efficiency of the product and improved quality of illumination through integrated system optimizations based on the accurate selection of low power consuming LEDs and efficient luminaire designs.

FOCUS ON MARKET CREATION

Going forward, between 2012 and 2015, with support from the Department for International Development (DFID), the LaBL initiative which was originally nurturing a pool of village level entrepreneurs who owned and operated LED-based solar facilities and provided lighting as a service to households and rural enterprises, focussed on market creation approaches for provisioning energy access in rural India. As part of this, LaBL facilitated the institutionalization of energy enterprises (EEs) that undertook retail sales of solar lighting products and provided after-sales-service to rural consumers at the last miles. These EEs began their operations with a handful of business in their pockets — they were connected to manufacturers who were already empanelled with the LaBL and also the EEs have delegated the responsibility of providing after-sales-service to LaBL's existing solar facilities in their respective territories. This approach not only favoured the consumers, who could now purchase a quality solar product from a shop in their proximity, it also benefitted the manufacturers and state level stockists of solar LED-based lighting products by emerging as their local point of contact. With relevant capacity building and handholding, slowly began to undertake installation of solar based LED street lights and solar micro-grids in remote areas and difficult terrains of the country.

Access to consumer finance and enterprise finance are two important ingredients for fostering the uptake of solar LED products in rural areas of the country. Hence, over the years, the LaBL has partnered with a range of micro-finance institutions and Regional Rural Banks and facilitating the introduction/scale-up of clean energy solutions into their lending portfolios through the roll-out of customized financial instruments. In Bihar, with support from organizations such as the Bihar Rural Livelihoods Promotion Society (BRLPS), DFID and Power Finance Corporation (PFC) Limited, the LaBL team has provisioned access to solar lighting to over 50,000 self-employed women who are engaged with the BRLPS/JEEViKA.

BENEFITS REALIZED

Very recently, India declared all Census villages as electrified and is now undertaking its ambitious timebound SAUBHAGYA scheme for providing electrical connection to all households in the country. Unlike kerosene wick lamps, solar LED-based lighting products will not lose relevance even after the commissioning of the grid network as solar products can be used as a backup solution and the mobility of standalone LED lighting products is certainly an attraction for rural dwellers.

Over the years, access to clean solar LED lighting has outpaced expectations by augmenting livelihoods opportunities, accelerating green entrepreneurship opportunities for men, women, and young people, and most importantly improved the quality of lives of previously energy-poor households. Since inception, the initiative has already benefitted 5 million plus lives and surpassed the goals that were set at the Annual Assembly of the CGI in 2007. At present, LaBL has its footprints in 20 plus states of India and 13 plus countries globally.

Much before the urban inhabitants in India, the people living in rural areas had endorsed LED-based lighting products as an important element of their living space, kitchens, common areas, and bedrooms. Initiatives such as the LaBL share the credit of boosting consumer's confidence on solar LED lighting products. Going forward, LED-based lighting products will play a vital role in containing the electricity demand surge that can otherwise happen due to massive use of energy inefficient incandescent bulbs.

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Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

LIGHTING FOR THE NEW AGE WORKPLACE

Modulation of colour of light impacts circadian rhythm and wellness of the employees

The Workplace Design in recent times is undergoing a radical change. Organizations are looking at creating spaces which enhance Employee Well-Being. Wellness of employees, User Experience, Use of Technology to deliver this is picking up pace.

Design Intents are changing globally and Indian Market is also seeing advent of new style workplace come into being.

RIGHT LIGHT FOR THE WORKPLACE

Open spaces, Open ceilings, collaborative spaces are gaining popularity as these encourage higher interaction and collaboration between employees thus leading to enhanced employee productivity and employee retention. Wipro Lighting offers products and solutions delivering these outcomes keeping in mind the design intent of architects & designers creating such workplaces. Wipro Lighting has developed a vast range of linear and suspended lighting fixtures which support the design intent.

Workplaces are becoming agile and smarter. Personalized User Control, Actionable Insights into Space Optimization, way finding, hot desking, meeting room bookings are some of the outcomes being looked at. In addition to this modulation of color of light - impacting circadian rhythm and Wellness

of the employees are gaining popularity. The WELL Building Standard™ (WELL) provides guidelines that minimize disruption to the body's circadian system, enhance productivity, support good sleep quality and provide appropriate visual acuity.

In line with these, Wipro Lighting has developed enhanced focus on inSync™ - our human centric lighting solution intended to promote a person's well-being, mood and health. It can improve concentration, safety and efficiency in workplaces or educational environments. By changing color of light and/or intensity of light, we provide biodynamic light based on human circadian rhythm for increased employee concentration, cognitive performance, alertness and in general well-being.

Wipro Lighting's alliances with International Technology companies will usher a new revolution in work-lives. We have collaborated with Cisco for Power on Ethernet (PoE) based lighting solutions and Human Centric Lighting solutions for new age workspaces enabling improvement in workspace productivity and enhanced employee well-being. Our partnership with pure Li-Fi, Scotland will deliver high speed & secure data transmission through LED luminaires.

Internet of Lighting (IoL)™ is our step in the direction of offering our customers best in class solutions in Lighting & beyond. It is Wipro Lighting's platform on which lighting and technology confluence. Wipro Lighting will be providing its applications and solutions right from smart homes, smart buildings to smart cities under the brand identity of IoL™. We are offering pathbreaking Power over Ethernet (PoE) and Bluetooth Low Energy (BLE) based solutions, inSync™ - human centric lighting solutions, LiFi and smart city solutions under the brand identity of IoL™.

PRODUCTS AVAILABLE

As a leader in Lighting Solutions, we have always made sure that we provide our customers with the Gold Standard in Lighting Innovation. Design & Innovation have become a way of life at Wipro and cutting-edge work is happening on new products and new technologies.

A signature product for modern workspace, Wipro's VERGE LED has won the prestigious Red Dot Award: Product Design 2017, India Design Mark 2017 and features in Global SSL Top 100 Showcase 2017. A backlit luminaire with high efficiency, blends in innovatively and captures the essence of any workspace. The product is compatible with the recent connected technologies and can be colour tuned.

Another unique product, OpusLED, is an elegant, fluidic & modern in design luminaire with unique floating spherical diffuser and surrounding light chamber that subtly introduces a circular geometry into the ceiling plane. This product is capable of direct, indirect, and direct-indirect lighting modes and allows personalisation of workspaces with functional and/or ambient lighting options. Futuristic and smart lighting ready, OpusLED can be used with lighting controls as well as with recent connected technologies in lighting.

Whistling Bollards are our premium category functional lights for illuminating the pathways and enlightening the surroundings with musical notes. Redefining outdoors with enhanced quality of light complimented with delightful musical and socialising experiences, these bollards are designed for glare-free asymmetric distribution, focus the light on pathways and avoid scattering effect, giving the user an enigmatic experience. Light from the bollards illuminates faces subtly along with the pathways with the usage of specialised lens made from molded seamless premium diffuser for subtle and guided asymmetric distribution of light. An add-on speaker module with wired connectivity to the amplifier adds to the musical melody.

Author: Anuj Dhir is Vice President & Business Head, Wipro Lighting. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

THE DEFINING PERIOD FOR LIGHTING AND WAY FORWARD TO SMART LIGHTING

With the addition of intelligence, sensors, wireless connectivity, scene creation and colour tuning, now lighting is "IoT (Internet of Things) ready"

The lighting industry is undergoing profound change and is experiencing an extended period of disruption and uncertainty.

In the world of commoditisation and falling prices, light fittings are no longer simply providing illumination instead, manufacturer are now looking to offer a growing range of on-board capabilities with intelligence, so that with the addition of intelligence, sensors, wireless connectivity, scene creation and colour tuning we now talk of lighting that is "IoT (Internet of Things) ready".

We 'Halonix' as one of the pioneer Indian manufacturer also considering to add on board digitization capabilities to integrated lighting with smart IoT technologies and ready to provide various smart lighting solution under smart city mission of Indian Government.

Smart City- any city which is going to adopt integration of things over Internet (IOT) with sustainable development prospect in either way of controlling or monitoring such as Waste Management, Water Management, E-governance and Citizen services, Energy Management, Urban Mobility and many other things as shown in Figure 1, become a Smart City.

"Lighting use to be about 'on, off and scene creation', today its about Lumens doing more. We are heading towards a future in which smart lighting is more customisable and that provides the infrastructure to drive a lot of other services by integrating the things together.

Intelligence is moving into the luminaire and the interface is moving to standard devices that use a variety of platforms, such

Figure 1: A smart city ecosystem

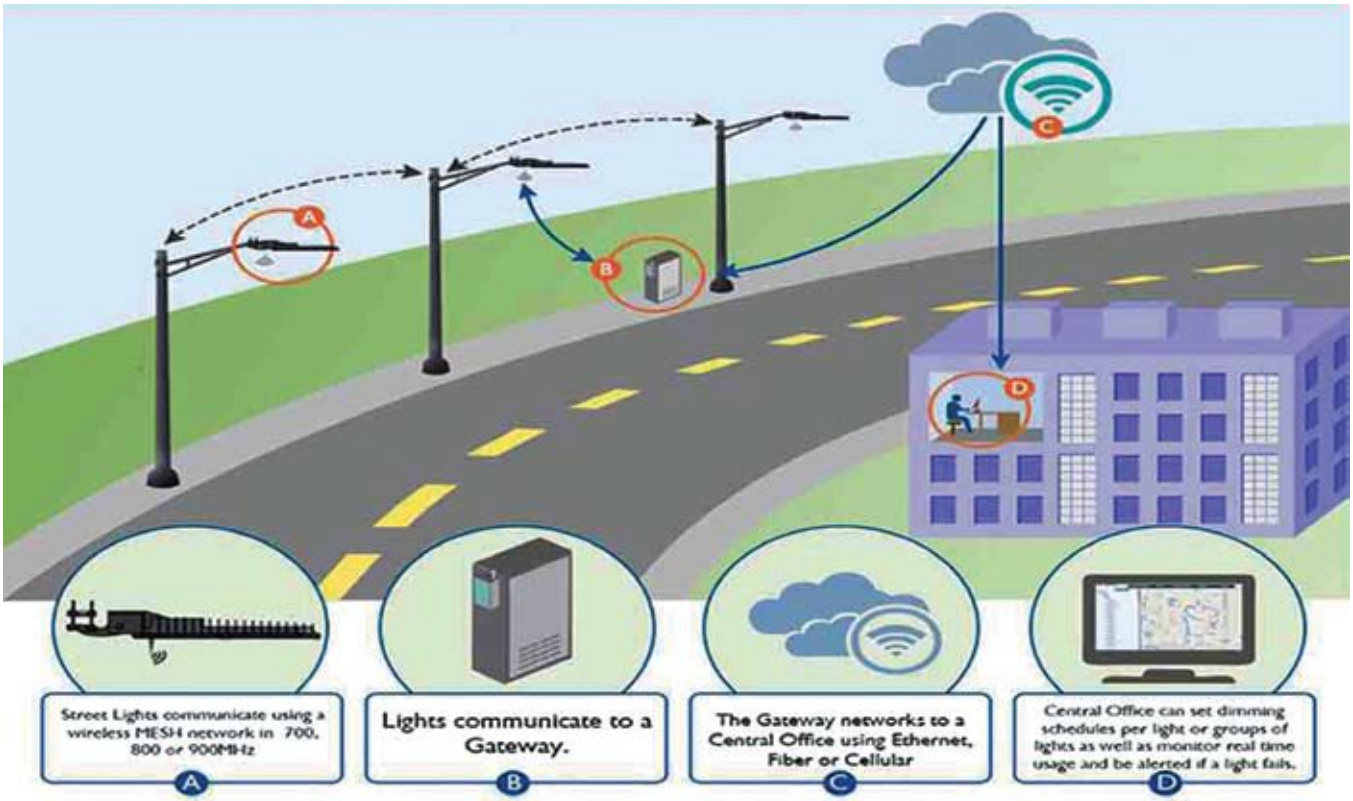

Figure 2: Key features of smart street lighting solution

as Bluetooth, Gsm/Gprs, RF, NBIoT, PLC and many more. 'Self-learning' algorithms are being deployed and are likely to start to appear as standard on a number of lighting control platform.

Connectivity is the key driver in the lighting market, which is expected to play a leading role in the roll out of the smart city, smart industries/offices and smart home. Lights in individual rooms can be switched on and off automatically and colours and scene to suit a particular environment are now available.

The LED Driver are the heart of any LED Lighting luminaires and these drivers to control lighting started 10 years before with the advent of dimmer switches. The development of intelligent LED drivers integrated with smart controller has provided a foundation for smart lighting, because they can also be remotely controlled and monitored.

In moving way toward the future, we 'Halonix' providing intelligent lighting products as smart street lighting, smart office and Industrial lighting and smart home lighting with control and also coming up to integrated the lighting with imagination using digital camera, such smart solution are the way forward in lighting field to create smart intelligent infrastructure under smart city mission. Using the smart lighting product user get convenience to control and monitor individual or group of lighting products locally or remotely over IoT.

Halonix's smart street lighting solution is already deploy in fields and equipped with following key features and describes in Figure 2 about it functioning over IoT digitization:

- Smart ON/OFF and dimming- Reduces power consumption
- due to automation of lights
- Automatic street light control throughout the years on bases
- of precise sunrise and sunset time
- User friendly processing & Handling – More interactive and
- Responsive system
- Dashboard & Analytics- Single window to complete & getting relevant information
- Map View- Spontaneous representation of street lights over
- Google map with their live status
- Open sensor Interface- Allow addition of new sensors in the network
- Open API for third party integration
- Schedules summary report to user/admin
- User defined zone's controlling and monitoring
- Real time data to detect faults, theft or dead lamps- Driving customer
- satisfaction through increased service levels and reducing maintenance costs
- Solution can be customized as per client specific requirements.

The most common use is for smart lighting, with as many as up to 74% using it to save electricity, ultimately reducing costs in the long term and provide convenience to user by accessing all electrical parameters by mean controlling and monitoring, but beyong that, smart lighting can also improve employee safety and wellbeing using IoT technologies and we 'Halonix' is ready to provide energy efficient, environment friendly intelligent lighting solution to India to make the citizen and infrastructure being intelligent and connected together.

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AFTER LED WHAT?
WELCOME TO THE WORLD OF CONNECTED LIGHTING

Connectivity is going to shape up the lighting industry

Today, we are on the cusp of an augmented age where technology is redefining the possibilities of what a human can truly be capable of. Sensors, networks, Artificial intelligence, Robotics, digital manufacturing, Nanomaterials, 3D Printing, Augmented reality, Machine Learning and Big Data are rewriting the rules in Lighting Industry.

THE CHANGING WORLD ORDER AS SEEN TODAY

Most are familiar with the invention of the steam engine in the late 18th century, ushering in the age of mechanization that released people from dependency on domesticated animals for production. This paradigm shifting change is known as the First Industrial Revolution. The second revolution took place around a hundred years later when the availability of electrical energy coupled with division of labour made it possible to mass produce items on an assembly line – the prototype of the modern factory. The third such transformation occurred when computing power enabled automation in the production process. The latest or Fourth Industrial Revolution, which some have said is an extension of the third, involves the integration of various technologies combined with artificial intelligence to enable inanimate objects to communicate resulting in a profound acceleration in progress.

Industry 4.0 will continue to be driven by connectivity solutions that don't stop at Smartphone's. Software will disrupt most traditional industries in the next 5-10 years. This evolution indicates a tectonic shift in technology from electrical to electronics.

In turn, this may represent a significant growth opportunity for companies offering connected LED solutions. With LEDs dominating the mainstream, the next emphasis in the community is 'connected lighting'. Connected Lighting thus will be the next disruptive force to reckon with.

Most great new enterprises in the years to come will either build their businesses off new sources of information or by converting previously analog environments into digital information. Information will the greatest asset of any Company. More reliably than any other asset, information has the potential to double regularly. Rather than simply assembling assets, the key to success is accessing valuable caches of existing information.

MARKET FOR SMART LIGHTING

According to a new research report by Global Market Insights. Inc Smart Lighting Market is predicted to be valued at USD 24 billion by 2024. The smart lighting market growth is attributed to worldwide initiatives for smart city development and the growing popularity of home and building automation systems in residential, commercial, and industrial sectors. As the modernized smart city infrastructure offers intelligent connectivity among different components of the administrative framework such as transport, healthcare, and law & order, further initiatives for developing smart cities are likely to be undertaken aggressively around the world over the next one decade.

Just as no one buys a smartphone based on its ability to make phone calls, future buyers of smart-lighting will not be buying lights for their ability to produce illumina-

tion. They will be buying into an ecosystem of applications and services that have absolutely nothing to do with light. You will find lighting intersecting with adjacent industries like security, sensing, big-data, and even advertising.

As lighting systems get smarter, a vision of autonomous, self-commissioning illumination systems is emerging where illumination plays an active role in managing human health and well-being, improving worker productivity, providing wireless communications, and improving building management system operation. "Light bulbs are destined to become an essential fixture in the IoT revolution".

The communication technology market is expected to exhibit excellent growth between 2018 and 2024 due to rapid advancements in wireless communication technologies such as LPWAN, Wi-Fi, and hybrid technologies. With the increasing popularity of highly interconnected IoT-based smart city ecosystem, these technologies are expected to play a critical role in enabling such intelligent and data driven infrastructure. In the light control market, sensors are expected to exhibit the fastest adoption over the forecast period. This accelerated adoption can be attributed to technological advancements in different types of sensors, such as occupancy sensors and motion sensors, which enhance the ability of smart lighting systems to effectively react to the surrounding conditions. Also, as these sensors enable remote operability of lighting systems through mobile devices, their utility in connected lighting solutions is likely to increase substantially over the forecast timeline.

LPWAN stands for Low-Power Wide Area Network, a wireless network designed to efficiently connect smart devices across long distances, usually through a low bit rate. LPWANs are ideal for IoT devices that don't need to manage large amounts of data, or for circumventing more expensive gateway technology. This can include smart meters, consumer products, and sensors. The overall value of the LPWAN market is expected to reach $25 billion within 4 years.

LoRa and **NB-IoT** are widely used and both operate within LPWAN technology. They are two major standards for low-power IoT devices.

The LoRa Alliance developed LoRa in 2015 as a secure, energy-efficient IoT standard that makes it easy to onboard new devices. LoRa is shorthand for Long-Range (WAN) and is a modulation technology for LoRaWAN. LoRaWAN is a related set of low-power specifications for IoT devices. LoRa and LoRaWAN are not interchangeable terms; LoRaWAN refers to a LPWAN protocol standard and is not a technology in and of itself. LoRa defines the physical layer. Its security standards emphasize end-to-end encryption, data authentication, and intelligent key derivation.

NB-IoT is an abbreviation for Narrow Band IoT, a cellular standard developed by 3GPP. NB-IoT is not a standalone technology, but a cellular standard that aims to standardize IoT devices to be interoperable and more reliable. It can be implemented in a standalone or in-band spectrum manner and does not require gateways, while each LoRa device needs a gateway to function (which can affect total cost). NB-IoT connects base stations directly with sensors.

SMART CITIES TO DRIVE THE GROWTH

Trends show Small Towns will soon be urbanized. As per estimates, about 25–30 people will migrate every minute to major Indian cities from rural areas in search of better livelihood and better lifestyles. With this momentum, about 843 million people are expected to live in urban areas by 2050. To accommodate this massive urbanization, India needs to find smarter ways to manage complexities, reduce expenses, increase efficiency and improve the quality of life.

As municipalities grow and urban population expands, city officials are feeling the pressure to invest in IoT pilots and programs. By adding embedded intelligence to its assets, cities can create a working framework of modern, cost-effective technology that gathers data and can ultimately improve the quality of life of its citizens. In addition, every city, regardless of size, wants to have the moniker of being a smart city. With transportation, energy, safety, water and air quality issues that could all benefit from smart technology upgrades, the first question is often, "where should we start?

Experts and Trade pundits show why street lights can pave the way for other city-wide IoT projects as:

a. Street lights represent a substantial portion of city energy budgets, up to 40 percent
b. Smart street lights can save 50 percent to 70 percent of this cost by dimming when activity is low, which means the city saves big money. These savings can be used to reduce city expense and to fund future initiatives while offering the utility a chance to increase its asset base at the expense of energy costs
c. Networked LED lights can provide not only energy savings, but information about outages or other anomalies in the energy network
d. Lights can be remotely dimmed to reduce energy usage. Networked lights can also be managed by smart devices that adjust lighting in response to traffic patterns and help identify roadway hazards
e. Networked lighting systems are also seen as a viable platform on which solution providers can build future sensing, data gathering and communications capabilities. For example, networked lights can communicate with video cameras, parking sensors, environmental sensors, weather sensors and more through same network infrastructure.

MOVING FORWARD

Smart street lightning has much more in it and future will evolve into something highly illuminating. We are debating and discussing thus light beyond illumination. Next phase of transformative technology advances, wearable and implanted devices will unlock human potential by tapping into our mood, heart rate and thoughts! Welcome to the brave new world of Augmented Humanity (AH). In Japan and China, a concept Lights-out manufacturing is gaining momentum.

Lights-out manufacturing refers to factories that operate autonomously and require no human presence. These robot-run settings often do not even require lighting, and can consist of several machines functioning in the dark. While this may sound futuristic, these types of factories have been a reality for more than 15 years.

Credits:
Bloomberg Report
Exponential Organization, Salim Ismail
Kranti Nation
E&Y Report on Smart Light Market

Author: Devashish Ganguli is working with Havells India Ltd. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

FOR THE LIGHTING INDUSTRY, WE WANT THE SUN TO RISE IN THE EAST

As a business group with strong roots in West Bengal, Century LED felt a responsibility to generate employment opportunities, and to play a role in the long overdue industrial resurgence of the region

The decision to enter the LED industry is not one that we took lightly. Today, it is an extremely crowded field, with a wide variety of players, big and small. As with many other proliferations of illegal products remain a perennial threat. We took our decision based on a number of factors. First and foremost, this business has major economic implications for India. Proper energy utilisation and greater energy access are crucial for our economic development. Viewed in this context, this was a 'virtuous' business to enter. As a business group with strong roots in Bengal, we also felt a responsibility to generate employment opportunities, and to play a role in the long overdue industrial resurgence of the region. Changing attitudes, both in government and on the ground, coupled with the quality of human capital, mean that this region is well placed to once more becoming a manufacturing hub, and to contribute to 'Make in India' initiative of our government.

There were obviously hardheaded business factors behind our decision as well. While this industry is currently very crowded, quality standards made to Indian condition shakeout in the near future is inevitable. In the above scenario it is our belief that those who manufacture quality products will stand the test of time. As the trade and customers become more demanding, we are already seeing signs of this in the market place.

FOCUS ON QUALITY

The choice of quality as a differentiator also makes sense in the light of our own experiences. Our sister concerns, CenturyPly and Star Cement, have achieved lasting success through a relentless focus on product quality. In the process, they have built lasting brand value. We believe that building such brand value is the key to a durable business. Such value cannot be built through advertising alone, but instead has to be based on a foundation of products that perform beyond expectations. We also share with our group companies a set of ethics and values, which ensures that partners, vendors and stakeholders are treated equitably and honourably. As a result of this, they remain invested in our success.

Our pursuit of quality in this field has led us through a process that was rigorous and entirely logical. The first step was certification. To conduct a business in this field properly, a variety of government and regulatory conditions have to be fulfilled. While the trade and customers may not always be aware of them, or consider them important, each contributes to a better product, and a culture of excellence. Accordingly, we have acquired NABL accreditation for our Quality Labs, and ensured that all processes are ISO 9001:2015 certified.

Our next step was to look very closely at the supply chain. We realised that there were multiple points of potential failure, and the only way to achieve the quality

standards we desired was to address each one of them individually. Comprehensive testing is done at every step, across component, process and Finished Goods levels. Over 100 such tests are conducted before a product leaves our factory. Our equipment includes a C-type Goniophotometer, surge testers, oscilloscopes, humidity chambers, thermal test facilities, and much more. Since lighting is ultimately about light, and the exploration of its properties, our testing equipment includes the largest mirror in India.

MOVING FORWARD

Machines and labs can only achieve so much. The heart of any endeavour is the people involved in it. We are fortunate to have found some exceptional technical minds, who are today not only assessing product quality, but also demonstrating high levels of skill in R&D and design. This gives us the capability to manufacture almost any product the industry requires, from scratch. Our capabilities extend from creation to delivery. This allows us to provide a complete range of products and solutions for the home, office, commercial, retail and outdoor segments. We are also in a position to offer highly customisable, comprehensive OEM services. Our current capacity is 1.6 million units.

It is just the beginning for us at this point, but we look forward to exciting times ahead. We are committed to continuous improvement. At any given point in time, we guarantee that we will provide best-in-class products and services to the lighting industry.

Editor's note

A brave step to venture into a manufacturing set up in West Bengal where no other Lighting Industry players have dared to. There are, of-course, a few manufacturers that have had a base in the eastern part of India for several decades, but most of them are on a smaller scale and may not be dedicated LED lamps and Lighting Manufacturers. This article is definitely worth reading.

Anirudh Kajaria is Business Head, Century LED. Views expressed in this article are those of the contributors and do not necessarily reflect those of the editors or publishers.

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