

## **ISLE LRC Course on Solid State Lighting**

**Bangalore** September 23 and 24

**Delhi** September 26 and 27

The primary objective of ISLE is to promote good lighting practice in India. This is particularly urgent in view of the need to conserve energy in lighting which consumes 18% of the energy consumed in India.

The coming of age of LEDs has provided a technology change that offers a unique opportunity to take advantage of this tiny light source for furthering energy conservation, flexibility, adaptability and high lumen packages. This technology is also environment friendly. As with any change in technology it is important for all practitioners of lighting to be fully aware of the different facets and consequences of the change. This is particularly relevant to large users where decisions need to be based on an understanding not only of the technology but also of the design requirements.

To this end ISLE organised a 2 two day intensive course on Solid State Lighting at Bangalore and New Delhi in September 2013 by the world's premier lighting institution, the **Lighting Research Center, Rensselaer Polytechnic Institute, USA.**

The faculty consisted of the following:

**N. Narendran**, PhD, FIES - Professor and Director of Research at LRC and pioneering researcher and educationist in the field of solid state lighting;

**Russel Leslie** AIA, FIES, LC - Associate Director LRC, practicing architect and expert in energy-efficient lighting design;

**Daniel Frering** LC, - Manager Education at LRC where he directs the education programs including teaching and curriculum development; and

**Jean Paul Freyssinier**, MS, LC - Research Scientist at LRC whose work includes the design and evaluation lighting applications and demonstrations and he also conducts research projects in the area of solid-state lighting technologies.

The two day course was comprised of the following sessions.

***Terminology: Lighting and LED Devices and Systems***

***Vision and Photometry***

***Colour Science and Colorimetry***

***Solid State Lighting Technology Overview***

***New Lighting Metrics***

***Lighting Design and Applications***

***LED Products Performance***

***Discussion on LED Products/Performance Needs***

The course was supported by the Bureau of Energy Efficiency (BEE) and U.S. Department of Energy (DOE) through the U.S.-India Joint Center for Building Energy Research and Development (CBERD).

The Bangalore course was inaugurated by Mr. Himamshu Prasad, President and CEO of GE Lighting and Mr. Bhavani Prasad, former Director General CPWD and Director Education and Training on the ISLE Governing Body presided over the inaugural function. Mr. M.S.N. Swamy, Chairman of the Karnataka State Centre gave the welcome address. Mr. M.G. Sathyendra, Secretary Karnataka State Centre gave the vote of thanks.

The course in Delhi was inaugurated by Mr. Saurav Kumar of Energy Efficiency Services Limited (EESL). The welcome address was made by Mr. N. Nagarajan, Chairman, Delhi State Centre and the vote of thanks given by Mr. B.M. Bhatia, Secretary ISLE DSC.

The attendance in Bangalore was 52 and in Delhi 47. The participants represented a cross section of interests; large users like CPWD, PWD, Airport Authority, Ministry of Defence, DDA, HAL, BESCO etc from the Government sector and CEPT, Infosys, Metro Valley from the private sector. There were also several participants from companies in the lighting industry as well as from academic institutions. In addition there were consultants, architects, lighting designers and specifiers. The attendance was dominated by the presence of engineers (42.911.7%) Educators (11.7%) and Manufacturers (11.7%). On average the participants had 12.4 years of experience in lighting with 2.3 years of these in working with LEDs.

Nearly 80% of the participants felt that LED lighting was ready for application in India, though only 35% felt that it was affordable. The majority of participants (94.8%) felt that for LEDs to gain widespread use in India the price increase over traditional lighting systems would need to drop to less than 25%.

Roadway lighting was listed by the largest number of participants (50.6%) as the LED lighting application that was felt to provide the greatest benefits, followed by exterior and façade lighting (27.3%), Commercial (23.4%). Residential (19.5%), Interiors (18.2%) and Office (8%).

81.8% Participants indicated that they had used or specified LED lighting professionally or at home. Downlights were the most popular applications (19%) followed by office lighting and roadway lighting (17.5%). The next most specified applications were exterior and façade lighting (15.9%) and residential lighting (14.3%). For those who had not done so the overriding reason was the high initial cost. 73% of those who had used LEDs indicated that they were satisfied.

Among the good features of LEDs 73% of participants listed energy efficiency and 13% as longer life, while high initial cost (28%) and premature failure (27.3%) were the most undesirable features.

Given below is a summary of the discussions in Bangalore and Delhi.

### ***Bangalore, September 24, 2013***

The discussion session on day two of the seminar in Bangalore was moderated by Professor Russ Leslie of the LRC. He began the session by asking participants:

*What is needed to increase the penetration of LED lighting products in India?*

Responses included:

- Standardisation of lamp and fixture wattages along with other factors such as CCT (correlated color temperature) and CRI (color rendering index)
  - Note: discussion ensued about the most prevalent CCTs used in India. Many participants commented that 3500K (kelvin) was most prevalent for residential applications while 5000K and 6500K were most prevalent for commercial applications. Two persons said that in their experience the 840-series (CRI>80, 4000 K) linear fluorescent lamp is a popular choice. Some participants expressed interest in a study to determine the most widely used CCTs in India.
- More efficient optics (diffusers and reflectors)
- Application-dependent temperature (thermal) ratings to help designers and specifiers bridge the gap between manufacturer specifications and actual performance. A request was made so that ISLE help organise lighting standards development and incorporation into the National Lighting Code.
- Clearer specifications for LED products including for life, efficacy, and standardised output (i.e. lumen output of different temperature conditions)
- Independent testing of products

Professor Leslie then asked the group:

*What types of LED lighting products would you like to see on the market in India?*

Responses included:

- Robust lamps and fixtures for rural areas with poor power conditions
- LED lighting products for residential applications (e.g., downlights)
- LED retrofit products - as a follow up, a number of people mentioned needing guidance to select LED products for retrofit applications. The idea of developing an LED experience and demonstration center was well received as a way to showcase and promote good applications of LEDs and increase consumer confidence. Such a center could start with residential vignettes at the point of purchase. A follow-up point was made to have more manufacturers showcase their products as opposed to only distributing literature.
- Control-integrated lighting fixtures with occupancy centers built into each fixture

- Fixtures for extreme environments
- High-bay fixtures for industrial applications
- Replacement lamps with improved optics to better match existing fixtures

***New Delhi, September 27, 2013***

The discussion session on day two of the seminar in New Delhi was also moderated by Professor Leslie. At this session, Professor Leslie asked what would be needed to increase the acceptance of LED lighting products in India.

Responses included:

- More accurate information about the life of LED lighting products
- Lower cost - costs are currently 6 to 7 times higher than traditional lighting products
- Longer product warranties - warranties are currently only one year
- Fewer premature failures of LED lighting products
- Products with up to 10 kilovolt (KV) surge protection needed for outdoor applications
  - Some participants recommended that the Bureau of Indian Standards set higher requirement for surge protection for outdoor fixtures so that manufacturers have a standard to meet
- The establishment of a website for discussion and answers to questions about LEDs
- Build insurance into the cost of the product so that customers can receive replacements if a product fails
- Improved product-to-product colour consistency both at the beginning of product life as well as over time
- Price point for replacement lamps needs to be competitive with compact fluorescent lamps (CFLs)
  - Some participants commented that there was a concern about theft of LED lamps from public and commercial spaces due to their high cost
- Some participants commented that larger commercial customers with long hours of use, such as hotels, were already replacing halogen and incandescent lamps with LEDs
- Participants also commented that dimmability of retrofit lamps for hospitality applications was a problem in India.