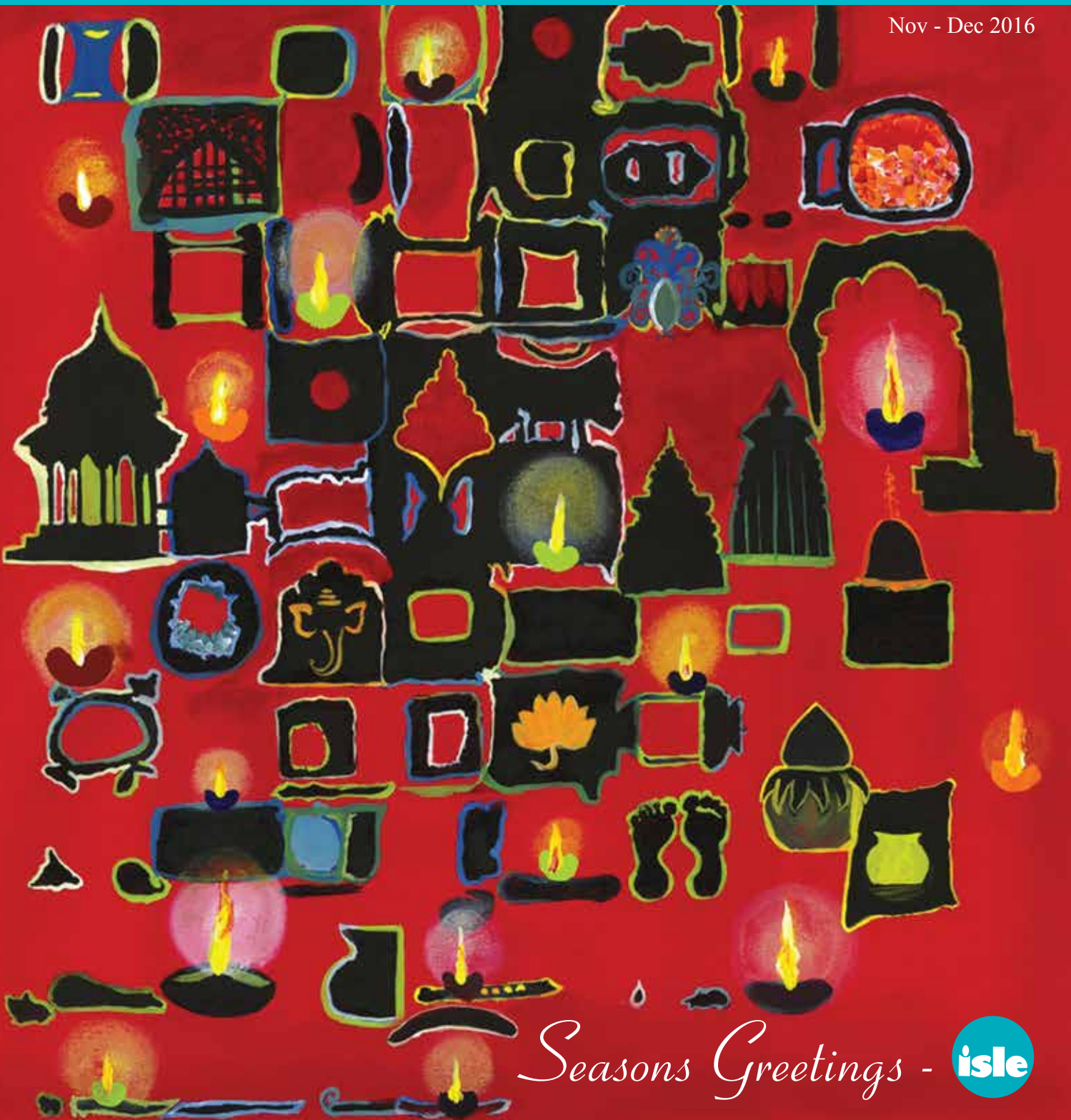


# LIGHT INDIA INTERNATIONAL

an official magazine of indian society of lighting engineers



Nov - Dec 2016

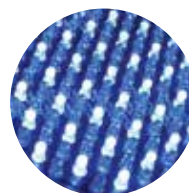


*Seasons Greetings -*





With a range of more than 3000 LED Products in our catalog, we are investing in a cleaner future



Our range of over 3000 plus products ensures that every project is fully catered to be a Samson product. Be it home, office, an institution, resort, club class hotel or be it on any stage - indoor, outdoor or underwater - a Samson product is available. We are powered by dynamic professional management, a network of dedicated dealers and technically qualified sales team. We, at Samson, endeavour constantly to innovate and delight our consumers with a product far beyond their expectations.

- \* LED LAMPS | SPOT LIGHTS | PANELS
- \* LED TUBES & FIXTURES
- \* INDOOR & OUTDOOR FIXTURES
- \* LANDSCAPE LIGHTING
- \* UNDERWATER & INGROUND FIXTURES
- \* ACCENT LIGHTING
- \* UTILITY LIGHTING






# See your home in a new light.

Explore a world of decorative lighting  
at the Philips Light Lounge.

Dress up your home like never before with a vast range of lighting options. Every design at the Philips Light Lounge reflects a unique style and philosophy. And with a vast array of lighting options to choose from, your regular home spaces will never be the same again. But don't take our word for it. Walk into the Philips Light Lounge and see for yourself.



innovation  you



**MAKLITES**

No.78, TVS Nagar 4th Street, Padi, Chennai - 600050.

Tel : 044-26540833 Mob : 7299944120

# PHILIPS

# indian society of lighting engineers

## GOVERNING BODY

Mr. Dilip Kumbhat	President
Mr. Harabhandhu Mukherjee	Vice President
Dr. Rajat Mandal	Hon'y General Secretary
Mr. R.Balasubramanian	Hon'y Treasurer
Mr. Bipin Dattani	Member
Mr. H.R.Vaish	Member
Mr. P.K.Sood	Member
Dr. Barjatia	Member
Mr. Stan Alvares	Member
Mr. Gulshan Aghi	Immediate Past President

### *Ex Officio members from State Centres*

Mr.Kamal Sethia	Chair / Calcutta
Mr.R.S.Saxena	Chair / Rajasthan
Mr.M.S.N.Swamy	Chair / Karnataka
Mr.Vinay Babar	Chair / Madhya Pradesh
Mr.Gurvinder Singh	Chair / Delhi
Mr.T.M.Ilamathi	Chair / Chennai
.....	Chair / Mumbai

### *Directors of Committees*

Dr. Barjatia	CIE India Committee
Mr. Kamal Sethia	Conference and Exhibition Committee
Mr. Swamy	Education & Training Programme
Mr. Saxena	Finance committee
Dr. Mandal	General Administration
Mr. Gurvinder Singh	Membership Committee
Mr. Dilip Kumbhat	Publicity & Publication
Mr. P.K.Sood	Standardization & other Govt committees ( BEE, BIS, EESL, DeiTY)

Mr.Gurvinder Singh,	Skill India / Digital India /
Mr.Vinay Babar, Mr.P.K.Sood,	Smart City
Mr.Vaish & All State	
Chairman as applicable.	

## EDITORIAL COMMITTEE

Mr.Dilip Kumbhat	Editor
Mr.Kamal Sethia	Associate Editor
Mr.Vinay Babar	
Mr.R.S.Saxena	
Mr.R.Balasubramanian	

## From the President's desk

At the outset, I wish to express my profound thanks to all GB members for electing me as the President of ISLE for the four year period 2016-20. I am grateful for the confidence reposed on me to lead the knowledgeable and experienced members of the Governing Body. With the staunch support and devotion of the team of GB members, we are committed to take ISLE to greater heights.



The country in general and the lighting industry in particular, is undergoing a major transformation and the focus has shifted from a select group of a handful of dominant manufacturers to a broad spectrum of small scale industries, importers and traders. Environmental necessities and energy saving compulsions were instrumental in the development and application of Light Emitting Diodes (LEDs) in the Lighting field. This was complemented with free imports and scaling up of the demand which resulted in competitive pricing of LED luminaires. Accordingly many players entered into the field of lighting and the scenario has changed.

The Indian Society of Lighting Engineers, the apex body to address all the issues of the lighting fraternity has now more responsibility to spread and educate the advancements and updates to more number of stakeholders. With this in mind, we have taken a conscious decision to bring back the official magazine of ISLE to serve the requirements of lighting engineers, architects, interior decorators, landscape architects and all other stakeholders.

I would very much appreciate feedback from all of you with your thoughts, views, suggestions as to how we should plan our strategies for the next four years, to make a strong presence of ISLE and make its functioning more fruitful and meaningful for the lighting fraternity. You can always send your mail to [dilip@klite.in](mailto:dilip@klite.in).

Finally I would like to thank Chairman and office bearers of Chennai State Centre for coming forward to sponsor the Lii magazine.

## DILIP KUMBHAT

President





# STOP SHORT CIRCUITS. GET ORBIT CABELS.

Triple Layered wires for triple protection



CABLES



UG CABLES

P.V.C. PIPES | LED | SWITCHES | FANS

## M/s. ORBIT CABLE INDIA (P) LTD

Plot No: 46, 47 & 48, Sector-II DC, IIE, Sidcul, Haridwar-249403  
 Contact : Mr. Amit Agarwal, Mob: 95000 45000  
 Chennai Office : 95000 54000 / Sasikanth : 72000 44000,  
 UG Cable Dept Email : amitkumarorbit@gmail.com



led lights has  
the power to change  
your life style



Orangecomm



## SEETU LIGHTING

No.63, Pedarari Koil Street, Chennai - 600 001. Tamil Nadu, India.  
 Ph : +91 044 4210 0018 / 4317 7999 Fax : +91 044 4204 6610  
 Watsup : +91 97908 02037 Email : orbitledlighting@gmail.com  
 www.orbitlightings.com

# Age, light perception and road lighting

As people age, the physiology of the eye changes. A couple of the more important changes are cloudiness of the lens and a reduction in pupil size. The latter aspect is illustrated in the photograph of the eye of a 25- and a 65-year old person, taken under the same lighting conditions. Both aspects have an adverse effect on how much light is transmitted to the light-sensitive cells (photoreceptors) within the eye. Among 50- to 65-year-olds, cloudiness of the lens leads to an average reduction in light absorption of between around 60% and 55% compared with a 25-year-old. Under identical lighting conditions, the pupil size of a 50- to 65-year-old decreases by between 65% and 55%. In a 50 - to 65-year-old person, the combination of these two factors means that only around 30% to 40% of light strikes the photoreceptors. For comparison, standard sunglasses allow through between 45% and 30% of light.

Reduced light perception can have particularly serious consequences under the

lighting conditions on the roads. Younger people can simulate this effect by briefly wearing a very dark pair of sunglasses while driving at night. The "revealing power" can be used as a measure of visibility under road lighting conditions. This describes the percentage visibility of a large number of objects with dimensions of 20 x 20 cm and a light reflectance factor equivalent to the clothing typically worn by pedestrians. When these objects are viewed from a distance of 100 meters (i.e. safe braking distance at a speed of 100 km/h to 120 km/h) and under road lighting with a luminance of 1 cd/m<sup>2</sup>, which is generally considered acceptable, the revealing power of 20-, 50- and 60-year-olds is 85%, 0% and 0% respectively.

Older car drivers have two options: Either they do not drive at night or they drive more slowly. Under the same lighting conditions, but over a shorter viewing distance of 75 meters (i.e. safe braking distance at a speed of 80 km/h to 90 km/h), the revealing power



**Mr. Wout Van Bommel**  
Past President of CIE  
[www.woutvanbommel.eu](http://www.woutvanbommel.eu)

of 20-, 50- and 60-year-olds is 97%, 60% and 0% respectively. Although the 50-year-old driver would be "a safe" driver at a lower speed, his slow driving would nonetheless constitute a hazard for others. People older than 50 have to drive even more slowly. Road lighting designs should, more than is done today, take the visual deterioration of people older than say some 50 years into account.



**Mr. Hans Allan Löfberg †**  
Past President CIE

## Message of Condolence



Mr. Hans Allan Lofbefg had a long association with ISLE. He was Vice President Technical in 1995 and was the person in charge of the technical part of the CIE Session held in India that year. As CIE President he attended Prakash '99 and Lux Pacifica 2002/ Light India 2002. He was also present at Lii2008 in a private capacity. ISLE wishes to record its heartfelt condolences for the sad demise of Hans Allan. May his soul rest in peace.

Hans Allan Löfberg, CIE President 1999 to 2003, passed away on August 1, 2016 after a short illness, he was 77 years old.

Hans Allan's initial involvement in the CIE was through contribution to its technical committees on natural daylighting, which, after the restructuring of CIE, became the work of CIE Division 3, "Interior Environment and Lighting Design".

Between 1985 and 1998 Hans Allan served as President of the Swedish National Committee of CIE, during which time he worked on the translation of the CIE ILV into Swedish, among many other achievements.

Within the CIE Board of Administration Hans Allan undertook the role of CIE Vice President Technical from 1991 to 1999. During this period Hans Allan oversaw the work that resulted in the signing of the MoU between CIE and CEN on co-operation between the two organizations. Subsequent to this, Hans Allan was elected to the position of President of the CIE, serving as such from 1999, during this time he made great contributions as leader of the CIE.

Jack Hsia, who was CIE President the term before Hans Allan, remembers Hans Allan as being "humble, talented, diligent, generous, and, in a word, a true gentleman", a memory which all who knew him from his work within the CIE would agree with.



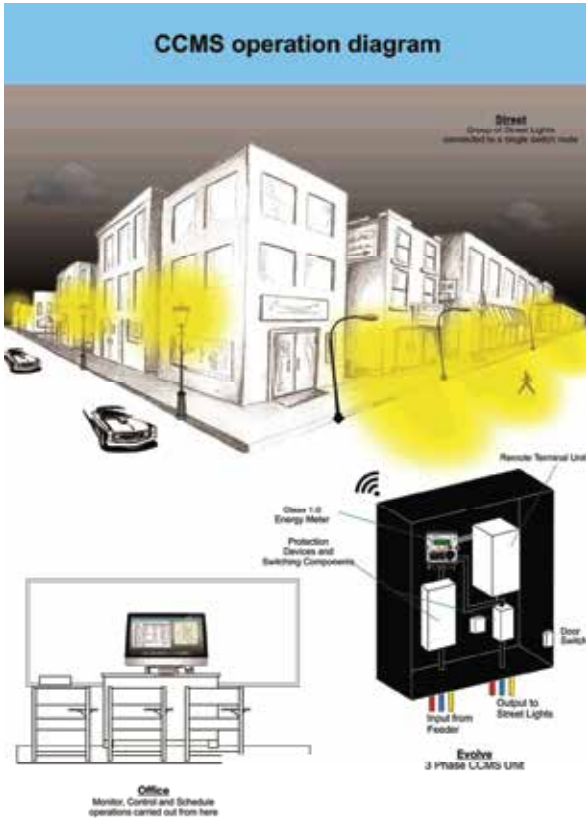
# Centralized Control & Management System (CCMS)

**Evolve** CCMS controller, a device that automates entire process leading to significant Energy Savings. Controls through Gateway & Web application mode facilitates remote access using GPRS Technology. Evolve Controller a comprehensive system suitable to control, monitor & create reports on important parameters of all kinds of lighting products including LED and heavy power tools like Motors & Pumps . Fully programmable and controlled via user friendly web application.



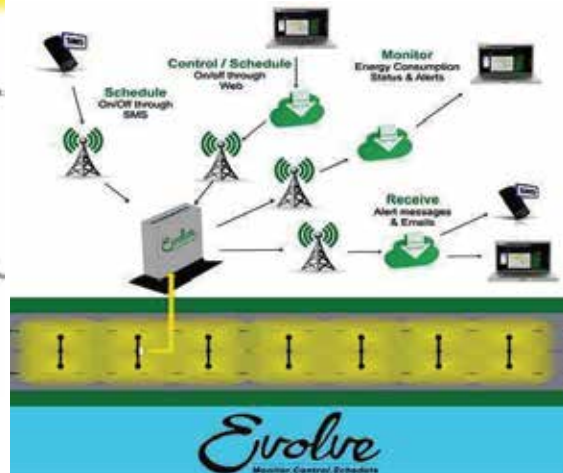
## Gateway Controller

- Micro controller based Gateway interacts with other major components - Contactor, Energy Meter and GPRS/GSM modem.
- The Gateway placed at the switching node/point.
- BIS Certified 3 Phase or 1Phase Energy Meter works on Modbus RTU protocol
- Delivered Meter data to Microcontroller at pre-configured intervals
- Bidirectional communication with Web Application via GPRS modem
- Commands from the Web Application or via SMS to turn ON/OFF
- Equipped with Short-circuit, over voltage, surge protection
- Generates alerts for various fault conditions with real time slots
- Individual Phase controlled for 3-Phase Units



## Web application Controller

- Cloud server based web application
- Compatible with both 3 Phase & 1 Phase systems
- Sends commands to the gateway to control
- Store parameters such as power consumption thr cloud server application
- Dashboard display of stored data
- Turns ON/OFF as per scheduled time
- Controlled as individuals, groups or by sites
- Energy savings through dimming
- 24/7 monitoring, Control and Programming
- Secure web site access control
- Archived post 2 years data
- Generates Energy Consumption, Savings & On-hours reports (Daily/Weekly/Monthly)
- Reports exported in CSV format for analysis



SECURE WEB CONTENT



ENERGY SAVINGS



WIRELESS NETWORK



TOTAL CONTROL



WEB-BASED



ALL WEATHER



PHOTOCELL & SOLAR CLOCK



GPS WEB MAPPING



**Dr. Amardeep M. Dugar**  
IALD, IES, SLL  
Founder & Principal  
Lighting Research & Design

# What is all this “Human-centric lighting” mumbo-jumbo about?

**Author :** Dr. Amardeep M. Dugar, IALD, IES, ISLE, SLL

in blue content, for example the mid-day sky with a CCT up to 10,000K. Blue-rich light suppresses melatonin and enhances dopamine, serotonin, and cortisol production, meaning greater exposure to it during the day can lead people being more alert and productive at work, or even during night shifts. Conversely at night, such melatonin suppression can create sleep issues.

## *What strategies need to be applied for circadian-correct lighting?*

Researchers have proposed the following lighting strategies for the appropriate functioning of the circadian rhythm:

- Quantity - stimulation of the circadian rhythm either requires higher illumination levels or longer durations of exposure to typical illumination levels.
- Spectrum - the circadian rhythm is responsive to the short wavelength otherwise known as the blue portion.
- Timing - depending on the timing of light exposure, light can phase-advance or phase-delay the internal clock, or it can have no effect at all. Phase-advance resets the clock to an earlier time, and phase-delay resets the clock to a later time. Because our clock's natural rhythm is a bit longer than 24 hours, we need to advance it every morning in order to be synchronised to the solar day.
- Duration - suppression of melatonin content in the bloodstream starts at approximately 10 minutes after bright light exposure is initiated.

## *Are there any more aspects to be considered other than circadian rhythm for lighting to be human-centric?*

Research reveals that there are no one-size-fits-all circadian lighting strategies as light-induced hormone levels can vary between different individuals or within the same individual over different seasons. Just like every individual had different health requirements, there is also a different prescription for light. Therefore each individual needs different doses,

different timings and different intensities of light. Additionally, the ‘non-visual’ effects of light covering circadian rhythm also include emotional wellbeing. The complexity of lighting for emotional wellbeing is not yet understood as it spurs from the great variability in human response. Research with respect to the ‘biophilia hypothesis’ confirms that people experience a feeling of wellbeing when in contact with nature.

## *How to design human-centric lighting?*

The quantity and spectrum of interior lighting during the entire course of the day should reflect the characteristics of exterior daylight, besides meeting minimum visual requirements. Lighting scenes or emotions should be set to provide bright, cool coloured light during the morning with gradual changes in brightness and CCT as the day progresses. The passage of time should be depicted by a continuous and gradual transition from one lighting scene or emotion to another providing enough time for people to perceive and adapt, while avoiding any abrupt changes. The duration of each lighting scene should be long enough to activate the right kind of emotion or mood required by the users of the space. For every change in a lighting scene, the new light settings should present hints of familiarity to support the transition. The success of the skilful application of human-centric lighting depends on the presence of abstract images of the environment such as colour, texture, shapes and symbols. The aim should be to create a visual link between the interior and the exterior natural environment. Additionally, the flexibility offered by personalized need-based control of lighting, to a large extent offers some solution to the complexities posed by the variability in circadian requirements and emotional responses. Figure-1 illustrates a conceptual lighting algorithm suitable for a circadian day shift work with desirable changes in light levels and CCT as the day progresses.

## **Introduction**

The last decade or so has witnessed a considerable amount of information exchange on “human-centric” and “circadian-correct” lighting. While everyone discusses the need for such lighting, there is still quite a lot of ambiguity with respect to its exact meaning. This article aims to clarify this ambiguity.

## **What is circadian rhythm?**

The earth's natural lighting cycle as received from the sun has low light levels and low correlated colour temperatures (CCT) early in the morning, high light levels and high CCTs at mid day, low light levels and low CCTs during evening, and extremely low light levels and a medium CCT under moonlight. These dynamic changes in light levels and CCTs define our 24-hour internal clock in terms of the different hormones produced. During the day, appropriate amounts of hormones are secreted such as dopamine for pleasure, alertness and muscle coordination; serotonin for impulse control and carbohydrate cravings; and cortisol for stress response. During the night, melatonin secretion allows for sleep and refreshes our body. This diurnal cycle of the human body is termed as the circadian rhythm.

## **How does lighting affect our circadian rhythm?**

The circadian rhythm can be disrupted without regular and direct exposure to dynamic lighting from the sun. The discovery of the intrinsically photosensitive Retinal Ganglion Cells (ipRGC) in our bodies has been found to be very important in setting our internal clocks. The ipRGC are especially responsive to light that is rich



Figure 1: Conceptual Lighting Algorithm for Day Shift Work

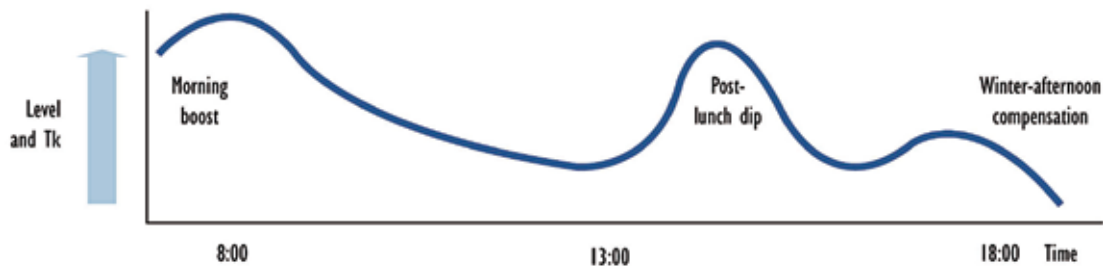


Image courtesy: Simeonova, M. (2004). "Healthy Lighting for the Visual, Circadian and Perceptual Systems." Business Briefing: Hospital Engineering & Facilities Management.

***Are there any realised project examples in India with respect to such lighting?***

Mindtree's Network Operations Centre in Bangalore is a prime example of human-centric lighting. Figure – 2 illustrates the LED cove lighting from Traxon that has been programmed to create different scenes that simulate the various times of day and then fade between those scenes over a 24-hour period in the following pattern:

- Morning - the lighting would be warm amber during early morning, changing to light amber and then white.
- Noon - the lighting would change from white to cool white.
- Evening - the lighting would change from cool white to white, and warm amber again.
- Night - the lighting would change to different shades of blues through the night.



Project : Mindtree Network Operations Centre, Banglaore Lighting design: Oculus Light Studio/USA in association with Lighting Research & Design / India Image courtesy: Amardeep M. Dugar

***Conclusion***

While human-centric lighting is still a relatively new concept (although it has been around since the existence of humankind!), developments in LED luminaires and control technologies have helped it find its way into architectural lighting design. However, a collective effort will be required from all players including architects, designers, engineers, manufacturers and policy-makers to make human-centric lighting an everyday requirement just like our daily doses of coffee or tea.

# Lighting Design Composition & Detailing



Park Hyatt Chennai, India

## Introduction:

Lighting design is a tool that brings architectural composition alive. It has to be meticulously articulated like a musical composition. It has got a structure, visual melody and grammar. Lighting has to tangentially follow the trajectory of spatial design elements and quietly underline it without disrupting the rhythm of architectural composition. Lighting and spatial design should be visually recognized as one. Tuning the composition or lighting design conceptualization is the first part of design process. The second part, very important one, is the detailing of design. It is crucial to learn detailing which is the vital step prior to implementing a project and only when you detail your design the right way, the effort or artistic essence would be retained and successfully reflected in the finished project. Detailing is the key to translating design from paper to reality.



**Ms. Anusha Muthusubramanian**  
Founder and Principal  
Lighting Spaces  
anusha@lightingspaces.co

## Conceptualization:

Painting a space with light brings out visual order of spatial elements and the space having an underlying idea or concept is the soul of the project. It is a process by which the designer understands the visual interaction of architectural elements and articulates them ingeniously into a spatial composition. This process is systematized by understanding the principles of lighting composition.



Sathyam Cinemas, Coimbatore, India

The process of lighting composition is as follows :

1. Dissecting and understanding spatial elements: Identifying each spatial element and its characteristics are very important to figure how they can be brought together in light. Lighting technique has to accentuate its visual progression.
2. Layering: After understanding the spatial elements, they are grouped into layers that can be visually unified with character. When one layer is visually differentiated from another with lighting variables such as light color, contrast, technique, etc. When one layer is overlapped visually with another with differentiating lighting character, it provides visual depth to a space.



3. Hierarchy : Setting hierarchy of highlight between each layer is a technique by which, visual interest is created. Visual priority set by the designer for each layer depending on which element deserves more visual emphasis. It is a deliberate attempt to channelize the viewer's perception and decide how the viewer's attention is directed.

4. Framing Views : Each view or vista is framed in the process that renders the spatial form to viewer. This sets the journey of visual progression through a space leading the user from one view to another. Thus providing a visual experience through a space.

5. Highlights and Pause : It is not just the highlights but also the pauses or non-highlighted elements that occur in combination add interest to a visual composition. It is the pause that adds more meaning to a highlight. When the pauses and highlights are in the right proportion and combination, an aesthetically pleasing view is composed.

#### **Detailing:**

The conceptualization is only about dreaming ideas in paper. It is a very important skill for a designer to learn detailing a concept or vision. Architectural detailing is the strength of a project whereby the integrity of concept is retained and the aesthetic quality is translated from paper to reality. Detailing is not just for conceptual interpretation alone, it is also crucial for periodic maintenance of fixtures and other hardware, longevity of quality of project and seamless integration into architecture.



**Park Hyatt**



**Villa Maya Restaurant, Thiruvananthapuram India**

The process of lighting detailing is as follows :

1. Understanding Architectural structure : To know how to integrate light within a structure, a designer should know its capabilities and limitations. Tucking in light cleverly into the structure and seamlessly making the light a part of space and the art of visually uniting them into one is a great strength for a designer. Recessing depths, interruption of beams and ducts, type of spatial elements (wall, ceiling and floor) and space required for fixtures and hardware are vital pieces of information that enables the designers to detail a space efficiently.

2. Electrical hardware and Wiring : Power requirements have to be coordinated at the right time with the electrical engineer. Understanding where and how the wiring input is in the fixture and number of drivers required in the case of linear runs gives information on how to lay them in a linear pocket. Concealing drivers and wiring are an important task to keep the hardware out of sight. In case of exterior and underwater fixtures, designer should be aware of requirements of integration with built space.

3. Aesthetic integration : While laying out the light fixtures per concept, it is important to avoid light gaps in linear wall wash, hot spots, uneven scallops due to improper spacing and improper alignments. Avoiding seeing the light source in direct visual field cuts off glare and visual discomfort.

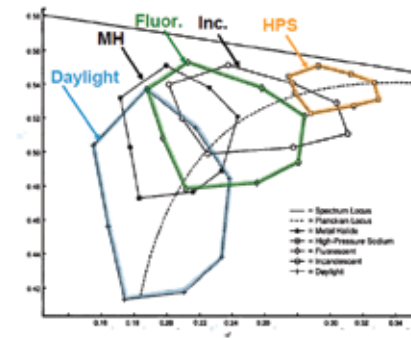
4. Mockups: There is a lot of difference between a design on paper and how it is at site with its real constraints. Testing details at site condition with the help of a mock up ensures that the designer's vision is carried forward. The challenges faced at site can only be better tackled with a mockup. Intuitive problem solving is an asset that mockup provides the designer.



**Mr. Senthilkumar Madasamy**  
FAE Manager, CREE India Ltd.,

# TM-30 standard : New Color Metric for quantification of color

confusion leading to poor lighting choices. However, the bigger question is whether higher color fidelity is sufficient to describe the color.



Adapted from *Human Factors in Lighting - 2nd Edition*  
Baker, P. R., 2003, London, New York: Taylor & Francis.

Figure-2: the Color gamut of different light sources

## Introduction

Color quality is critically important for most of indoor lighting applications. For several decades, traditionally, color has been quantified by the metric called Color Rendering Index (CRI). To compute CRI, the spectral power distribution (SPD) curve has generally been used from the integrating sphere measurement. CRI, by virtue, is fidelity measure. The computed CRI value produces an average number ( $R_a$ ) quantifying how closely a test source (source measured in the sphere) renders objects color like a reference source does. While calculating CRI, there are only eight test color samples (TCS) is chosen from the reference. The fidelity values of eight test color samples are not representation of actual color of the source. One can see the TCS samples and its colors shown in figure-1. TCS1 (R1) to TCS08 (R8) is poor representation as saturated colors like deep red is not included. Hence, TCS09 (R9) and up to TCS14 have been supplemented in the color quantification.

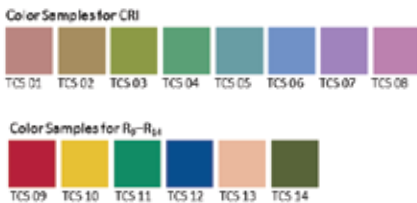


Figure-1: Test Color Samples (TCS) used for CRI calculation

Even with the R9-R14, the many colors are not represented in the CRI calculation. Hence, CRI is a poor measure of color quality or color fidelity. In addition, TCS is very sensitive to some specific wavelengths. Hence boosting specific wavelength in SPD, one can increase the CRI, which is not desirable. This has been causing lot

of interest to note that the light source has the ability to make the object color appear dim or vivid. This characteristic needs to be captured in the metric that characterizes color. Scientist from LRC initially proposed two metrics for color rendition [1]. One is CRI and the other is color gamut. Color gamut gives an idea about how much the light source influences the color rendition. The color gamut is also estimated for only 8 test color samples. One can see the color gamut of different light sources in figure-2. As you can see the color gamut area for the daylight is higher. This means the color appears brighter under the daylight illumination. One can discriminate different colors easily. It should be noted that the user preference to color is subjective and it is influenced by gamut/Chroma change. Hence color gamut is a complementary metric to CRI. It again should be noted that the color gamut or color gamut area index (GAI) is a number, which can be written as below

$$(1)$$

Where  $A_t$  is gamut area of polygon of the test source (please see the figure-2) and  $A_r$  is the gamut area of the reference source. It should be noted that some of the artificial sources can have a higher gamut area of polygon than the reference source. Hence, it is possible to get  $R_g$  value of more than 100.

This is again a simple number, which indicates an average value of chroma change (dim or bright) in the appearance of the object under illumination. Higher the  $R_g$  means higher is the color vividness in the appearance of the object.

Apart from these two metrics, CRI and GAI, there is one more standard that has also been proposed earlier, which is called Color Quality Scale (CQS)[2]. CQS employs three metrics namely color quality ( $Q_a$ ), color fidelity ( $Q_f$ ) and color gamut ( $Q_g$ ). Instead of taking 8 Test color samples, that we have seen in earlier in this section, CQS metric takes into account of 15 TCS. These samples include high chroma samples, which account for the shortcoming in CRI for saturated color. The metric  $Q_a$  provides valuable information on chroma and color saturation. A visualization tool has been established for  $Q_a$  to see how the various colors get distorted. This is better than the single valued color metric  $Q_g$ . Despite having great progress made in quantifying color, there is no universally accepted method that has been established. Hence TM-30 standard has been established collating all these concepts and modified to improve the color quantification.

## 2. TM-30 Standard

TM-30 standard has adopted two metrics for color with improved TCS samples selection. As we already know that 8 test samples that have been adopted for CRI metric has a lot of missing colors and lacks color uniformity (both space and spectral uniformity) in the selection. However, TM-30 uses 99 test samples (TCS) overcoming color uniformity issues with CRI metrics. With these improvements, the key features of TM-30 is

- Two metrics, Color fidelity ( $R_f$ ) and Color Gamut ( $R_g$ )
- Visualization tools that provides details about color distortion

### 2.1 Color Fidelity ( $R_f$ )

One of the issues with CRI discussed in the section-1, has been CRI sensitivity to



specific wavelengths. It is possible to increase the CRI by boosting certain wavelength in the SPG. This will increase change the color appearance of the object, which may not be desirable. One has to remember that CRI is measure of color fidelity. Hence, the Color fidelity ( $R_f$ ) calculation in TM-30 makes sure that it is not sensitive to wavelength. The TCS samples (99 numbers) have been carefully chosen such that they are not sensitive to wavelength. This eliminates the idea of manipulating the spectrum (SPD) to achieve higher  $R_f$ . For  $R_f$  calculation, the method followed is very simple

$$(2)$$

Where  $\Delta E$  is error resulting from test source and reference illuminant. Since this formula can yield negative ( $< 0$ ) value, hence above equation is scaled to 0-100 with modified equation

$$(3)$$

It is important to understand the difference between the traditional CRI measure ( $R_a$ ) and color fidelity ( $R_f$ )

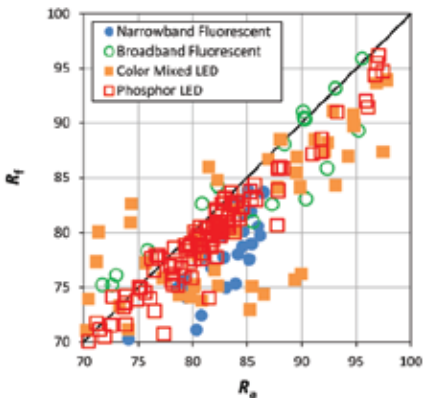


Figure-3. Correlation between CRI and color fidelity

The CRI value and  $R_f$  value match perfectly, when the spectrum (SPD) is smooth. But when the source spectrum is not smooth with lot of peaks, the CRI value does not match with  $R_f$  value. In figure -3, one can see the difference between the CRI ( $R_a$ ) and  $R_f$  is higher for narrow band fluorescent spectrum and color mixed LEDs. These two sources have lot of peaks in the SPDs and are made with optimized phosphor to increase the Light Efficacy of Radiation (LER). This is measure of how much radiated light falling within the eye response curve. Optimizing the spectrum of the light to increase LER there by

increasing efficacy (lm/W) may not desirable in terms of color quality perspective. Hence  $R_f$  is important when optimizing lighting scene for color quality.

### 2.2 Color Gamut ( $R_g$ )

For color gamut calculations, unlike CQS scale system, TM-30 uses 99 test color samples like the way it is done in fidelity calculations. Then, all these values have been grouped and reduced to only 16 hue bins. Hence, in color space, the gamut will have polygons with 16 hue points. Then the area within the polygon is computed and compared with reference source. Finally,  $R_g$  value is computed as per equation-1. It can be seen from figure 3a that if the gamut area for the test source is higher, one can get  $R_g$  value higher than 100. This procedure is similar to CQS calculation, but the difference is TM-30 takes in to account of more test color samples of each hue thereby increasing the accuracy. Color gamut ( $R_g$ ) gives valuable information about how much color appearance of the object is altered under the light source illumination. As it is known that light source can induce hue shift, saturating shift and de-saturating shift. Figure-3 portrays the color appearance change under illumination in color space. It should be noted that this color space portrayal is as per CAM02UCS method.

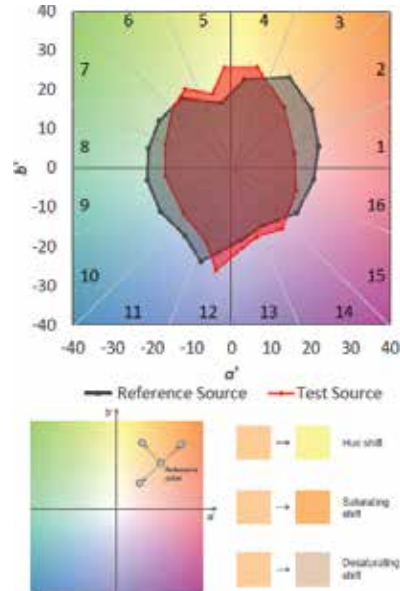


Figure-3: (a) Gamut area of the Reference source ( $A_r$ ) and Gamut area of the Test Source ( $A_t$ ) for calculating  $R_g$  (b) color shift due to movement of hue point shift in color space.

### 2.3 Color visualization tool

The two-metric TM-30 method can be portrayed graphically such way that one can get valuable information about the color of the source. Figure 4 (a) shows the two-axis graph providing information about color saturation (Dullness and vividness) and fidelity.

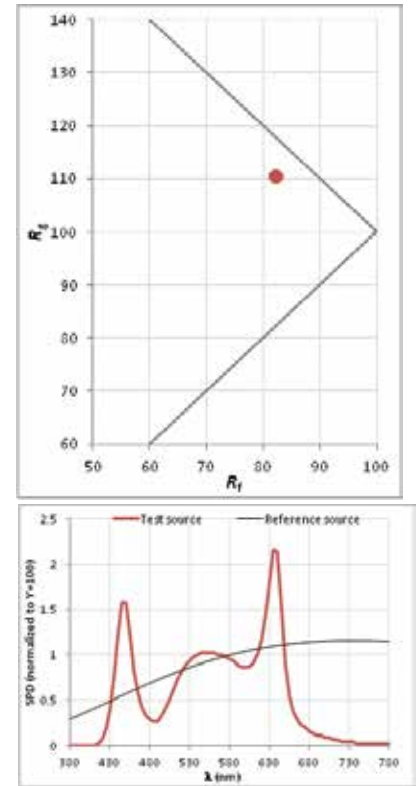


Figure-4: (a) Two-axis Color representation of (b) hybrid LED spectrum

It can be learnt from the two axis ( $R_f$ - $R_g$ ) graph that, the lower  $R_g$  values (less than 100) indicates less color saturation and higher  $R_g$  values (greater than 100) indicates higher vividness. In the above graph, the light source (LED) has  $R_f$  of 82 and  $R_g$  of 111. As one can see from the spectrum (figure 4b), the LED is hybrid LEDs with sharp red peak, which causes higher color saturation/hue shift. In order to understand further on which color is getting saturated or distorted, one needs to see the Vector graphic as show in the figure-5. This vector graphic is for the spectrum shown in figure-4b. The white gamut line in the figure is for the reference source and the dark gamut line is for the test source. One can see clearly how the test source is deviating from the reference source causing the hue shift.

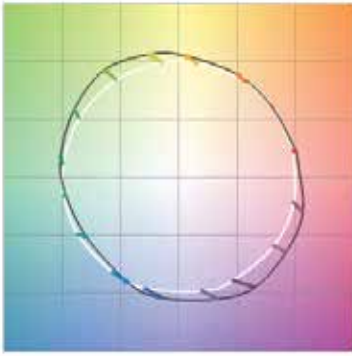


Figure-5: Vector graphic indicating the color saturation

### 3. Conclusions

TM-30 standard, which is two-metric standard together with the interesting visualization tool enables better understanding of color of the light source compared to earlier standard. It predicts not only the color fidelity with better accuracy, but also the color saturation and distortion. It should be noted that high fidelity is not always the right metric for lighting applications. The color saturation and vividness also plays major role in selecting light source for given application. TM-30 clearly will help to optimize the lighting design.

### 4. References

1. J P Fresyssinier and M Rea, "A Two metric Proposal to specify the color rendering properties of light sources for retail lighting", Proc. Of SPIE Vol 7784 77840-V3.
2. A David, PT. Fini, et.al., "Development of the IES method for evaluating the color rendition of light sources", Optics Express, Vol.23, No.12 (2015)



"MINNA NO MORI" MEDIA COSMOS, Gifu, Japan  
Award of Merit + Sustainability

Credits:  
LIGHTING DESIGN  
KOARU MENDE, FIALD

PHOTOGRAPHY  
© Lighting Planners Associates

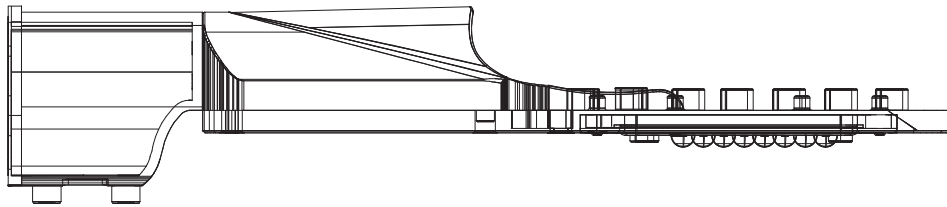


# Introduces NAYAN 40

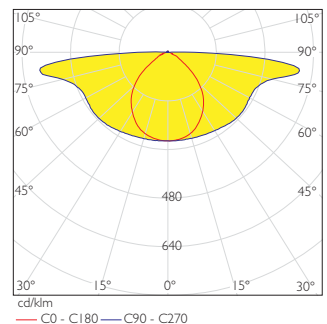
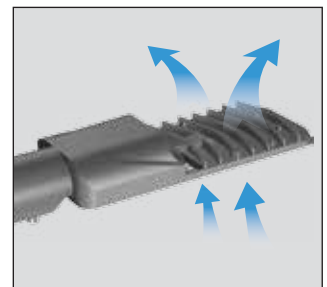
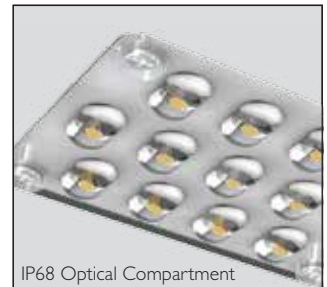
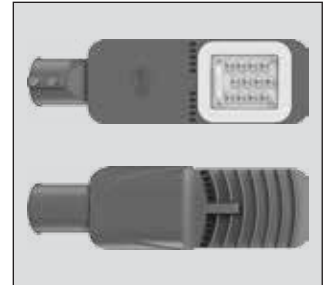
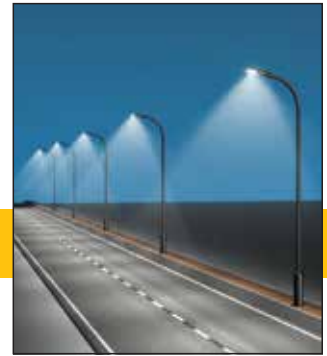
Rethink Efficiency . Rethink K-lite

Unbelievable performance . Unbelievable price

India's Lighting Company



- Elegance . Functionality
- Cutting edge light performance with IP68 optical compartment.
- Very low energy consumption, 40 watts with 5600 lumens.
- Ergonomic lighting distribution to achieve uniform illuminating effect.
- Smaller roadways, private driveways, residential areas, public area lighting like parks & squares.



Illuminating your way



D-10, Ambattur Industrial Estate, Chennai - 600 058.

Tel : 26257710, 42281950, Fax : 26257866

Cell : 95000 79797, 95000 85511 | Email : info@klite.in

Website : [www.klite.in](http://www.klite.in)





**Mr. Amrith Prabhu**  
Country Manager-India  
Philips Lumileds

## CASE STUDY

# Selfridges Windows Entice Like Never Before With Dynamic Lighting

Every three months, Selfridges in-store creative team reveals new designs for its multiple windows facing Oxford Street, the busiest shopping street in Europe. In these windows, the shop has installed LED track lights using Lumileds LUXEON Z LEDs with wireless control and a dynamic web app to enable dynamic light shows that bring the dazzling displays to life.

## Challenge

For over a hundred years, Selfridges has been known for its spectacular window displays. In recent years, the displays have become quite dynamic. Last Christmas, following a zodiac theme of Journey to the Stars, one display showed Scorpio in an elaborate headdress that changed color in reaction to heat from the sun. Such dynamic displays were poorly served by CDM lights in white and fixed colors with no method for providing dynamic lighting. In addition, every three months the 24 window displays are changed and new lighting is brought in and installed alongside the installation of the new displays. A less costly and cumbersome approach was needed.

## Solution

The store's creative team explored the installation of flexible LED lighting that would not only allow for dynamic light shows but also provide superior light quality and eliminate the frequent replacement of the lighting fixtures. The store chose Invisua Lighting for its holistic solution of providing fixtures, a control and web app system that is plug-and-play. Invisua's Masterspot 2 spotlights work seamlessly with the Lightport controller and interfaces with the user's tablet or phone for ease of use. Invisua's UK-based distributor Progress Lighting Ltd provided installation and programming of the light shows to match Selfridges window displays.

**"Each window creation is like a small theatre. Dynamic LED lighting is often essential to the story it's telling."**

— Matthijs Keuper, CEO and Founder  
Invisua Lighting



## Challenge

To replace the CDM track spotlights in 24 display windows at Selfridges in London with color and white LED track spotlights capable of wireless, dynamic light shows programmed specifically to best show off each window's content.

## Solution

Using existing tracks, Progress Lighting installed between four and eight Invisua's Masterspot 2 wireless track lights per window in place of the CDM lights. For the Masterspot 2's, Lumileds LUXEON Z white and color (red, green, blue) LEDs were chosen for their high flux and color consistency. Wireless control and a dynamic web app enabled on-demand delivery of light shows in each window.

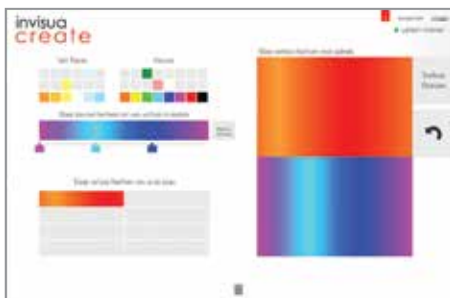
## Results and Benefits

The dynamic lighting and light shows greatly enhanced the already stunning window displays at Selfridges. Now that the lighting hardware no longer needs to be changed when new design installations are brought in, the creative team can concentrate on best coordinating the light shows with the window designs.





The Masterspot 2 spotlights are ideally suited to this project due to their ability to produce high luminous intensity of 35,000 candelas (3200+ lumens) with outstanding color rendering (CRI = 95, R9>90) and an adjustable beam angle of 12-24°. Invisua uses white, red, green and blue LUXEON Z High Power LEDs from Lumileds because they deliver exceptional color consistency, high flux density as well as superior beam angles due to the very small emitter size. The emitters produce every color from all shades of white light along the blackbody locus to the most saturated RGB colors. Using between four and eight spotlights per window, some Masterspot 2 spotlights are dedicated to tunable white light while others provide colored, dynamic light as required by the light show.



## Results and Benefits

Selfridges window displays have a lot of action taking place in a small space of only 5 x 2.5 meters, so the ability to adjust beam angle of the spotlights is important and it is a feature not commonly offered on competing products. In this small space, there may be dozens of people working to assemble the window displays at once. Having a lighting system in place that will not change with each display installation greatly simplifies the overall process.

The intuitive web app allows for quick and easy setup and light scene design. A light scene previewer allows planning and comparison of scenes. Feedback from viewers of the new dynamic lighting approach has been overwhelmingly positive. People see the dynamic lighting as portraying a more modern aesthetic. With dynamic lighting, the spotlights can also be programmed to tell the story of what is taking place in the window, to match the scenery outside the windows, or to switch between the two. Dynamic lighting gives the creative team at Selfridges a creative “knob” that they did not have with static lighting.

**“The window displays and lighting typically are changed every three months. But now with a flexible LED lighting system capable of dynamic lighting effects and wireless control, only the lighting programs change, which greatly simplifies matters..”**

— Matthijs Keuper, CEO and Founder  
Invisua Lighting



“The magnificent lighting opportunities afforded by the Invisua Masterspot fixtures have really brought our window displays to life.”

— James Barnett,  
Production Manager Windows and Creative, Selfridges & Co

## About Lumileds

Lumileds is the global leader in light engine technology. The company develops, manufactures and distributes groundbreaking LEDs and automotive lighting products that shatter the status quo and help customers gain and maintain a competitive edge. With a rich history of industry “firsts,” Lumileds is uniquely positioned to deliver lighting advancements well into the future by maintaining an unwavering focus on quality, innovation and reliability.

To learn more about our portfolio of light engines visit [www.lumileds.com](http://www.lumileds.com).

## About Invisua Lighting

Invisua Lighting develops, produces and sells innovative dynamic LED lighting solutions for the retail and hospitality market. We enable the use of dynamic accent lighting solutions for professional applications and strive to excite people by the performance and possibilities of our products. Learn more at [invisua.com](http://invisua.com).



©2016 Lumileds Holding B.V. All rights reserved.  
LUXEON is a registered trademark of the Lumileds Holding B.V. in the United States and other countries.

[lumileds.com](http://lumileds.com)

Neither Lumileds Holding B.V. nor its affiliates shall be liable for any kind of loss of data or any other damages, direct, indirect or consequential, resulting from the use of the provided information and data. Although Lumileds Holding B.V. and/or its affiliates have attempted to provide the most accurate information and data, the materials and services information and data are provided “as is,” and neither Lumileds Holding B.V. nor its affiliates warrants or guarantees the contents and correctness of the provided information and data. Lumileds Holding B.V. and its affiliates reserve the right to make changes without notice. You as user agree to this disclaimer and user agreement with the download or use of the provided materials, information and data.





since 1963

# *Termination Solutions for diverse applications*



## **Elmex Controls Pvt. Ltd.**

12 GIDC Estate, Makarpura Road, Vadodara 390 010, India  
Telephones : +91-265-2642021, 2642023 ♦ Facsimile : +91-265-2638646  
e-mail : [marketing@elmex.net](mailto:marketing@elmex.net) ♦ URL : [www.elmex.net](http://www.elmex.net)



**Mr. Ashish Rakheja**  
Chairman  
ACREX India 2017

## Reflecting Upbeat India

ACREX India 2017 is already being spotlighted across continents and the industry is setting up with interest. Around the globe ACREX representatives are introducing the event to associations as well as attending various shows. The Industry is supporting this event in a big way and promises the biggest ACREX in 2017. Mr. Ashish Rakheja, the Chairman of ACREX India 2017 was happy to reveal that this edition is set to bring in new trends for the Exhibition industry. Following are excerpts from the discussion with him where he gave us insights on the current action:

TOUCHING ON the current pulse of the industry, Mr. Rakheja observed, “The increasing buzz indicates an upswing in the industry. The summer of 2016 showed brisk business for unitary and VRF products. New and upcoming Hospitals, Retail, Industrial, Infrastructure as well as Commercial developments should now provide a fillip to central plant business and drive a positive growth pattern, keeping pace with the steady rise in the Refrigeration industry. Most upbeat has been the last decade of Green building movement and focus on Energy efficiency: the end users, specifiers and installers have become aware of the benefits of investing in energy saving technology. The government’s new “Make in India” program has boosted manufacturing in HVAC&R sector making the latest products more affordable. India is currently a favourite for large International players who see the country as a growth engine for their business”.

### **The place to be**

“ACREX India 2017 will reflect the buoyant sentiments of the industry,” explained Mr. Rakheja. “With aggressive stall bookings, companies are investing readily to showcase their new range of products. Over 60% space has been booked within three months of the event-launch and demand continues to be aggressive. Delhi as a venue never fails to attract huge industry participation, leaving visitors with a feeling of time well spent. Bucking the stagnating trends of the last few years, the show at Delhi is set to cross a 30,000 sq m mark. This is a robust 15% growth over the previous editions making it the biggest event so far.”

### **Biggest Alliance Ever!**

Mr. Rakheja went on to reveal, “Visitors will be treated to a new experience this year: ISHRAE under it’s “Vision ACREX Plan” has created the brand name “Build Fair Alliance (BFA)”. BFA will bring different players of the Construction Industry under this umbrella and thus offer all stakeholders of the industry an opportunity to acquaint themselves with the latest technology in the field. The action packed three days will be difficult to resist and the visitor count is expected to be at an all time high.”

### **Global presence**

Mr. Rakheja proudly elaborated, “This year ACREX India will host heads of over 25 International HVAC&R associations. International participation is expected to touch nearly 30% of space booking making ACREX a window to India for the global market. IEML Greater Noida offers a world class venue creating a significant impression on international visitors as well as exhibitors. Such an impressive location with extensive car parking, amenities and conference facilities is a fitting venue for hosting the Build Fair Alliance available only at IEML.” “In addition, ACREX being a B2B show will attract only the serious visitors. This aspect was amply reflected in the key exhibitor survey conducted prior to taking a decision on moving ACREX to this new venue. Overall, the show is set to grow to new heights,” he asserted.

### **Attention MSME**

“MSME are key to the growth story of any sector. To promote MSME participation, trade association meetings designed to understand their needs have been conducted. Based on the feedback, we offer special MSME packages at a nominal charge which include six or nine sq m booths managed by a hostess, airport transfers, hotel stay, tickets to key events as well as an opportunity to meet with international visitors and exhibitors,” explained Mr Rakheja.

### **Automation Industry**

On a closing note Mr Rakheja shared, “This year a focused approach is being made to increase participation of the Automation Industry. HVAC and Automation are traditionally closely associated with common specifiers and manufacturers. An Automation industry meet is being organized on the ACREX Platform both before and during the event which will be helpful “ concluded Mr.Rakheja.

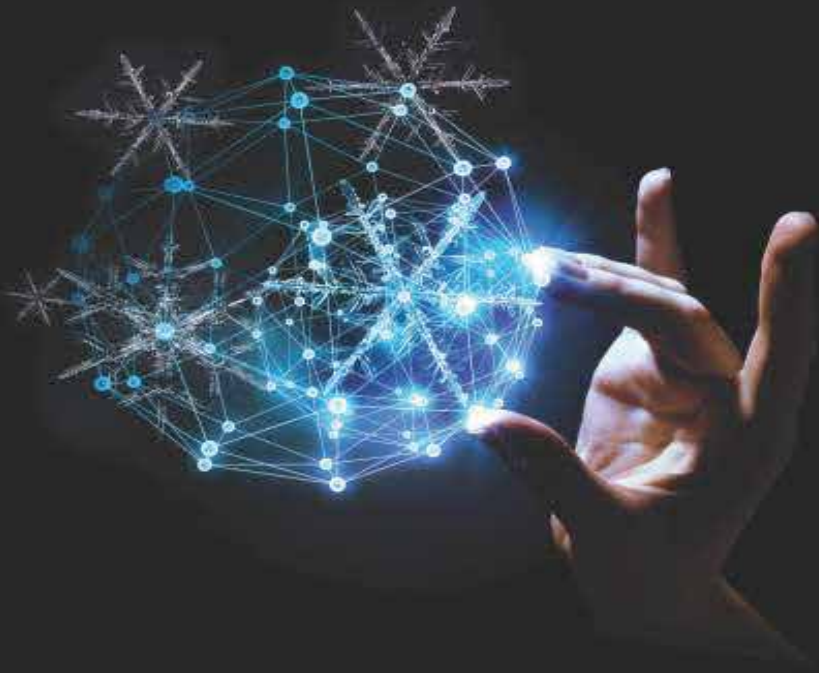
# ACREX<sup>®</sup> India 2017

23 - 25 FEBRUARY • 2017  
IEML • GREATER NOIDA • DELHI

[www.acrex.in](http://www.acrex.in)

South Asia's Largest Exhibition on Refrigeration, Air-conditioning, Ventilation and Intelligent Buildings

RISING INDIA:  ENTERPRISING & COOL  
Witness 'Global Cooling'



Organiser



**ISHRAE**

Event Producer

**NÜRNBERG MESSE**





## EMERGENCY EGRESS ROUTE LIGHTING SOLUTIONS

We, at **PROLITE AUTOGLO LIMITED**, vouch to remain committed to continually improve our services (“Manufacturing, Sales & supply of Exit/Emergency Egress Route Lighting System , Photo luminescent Signages, Site Safety Signage, Low Location Lighting Solutions, Directorate General Of Shipping Approved Signages, Safety Posters”) & the effectiveness of the quality management system through enhancing customer satisfaction ,timely actions and ensuring/applying best industrial practices.

We are the pioneers in Emergency / Egress Route Lighting Solution Since 1984. During our journey we have expanded our network from one office in Mumbai to eleven offices in India alongside having a wide network of Sixty Plus Dealers across India. We are Exporting to 26 Countries and are in the process of Appointing Distributors abroad. With Having the CE certification with us, we are penetrating the international market and managing to execute high end projects.

With introduction of LED lamps we were able to reduce wattage of lamps giving the same output, which helped it in adhering to the Green Building norms.

Due to the Nano technology we have been able to reduce the size of the fixtures drastically which has given the Emergency light a very sleek and aesthetic look which played a very vital role in getting the same implemented in projects where aesthetic values matter a lot. Also with the new advancement in the type of charging cells available across the globe the weight has also been considerably reduced.

Our Products are helpful in Evacuation of people from the interiors of the premises to the exterior during a disaster. Our constant efforts in promoting and spreading awareness of our range of products have somehow played a crucial and vital role in peoples mind to implement the same at all their premises. It has also become a mandate to install Emergency/Exit route Lightings systems at each and every premises. The same has been made compulsory by the most recognized authority in the construction field that is **National Building Code of India (NBC)**. **It has also been made a very crucial product to be installed which is in return checked and confirmed by the Fire Authority which plays a vital role in approving the Safety of each premises.**

Prolite has an in House R&D Team consisting of technically qualified trained engineers working on developing new products which would meet or exceed the future market trends and requirements.

Our team main criteria is to create best quality products, best in technology, Rugged/Robust in nature, appealing aesthetically and at affordable prices.



Scan me to connect...



Bengaluru • Hyderabad • Kolkata • Lucknow • Ludhiana • Nagpur • New Delhi • Pune • Rudrapur • Vadodara

## LED EMERGENCY BATTERY BACK-UP MODULE



Prolite Emergency Conversion Module (PECM) helps in converting your existing light to Emergency Battery Backup Light. This helps us in retaining the aesthetics of the premises and allow us to follow the fire norms as per the requirement. By using these innovative & sleek units we also fall in line of following the luxe level output required in a emergency situation by the premises. These conversion Modules are available in all main formats of lighting like CFL, FTL, LED and Halogen.



Scan me to connect...



**Prolite Autoglo Limited**  
25, Singh Industrial Estate No.3, Ram Mandir Road,  
Goregaon (W), Mumbai-400 104. Maharashtra INDIA  
+91-22-67868100 | sales@prolite.in | website : www.prolite.in

Bengaluru • Hyderabad • Kolkata • Lucknow • Ludhiana • Nagpur • New Delhi • Pune • Rudrapur • Vadodara



**Mr. Kaushik Shendye**  
Product Manager  
bag electronics (I) Pvt Ltd.,

## Development of robust LED driver suitable for Indian Power conditions

conditions by means of a sophisticated data recorder. Data was then processed and analysed to form functional requirements for the new series to be developed specifically for Indian power conditions, because the products developed to global specifications did not meet the needs of the Indian power conditions.

The findings are quite interesting. The power fed to Indian consumer is full of fluctuation. We observe voltage events as low as 140V and as high as 300 Volts. Some incidences of having more than 400VAC due to loose contacts in Neutral wire connections was also got catches and this is much common in sites under commissioning, or older installations where preventive maintenance is not carried out. To handle such wide voltage fluctuation special care has to be taken in drivers. In some cases voltage outages are observed in other words they are also called voltage cuts. This can cause flicker for that instance.

Another big threat to the driver is presence of surges and fast transients on mains supply. Fast transients are very high voltage, in range of 3~4KV, low energy superimpositions on mains supply, mainly responsible for causing malfunction in microcontrollers in driver. Controller IC controls function of driver and responsible for all critical parameters such as LED current control. Flicker free operation, THD, Power factor correction etc. Surges are high voltage, in range of 3~4KV, high energy superimpositions on mains supply. Surges do cause permanent damage to drivers, results in burning of controller IC, MOSFETs, and LEDs. This cause Luminaire non workable much before estimated lifetime causing huge loss in terms of loss of work due to non-availability of light and replacement cost of luminaire.

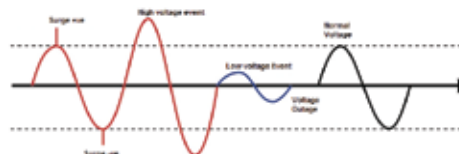
surges. In case there is no surge arrestor or filter is installed in between supply line and load the surge freely transmitted to power cables and affect nearby sensitive electrical devices such as LED drivers. Surges come through lightning and other natural events but occurrence of such events is comparatively negligible in Indian continent. Many low power electronic gazettes do not have active power factor correction. Now a day's use of such product is significantly increased. In lighting a low cost lamp fitting typically below 25 Watt was generally without active power factor correction circuit had low Power factor of 0.5 & 150% Athd. Usage of such lamps was restricted. When LED came in to market most of these lamps got replaced with LED with same electrical specs as well as Fluorescent lamp fittings upto 40 Watts got replaced with low cost Led fittings below 25Watt due to high efficiency of LED. This cause heavy load on transmission lines as the wattage got reduced but the Power factor and THD got worse.

To overcome this situation, and protect the devices in such power conditions there are two ways one is to make the product stronger and other is to give add on protections to existing product. Both ways have their own advantages and disadvantages. We have developed a product called SPD, A surge protector device which suppress the surge voltage and protect the device from getting damaged. SPD are to be connected as electrically close as possible with the driver. The other option is to design the driver with higher immunity to surge and fast transients. There are additional protection components added in input side to suppress surge. The side effect of the same is reduction in Power factor and deterioration of ATHD. A Power factor value of  $>0.9$  with ATHD  $<20\%$  should be a fairly acceptable limit for low wattage (upto 50W) LED drivers. Product should have low voltage and High voltage cut off to get protected from voltage fluctuations.

<http://www.OEM-Systems.com>

Established in 2008, at Pune (Maharashtra, India), "BAG Electronics (I) Private Limited," is a prominent manufacturer, exporter and supplier of a variety of Components & Electronic Gears for Lighting. In year 2010 we initiated market study for Indian market. The three main aspects are to understand wishes of an Indian customer, Indian environmental and power conditions and market trends. This was the first and most important step towards the new product design for Indian market. Indian customer is very choosy, value conscious and always welcoming new concepts and products, as long as they are within her spending capacity. Being one of the most populated country, and a developing nation getting customer for a product was not a big issue. The environmental conditions were generally known to us. The only challenge left was to know about Indian power conditions.

India is very big compared to European nations. There is a huge variation in the country itself. Different climatic situations, extreme dry deserts to extreme humid seashore areas. Ice cold "Himalaya" to burning hot "Thar". Dense cities like Mumbai, Delhi to least populated villages. Industrial cities, commercial cities, Farms in villages, Hill stations. The electrical conditions at each place have its own blend. Rural areas are more known for low voltage and power cuts. While the urban areas have comparatively stable supply, the industrial zones are more prone for surges and impulses, while farms and Hill stations are known for thunders and lightening related surges. BAG engineers took "Bhagirath efforts" to collect the actual data of electrical conditions, visiting various places and recording abnormalities in electrical





IALD AWARD OF EXCELLENCE



Credits:  
LIGHTING DESIGN  
NUANXI HUANG  
YU-HUANG CHEN  
CHIAO-CHIH LIAO  
HWO-GHEE TAN  
ORIGINATOR LIGHTING DESIGN  
CONSULTANTS INC  
PHOTOGRAPHY  
© Chin-Ming Cheng

## ARTRON BOOK WALL, SHENZHEN CITY, CHINA

The Artron book wall is found inside a Chinese art center owned by a printing company. Visitors descend a massive staircase and arrive at the wall itself, which houses more than 50,000 art books. The enclosing space is 50m wide, with a towering 30m ceiling – in approaching this “black box” with no natural daylight, the lighting designer’s aim was to soften the space and shorten the distance between art and human.

A clear glass panel protects the books, but posed a unique challenge in applying light well. To avoid glare, the team from Originator utilized projectors to light the books from inside the glass panel and help visitors view them clearly.

“Light the task,” one judge commented, “and everything else will take care of itself.”

While the book wall is the main focus of the space, the sculptural staircase makes its own impression. The staircase is covered by a layer of greenish blue aluminum mesh on both the bottom and one side, while the opposite side is clear glass. Colored reflections from the mesh strike the glass of the book wall and add mystery to the space – and the clear glass handrail allows visitors to see through to the wall as they approach.

Since the main light source comes from the wall itself, the designers were able to leave a clean ceiling, with just a few downlights. Lighting for the walking path is integrated into the handrail system at two layers: sources are found both above the handrail and concealed within.

The surfaces opposite the book wall are kept as dark as possible to serve as contrast and strengthen the effects of the wall and stair. A linear light box housing a row of fluorescent uplights and several pairs of halogen downlights is added to the middle tier, re-emphasizing the spectacular vision and providing illumination on the mezzanine.







Inaugural Function of Lii 2011



Inaugural Function of Lii 2011







Inaugural Function of Lii 2013



Inaugural Function of Lii 2013









**Mr. Kamal Sethia**


Director  
Conference & Exhibition Committees  
Indian Society of Lighting Engineers  
c/o Cosmos Engineering Industries (P) Ltd.  
8, Ganesh Chandra Avenue, Kolkata 700 013.

With the new team of Governing Body Members of ISLE for the period 2016-20, led by the President Mr. Dilip Kumbhat, restoration of the newsletter as a magazine under the banner of Light India International is the first step to establish ISLE's commitment and leadership in the field of lighting in India and lead the lighting fraternity to greater heights at the international level. The response received

for this magazine is itself a proof for the future success in all our endeavours.

In any field, exhibitions and conferences are the direct contacts for technology updation and closer fellowships for the respective fraternity. The technology growth is so fast that changes are continuous and unless we update at every opportunity we will be out of business and lost for ever. In fact ISLE pioneered such conferences in 1988 itself and conducts them at various places at the national level regularly. A Lighting Educators' Course was organised specially for a group of 19 Lighting Educators from India at the Lighting Research Center, (LRC) Rensselaer Polytechnic Institute, Troy, New York in the year 2000. The group consisted of 8 architects, 8 from the lighting industry and 3 from Home Science departments of Universities. ISLE organised in association with University of Sydney 'Principles of Lighting Course 2000' during 2000-01. This course was held at all 5 State Centre headquarters and was attended by 194 participants. Subsequently two day courses were held in various centres with

Now

 Lii 2017

international faculty through LRC along with lighting education programmes. Degree courses in illumination engineering have been initiated through ISLE in Universities.

As for the exhibitions, it all started as LIGHT SHOW 87 in Mumbai, LIGHT SHOW 88 in Bangalore, changed into PRAKASH 91, PRAKASH 95, PRAKASH 99 in Delhi and finally it is Light India International Lii2002, Lii2005, Lii2008, Lii 2011, Lii2013 and Lii2015. Lii is now an accepted international event calendered in world magazines. It is obvious that the turn is now for Lii 2017. When and where – should be fitting one to address the Make in India concept and meet the challenges thrown at the present juncture. Await our announcement.

 Lii 2017

Focus - **L.E.D**

Concurrent Event - **SOLAR**

**International Lighting Exhibition**

**Date & Venue - to be announced soon**

Supporting Greener India



VISION

**Watch out**



# India's Urgent Need for Lighting Education

It is surprising that, in a world that is absolutely dependent upon light, there is almost no lighting training or education. In many countries there is some training, given in-house by lighting companies or as part of trades courses in technical colleges. Tertiary level lighting courses exist in a few countries but these can be counted on the fingers of two hands. Developments in lighting technology have produced a range of design tools that can lead to improved and energy-efficient lighting. However, most of this technology is harder to use than traditional technology, emphasising the need for not only improved lighting education but for its initiation. This paper discusses the need for education and makes some recommendations for a coordinated approach that might be used in India and that the ISLE might be the logical organisation to undertake the task.

## Introduction

Electric lighting has existed for almost 135 years. For many people, lighting means electric lighting but lighting has existed since people moved into caves for shelter and began constructing buildings for shelter and other activities. Until electric lighting was invented, the only light sources were daylight (light from the sky and sun) and flame sources based on animal and plant fats and oils.

The flame sources were very inefficient, very expensive and very dangerous with most old cities experiencing disastrous fires at least once in their histories. Builders and architects had to know how to design with daylight, since that was the only abundant source of light. Only the rich could afford plentiful flame sources. People lived and worked by the seasonal and diurnal cycles of daylight. Fine work was done in shaded areas outdoors.

Electric lighting dominates our world and it is inconceivable, for those with it, to imagine what life was like without abundant light. Most of our night-time activities would be impossible. Our, some would argue our stupid 24h lifestyle would also be impossible.

Daylight has been forgotten, especially by architects, except as a luxury, a view or as a concession to appearing to have green credentials.

The lighting industry sees itself only in terms of electric lighting and even worse, often as purveyors of hardware rather than the providers of good seeing conditions. Just imagine if the lighting industry genuinely involved all of lighting: added would be the glass industry and the glazing industry (windows and roof lights).



**Emeritus Professor Dr. Warren Julian AM**  
Faculty of Architecture, Design and Planning,  
University of Sydney Chair, Lux Pacifica

## *A very small world*

For the last fifty years, until the last few years, the developed world has enjoyed a triopoly of lamp manufacturers; or has a triopoly enjoyed the world's need for light sources? There have been other major players in protected economies (like India's) or isolated economies (like China's). The triopoly was a result of mergers and acquisitions, bankruptcies, failed economies, developments in a closed technology and the protection and sharing of intellectual property.

There have been advantages from this way of doing things: robust technology, similar products from more than one manufacturer,

large scale production, large profits to allow research and development, a stable market of stable products and an interest by the lamp manufacturers in the industries that consume their products (e.g., luminaire and control gear manufacturers, national and international standards and education). In most of the world it is interesting, when talking to people who have a long term commitment to lighting, that many, maybe most, were introduced to lighting by working for a large manufacturer that in many cases provided their education in lighting. That education may have been broadly based in electric lighting or it may have been training to allow product sales but at least the education/training existed.

## *A world in chaos*

That small lighting world is now in turmoil because almost anyone can make LEDs and anyone can mount them on a circuit board. In China there are 3000 LED manufacturers. The most negative view of this change is that it has been from lighting to chips.

The governments of many countries weak in lamp manufacture but very strong in electronics are supporting their electronics industries to become (lighting) LED manufacturers, for example, Japan, Korea, Taiwan and China. Their interest and expertise is (only) in the LEDs and possibly, their optics and thermal management: basically, electronics, not lighting. I have experience of this as a director of the International Solid State Lighting Alliance.

It will take some years to see what will emerge from the electronic lighting industry; competition is fierce and the rate of technological development has produced uncertainty in the design/applications industry. At least one traditional, big lamp manufacturer will probably be a casualty in this period of upheaval.

## *The effect industry dislocation on education*

You might now be at the stage of saying "we know all this, what's it got to do with



education?” Well, a lot, for the reason given above regarding the advantages of a triopoly and similar companies in protected markets. The lighting industry has provided most of the education, limited as it may have been.

The industry also limited the opportunities for independent designers because they also provided “free” lighting design services, either directly or indirectly through luminaire sellers, wholesalers and electrical wholesalers. Some independent lighting designers have come from the supply industry, others from theatre lighting and increasingly from independent education, all having to compete with the “free” design services. Nothing is free but it’s a very effective marketing tool.

#### *Other effects on education*

There have been other indirect threats to education in the developed world through the privatisation of the electricity generation and distribution industries. These used to have an interest in lighting either as an end-user or as a supplier of public lighting. The electricity industry was a significant employer of trained/educated lighting designers. Some parts of the industry also undertook applications research, most particularly in road lighting.

Many social democracies have also closed building research establishments, many of which did significant research on lighting applications, particularly, on design methods, standards, daylight and maintenance. The researchers often provided education not only at PhD level but also in courses directed at training and/or professional education. As similar fate has beset many public works departments which often had testing and research facilities as well as expert staff. Many are now simply contract administrators, relying upon consultants, few of which have the skills developed in the public sector. Even the consultancies are “merging” into international, stock exchange listed companies.

Governments seem also to be trying to extricate themselves from post-school

education. Technical (trade) education is becoming fee-paying or privatised and university students have to pay a greater share of the cost of their education. Consequently, colleges and university are closing courses that are not “profitable”

All of the above have happened in Australia. There used to be technician level lighting courses in all mainland capitals. Now there are only two. The Masters degree at Queensland University of Technology was closed last year but it still offers a PhD in lighting.

#### *Positive drivers for education*

One of the most important drivers is the existence of an open membership learned society for those interested in light and lighting. In India, that is the Indian Society of Lighting Engineers (ISLE).

As well as running technical meetings and conferences, the ISLE could continue encouraging the various education providers to conduct courses which the association could recognised for higher membership grades. For example, there might be a grade Technician that would require passing a higher trades course, while Member might require tertiary education.

The ISLE might also conduct lighting awards that recognise good design and that can be used to promote the advantage of using qualified lighting designers, to architects, engineers, building owners, etc. Governments are introducing mandatory energy efficiency requirements for light sources, luminaires and buildings.

The ISLE could lobby that the only people who had passed an approved (by the ISLE) course could sign-off on designs. This would create the synergies between the ISLE, educational institutions and regulators that other professions enjoy.

This introduction has been long because countries wishing to introduce (or extend) lighting education need to be aware of the economic, commercial and political environments in which they exit.

## **Lighting and lighting design**

### *What is lighting?*

Lighting is the process of making tasks visible as safely, comfortably and efficiently as possible. A task could be performing surgery or floodlighting a façade. Tasks are made visible by revealing or creating contrasts (brightness and/or colour) so that the necessary ones can be detected by the visual system. Comfort means minimising discomfort glare and distractions caused by the lighting equipment.

Safety refers to the minimisation of lighting effects, caused either directly or by reflection of the lighting equipment that results in disability glare. It is implicit that the lighting equipment and its installation should be electrically and mechanically safe. Efficiency refers to the efficiency of not only the light sources and luminaires but also to the design of the lighting system. It can also refer to capital cost and ongoing maintenance costs. Lighting is for people; the use of light for other purposes, e.g., growing plants, is not lighting. Lighting is a technology.

### *What basic knowledge is needed?*

The preceding paragraph suggests the basic knowledge needed to provide lighting. Broadly, this is: the human visual system, the physiology and psychology of seeing, the nature of visual tasks, the relationship between task performance and light (including negative effects), light sources (electric and natural), luminaires, how light interacts with materials, the measurement of lighting quantities and calculation methods.

### *What is lighting design?*

Lighting design is the process by which technology is used to achieve the lighting objectives. Lighting design, like engineering and architecture, is an urgent practical endeavour. It is urgent in that lighting solutions are needed immediately rather than when the knowledge of the subject is complete. It is practical for the same reason. Problems are often poorly described and where models of behaviour or performance exist, they are often weak.

*Lighting is not an end in itself: it always has a context*

Lighting and lighting design do not take place in a vacuum. As well as working with other designers, lighting designers are often involved with environmental protection, limiting unwanted effects on others, energy efficiency, statutory requirements, urban design objectives, technical performance and compliance with Standards and best practice. The designer needs to be able to interpret ideas from clients and others in the design team. The designer also needs to be able to explain to people, from many different backgrounds, his/her ideas using a language and media understandable by each. Lighting design is not just selecting luminaires and sources but concerns the creation of solutions to design problems. That lighting has a context has implications for lighting education and when in a person's education it should take place.

*Where has basic lighting knowledge come from?*

Much of the hard knowledge of lighting has come from physicists, who develop metrology, some calculation methods and with chemists, to create light sources. Engineers have dominated the applications arena of lighting. With rare exceptions, engineers and physicists tend to look at lighting as a physical problem often ignoring the essential human element. This is somewhat surprising, since photometry is based on a human response: radiometric quantities are converted to photometric ones by the application of the relative luminous efficiency function,  $V(\lambda)$ , for photopic vision and  $K_m$ , the maximum luminous efficacy of the visual system ( $= 683 \text{ lmW}^{-1}$  at 555nm). Experimental psychologists have produced some of the applications knowledge, particularly, that related to human factors, including colour.

*Lighting technology is complex*

Electric light sources are complex technology, whose purpose is to convert electrical energy into visible radiation, as efficiently as possible and to produce nominally white light. The last point is essential: white light is needed to reveal a coloured world. Metamerism suggests that

the white needs to contain sufficient wavelengths in order that colours remain "true" under various illuminants. Lighting designers need to understand how light is produced and understand human colour vision in order to appreciate the limitations of sources.

The lighting manufacturing industry has provided many new products; especially new lamps and LEDs. These are more energy efficient than those of the past and many have longer lives and improved colour properties and colour stability. However, in most cases the new sources are much more critically dependent upon correct electrical and thermal conditions to achieve their promised performance. They are less tolerant of bad luminaire design.

Competent, responsible lighting design requires people who understand how people react to light as well as the technology of light production, etc.

#### **Providing lighting education in India**

The author is aware of university-based education in India but is unaware of formal non-university education. There may be in-house training in some lighting companies. There may have been special one-off short courses.

#### *Professional lighting education*

Ideally, the universities should be producing the future lighting researchers, professional independent lighting designers and "teaching the teachers" for the paraprofessional education needed for technicians and technical sales and sales-support staff.

The educational objective at this level is the achievement of an in depth understanding of the core knowledge of lighting. This should produce inquisitive, sceptical people who can continue life-time learning, mostly on their own.

Professional level lighting education is probably best undertaken as postgraduate study, building on the general design knowledge provided in engineering, architecture and related fields. This is

important because lighting always has a context. This also suggests that lighting is something you do after some other education. For the reasons given earlier, the home for lighting education might be more comfortable in a multidisciplinary area of study, such as, architecture, provided that the architecture schools has a strong, in-house architectural science unit and is willing to provide staff and other resources for lighting research. Engineering (eg, electrical and transport engineering) and science faculties are involved in some countries.

An example of a successful graduate level course, the first in the English-speaking world is that in the Faculty of Architecture, Design and Planning at the University of Sydney which has a solid foundation in both science/engineering and human factors. The program is an embedded Masters programme where the award can be a Graduate Certificate, Graduate Diploma or Masters depending upon the number of units completed. Entry requires an undergraduate degree except for the Graduate Certificate where work experience and adequate preparation are sufficient. People who enter by that path can move to the higher awards by achieving a credit average in the Graduate Certificate. This is a good model to allow capable people without a degree to enter. Another advantage of a graduate-level course is that it can assume that students have the necessary prior knowledge from their undergraduate education, making it shorter. The Sydney Masters course can be completed in three semesters.

For more information see: [sydney.edu.au/architecture/programs\\_of\\_study/postgraduate/illumination\\_design.shtml](http://sydney.edu.au/architecture/programs_of_study/postgraduate/illumination_design.shtml)

Lighting education for related professions  
Related professions, such as, architecture, interior design and building services engineering have or should have lighting in their undergraduate programmes. The ISLE could assist in recommending appropriately qualified casual staff for courses that cannot support full-time staff. The ISLE could also seek industry support for demonstration equipment and for site visits.

This level of education should make these professionals aware of the importance of lighting and give the skills necessary for working with lighting designers. For architects, it should include daylight design. Some of these related professionals may be attracted to lighting and undertake graduate studies, especially if their experience was of good, exciting, committed teaching.

#### *Lighting education for paraprofessionals*

This is probably the area of greatest need since most lighting is not designed by lighting designers. As noted earlier, some lighting manufacturers and wholesalers provide design services. In some cases electrical wholesalers also provide services to electricians and sometimes electricians do design, especially the larger ones involved in design and construct projects. There are dozens of other technical support occupations involved in lighting design in the transport industries, interior design, building management and retail.

There are potentially thousands of students and there is pent-up demand due to the lack of institutions offering what could be termed “entry level lighting education”. There should be courses in all the major population centres and they are probably best offered through technical and further education institutions. The ISLE should recognise the institutions and their successful graduates, provided that the ISLE accredits the course they offer. As mentioned earlier, the graduates may, with suitable work experience, qualify for Technician grade member, perhaps using the post-nominal TechISLE. It is at this level where the lighting manufacturing industry can be particularly helpful in providing casual staff. It would take some time to establish the network of courses at suitable institutions but the process should begin.

This level of education should give students a basic understanding of lighting and give the practical skills necessary for supervised work.

#### *Lighting education (awareness) for everyone*

It is also important to educate everyone with regard to goods lighting. It may be possible to introduce some lighting ideas into school science or health studies. An effective means is for the ISLE to have a website that provides guidance on good lighting and perhaps, some contact details. A very important method of promoting good lighting is for the ISLE to recognise good lighting by an annual ISLE Lighting Awards competition. The awards will promote good lighting to users, architects, government and industry by awarding good examples of lighting and the benefits from them. The IES of Australia and New Zealand (IESANZ) could be a good example to use.

A national lighting magazine, preferably printed, is a good way to communicate with members and the wider community by subscription or free copies. Again, the IESANZ could be an example.

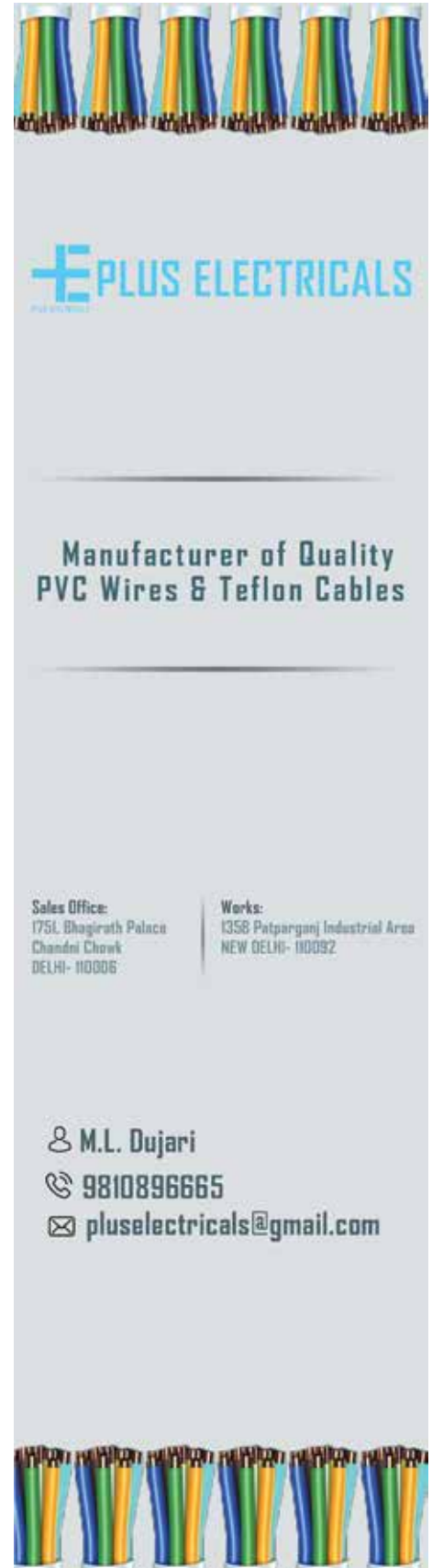
#### **Finally**

Lighting design (illuminating engineering) is an important activity that should be undertaken only by suitably qualified, competent lighting designers who can work closely and effectively with other design professionals and clients. Very few such people exist anywhere in the world and a major effort is needed in most countries to improve or, in most cases, to establish professional lighting education.

Similarly, the paraprofessionals working in lighting design also need education, perhaps more urgently because their numbers are greater and are more dispersed than the professionals.

The author believes that at all education levels, there should be a very strong emphasis on human factors, as well as, the more traditional science and technology.

The ISLE has a challenging time ahead as it develops a comprehensive lighting education program for India. It is an important task.






**PLUS ELECTRICALS**

Manufacturer of Quality  
PVC Wires & Teflon Cables

Sales Office:  
175L Bhagirath Palace  
Chandni Chowk  
DELHI- 110006

Works:  
135B Patparganj Industrial Area  
NEW DELHI- 110092

 M.L. Dujari  
 9810896665  
 pluselectricals@gmail.com





**Mr. N. Narendran, Ph.D.,**  
Professor, Director of Research  
Lighting Research Center,  
Rensselaer Polytechnic Institute, NY

## Lighting Research Center Expands Educational Program, Offers Paid Externships

Lighting  
Research Center

Science and technology education has grown considerably in the past decade, and many new graduates are entering the workforce with university degrees in applied sciences and engineering. Lighting is one career area that is growing, especially the field of solid-state lighting, and more graduates are needed with education and experience in the science and art of lighting. To meet this demand, the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute in Troy, New York, USA, has recently expanded its Master of Science (M.S.) degree in Lighting. Starting in August 2017, students enrolled in the degree program will spend nine months engaged in hands-on learning with world-class faculty and research experts in architecture, engineering, design, and biosciences, followed by a paid career externship at a leading lighting manufacturer, design firm, or government organization in the United States.

“The new externship program is an excellent opportunity for students to gain additional real-world career experience in lighting, outside of the classroom and laboratory,” said Rensselaer Professor Nadarajah Narendran, Ph.D., the LRC’s director of research. “It is a bridge to a career in lighting.” The paid externship will last for three months or more with one of many major lighting organizations that have agreed to host LRC students.

In 1990, the LRC became the first university research center to offer graduate degrees in lighting and today offers an M.S. and a Ph.D., as well as shorter professional seminars, to educate future leaders in lighting. The LRC is part of Rensselaer

Polytechnic Institute, America’s first technological research university, founded in 1824. With more than 35 faculty and staff working closely with 15 select graduate students, and a 30,000-square-foot laboratory space, the LRC is the largest university-based lighting research and education organization in the world.

The M.S. in Lighting program is the premier master’s-level graduate degree offered in the field of lighting, focusing on technology, design, human factors, and applications. Students enrolled in the program explore emerging trends in customization and data analytics, in areas such as the Internet of Things (IoT) and networked/connected lighting, 3D printing of lighting components, lighting for circadian health and wellbeing, lighting for plant health, aviation and automotive lighting, and other topics in lighting technology, application, and design. The LRC attracts students with undergraduate degrees in engineering, physics, biology, psychology, architecture, and design.

The program culminates in a master’s project in the second semester during which each student focuses on a particular area of interest under the guidance of a faculty advisor. Some examples of recent student projects include: remote monitoring of LED lighting system performance, designing a portfolio of lighting patterns to support circadian health and wellbeing, studying the impact of lighting on performance, and evaluating OLED and edge-lit LED lighting panels.

The application deadline for Fall 2017 is January 2, 2017. For more information, visit:

<http://www.lrc.rpi.edu/education/graduateEducation/degrees/msintroduction.asp>

### **About the Lighting Research Center**

The Lighting Research Center (LRC) at Rensselaer Polytechnic Institute is the world’s leading center for lighting research and education. Established in 1988 by the New York State Energy Research and Development Authority (NYSERDA), the

LRC has been pioneering research in solid-state lighting, light and health, transportation lighting and safety, and energy efficiency for nearly 30 years. LRC lighting scientists with multidisciplinary expertise in research, technology, design, and human factors, collaborate with a global network of leading manufacturers and government agencies, developing innovative lighting solutions for projects that range from the Boeing 787 Dreamliner to U.S. Navy submarines to hospital neonatal intensive-care units. LRC researchers conduct independent, third-party testing of lighting products in the LRC’s state of the art photometric laboratories, the only university lighting laboratories accredited by the National Voluntary Laboratory Accreditation Program (NVLAP Lab Code: 200480-0). In 1990, the LRC became the first university research center to offer graduate degrees in lighting and today, offers a M.S. in lighting and a Ph.D. to educate future leaders in lighting. With 35 full-time faculty and staff, 15 graduate students, and a 30,000 sq. ft. laboratory space, the LRC is the largest university-based lighting research and education organization in the world.

### **About Rensselaer Polytechnic Institute**

Rensselaer Polytechnic Institute, founded in 1824, is America’s first technological research university. The university offers bachelor’s, master’s, and doctoral degrees in engineering; the sciences; information technology and web sciences; architecture; management; and the arts, humanities, and social sciences. Rensselaer faculty advance research in a wide range of fields, with an emphasis on biotechnology, nanotechnology, computational science and engineering, data science, and the media arts and technology. The Institute has an established record of success in the transfer of technology from the laboratory to the marketplace, fulfilling its founding mission of applying science “to the common purposes of life.”



**PDF Version available for PC and Mac**

# 10<sup>TH</sup> EDITION OF THE IES LIGHTING HANDBOOK

**Editors: David DiLaura, Kevin Houser,  
Richard Mistrick, Gary Steffy**

**Recipient of the  
JUDGES' CITATION AWARD  
LFI Innovation Awards 2011**

## Features:

- Provides a compendium of what is known that directly relates to lighting and lighting design
- Concise explanation of material
- Content and format tailored to those involved in lighting decisions including practitioners, designers, architects, and engineers
- Four color throughout; 600+ illustrations that enhance understanding
- Conveniently-referenced tabular information is exemplified with numerous photographs and illustrations
- Sustainable practice embedded throughout: refinement of light level criteria, definitive criteria related to brightness and user impressions, factors influencing power and energy use for lighting, and methods to minimize light trespass and light pollution

## Advantages of a PDF file:

**Portable:** Travels with laptop

**Easily Navigable:** Contains 12,000+ links, connecting text to text, graphics to text and text to graphics

**Permanent Access:** Once the PDF is successfully downloaded on your computer and you have been verified, no further login is required

**Viewing Options:** Single or two-page viewing (beneficial for Illuminance Tables)

## System Requirements:

Acrobat Reader 6 or later (downloadable from IES)

Acrobat Plug-In (downloadable from IES)

Hi Speed internet connection recommended but not necessary for download

PDF available as a download file only (no disk).

### PRINT VERSION

Pages: 1331

Illustrations: 600+

ISBN # 978-0-87995-241-9

Trim Size: 8 1/2 x 11

List Price: \$595.00

IES Member Price: \$350.00

Order #: HB-10-11

[www.ies.org/handbook](http://www.ies.org/handbook)

**Mail:**

**Fulfillment Department  
IES, 120 Wall Street, 17<sup>th</sup> Floor  
New York, NY 10005-4001**

**Fax:**

**212-248-5017**

**E-mail:**

**asuen@ies.org**

**Phone:**

**212-248-5000, ext. 112**

### PDF VERSION

Special discounted price to  
Print Purchasers\*:

**IES Member Price: \$200**

**List Price: \$250**

Non-Print Purchasers:

**IES Member Price: \$350**

**List Price: \$595**

Multi-user annual subscription also available.

[www.ies.org/handbook/pdf](http://www.ies.org/handbook/pdf)

\*Includes IES Sustaining and Subscribing Members  
Special price limited to one PDF per customer





## “MINNA NO MORI” MEDIA COSMOS, Gifu, Japan

The main feature of this two story multi-use facility is an open-floor, open-shelf reading room with large, suspended, umbrella-shaped “globes” that gently divide the space, incorporate daylight, and circulate air. The lighting design concept from Lighting Planners Associates aimed to create the illusion of being in a forest, connecting the visitor to nature through the lighting environment, while reducing primary consumption of energy by 50%.

Each hanging globe features a unique design, glowing beneath the gently rolling timber ceiling. Additional lighting includes daylighting, sphere and ring pendants in the globes, and disk-shaped pendants. The placement of task lighting near the globes gives the space vibrancy and coherence. During the day, daylight is diffused from top lights creating a comfortable space with minimal energy use. When cloudy, the system can still secure 300-700 lux; but if needed, daylight sensors are activated and ring-shaped pendant uplights and manual task lighting supplement the area for 400 lux on the table tops. Throughout the design, varying combinations of temperature, humidity, and brightness create heterogenous spaces. This variance actually reduces the amount of energy needed to control and regulate the structure.

“This innovative approach to bringing daylight into the interior space allows for a tight integration of lighting with the architecture and interior design, and creates a great symbiosis of light and form,” one judge praised.

Disk-shaped, glareless downlights are wired together in several small groups, allowing the electric light to dim and reduce as daylight moves through the space. Task lighting is integrated into custom designed furniture throughout the space. Where necessary, localized spotlights and pendants supplement ambient light at the first floor, adding sharpness to the area and reducing energy use. “This project evokes a playfulness, a response to light and form, and a beautiful use of translucency and diffuse light,” another judge wrote. “A truly impeccable design.”

### Credits:

#### LIGHTING DESIGN

KOARU MENDE, FIALD  
MARI KOBOTA, ASSOCIATE IALD  
MIKINE YAMAMOTO, ASSOCIATE IALD  
MISUZU NAKAMURA  
LIGHTING PLANNERS ASSOCIATES

#### PHOTOGRAPHY

© Lighting Planners Associates  
© Lighting Planners Associates, Toshio Kaneko



# Crompton

Embrace a well-lit future with Crompton Lighting. Our wide range of lighting products deliver performance, flexibility and control like never before. With the perfect blend of functionality and aesthetics, Crompton lights incorporate technological innovations and design sense for diverse applications. Whether you're looking for colour changing LED mood lighting, automated lighting solutions, efficient business lights or high-power industrial lights, Crompton's luminous expertise of more than 75 years will brighten up your surroundings.

## Industries



## Offices



## Home



## Street Lights



## JAIN ELECTRICALS

New No.216, Old No.138/2,  
Govindappa Naicken Street, Chennai - 600 001.

Tel : 044-42165886 / 25368789,

Mobile : 99406 68565 / 98400 38565

E-mail : [jain.electricals@hotmail.com](mailto:jain.electricals@hotmail.com)

# The Future Feels A Lot Like 1984

Some 30 years after a groundbreaking study, the ‘biophilia hypothesis’ has come full circle in healthcare applications. What will this focus on the importance of natural settings mean for lighting design?

By Karyn Gayle

**Note :** Article originally published in the LD+A January 2015 Issue. Reprinted with permissions from the IES and LD+A

What is the purpose of modern lighting? Many would seriously question the merit of this type of inquiry, particularly when posed in a lighting publication, thinking it elementary, perhaps a bit obvious. Isn't it clear? As members of the lighting industry, we spend hours, years, decades of our lives refining the art and science of lighting various applications, using an acute sense of design and an ever-evolving toolkit of lamps, luminaires and lighting controls to promote visual acuity for occupants in the built environment. Our designs highlight the beauty of our surroundings, creating visual hierarchies and focal points for the people who use these spaces.

Although our mission seems incredibly straightforward at face value, reevaluating the purpose of modern lighting is a worthy exercise as we learn more about the nature of light and its more nuanced properties—attributes that extend beyond light's most obvious benefit, the fact that it enables us to see. In the built environment, we try to deeply understand the visual experience that should be realized, which leads us to a choice of lighting equipment. This thought process isn't only true for buildings. When it comes to the great outdoors, we instinctively think about quality and quantity of light in the context of our 24-hour day. Many of us consider the timing of sunset before embarking on an evening run to ensure that we're not trying to navigate in darkness. These are important considerations, but they are certainly not the only factors at play. The feeling of awe that washes over us when viewing a spectacular sunset has very little to do with average maintained illuminance on the running surface. Similarly, the soft, varied pattern of dappled sunlight passing through tree canopies and the feeling of pleasant

refuge that accompanies this scene cannot be fully described through contrast ratios or luminance metrics.

Our affinity for these spaces can be explained, in part, by what is called the “biophilia hypothesis”—the idea that humans are predisposed to prefer nature and natural settings. Social psychologists, scientists, researchers, and architecture and design professionals have toiled for decades to understand the link between biophilia and outcomes, and the body of research in this field is growing. With continued advances in technology, the multihued sunset vistas we pause to gaze at may soon be replicated (or rendered artistically) indoors, as new, dynamic lighting systems use color, intensity and personalization to bring the outside world within reach.

## CASE IN POINT: HEALTHCARE

In healthcare, it is impossible to discuss biophilia without citing environmental psychologist Roger Ulrich's seminal study, published in 1984 in *Science*, on views of nature and recovery rates of patients. In this landmark study, researchers found that patients with a view of landscape and trees recovered a day faster than those facing a view of a brick wall. The patients, who were recovering from gall bladder surgery (remember, this was 1984), required less pain medication and suffered fewer complications when they had the view of tree tops than did their sensory-deprived, brick-wall-facing cohorts. Few of us would be surprised by these findings, and in the 30 years since those conclusions were drawn, this research has informed the current practice of incorporating daylight and views into patient care spaces.

We have also learned more about the neurological mechanisms that enable access



**Ms. Karyn Gayle**

Member IES (2013), is vice president of healthcare at Acuity Brands. She has delivered educational presentations, workshops and in-depth seminars on lighting and control design for healthcare facilities to hundreds of participants across North America.

to views to support healing responses. Recent studies, most notably by Texas Tech Neuroimaging Institute, have utilized functional magnetic resonance imaging (fMRI) techniques to explain our neural responses to positive images. The fMRI-enabled studies demonstrated that brain activity, as measured by changes in blood flow, moves away from pain centers and toward pleasure centers when subjects are exposed to positive images, thereby reducing the need for pain medication.

Ulrich's findings inspired the use of restorative views, both natural and simulated, in indoor environments. In a recent iteration of their patient room of the future concept, Clemson University's Architecture + Health program utilized backlit tree canopy scenes in their full-scale patient room mockup. These graphic ceiling images were used as a design intervention intended to boost patient mood and sense of well-being through positive distraction. Techniques like this are particularly important for healthcare institutions where

patients are often alienated from natural elements, a term Richard Louv, of The Nature Principle, calls “nature deficit disorder.” Simulated, image-based nature scenes can benefit patients and are an option for care settings, especially in urban environments, which lack restorative, natural vistas.

### **DAYLIGHT: REAL AND SIMULATED**

The knowledge base around the impact of views has been complemented by numerous studies that prove the therapeutic benefits of daylight, establishing links to desirable healthcare outcomes such as shorter stays, reduced agitation and depression in patients with dementia, and inhibited pain response. The findings related to patient access to daylight and briefer hospital stays are incredibly dramatic. A 1998 study by Beauchemin and Hays found that patients in a cardiac intensive care unit stayed in the hospital roughly two days when placed in a sunny room. Patients in shaded rooms stayed a full day longer—an average of three days in ICU.

Longer hospital stays are often correlated with increased prevalence of complications, not to mention the psychological, quality-of-life impacts of a prolonged hospital stay on patients and families. For hospital owners, longer stays translate to increased costs of care. The Agency for Healthcare Research & Quality estimates that the average cost of an inpatient stay in the U.S. is roughly \$2000 per day. Finally, the impact of daylight highlighted even more serious contrasts in the aforementioned study. Mortality rates were found to be statistically higher for patients in the shaded rooms, as compared to the sunny ICU rooms.

Because these studies did not establish a causal relationship between daylight and the health outcomes, we are left to infer the specific mechanisms that delivered the benefits. We do know, however, that electric lighting can be used to simulate daylight, both in intensity and spectra, and that this daylight simulation may allow us to delve deeper into the human physiology behind these attractive outcomes. Since it is impossible to ensure a preternaturally sunny room for every patient, regardless of geography or climate, we have a responsibility to seek ways to replicate these therapeutic effects, democratizing access to healthier light, irrespective of room orientation or allocation. Science may be slow to catch up on understanding our complex relationship to sunlight, but these studies show that we can have a positive impact on the care environment, even if we don't have all the answers.

In years to come, dynamic lighting systems that vary in color, spectrum, and intensity may become ubiquitous, replacing static systems as the price/performance equation becomes increasingly attractive to owners. Lighting specifiers and manufacturers know that there is a fine line between dynamic and distracting, and that the devil is in the details. Color quality and graceful, flicker-free changes in intensity should be the norm as these systems increasingly become mainstream.

### **BEYOND FUNCTIONAL PERFORMANCE**

If we rephrase the question about the purpose of modern lighting, especially for critical applications like healthcare, it may be better to ask instead, what is the “true calling” of light in the built environment?

Can natural and electrical lighting, with its physiological and psychological benefits, deliver holistic benefits to all of a building's occupants? We have moved toward smarter buildings, without question, but what about healthy buildings?

Unfortunately, the institutional design commonplace in many healthcare buildings is anxiety-inducing, dehumanizing and rife with environmental stressors that inhibit healing responses. Connecting evidence-based design approaches with smart lighting design can aid in reducing these stressors and improving key healthcare outcomes.

For the healthcare environment, where the health and wellness of patients, caregivers and staff is paramount, there is no doubt that holistic systems that use natural and electric sources, that enable task performance but also support mood and distraction to unlock functional, emotional and physiological benefits, will drive the most value in years to come. This represents a meaningful change to the (well-meant) status quo, which is primarily focused on functional performance.

Indisputably, function and performance are the primary design goals in healthcare. Lighting systems have to deliver appropriate levels of illumination, and equipment must meet stringent safety and infection control protocols for various levels of care. We should continue to treat these as “table stakes” for lighting in healthcare, and these safety protocols should continue to evolve in conjunction with clinical and public health best practices. However, assuming that we have covered the basics, perhaps our definition of “function” should evolve beyond visual





acuity, system compatibility and safety criteria. In addition to those attributes, should lighting systems be scored on circadian stimulus, visual experience, and other non-traditional metrics that are linked to patient outcomes and caregiver performance?

### EVOLVING TECHNOLOGY

Given the myriad objectives of the modern healthcare institution, it's reassuring to know that lighting technology has kept pace with changing needs. Novel luminaire forms enabled by LED and OLED sources can impart a softer, more organic feel to indoor and outdoor settings, disappearing into architecture, or echoing cues from architectural and landscape features. Solid-state lighting sources continue to improve, and their digital nature allows them to be easily incorporated into adaptive environments. The ability to manipulate the color and spectrum of SSL sources to deliver beneficial wavelengths as well as positive distraction for patients and families—it's all within our reach.

It seemed infeasible only a few years ago, but pervasive connectivity and the fact that there really is an app for everything has transformed our world in ways we're only beginning to contemplate. Even conservative industries like healthcare have embraced apps as a way to tap into the "big data" captured in care environments, and as a way to influence an even larger issue: population health. The Internet of Things will certainly connect our lighting systems to wearables, healthcare apps and other smart devices. Sensory networks, large and small, are blanketing our built spaces and move with us wherever we go. The Orwellian implications of this (yet another 1984 reference) may be unsettling, but we can use the insights from our smarter systems to improve quality of life.

### BRAVE NEW WORLD

In the future, why wouldn't our lighting systems intuit what we need, sensing that a sleepless night may require more intense task illumination at our desk the next morning, or that an elevated heart rate may

benefit from a more soothing ambient lighting scene? As more lighting tools become available, we can never forget the fundamental principles of lighting design for healthcare. However, it's clear that we're moving to a world where the lighting system must play a larger role in facilitating better outcomes in healthcare settings. From our most vulnerable neonates to those nearing the end of life's journey, an informed, holistic lighting scheme can deliver profound impacts to quality of life. The pursuit of that objective is what makes this new lighting exploration so worthwhile.

Karyn Gayle, Member IES (2013), is vice president of healthcare at Acuity Brands. She has delivered educational presentations, workshops and in-depth seminars on lighting and control design for healthcare facilities to hundreds of participants across North America.



## MAHAL LAMP SHADES

227 / 2, AJC Bose Road,  
Kolkata - 700 020.

Phone : 22902710 / 22877085

Fax : 22879517

**Get Light of 18W LED Tube in Just 12W Only!**

**Now Switch To**

# **4-foot T-8 PowerLED Tube Light**

**(Power Consumption 12W only)**

ULTRA HIGH EFFICIENCY

**33%**

**Lower Power  
Consuming**

**MOST  
EFFICIENT POWER  
RATING LED  
TUBE LIGHTS IN  
THE MARKET!**

While most comparative competitive LED tubes achieve a lumen output of 1600 lumens at 18W approx., the **BINAY ULTRA HIGH EFFICIENCY QUADRA-12-ES PowerLED Tube Light** is designed for 2000 source lumens at a 33% lower power consumption of 12W, thus achieving considerable power savings (apart from much-longer maintenance free life). The light output performance is equivalent to that of the 1200mm T-8 fluorescent tube.

**5 YEARS** Warranty **WITH AN ESTIMATED LIFE OF 12-15 YEARS**



**Binay Opto Electronics Pvt. Ltd.**

27, PANDITIA TERRACE, Calcutta 700 029, India  
Telephone: +91 (33) 4006 9875, 2475 0392, 2475 0030  
email : [info@binayled.com](mailto:info@binayled.com), <http://www.binayled.com>

**POWERING LED TECHNOLOGIES WORLDWIDE SINCE 1983**



IALD HIGHEST AWARD - RADIANCE AWARD



## LINCOLN SQUARE SYNAGOGUE, NEW YORK

### Sacred Space in the City that Never Sleeps

Five undulating glass ribbons, representing the five books of an open Torah scroll, form the east façade of the Lincoln Square Synagogue and welcome visitors to this striking house of worship in the heart of Manhattan. Linear LEDs integrated into the top and bottom extrusion of each glass facet illuminate the interlayer of sheer, bronze-colored, woven and pleated fabric, as well as the white translucent dot frit pattern on the interior lite. This increases privacy for worshippers inside while allowing a slightly obscured view to the beauty of the interior. At the base, a white acrylic diffuser protects the LEDs, while wiring for the 500+ fixtures runs horizontally through the narrow extrusions to 50 drivers located in accessible ceilings to the north and south of the façade. “This project shows clear evidence of a tight collaboration between all design consultants,” one judge commented. “The lighting significantly contributes to an uplifting, poetic, inspiring experience of space, and boasts fantastic fixture integration throughout.” In the sanctuary, the light on the translucent frit, fabric interlayer, and glass mullions forms a backdrop for the Ark. Six hundred thirteen 1-3/4” diameter recessed LED downlights in the gentle convex ceiling make reference to the 613 commandments in the Torah, and create a star-like atmosphere that suggests the desert sky.



Credits:

LIGHTING DESIGN

SUZAN TILLOTSON, IALD

ELLEN SEARS

DAVID BURYA

TILLOTSON DESIGN ASSOCIATES

PHOTOGRAPHY

© Emile Dubuisson, Studio Dubuisson

© David Sundberg, Esto Photographics Inc



# STERLING SIGN SYSTEMS

Marketing Partner For MEAN WELL in INDIA

LED Power Supply  
LED Driver



*Your Reliable Power Partner*







Credits:  
LIGHTING DESIGN  
MATT FRANKS  
STAR DAVIS  
BRIAN STACY, IALD  
CASEY CURBOW  
ANDREW MCNEIL  
ARUP  
PHOTOGRAPHY  
© JAMES EWING  
© ZAK KOSTURA  
© STAR DAVIS

## FULTON CENTER AND SKY-REFLECTOR NET, New York

Light and daylight played a critical role in re-envisioning this downtown transit hub serving 300,000 daily commuters. By studying the solar geometry of the site, the team from Arup determined the influence of surrounding buildings on daylight access, informing the location and design of a 50-foot diameter skylight oculus.

The skylight tilts gently towards the south, allowing more direct sunlight to enter and reflect into the space below. Under overcast conditions, diffuse daylight is filtered inward, illuminating the space year round and allowing electric lighting to be dimmed or turned off. During summer months, direct sunlight penetrates two levels below ground, delighting passengers on subway platforms.

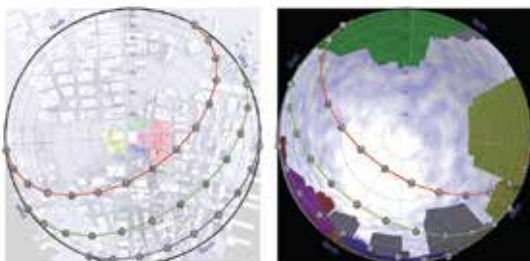
“This project displays truly beautiful engineering and mesmerizing geometry,” wrote one judge.

A cable-net structure with custom designed reflective panels surrounds the interior space below the oculus, folding subtle images of the surrounding environment into the space. Glass panels called “parasols” reflect small amounts of direct sunlight onto the interior of the cable-net structure, adding a dynamic sparkle of movement when sunlight enters. The station headhouse building features a transparent street-level façade with excellent daylight access. At street level, the glazed façade helps maintain transparency and connection to the city.

“The architectural form is bold and wins the first impression,” another judge said. “But the lighting study illustrates sophistication and a subtle result that truly supports the architectural design intent and provides a pleasant space below.”

Custom-designed adjustable mounting brackets allowed for precise fixture aiming angles taken directly from 3D modelling software to contract documents, resulting in even illumination of the interior of the cable net structure. The metal halide light sources are energy efficient and relatively easy to maintain from catwalks along the edge of the skylight oculus.

Hidden electric lighting reflects off of the structure’s interior, providing indirect general illumination and resulting in a dramatic, even glow without requiring additional fixtures above the central space.





THE HINDU  
**BusinessLine**

Presents

**cai**  
EXPO 2016



Supporting Partners



**GOA**

**DATE : 9 - 11 DECEMBER 2016**

**VENUE : DR. SHYAMA PRASAD MUKHERJEE STADIUM**

**EXHIBITING**

Steel • Concrete • Roofing • Cements • Hardware • Wall Cladding • Facades • False Ceilings • PVC Pipes • Paints & Adhesives • Landscaping • Air Conditioners • Generators & Inverter • Electric Cables / Wires • Switches • Engineered Marble Stones • Tiles • Floorings • Ceramics • Wooden Veneers • Construction Equipments • Architectural Lightings • Bathroom Fittings & Fixtures • Sanitation • Interior Solutions by Architects • Fire Safety & Security Systems • Solar Products • Doors & Windows • Luxury Furniture & Furnishing • Railings • Modular Kitchens • Exclusive Interior & Home Decor Products • Prefabricated Structures etc..

Bangalore : +91 8884688894 Ahmedabad : +91 8866025085 Chennai : +91 8056867577

Delhi : +91 8285347715 Goa : +91 901105 8876 Hyderabad : +91 9248161341 Mumbai : +91 9004619392

facebook.com/caiexpo

cai-expo.com



# Karnataka Centre Activities

## Vision 2020

International Conference and Exhibition on

“SMART LIGHTING - THE FUTURE”



**Mr. M.S.N. Swamy**  
Chairman, ISLE-KSC

ISLE-KSC is entering to its twentieth birthday. It is a matter of pride and privilege that the ISLE-KSC has organized VISION 2020 an International Conference and Exhibition on ‘Smart Lighting-The Future’ during November 4-6, 2016 at Bengaluru next only to LII which is conducted by GB National Governing Body of ISLE.

This ‘VISION’ series is organized by a State Centre since 1997 at regular intervals by bringing experts in the field to update the Lighting Professionals/Consultants on the developments in the field of Lighting, in addition to organising various activities like; Lectures, Workshops, Demonstrations, Educating Students and Rural People on proper Lighting and Disposal of lighting products keeping in mind the Saving of Energy and Environment.

The objective of this ‘VISION 2020’ conference is not only to disseminate knowledge and information about the latest developments in illumination technology; but also to bring together manufacturers and customers (including lighting professionals, architects, interior developers, contractors,

research laboratories and academic institutions) on the same platform to discuss various issues. As is well known, LED based lighting products have made spectacular strides the world-over. In India, there have been substantial efforts by the Government to promote this technology in view of its inherent advantages.

With the advent of LED Products Lighting has become very specialized subject since one can incorporate most of the activities that a mobile can do, Hence, it becomes more important to know from the point of Security what to incorporate and look for in the

**LED Products.** we are going to discuss in depth :-

- The Specifications/Standards
- Electronic circuits
- Health aspects
- Solar and LED, Life of Battery and connected issues
- How one can play with Lighting

We are glad to note that on this occasion, ESSCI, a Government of India organization has joined hands with us to impart skill development. The exhibition of products from reputed manufacturers will also be displayed for the benefit of the delegates.

We hope this event will spur further interest and growth with win-win situation both for manufacturers and customers.



# CONFERENCE ON SUSTAINABILITY AND GREEN BUILDING



**MUMBAI: 12TH**  
**NOVEMBER 2016**  
BOMBAY EXHIBITION CENTRE

## KEY NOTE SPEAKERS



Ar. Karan Grover



Ar. Neelkanth Chaya

## EMINENT SPEAKERS & PANELISTS



Ar. Sanjay Prakash



Ar. Ashok Lall



Ar. Chitra Vishwanath



Rajat Malhotra



Prof. Ar. Jaisim Krishna Rao



Johny Joseph

**MUST VISIT**





# TRANSITION OF LIGHTING & BALANCING ACT FOR INDIA



**Dr. Rajat Mandal**  
Hon. Secretary, ISLE

**Abstract :** Lighting technology is now changing dramatically and very rapidly. Though the speed of light is maximum, the speed of change of lighting technology was very slow until finally solid state lighting came along. Now almost every day the market is changing, a challenge being faced by industry, customer, application engineers, and consumers and in fact all who need light and by all stake holders. Many stake holders have many dimensions to deal with these challenges in their own way, but success and time line of completion of Transition depend on how the transformation is implemented. The author highlights the unified approach by the INDIAN SOCIETY OF LIGHTING ENGINEERS (ISLE), a professional body of lighting people from all walks of life to make this in the Indian scenario.

## **Introduction :**

Let us see how, in the past, changes of lighting technology affected the lighting environment, particularly in Indian conditions. Let us see the degree of adaptation and how the learning took place.

- It is nostalgic to remember those days at the beginning of the eighties where for applications changing over to High pressure Sodium vapour from High pressure mercury vapour was a big challenge in industrial and public lighting because of shift of colour and its effect on the environment and even in a few cases IR

issues to resolve.

- Then adaptation from T12 to T8 in the India scenario, a well-known episode of mixed feelings, low voltage issue was chasing the customer. Even today T12 demand comes up though BIS & BEE has withdrawn the product.

- Electromagnetic to electronics ballast was very tiring because of local conditions and poor quality because no defined parameters on performance standard and learning the subject on reliability in Indian conditions.

- Halogen to Metal Halide was the real energy saving change without sacrificing the quality.

- T8 to T5 lamps were accepted easily in the commercial installation sector and the T5 Batten is still popular.

- CFLi retrofit was the well-known technology transition from GLS replacement and much talked about subject across India. It took us 16 long years for learning and mastering the subject. But at the end what a gracious result achieved by the Indian Lighting Industry.

- The T5 RETROFIT solution came and won the lighting user's heart in a short time and in my opinion this hybrid lamp, electronics technology was really an Indian way and originated in India.

2003 /2004 a small box of led modules and few odd ppt slides were used for propagating Solid state lighting. LED technology now is used across applications and complete in each and every application and going from strength to strength. So it is a transformation of lighting technology. This is the time for Indian lighting sphere to use all knowledge and experience learnt from all the past transition phase for all round development for a glorified Lighting India. Now what is happening in 2016 and what should happen in 2020 in general lighting applications?

## **Lesson learnt :**

Let us see how we handled the transition in

India and what are the key points to take home from our past experience. We need to learn from other countries how they have progressed in handling the emerging SSL lighting biz.

The GLS lamp was greatest success story of "Make in India". Once it used to be assembled in houses of all major cities and millions of people were engaged by this industry. Fluorescent technology and its production started and expanded very fast successfully with almost all indigenous components and its manufacturing process and equipment. Luminaires were then always dedicated to small scale and almost 100% self-sufficient Indian base. The High pressure discharge lamp was a volume based high cost intensive technology and India always concentrated based on local consumption. Therefore, investment for make in India was always an issue though two or three companies tried but somehow failed most probably due to insufficient volume and technology tie up. Thereafter technology transition was basically an adaptation of western technology and maximum to assembly till electronics was attached with lighting. After 16 long years of struggle, CFLi was established in India and today can challenge any country, even China, thanks to manufacturing assembly skill, though electronics components and tri phosphor, the two main components come from China more than 95% due to a lack of electronic components manufacturers in India. CFLi production created a huge growth in the Indian Lighting Industry as well as created lot of employment in manufacturing. A point to note, China mastered the subject within 2 to 3 years and ruled the whole world. Besides the volume China gave a lot of emphasis to electronics learning with support from all corners, Government to Researchers, investors to industrialists, standard to test house. Looking closely, this transition of CFLi was mainly the transition to lighting electronics, the use of power electronics to solve the mains voltage fluctuation, surge, humidity,



# SOLAR TODAY EXPO

International Exhibition For The Solar Industry

**Harness the source of Unlimited Power!**

## Concurrent Event



International Exhibition On LED Lighting Products & Technology

**6 7 8 April 2017**

**Bangalore International Exhibition Centre,  
Bengaluru-India**

## A Hi-tech Business Platform For Indian Solar & LED Industry

### About the Event

Solar & LED Industry is one of the fastest growing market in India, Star Exhibitions is providing a right platform to showcase solar & LED products, Manufacturers, Technology & Services.

#### Key Elements of Solar Today Expo 2017

Solar Products • Solar Manufacturers • Solar Buyer & Suppliers • Roof Top Solar • Ground Mounted Solar • Battery Storage • Solar Cities • Solar Villages • Micro Grid • Street Lighting • Energy Efficiency Products etc.

#### Government Initiative

**Honorable Prime Minister. Shri Narendra Modi's** Target is to achieve 100GW of Solar power Capacity by 2022 with an investment of around US\$ 100 Billion. The government of India is also focusing on to initiate LED Lighting for less power consumption all over the country.

#### Key Elements of LED India Expo 2017

LED products • LEDs • LED Lighting products • LED manufacturing Technology • LED manufacturers, LED buyers & Suppliers • LED components • LED accessories • LED Chips • LED raw material LED Signage's and display • LED manufacturing equipments • Machinery, fixtures & allied products. LED Applications, Lighting, research organization and testing laboratories



### For Participation & More Information, Contact

Star Exhibitions : Office No. 3 & 4, Alig Tower, Opp. Asmita Super Market,  
Naya Nagar, Mira Road ( East ), Thane , Mumbai - 401107, India.

Tel.: +91 22 65777990 / Hand Phone : +91 9820130615

Email : [info@solartodayexpo.com](mailto:info@solartodayexpo.com) | [www.solartodayexpo.com](http://www.solartodayexpo.com)

Organiser :



dust of the Indian environment and mastering design and assembly of PCBA with the compatibility with the arc tube. Though for manufacturing wired bulb (arc tube) we depend on 85% raw materials from China, we have seen how very cheap price and cheap quality goods create a bad image of the technology. It was evident how volume was the game changer enabling total economy of scale and how the product became affordable. It took a long time as actions were taken by stages as and when required to overcome the hurdles to establish the CFLi transition. But our journey of learning should now be used systematically to sustain the LED transition of lighting to India.

### **LED-A Disruptive Technology!**

LED transition is all about system not in isolation of led chip, driver, heat sink or housing. It is an integrated system. LED lamps are taking care of heat sink and new devices have only one element which acts as driver, heat sink and LED chip mounting means one in all. LED transition converted lighting to lighting electronics and now the lamp factory will be without the flame, heat, glass and chemicals, metal and looks like any modern electronics factory.

In China itself more than tens of thousands of companies are challenging each other and spreading their business across world. During the last two decades cost cut and volume game was the mantra of the lighting Industry for their survival. In fact, low technology and mass product base shifted to China manufacturing base thanks to their governmental support to the Lighting Industry in infrastructure development and incentive in export. One must appreciate Chinese aggressive investment and quick development and adaptation in this technology transition process. The key to the success of China lies in their quick development of competence in lighting be it lighting manufacturing, testing equipment, education and research and development.

Every transition has its effect. Let us see how LED transition is affecting the market. The present situation as per analysis is **“The Led market is now chaotic and disorderly “**.

Technology is changing very fast and no one is sure what is the next development or innovation and when? So the investment is very risky for manufacturers and traders. Storing and stocking of the LED products is very risky as product life cycles of the complete products are very short. As the technology is still evolving and strict uniform standardisation is very difficult to make and finally everything is happening in a very fragmented way. Industry needs huge investment for LED semiconductor chip and it is a volume game costing. LED life is very high and there will be hardly any replacement business for the life cycle of the production. Driver can over drive the LED as per design that also create a huge difference from Ideal life to accelerated life. Sometimes, warranty and guarantee of the LED products are ad hoc declarations made by the manufacturers who take full advantage of lack of legislation. Implementation of legislation, longer testing methodology and limited number of test houses all lead to uncertainty in the stakeholder's mind.

All said and done, the LED transition is here to stay and will continue until 2020 before it is overtaken by another transition to OLED.

Now LEDs are fast displacing traditional light sources, consumer luminaires and street lighting such as incandescent, halogen and fluorescent bulbs, catalysed partly by double-digit annual price declines in components. Frost & Sullivan estimates the global LED lighting market grew 35 per cent to \$32.3bn last year, and it is forecast to more than double to \$70bn by 2019. LEDs as a proportion of the total lighting market is set to near 50 per cent by the end of 2015 and reach 84 per cent by 2020. Transition is going on its own way irrespective of so many studies and models made by so many world famous consultants in the last 5 years.

My national as well international exposure and study is a bit surprising “LEDs have more penetration in replacement of traditional markets in Asian countries than that of western and developed counties”. Presently in Europe and NAFTA, the

decline of traditional products are in the range of 15% whereas in Asian countries it is ~ 35%. The analysis revealed the probable reasons. In developed countries due to technical regulation the product is in a higher spec which leads to higher cost to the consumer plus replacement labour cost in professional installations is very high. Finally, energy cost and energy starving countries in Asia welcome this transition at the very first go. Plus in this part of the world thanks to government legislation and support for LED lamps and LED street lighting projects.

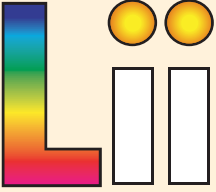
### **Transition in India**

Clear understanding of activities and action plans being carried out by USA, EUROPE, China and Taiwan, how they are coping with the transition as well keeping our past experience in mind, we should prepare and make medium to long term strategy for smooth successful transition in India on a win- win basis for all stake holders.

In India the LED era has just entered the second phase of the introduction of the Product life cycle. Looking at the energy saving potential, as usual a huge number of manufacturers entered this field and quite a few could not sustain themselves and do not exist today. “LED field easy to enter but difficult to sustain” that's the characteristic of the LED transition and true for India as well. With all due respect, prima facie it looks a screw driver technology like organising all components including LED chip or module, heat sink , plastic or aluminium housing and do a driver assembly or get this made, to make the final assembled products. But factually it is beyond the screw driver technology and one has to go beyond for sustaining oneself and emerging as a winning player.

The Initial phase of LED introduction in India 2009 onwards, was through led festive lighting which comes in container load from China. This was basically a trading model only and indigenous production and application was in signage, bill board and street lighting. Many newcomers and fresh startup LED companies came during these days and a few are still doing well. A lot of TV making industry players saw a new life through the LED transition.





## To Advertise - Contact

Director / Publications  
Indian Society of Lighting Engineers  
D10, Industrial Estate Ambattur,  
Chennai - 600 058.  
Email : [info@isleind.org](mailto:info@isleind.org)

Manager  
Office of ISLE  
No.1, Ground Floor,  
New Delhi - 110 024.  
Email : [isledel@vsnl.com](mailto:isledel@vsnl.com)

## Wants to become a Member of ISLE?

For Applications and other details refer ISLE Website [www.isleind.org](http://www.isleind.org) or contact our Regional State Centres

Mr.M.S.N.Swamy, No. 8, P.R. Layout, 1st Main Road Seshadripuram, Bangalore-560 020. Karnataka	Chairman / Karnataka	90192 01755	<a href="mailto:chairman@islek.in">chairman@islek.in</a>
Mr.Kamal Sethia Cosmos Engineering Industries (P) Ltd. 8, Ganesh Chandra Avenue, Kolkata 700 013	Chairman / Kolkata	94330 02656	<a href="mailto:cosmos.engg@gmail.com">cosmos.engg@gmail.com</a>
Mr.R.S.Saxena 385, Ridhi Sidhi, Nirman Nagar, AB Janpath Shyam Nagar, Jaipur 302 019. Rajasthan	Chairman / Rajasthan	98290 64329	<a href="mailto:rs_saxena3@yahoo.co.in">rs_saxena3@yahoo.co.in</a>
Mr.Gurvinder Singh 88 Triveni Apartments, West Enclave,Pitampura, Delhi 110 034.	Chairman / Delhi	98684 79919	<a href="mailto:gssidana@gmail.com">gssidana@gmail.com</a>
Mr.T.M.Ilamathi B7 Shanthi Apartment, Old No. 23 New No. 36 Mahalaxmi Street, T. Nagar, Chennai - 600 017,Tamil Nadu	Chairman / Chennai	94440 21174	<a href="mailto:m_ilamathi@msn.com">m_ilamathi@msn.com</a>
Mr.Vinay Babar Technocraft, 23 Kalpana Lok Colony Indore 452 001,Madhya Pradesh	Chairman / Indore	98260 75101	<a href="mailto:vinaybabar@gmail.com">vinaybabar@gmail.com</a>
Mr.Stan Alvares 1 Lily Cot,15 Meera Baug, Santa Cruz (W) Mumbai 400 054,Maharashtra	GB Member / Mumbai Note (Till a new Chairman assumes office)	98206 02362	<a href="mailto:stan.alvares@gmail.com">stan.alvares@gmail.com</a>
Delhi Office ( Mr.Kiran Ganguli) A10 Lajpat Nagar, No 1 Ground Floor New Delhi - 110 024.	GB Office	011 41326950	<a href="mailto:isledel@vsnl.com">isledel@vsnl.com</a>



Though abused with the technology in manufacturing and usages, thanks to its inherent strengths, the LED was a hit from the word go in the Indian market. In fact, first time customer /users had as such no mass complaint of its reliability or any hitch in using it. So really the LED was a breakthrough technology transformation observed for the first time in the Indian market with respect to Lighting. Later LED Down lighter was an instant captured the traditional down lighter market of CFL pin, CFLI and Halogen lamps.

The second phase of the LED industry and market is really vibrant with lot of activities on all fronts and very positive vibrations in transition. This interesting story started with low cost so called RC circuit LED lamps and high spec street lighting. RC lamps are even cheaper than CFLI. And the market was taken for granted with the wrong notion of watt of lamp not lumen output or efficacy. These without guarantee lamps were only assembled in India but were OK with respect to reliability in Indian conditions and could meet safety norms if properly made. This is the point where we saw quite a few very aggressive investments in TV and newspapers by some Industry leaders along with one newcomer from the mobile industry which created a good movement in distribution market.

Using the lessons learnt from CFLI, the government took the initiative to get 12 standards published to define the LED transition beforehand at the beginning of the product introduction phase. But the pace of transition was slow and sluggish on price point and did not get a thrust until the Government tender of lamps and street lights came into market. LED lamps in particular got a jerk start and the whole dynamic of the LED transition changed. History was through the master stroke of the EESL tender of DELP (Domestic Efficient Service Model) and EESL service model of street lights. Prices started coming down in each and every one of these voluminous tenders due to mutual competition in the Industry to grab the order for their existence. On the other hand, the distribution market looked very sluggish, another worrying factor.

It is clear that the transition has now migrated to the growth stage. Point to be

noted that the CFLI growth stage saw 35 to 40 stable organised manufacturers across India with a mix of OEM, private label branding, own manufacturing. But now LED manufacturing is still concentrated with a few very big 2 to 3 OEM. All are doing mainly assembly bringing all components most of the times even imported driver. So, India has a long way to go before truly becoming a manufacturing base. This Golden era of LED is yet to come.

#### **India Shining in LED Transition:**

Now what do we do to bring the GOLDEN days of the LED transition. This is not a prescription or advice, it is a thought process where all stakeholders have a role to play in win-win basis keeping both short term and long term vision clear. The LED transition has created a different model based on objective and opportunity for us. A few models are direct and easy to handle and a few models are conceptual and complex to handle, but clear understanding of these and time to time review will help all round development for customer, consumer, manufacturers, channel partners, government and finally for the country as a whole partnering this transition model.

#### **Energy saving and Make in India:**

These two are very complementary to each other and can do a fantastic job for India if they are synchronised. USA and China have mastered this subject very successfully for their motherland. The Indian government is now playing a very key role for the first time thanks to the LED transition. The opportunity for a quantum jump in volume needs to be formulated properly for prime minister's "Make in India" vision. It is worthy to note that at present some legislation is being implemented very successfully by government agencies and the industry model is now being transformed from a trading model to an assembly model. But the second part to have a real Make in India is most challenging, but is possible if there is a clear road map in mind. Like China India has a big benefit of Economy of scale and per capita lighting consumption is very low. Energy starved India needs a huge Led lighting system in the coming 8 to 10 years

to make the transition complete. Advantage LED production is a volume game. Unfortunately India has no LED chip or even LED package manufacturing base. All these basic light sources are coming from all over world. China, Korea, Taiwan already have a very sound manufacturing base. Presently 95% of the electronics component comes from China. India needs to work hard in vision accomplishment. Taiwan, a tiny country became an LED technology leader with partnering China and together enjoying 70% market share globally. But to be self-sufficient and competitive as well truly global, we need to have these manufacturing facilities in India. Technology tie ups can enable India to access the same. But at the same time this needs a huge investment and the investment needs to be protected to make it successful. In fact, as a whole India need huge investments in the semiconductor manufacturing base. In case of semiconductors, basically hardware electronics manufacturing till now the government worked as a facilitator and made few favourable policies for investment but India is yet to become a destination for the global semiconductor manufacturers. To have Make in India vision complete in LED transition, the government has to provide a very favourable position in direct investment as the case may be deemed fit with a good partner and consulting firm. For Industry to become a truly global player, India needs to export. The Government needs to think seriously to give financial benefit to exporters of electronics products /components push like China did to its lighting industry. Given a level playing field, the Indian lighting Industry can prove their worthiness in the competitive global lighting market. It is evident from the CFLI case study.

#### **Most complex in Standardization, legislation, test houses and specification**

Earlier discharge lamps were of three types. Luminaire combinations were very simple for making the standards. As a result of lessons learnt from CFLI, the LED transition saw very proactive preparation of standards but now the time has come to consolidate these standards to be more



practical and be India specific so that rational implementation of legislation of the standards is done effectively. These are mostly modified versions of IEC standards. Now after almost 5 years we need to have a complete revisit all the specs to face the new transition challenges. Out of the many practical issues below are a few shared experiences and the standards needed ASAP.

**LED myth :** when lamps or luminaires are specified or sold as “watt”. This needs to be unlearned and we need to relearn the subject of LED systems with respect to “system efficacy”. We need to stop describing the lamp or luminaire with respect to wattage for the sake of technology and customer/ user benefit.

Street light of different source like COB , SMD. Even SMD LED chips are low, mid, high power LED and also with or without lens. So many challenges we have to face looking into Indian context of customer and consumer as well as applications including the market environment.

Panel lights of different configuration say backlit and edge light.

See new lamps like filament lamps is are almost at our doorstep to become popular so we need to think to make different Standards or we face the technology barrier to come to India. Same is the case of different lamp holders. Driver technology is another challenge as the same driver can be driven for different wattages plus different drivers for different applications. We need to think how to cover these properly so that the right product gets the right value.

Life and warranty is another aspect of great concern. LED has long life declaration, anything from 100,000 to 15,000 hours. Why such a big variation even for the same LED chip / module?! Unfortunately the reason behind the story is not clearly told.

LED life is another paradox. With due respect to all and no offence to anyone, to me as a general customer it looks like a commercial myth. Who really waits as long as 3 to 5 years for bulb replacement! Pay back of 6 months to 2 years is good enough for me.

The Testing house plays a vital role in any transition and LED still being an emerging

subject the testing house plays a very critical role in the mandatory CRS scheme or voluntary star labelling scheme. Methodology and process of certification need to be designed very carefully to give morale boosting to Indian manufacturers. The number of approved test houses, its testing equipment, time and cost of test should not hinder the speed of the transition. Lighting, a multidisciplinary subject and its ingredient varies with time and space, therefore, there is always a local requirement. So copy and paste of standards from any country or uniformity global norm, need to be validated as per Indian requirements. System made “once for all” attitude needs to transform into a continuous monitoring and updating system with respect to the Indian way.

Standardisation, legislation and testing all should be an integral part of the make in India vision.

#### **Distribution and Project Management:**

The LED transition has already challenged the traditional way of the lighting business model in India. LED in traditional distribution channels is so far not very upbeat as it is in the cross fire between the Govt DELP distribution model and online business model. LED lamps in the distribution model cannot meet cost parameters with the other two models and the price will be higher than CFLi lamps as 80 to 90% cost is incurred in traditional distribution channels in India. It is hoped that this is a temporary phase of transition and good luck to traditional channel partners. Sooner or later another tough challenge will be faced by the lighting companies, lighting Project management. Here learn fast and act fast will be the key mantra. Days are numbered where lamp, luminaire or driver independent sale will be very limited and main volume will be generated by selling the light as a system including supply, execution/installation, warranty and finally as a service provider. See the fun is going to start with another govt initiative of PRSF (partial risk sharing facility for energy saving projects) in street lighting and other government establishment’s energy saving renovation or ESCO projects. Here the winner will be those lighting companies who are trained or

preparing themselves to handle total lighting as a one sale. Street lighting has already gone in this direction and many more projects to come for a single window handling lighting business. So the LED transition will force the lighting companies and its channel partners to think beyond the usual traditional distribution and the countdown has started.

#### **Academic and Research**

Success of the LED transformation and its sustainability will depend on how we handle present day and what we are doing for new generation to take care. A system needs to be adopted like China who in turn copied the US and European model. In India for a long time optics and optoelectronics have been major subjects in different top institutes to include some amount of general lighting subjects. Almost 25 years back education of lighting started in limited engineering colleges. This credit goes to few personalised initiatives and approaches. All these curricula were on specific subjects, either on laser or on lens design or software of lighting lay out design. Even today, these institutes have produced many world class lighting professionals and India feels proud of them in their global leadership positions. The stream of research and development in general lighting aspects have a low priority in these institutes due to various valid reasons. Germany, USA and even China has a few established lighting institutes where almost all multidisciplinary general lighting subjects are being taught, be it chemical (powder) to electronics, glass to material science , biology to psychology, architecture to mechanical and so on. In those countries Industry played a major role in collaboration with lighting institutes in developing lighting technology. Academic focus is the backbone of these countries to maintain the world leadership position for a long time. Way back in 2006, at one of the meetings and special deliberations our visionary past president late Dr. Abdul Kalam dreamed of Nanotechnology and LED production in India. The job was assigned to NTPC to explore the possibility. Legacy of Indian traditional academic syllabus, lighting in India becomes a share the subject of so many disciplines starting

from energy institutes to electrical to optoelectronics to applied optics etc. Now a Quantum jump in volume for new technology, opened up unlimited opportunity in the field of academic and research sector in India. It is now high time lighting in India should be treated as a full engineering stream and standalone institute. This is only possible with the government search of its Lighting Excellence centres. To start with all existing engineering colleges where lighting is already part in degree or post graduate syllabus should get state of art testing equipment and fresh curriculum. To add a flavour of practical approach in academics, pooling of experienced field personnel and experts need to be a part of the teaching and research staff. Indian institutes need immediate tie ups with foreign lighting institutes and lighting companies for research and development work. A systematic time bound focus approach from

the government and UGC is required to revamp the LED Transition. Properly cultivated Young talented students of India will become lighting experts for the future global need.

#### **IT and Lighting :**

Lighting is starting to become part of the “internet of things” — where different devices are all connected on telecoms networks. India being the world IT leader already a few global lighting companies are using India for their global design competence centre. IC design to system configuration to driver design are all now under the IT platform. Thus the LED transition has created a new dimension in lighting to become digital. Properly exploring the lighting field there are all possibilities that India can emerge as a global leader in lighting software development that includes lighting lay out design.

#### **A COMMON PLATFORM & ISLE**

Lighting is an integrated and multidisciplinary subject. ISLE is the common platform for all without any bias. ISLE was the first to start the Lighting awareness in India through many seminars, Exhibitions of real international quality, CIE conference, representing BIS for formulation of standards, supporting BEE to formulate ECBC, preparing the National Lighting code, giving scholarships to university students so many & so on. ISLE dedicated its services to the lighting fraternity over 3 decades.

Now , this is a very crucial time for the Indian lighting scenario to handle the LED transition where ISLE will integrate all stake holders and play a vital role in time to come for the common Indian - a green transition to their life “as light is life” and as a great saviour of their children, their grandchildren.



# **POWER ELECTRIC CO.**

## **Authorised Distributor**

**No. 10, 1st Floor, S.M. Plaza, No. 93 (Old No. 45),  
Armenian Street, Chennai - 600 001.**

**Contact No. : 25223524, 25247163, 42051211,**

**Telefax : 25231485**

**Email : powerelectric93@gmail.com**





# Calcutta Centre Activities



Calcutta State Centre conducted successfully Lii2015 and also a Technical Session during the AGM (2015-16)



## Lighting for tomorrow

The definition of light as particle as well as wave has been established a long ago in physics. But there is a fine line exists between light & lighting which is not well defined still today. Lighting is apparently not to deals with physics only but the application of light to illuminate a space. There is a myth that light source takes the most vital role in lighting design, but real story says something more. The lighting design encapsulate the selection of luminaire, light source, the placement of the luminaire moreover the energy efficient design. The classical tools of lighting design are becoming outdated today, because of

two revolutionary steps in field of lighting design. The lighting design is now no longer restricted with the energy efficient solutions rather a new dimension has been included, which is called future of lighting, the “Human Centric Lighting”, which is really a revolutionary change in lighting. The “Internet of Things (IoT)” is also a remarkable footstep towards future lighting, where, internet can be used to control the level, color, intensity of light in any space in concurrence the general harmony between human centric lighting requirements and energy efficiency.



Mr.Suddhasatwa Chakraborty,  
Assistant Professor,  
Illumination Engineering Laboratory,  
Jadavpur University



Advanced Lighting Vocabulary



# Mumbai Centre Activities

Inauguration of Student Chapter of Indian Society of lighting Engineer (ISLE) at Dr.D.Y.Patil Institute of Engineering and Technology, Pimpri, Pune



Copy of ISLE Indian Lighting Directory being presented by Dr.Prakash Barjatia, Hon.General Secretary, ISLE to Prof.(Dr.) Rakesh Jain, Principal, DYPIET,Pimpri,Pune

National Symposium on Intelligent Lighting at Bharti Vidya Peeth Deemed University, College of Architecture, Pune



Proceeding being presented by Dr.Prakash Barjatia, Dr.BC Gargash & Ar.Kaustubh to Dr.Archana Gaikwad, Co-ordinator-M.Arch.



# Chennai Centre Activities



Speaker Ms. Anusha Muthusubramanian

Intricacies in lighting design



Speaker Mr. Senthilkumar Madasamy

Next generation LED lighting fixtures



One day technical seminar by Prof. W. Van Bommel from Holland



Workshop on LED lighting for MES Engineers





# Delhi Centre Activities

Technical Seminar on LED market and the future ahead at  
Vidyut Bhawan CPWD New Delhi



**Mr. Gurvinder Singh**  
Chairman - Delhi State Centre



# M.P. Centre Activities



Seminar



Photon



RR CAT



# Rajasthan Centre Activities

Electrical and LED Exhibition at B.M.Birla Auditorium, Jaipur.



**Mr. R.S.Saxena**  
Chairman - Rajasthan State Centre





RECOGNITION OF *Quality Plus*

# PLUG & SOCKETS



**UL LISTED V2 FLAME RETARDANT GRADE,  
960° GLOW WIRE TESTED  
ENGINEERING PLASTIC,  
UNBREAKABLE & FULLY INSULATED**



## PLUGS



16 Amps Ang. J20 3 AP  
2 pole + ⊕ IP44



16 Amps Sgt. J20 3 SP  
2 pole + ⊕ IP44



16 Amps Sgt. J20 5 SP  
3 pole + N + ⊕ IP44



32 Amps Sgt. J32 3 SP  
2 pole + ⊕ IP44



32 Amps Sgt. J32 5 SP  
3 pole + N + ⊕ IP67

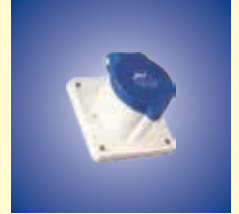


63 Amps Sgt. J63 5 SP  
3 pole + N + ⊕ IP67

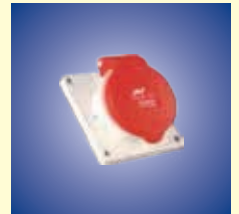
## SOCKETS



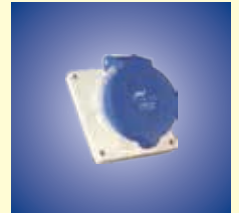
16 Amps Ang. J20 3 AS  
2 pole + ⊕ IP44



16 Amps Sgt. J20 3 SS  
2 pole + ⊕ IP44



16 Amps Ang. J16 5 AS  
3 pole + N + ⊕ IP44



32 Amps Sgt. J32 3 AS  
2 pole + ⊕ IP44



32 Amps Ang. J32 5 AS  
3 pole + N + ⊕ IP67



63 Amps Ang. J63 5 AS  
3 pole + N + ⊕ IP67

**JAIBALAJI**  
CONTROL GEARS PVT. LTD

Plot No. 89 (New No. 107), SIDCO Industrial Estate, Ambattur, Chennai-600 098. India

Ph: 26251279,26257859,26254469,26254470, Fax: 0091-044-26255038

E-mail: dchandramohan@jaibalaji.firm.in Website: www.jaibalaji.firm.in

Branch: Bangalore-Ph:0091-80-23425254

Delhi-Ph:0091-11-22440955 Mumbai-Ph:0091-22-24092841

DEALERS ENQUIRIES SOLICITED



# LED - PERSPECTIVES & PROSPECTS



**Dr. Prakash Barjatia**

Director of MIT School of Energy & Lighting  
 NABL Technical/Lead Assessor  
 Governing Body Member of ISLE  
 pbarjatia@gmail.com

## 1. GREEN LIGHTING ?

With the word GREEN - Environmental friendly living - hot topic today, many people wonder how they can play their part in this massive movement. One of the easiest ways to cut down energy drastically is by paying attention to Light Bill. Artificial lights on an average accounts for up to 20% of annual energy usage ! When we are able to cut down that amount, it can definitely make a difference to not only wallet but also to the environment. To get a realistic view of the cost of energy, consider that if every household replace old bulbs for energy efficient ones, the amount of greenhouse gases reduced would be equal to gases emitted from approximately ten million vehicles !

Implementing this change can be as easy as switching from traditional light bulbs to Light Emitting Diodes (LEDs), and switching off the lights when they're not in use. Although LEDs initially cost more than other bulbs, the savings they incur over time more than makes up for one-time expenditure. Maximizing natural daylight can also make it look larger and brighter, while saving on energy bills. While we don't often feel like these types of small changes really make an environmental difference, consider how much the difference would be increased if everyone tried to conserve energy in a similar manner.

## 2. TRANSITIONING FROM INCANDESCENT TO LED LIGHTING

Incandescent light sources based on Thomas Edison's original patents have been in use for over 125 years, which has made them the standard for artificial lighting for more than a century. The relatively rapid move toward CFL and LED lighting represents the biggest leap forward in this technology since electric bulbs replaced gas lamps and candles.

Fluorescent lighting made its first public appearance at the 1939 World's Fair in New York. It uses a very different technology for producing light than the incandescent lamp, namely a gas-discharge where electricity excites a mercury vapour. But even with its added complexity, today's evolved compact fluorescent lighting continues to gain favour because it converts electrical power into light much more efficiently than incandescent.

LED lighting may have an even more promising future as it approaches greater economic and commercial viability. Despite its higher initial costs, LED's advantages of long life and decreased power usage, LED technologies have the benefits of higher luminous efficiency and reduced power when compared with the incandescent technology that preceded them.

In a move sparked largely by the drive for increased energy efficiency, government legislation and increasingly lower costs, much of the world is transitioning away from traditional incandescent lights to more energy-efficient light-emitting diode (LED) lighting. The evolution to CFL and, eventually, LED lighting currently underway is being driven by state and federal energy efficiency initiatives as well as buy-in by retailers and consumers as costs have dropped. These newer lighting technologies differ significantly in their electrical properties from incandescent lighting, yet they are required to function in homes and businesses primarily via hardware and fixtures designed for the older technology. Performance Comparison with respect to their Energy Consumption and Environmental Impact are given below.

### Performance Comparison

Energy Consumed (Watt) for the Same Light Output			
Incandescent	Fluorescent (CFL)	LED	
60	13-15	6-8	
Life Span (average) Hrs.			
Incandescent Light Bulbs	Fluorescent (CFL)	LED	
1,200	8,000	50,000	

### Performance Comparison Environmental

Carbon Dioxide Emissions - (Pounds/year) – 5 hours/day for 365 days/year for 30 bulbs			
Incandescent Light Bulbs	Fluorescent (CFL)	LED	
4405	1028	514	
Contains TOXIC Mercury			
No	Yes	No	

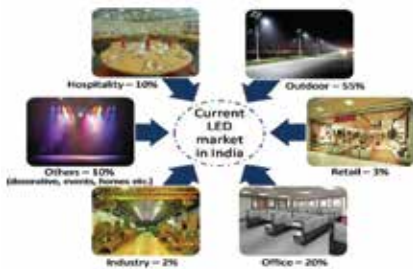
The use of an energy-efficient lighting design not only provides significant lighting savings, but also can reduce the cooling requirements for a building. Engineers should use building energy modeling software to incorporate lighting system design and properly size the HVAC systems.

## 3. GROWTH OF LED BUSINESS IN INDIA

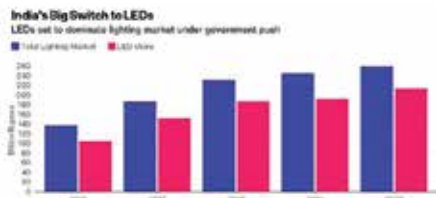
According to the study conducted, lighting is typically the largest source of waste heat, also known as heat gain, inside commercial buildings. Approximately 18% of the electricity generated is consumed by lighting loads, with another 5% being used to cool the waste heat generated by the lighting. Because lighting represents the largest portion of a commercial building's electricity consumption, it also presents a great opportunity for energy savings by using energy-efficient lighting systems and lighting controls. This applies to both existing and new buildings. LEDs are having such a wide application that apart from the following few applications, LEDs are even used for the growth of vegetables in space shuttles.

Such move has led to an increase in the need of LED Business in India. During last three years the lighting industry

## LED - Present Indian Scenario



has adjusted and considerably modified its approach in order to remain competitive in an increasingly open market scenario. With an estimated market of about Rs.260 Billion by 2020, the Lighting Industry is witnessing tremendous growth. In spite of tremendous growth possibility, nothing much has been done to develop the professionals and skilled man power who can further progress with more scientific and innovative approach. Further in LED segment alone there is a growth of more than 80 %. As such the main issue being faced by LED Industry is the lack of skilled manpower and ensuring quality of LEDs and aggregates.



## 4. ISSUES FACED BY LIGHTING / LED INDUSTRY

These 2 important factors - Trained Professional / Skilled Manpower and Testing & Evaluation Facilities are

therefore essential for the growth of LED/Lighting Industry. Although lot of funds are available with the Govt. for providing these resources, but since they are not organised together, nobody is able to get the benefits. Not many Institutes / Organisations are providing appropriate educational / testing facilities in this vital field of Lighting / LED. It is therefore need of the hour to develop appropriate Education / Testing facilities in the country.

### 4.1 SKILL DEVELOPMENT

“Skill development is most important dimension for nation’s development. I see our youth as our biggest strength and most valuable resources and if we strengthen our Yuva Shakti with relevant skills, no one can prevent the 21st Century from being India's century.” “Nation needs skill growth, Food Bill can't feed needy” “Lets create a 'Skill India' and not a 'Scam India'”

- **Shri Narendra Modi, Prime Minister of India**

#### Need

- In spite of very robust formal education system it does not produce people ready to take up work effectively without specific Skill Development, we see a lot is required to make Indian workforce productive without training for development of skills.
- A lot of workforce is employed without requisite skill set.
- There is regular requirement for up-skilling.

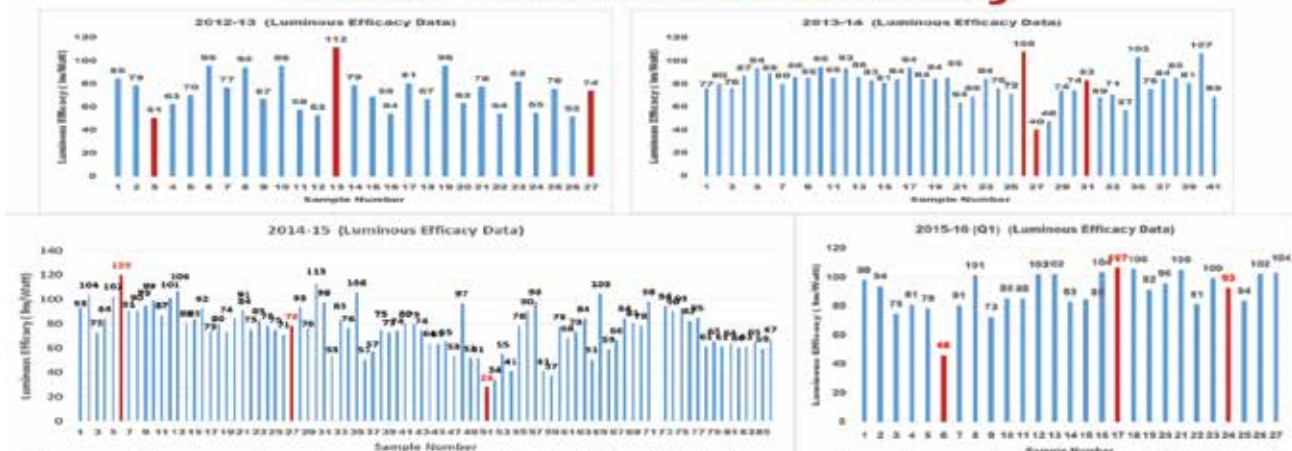
### Benefits - For Individuals

- Skill Development can increase individuals' employability
- Skill Development will get them advantage in compensation.
- Skills development gives people better Job roles and career growth.

### Industry Requirement

The lighting industry is now poised to take a broad look into the future by considering the diverse trends and uncertainties acting among its many constituents. Using this approach the industry will enable its players to start placing the strategic bets necessary to evolve and prevail. Indeed, the stakeholders of the lighting industry may well be able to shape the evolving future if they proactively position lighting as a high-value contributor to society and the marketplace. The lighting industry needs to play a critical role so in the context of the larger issues of energy, health and sustainable growth. As it does so, the industry can set the agenda for its own future and its ability to enhance the quality of life. However, till now unfortunately there is a lack of formal education in this vital field. Since as mentioned in the earlier paragraphs, the Lighting has been taken for granted as other commodities, the necessity of formal education is not felt so far. With the advancement in technology and the presence of Lighting in the form of electromagnetic waves in all spheres of life, starting from Lighting as Illumination for proper visibility to the communication by Mobile Phones through satellite, the

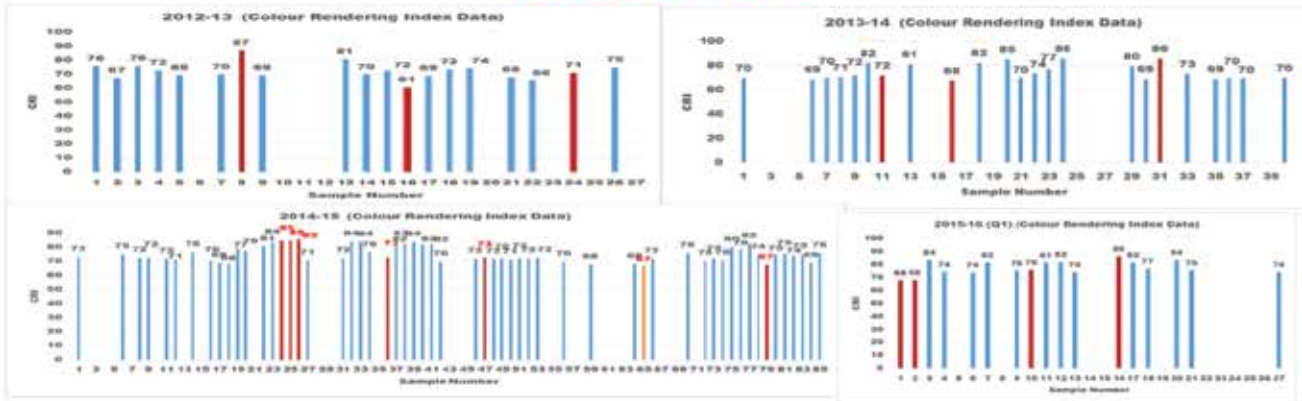
## Data – Luminous Efficacy



The maximum value observed was 120 lm/W and minimum value observed was 28 lm/W. The data variation implies that there is large variation between different samples and this is mainly due to usages of LED chips of different efficacy (lm/W) and lumen packages, and thermal management design.



## Data - CRI



**The maximum value observed was 87 and minimum value observed was 61. The data variation is not much if we compare Maximum, Minimum and Median data of each year and is mainly due to good colour properties of LED chip.**

necessity of formal education is being felt by users as well as Industries.

- Productive man force from day 1 of joining employment
- Higher standards in delivering quality of Service
- Reduced in - house training cost due to industry ready personal.

### 4.2 TESTING FACILITIES

In spite of bold claims on Performance and Life of LED Light sources even by Multinationals, it is a fact that they do not prove to be up to their claims. This has led to doubt in the mind of the users who opt for LED in spite of high cost. A Summary of Performance of LEDs in a reputed Laboratory is appended below.

Considering the varied performance of LED and its aggregates, specifically which are being dumped in the country from China, Korea and other South Asian Countries, Bureau of Energy Efficiency (BEE) , Govt. of India has already declared LED Light Source under their Star Rating Program. On a study, it is seen that very few Accredited Testing facilities are available in the country. As such without adequate Testing Facilities, such programs may not result in effective implementation.

Although Govt. Is encouraging Industries / Institutes / Industry Associations to develop such Testing facilities, it has not got satisfactory results.

### 5. SOLAR LIGHTING SYSTEMS

Increasingly, solar power is being used for LED lighting around the world. The long term power saving, conservation of

precious natural resources and elimination of the need for generating additional power are leading to the fast adoption of solar lighting systems around the world. In a tropical country like India, solar lighting makes all the more practical sense, given the abundance of solar energy round the year. Solar panel collection systems using photovoltaic (PV) technology are a direct current (DC) energy source, which for most applications, including standard lighting, must be converted to alternating current (AC). However, since LED technology is inherently DC driven, it is more suitable for integration with solar power systems. The potential low power requirement for many LED applications also makes LED more suitable because solar power capacity is currently more limited in comparison to typical electrical grid AC power. Solar panel or photovoltaic systems are being paired with LED exterior lighting systems to leverage renewable energy benefits and off-grid flexibility. Solar driven lighting systems generally consist of a lamp, fixture, solar panels, inverter and/or converter, battery, support structure, and foundation.

### 6. CONCLUSION

When this subject was discussed during LED Summit 2012 held at Delhi in Dec.,2012, which was addressed by Secretary, DoEITY, everybody felt a need of integration of all relevant subjects. Further Dr.N.Narendran Director of Research, Lighting Research Centre, New York who was specially invited at the Summit for sharing his US experience for the benefit of Indian Lighting Industry, he

clearly mentioned a huge scope in "LUMINIARES" based on LED as a Light Source as it is clearly an "Electronics System" which can benefit under DeitY "ESDM" manufacturing scheme. It is further felt that there is a huge potential for the unemployed rural youth to train them for the operation and maintenance of all these LED Lighting based on Solar Systems empowering them to solve their problems at their community level.

Although tremendous scope / potential exists, but considering the present status of MSMEs / Solar, LED and Battery Professionals which includes Manufacturers, Assemblers, Designers, Academicians and Students, nothing much has been done in this direction to develop infrastructural facilities specifically in the areas of Skill Development and Quality Monitoring. An integrating approach is therefore required to promote and form a Consortium of Solar, Battery & LED Professionals / MSMEs.

Although Indian Society of Lighting Engineers (ISLE) is instrumental in developing Academic Courses since 1988, still there appears to be a lack of interest in students and their parents to opt for career in this upcoming field. During an interaction with the manufacturers under the aegis of Maharashtra Energy Developing Association (MEDA) – Agency for promoting non-renewable Energy in Maharashtra, ISLE suggestion of encouraging Educational Institutions for developing preliminary Testing facilities with them, may help in overcoming both the issues, Training and Testing.

# Welcome to new members -



Name	Membership No.	Grade	State Centre
Nisar Ahmad	M.2006	Member	MP
Chaman Lal	M.2007(L)	Member (Life)	Delhi
Nileshkumar Ramchandra Ramavat	M.2008(L)	Member (Life)	Mumbai
Gaurav Sunil Patravali	A.1332	Associate	Karnataka
Rohan Suresh Ambavane	A.1333	Associate	Mumbai
Omprakash Roopchand Todi (Transfer M to F)	F.0864(L) from M.1621(L)	Fellow (Life)	Mumbai
Suddhasatwa Chakraborty (Transfer A to M)	M.2009(L) from A.0991(L)	Member (Life)	Calcutta
Haresh N. Thadani	M.2010	Member	Chennai
M. Selvin Mary	M.2011	Member	Chennai
M. Yuvaraja	M.2012	Member	Chennai
P. Gnana Selvi	M.2013	Member	Chennai
Praveen Lunkad	M.2014	Member	Chennai
Deepu Jain	M.2015	Member	Chennai
V. Manigandan	M.2016	Member	Chennai
S. Karthik	A.1334	Associate	Chennai
Thirupathi Ramakrishnan	A.1335	Associate	Chennai
Akram Basha Haffez	A.1336	Associate	Chennai
Deepak Thirunavukkarasu	A.1337	Associate	Chennai
Jagan Perumal	A.1338	Associate	Chennai
R. Revathi	A.1339	Associate	Chennai
Sathish Kumar M. Raman	A.1340	Associate	Chennai
Karthik Subbu	A.1341	Associate	Chennai
J. Madhavan	A.1342	Associate	Chennai
Kumaresan Minnal Raja	A.1343	Associate	Chennai
Akshay Srisrimal	A.1344	Associate	Chennai
Sellamuthu Ramasamy	A.1345	Associate	Chennai
M. Pradeep	A.1346	Associate	Chennai
K. Manoj Kumar	A.1347	Associate	Chennai
The International School Bangalore (TISB)	I.0197(L)	Institutional (Life)	Karnataka
Priya Rahul Bangle	M.2017(L)	Member (Life)	Mumbai
Aditi Vishwesh Lanke	M.2018(L)	Member (Life)	Mumbai
Pramod Kumar Dubey	F.0865(L)	Fellow (Life)	Rajasthan
Vasudha Bhalchandra Karhadkar	F.0866(L)	Fellow (Life)	Mumbai
Senthilkumar Tamilkolundu	F.0867(L)	Fellow (Life)	Chennai
Sham Sunder Garg	M.2019	Member	Delhi
Mahidhar Prasad Sharma	M.2020	Member	Delhi
Ramesh Chandra	M.2021	Member	Delhi
Ashok Kumar Sharma	M.2022	Member	Delhi
Prakash L. Gehani	M.2023	Member	Delhi
Mahavir Singh Saini	M.2024	Member	Delhi
Kanhaiya Sah	M.2025	Member	Delhi
Hari Sankar Roy	M.2026	Member	Delhi
Sanjay Kumar	M.2027	Member	Delhi
Bijendra Kumar	M.2028	Member	Delhi
Ajit Kumar	M.2029	Member	Delhi
Ramesh Kumar Garg	M.2030	Member	Delhi
Nawal Kishor Meena	M.2031	Member	Delhi
Anil Kumar Jain	M.2032	Member	Delhi
Shri Kant Parashar	M.2033	Member (life)	Rajasthan
Sreemoy Sundar Das	M.2034(L)	Member (life)	Calcutta
Shukla Das	M.2035(L)	Member (life)	Calcutta
Girja Shankar Charan (Transfer M to F)	F.0868(L)	Fellow (Life)	Rajasthan

Also welcome to all student members from Karnataka / Calcutta / Bhubaneshwar / Mumbai / Chennai



**LIGHTING DIRECTORY 2017 TO BE RELEASED SHORTLY**



Limitless Possibilities



D-10, Ambattur Industrial Estate, Chennai - 600 058.  
Tel : 26257710, 42281950, Fax : 26257866  
Cell : 95000 79797, 95000 85511 | Email : info@klite.in

India's Lighting Company

Website : [www.klite.in](http://www.klite.in)



# OEM Systems Group

products for excellent lighting.



## Products for excellent lighting.

**LED Drives Specifically made to tough out the Indian Power Condition**  
**Robust, Reliable, Luminaire Component - Housing, Diffuser, Accessories**



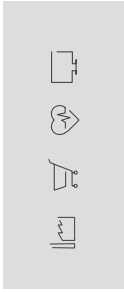
**BAG electronics (India) Pvt. Ltd.**  
Head Office : Survey No. 19, Kondhwa Road, Yewlawadi, Pune - 411048.  
Tel. No. +91-20-30450700 Fax No. +91-20-30450800  
e-mail : marketingindia@bagelectronic.com  
Website : www.OEM-Systems.com



**Intelligent & individual**  
All from a single source. We support your specific needs with our product and service components, ranging from standard components to customer-specific solutions and from LED modules and control units to complete luminaires. Make the most of our global development resources for your projects. Your high-performance partner for outstanding light.

**b,ag,**  
Electronics / Control gears

**We are BIS certified**



**Subrata Mukhopadhyay**  
Mob.: +91 98336691112  
Email Id: s.mukhopadhyay@oem-systems.com

**Maresh Gaikwad**  
Mob.: +91 9921829011  
Tel.: +91 20 30450712  
Email Id: mgaikwad@oem-systems.com

**Sarad Gairola**  
Mob.: +91 9820094621  
Email Id: sgairola@oem-systems.com

### Sales Contacts

\*If you wish to write to our Managing Director then please write at [mdindia@bagelectronics.com](mailto:mdindia@bagelectronics.com)



# We create light because it illuminates what's important. See more

For years, we've been the world's leading creator of light engine technology. Innovation, quality, and reliability drive everything we do. We're proud to reintroduce ourselves as a uniquely focused company, dedicated to shaping the future of light and helping our customers illuminate the world.

[lumileds.com](http://lumileds.com)

©2015 Lumileds Holding B.V. All rights reserved.