JULY/AUGUST 2008

LEDs MAGAZINE

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TECHNOLOGY AND APPLICATIONS OF LIGHT EMITTING DIODES

LightFair
Riding the wave of LEDs in Vegas P.24

Energy Star
Conflict between DOE and EPA P.17

Displays
LED backlights and OLED displays P.31

Interior Lighting
Office lit with LEDs P.10

LEDs MAGAZINE®

ISSUE 22

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Cover Story

An entire office building in Paris, France has been lit with LEDs supplied by Philips, including 422 luminaires integrated into the ceiling (see page 10).

features

columns/departments

Previous Page | Contents | Zoom in | Zoom out | Front Cover | Search Issue | Next Page

commentary

R&D investments lead to enhanced performance

Notice anything different? Since our last issue, our production team has been very busy and has given the magazine a design overhaul; we hope you like the results. Our editorial team has also been busy with a packed conference and tradeshow calendar. In fact, with more events being added all the time, the LED calendar is rapidly becoming saturated, and it becomes a challenge to differentiate the "bandwagon" events from those that provide a worthwhile contribution to the growth of the LED industry. Firmly in the latter category are two important tradeshows covering displays and lighting respectively –LightFair and SID – that have a very significant and rapidly expanding LED content, as described in our articles beginning on page 24 and page 31. Another strong, but much smaller, conference is the UK-based EuroLED, which included several interesting talks relating to R&D in Europe, and how regulations relating to disposal and recycling of lighting fixtures could affect LEDs (page 44).

It was at EuroLED that we first got wind of the gathering storm in North America over the conflicting Energy Star criteria, which has dominated news channels (on our website, at least) in the last month. Our article on page 17 describes how the events unfolded. The debacle has wide-reaching consequences. Brian Owen, our Contributing Editor, says he has received a number of requests to make presentations to the financial community to outline the issues surrounding Energy Star. Of course, his hosts were interested in an explanation of how the outcome could affect the growth of the SSL industry with respect to the investments made in SSL technology companies. "Irrespective of the cause, confusion can cause disturbance and disruption to an already disruptive technology," he says. "This can create an apprehension to invest in what may be perceived to be a chaotic environment, causing the investment community to sit on the sidelines and wait it out. The consequence could be a slow-down in R&D investment, instead of accelerated growth."

This is undoubtedly true, but for larger companies there is an ongoing commitment to internal R&D investment. Further evidence of impressive R&D progress in power LEDs was provided as this issue was being finalized. Osram claimed an R&D record for luminous flux and efficacy from an LED driven at 350 mA. The figures were 155 lumens and 136 lm/W for a white LED based on a 1 mm^2 chip. The device had a color temperature of 5000 K, with color (x,y) coordinates at (0.349, 0.393). The LEDs can be driven at 1.4 A, producing up to 500 lm. Osram says that the key to success was a perfectly matched system of optimized chip technology, a highly advanced and extremely efficient light converter (phosphor) and a special high-performance package. It's important to remember that these are R&D numbers, but the technologies behind them will filter into production devices and continue to enable the LED industry to fulfill its potential.

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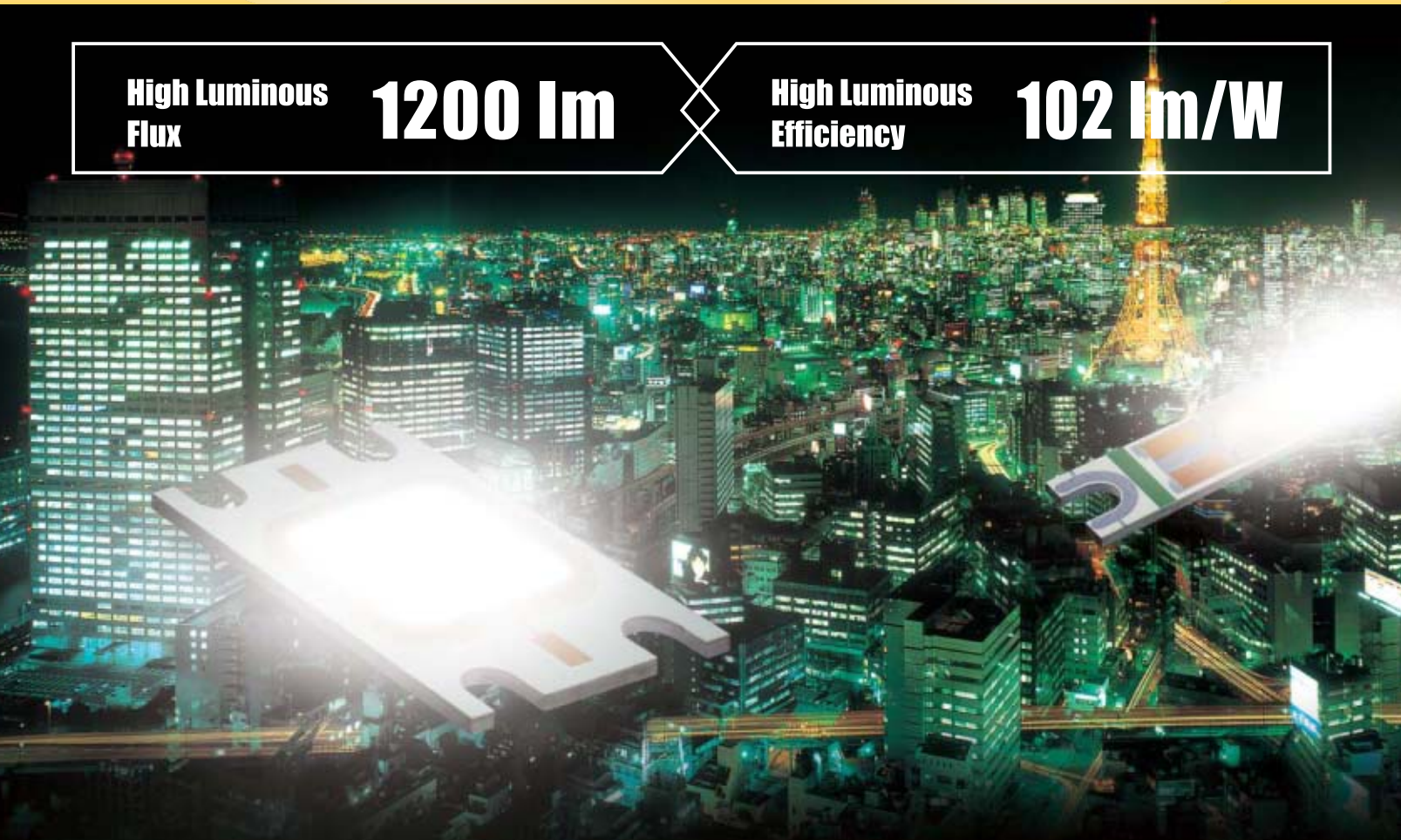
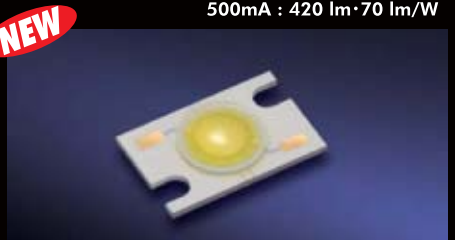
High Luminous Flux **1200 lm** | **High Luminous Efficiency** **102 lm/W**



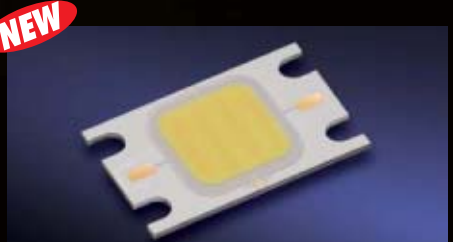
New Citizen White LEDs deliver more light with less power!

NEW

CL-L190-C5N-A(5000K)
350mA : 320 lm·82 lm/W
500mA : 420 lm·70 lm/W



NEW



CL-L220-C16N-A(5000K)
350mA : 330 lm·102 lm/W
700mA : 630 lm·88 lm/W
1000mA : 860 lm·78 lm/W
1500mA : 1200 lm·66 lm/W

NEW

CL-L230-C10N-A(5000K)
350mA : 210 lm·91 lm/W
700mA : 560 lm·75 lm/W
1000mA : 730 lm·67 lm/W

Already in production!

CL-L102-C3N(5000K)
Typ 350mA : 245 lm·67 lm/W

CL-L102-C3L(2900K)
Typ 350mA : 150 lm·41 lm/W

CL-L102-C7N(5000K)
Typ 700mA : 540 lm·70 lm/W

CL-L102-C7L(2900K)
Typ 700mA : 330 lm·43 lm/W

Natural color Ra : 95

CL-L102-HC3N(5000K)
Typ 350mA : 190 lm·50 lm/W

CL-L102-HC3L(2900K)
Typ 350mA : 160 lm·42 lm/W

NEW

CL-654-C1N(5000K)
Typ 350mA : 96 lm·80 lm/W

CL-654-C1L(2900K)
Typ 350mA : 79 lm·65 lm/W

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LEDs MAGAZINE™ | web exclusives

World of LEDs blog

View commentary and feedback on the important stories in the World of LEDs at www.worldofleds.blogspot.com.

JUNE 13: Energy Star Wars

JULY 2: Philips offers IP license for LED technology

Webcasts

Access archived events at www.ledsmagazine.com/webcasts or find details of upcoming events:

Market Trends and Emerging Applications in the LED Industry

ROBERT STEELE, Strategies Unlimited (July 30, 2008)

Essentials for Designing LED Luminaires

SCOTT RIESEBOSCH, CRS Electronics (April 29, 2008)

Thermal Design for Enhanced LED System Performance

Date and speaker(s) to be decided

Articles

LightFair Daily – live reports from the tradeshow in May

www.ledsmagazine.com/features/5/5

Architects benefit from professional education on LEDs

Architects were enlightened by input from the solid-state lighting community at their annual convention in Boston, writes Brian Owen.

www.ledsmagazine.com/features/5/5/3

ADVERTISERS *index*

FEATURED *event*

LED Japan/Strategies in Light

October 16-17, 2008
Tokyo, Japan

Strategies in Light, the leading event for the global LED industry, attracted over 1,000 attendees this year and is the largest and longest-running event in the industry. LED Japan/Strategies in Light, which will be held annually in addition to the original US event, will bring new focus to the LED market in Japan, where there is a large number of LED manufacturers, LED users, and suppliers of equipment and materials to the LED industry.

Go to http://www.strategiesinlight.com/ledjapan2008 for more information.

SPIE 8th Int'l Conference on Solid State Lighting (part of Optics & Photonics)
August 10-14, 2008
San Diego, California, United States

SSLdesign Summit
August 26-27, 2008
Weehawken, New Jersey, United States

China International Optoelectronic Exposition (CIOE)
September 06-09, 2008
Shenzhen Convention & Exhibition Center, China

PLASA 08
September 07-10, 2008
London, United Kingdom

LIGHT - International Specialized Exhibition
September 17-19, 2008
Kiev, International Exhibition Centre, Ukraine

Light Canada
September 25-26, 2008
Direct Energy Centre, Toronto, Canada

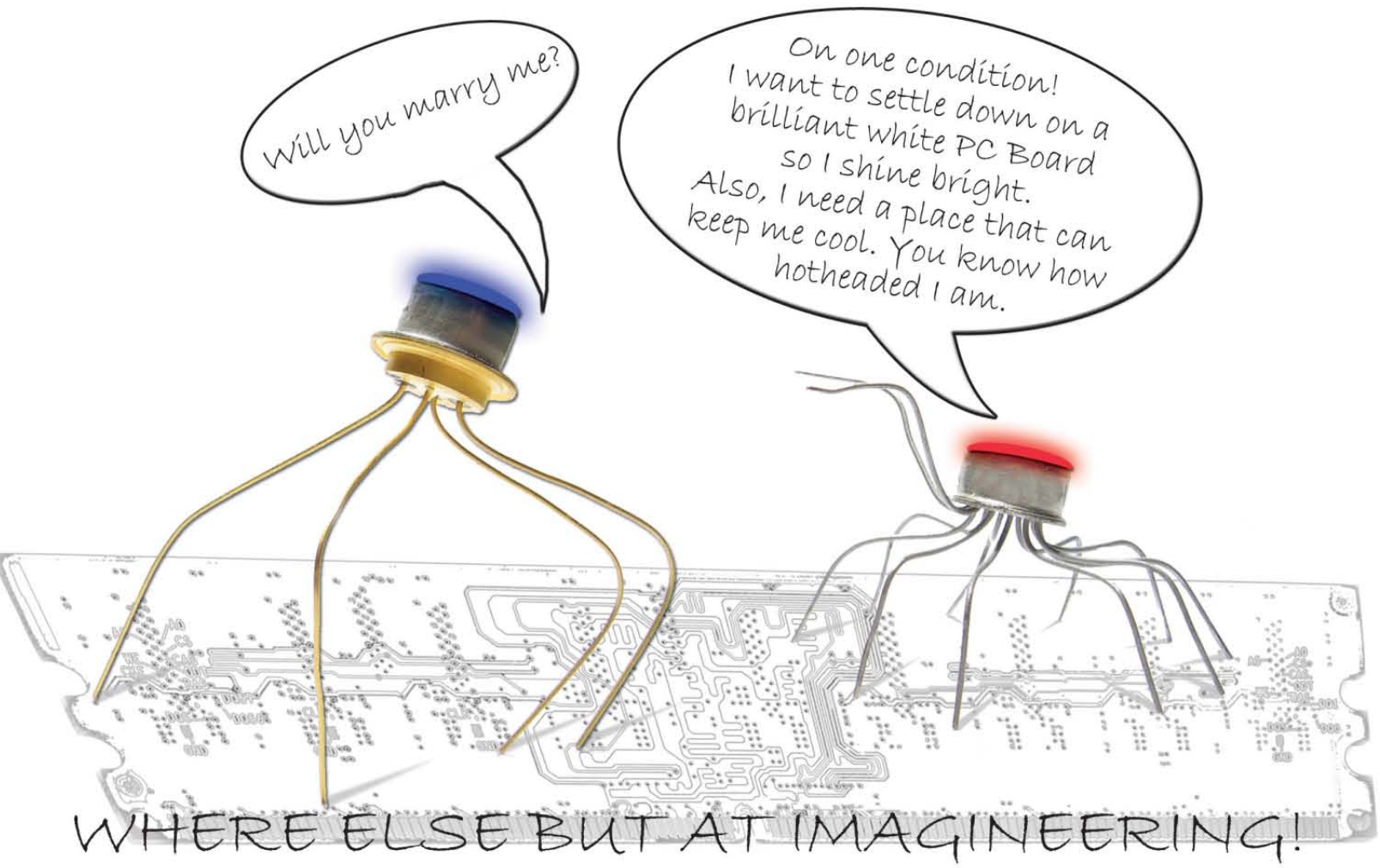
Light Emitting Diodes 2008
September 29-October 01, 2008
San Diego, California, United States

Organic Semiconductor Conference (OSC-08)
September 29-October 01, 2008
Frankfurt Messe, Germany

Roadmapping the LED Future
October 30, 2008
Eindhoven, The Netherlands

electronica 2008
November 11-14, 2008
Munich, Germany

See our Event Reports section online for news and information from the most recent events.



WHERE ELSE BUT AT IMAGINEERING!

Choosing the right Printed Circuit Board Fabricator for your LED applications shouldn't be that difficult if you keep the following in mind:

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The right Material to dissipate heat

At Imagineering we have gone above and beyond to research different white masks to find the most brilliant ones in the market. With experience, we found that some white masks go dull during reflow while others go on thin showing a hint of copper making it appear pink.

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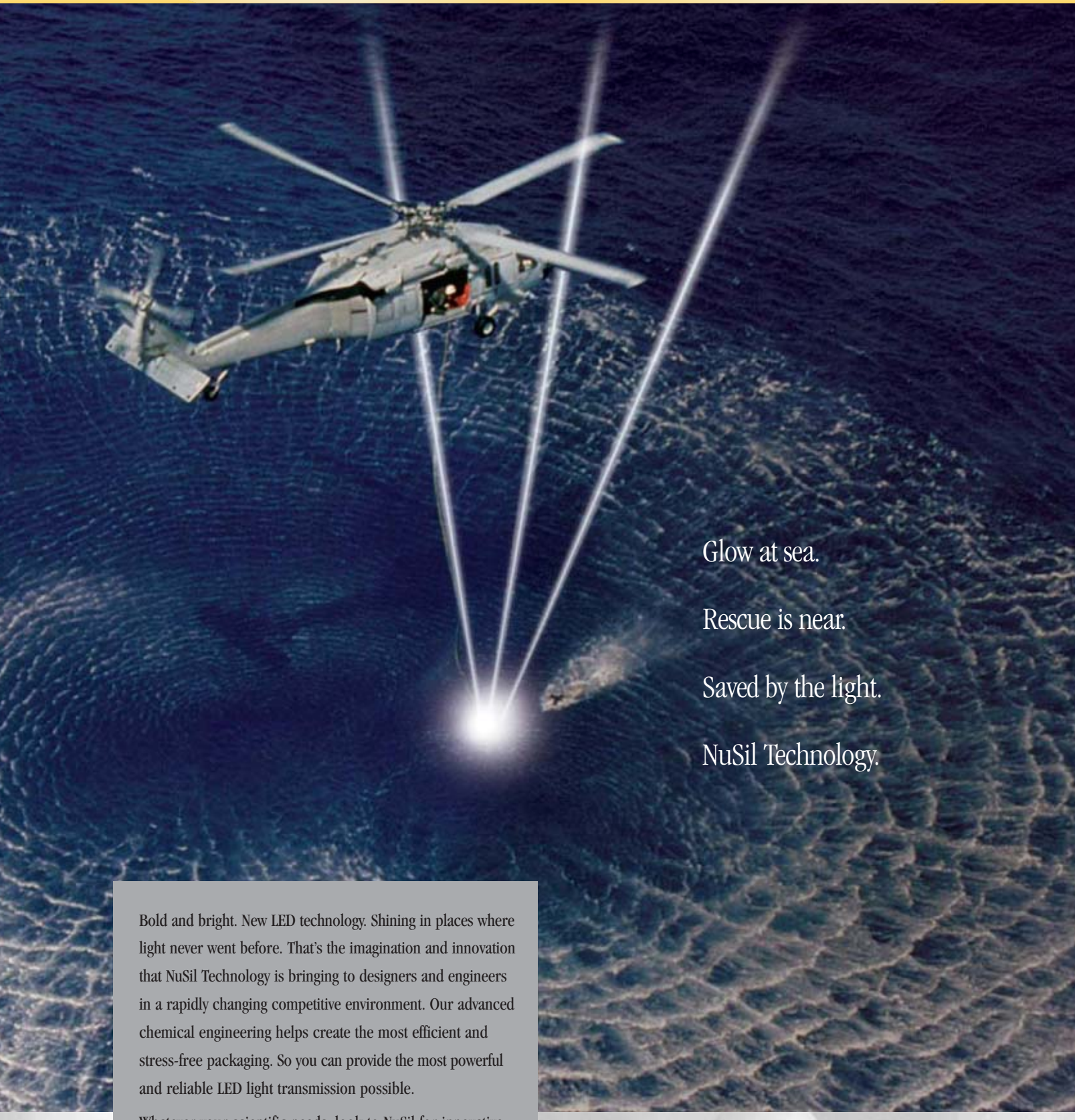

Glow at sea.

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news views

OLEDS

European OLLA project delivers final OLED milestone

The 45-month European OLLA project to develop advanced OLED lighting technology has ended with a demonstration of a white OLED light source with 50.7 lm/W efficacy at an initial brightness of 1000 cd/m^2 based on the Novaled PIN OLED technology. The project, lead by Philips, started on 1 October 2004 with a budget of EUR 20 million, of which EUR 12 million came from the European Union. OLLA involved 24 partners from 8 European countries. Philips, Osram Opto, Siemens, Novaled and Fraunhofer IPMS will continue the development of OLED lighting technology in a follow-up project entitled OLED100.eu, which aims to increase the efficiency, lifetime and size of OLEDs. The EU is also funding the CombOLED follow-on project.

Peter Visser, Project Manager OLLA project, Philips Lighting, commenting on the final OLLA demonstration, said "The high efficiency combined with the extrapolated lifetime values prove that OLED is a serious technology for lighting applications, allowing innovative design capabilities and energy savings for future lighting products. This is a very important step towards the introduction of OLED technology in the lighting market."

In related news, OLED developer Universal Display Corp. has reported a lab demonstration of a white OLED with an efficacy of 102 lm/W at 1000 cd/m^2 using its proprietary, high-efficiency phosphorescent OLED technology. Funded in part by the U.S. Department of Energy (DOE) through its Solid-State Lighting initiative, Universal Display's 102 lm/W milestone is a step on the path toward the DOE's roadmap goal of a 150 lm/W commercial OLED light source by 2015. ◄

MORE DETAILS: www.ledsmagazine.com/oleds

The CombOLED project (www.comboled-project.eu), coordinated by Osram, builds on the experience gained in the OLLA project, in which this 15 x 15 cm demonstrator based on light-emitting polymer materials was produced jointly with Siemens and other partners.

STANDARDS

LED standards published in North America

The ongoing controversy relating to Energy Star requirements for LED-based fixtures (see p17) should not deflect from the excellent and rapid progress that has been made in developing standards for LED-based products in the US. Since we published an article entitled "Standards required for further penetration of solid state lighting" in April 2007 (www.ledsmagazine.com/features/4/4/10), several standards discussed in that piece have now been published. In fact, the DOE's Energy Star criteria draw from, and are directly related to, many of these standards.

C78.377 (Chromaticity): At the beginning of 2008, the American National Standard Lighting Group (ANSLG) published ANSI_NEMA_ANSLG C78.377-2008 entitled "Specifications for the Chromaticity of Solid State Lighting Products". This standard specifies the range of chromaticities recommended for general indoor lighting with SSL products, and ensures that the white light chromaticities of the products can be communicated to consumers. The standard can be downloaded as a PDF file from the NEMA (National Electrical Manufacturers Association) website at www.nema.org/stds/ANSI-ANSLG-C78-377.cfm.

» page 11

LICENSING

Philips introduces licensing program for LED-based luminaires

On June 30, Philips introduced a patent licensing program for LED-based luminaires used in the general illumination, architectural and theatrical markets. Philips has pulled together a list of about 1000 patents – including those originally filed by Color Kinetics - that it says address the basic control technologies required in a broad range of LED lighting applications. The company says that its policy to "share" its IP for LED-based luminaires through licensing will "open up the potential of new LED lighting solutions to companies and consumers." Ruud Peters, CEO of Philips Intellectual Property & Standards, said that "having the technology is just one part of unlocking the potential of LED-based lighting. By licensing our technology we are able to open up the full potential of new LED lighting solutions to companies and consumers, helping the solid-state lighting market to grow."

» page 8

news+views

Philips from page 7

Philips also said that the new program extends the former Color Kinetics (CK) licensing program. The CK patents have been combined with a vast array of relevant Philips IP, all of which is listed in a 17-page PDF document containing around 1000 patents, which can be downloaded from www.ip.philips.com. The website also lists the royalty rates by category, as follows:

- Single Color luminaire: 3% of net selling price
- Tunable White luminaire: 4% of net selling price
- Color-Changing luminaire: 5% of net selling price

Since Philips acquired CK in summer 2007, there has been speculation regarding the way in which Philips would approach the market with its IP portfolio – see www.ledsmagazine.com/features/4/8/9. Would Philips take a heavy-handed approach to extract license fees with threats of legal action? Or would it open up its IP portfolio, perhaps even relinquishing the fundamental (and controversial) CK claims relating to pulse-width modulation control of LEDs? The answer is somewhere in the middle.

One comment on the World of LEDs blog (http://worldofleds.blogspot.com) described this as looking like "the first turn of the screw. 5%...represents a very large chunk of the manufacturing price for lighting equipment sold through the professional market place." The commentator also said that Philips appeared to be "aiming to get a monopoly stranglehold on the LED lighting market...unfortunately Philips have the power and financial weight to be able to kill off any company it fancies...This is a sad day for the future development of LED lighting!" Others may disagree – at least everyone knows where they stand. We expect to see a number of companies boasting "Philips inside" stickers on their LED fixtures in the near future. ◄

COMMENT ON THIS STORY: worldofleds.blogspot.com

PATENTS

Cree and Toyoda Gosei in patent agreement

Leading LED manufacturers Cree and Toyoda Gosei have entered into an agreement providing the companies with access to each other's patented LED chip and packaged LED technology, including white LED technology. The companies both hold broad and substantial optoelectronic patent portfolios, and say that the agreement will make it easier for both to develop and manufacture LED products without concern for the other's patents. This is the latest in a series of cross-licensing agreements involving major LED makers such as Nichia, Lumileds and Osram. ◄

PHOSPHORS

Merck acquires phosphor manufacturer Litec-LLL GmbH

Merck KGaA, the global pharmaceutical and chemical company, has acquired Litec-LLL GmbH, a company based in Greifswald, Germany, that specializes in the R&D and production of ortho-silicate materials. These can be used as the wavelength-conversion material in white LEDs, as an alternative to more commonly used YAG and TAG materials. Litec is a co-assignee, along with Toyoda Gosei, Tridonic Optoelectronics and Leuchstoffwerk Breitungen, of US patent 6,943,380 (WO02/05450, PCT/JP01/11628) entitled "Light emitting device having phosphor of alkaline earth metal silicate." By integrating Litec's competencies, Merck says it will enter the market for "innovative, highly-efficient light sources" - the company is an established supplier of OLED materials. Financial details of the deal were not revealed. ◄

MORE DETAILS: www.ledsmagazine.com/news/5/7/9

ENTERTAINMENT

Barco acquires High End Systems

LED display manufacturer Barco has acquired High End Systems, Inc., an Austin, Texas-based provider of automated luminaires, digital lighting and lighting controls for $55 million.

High End employs 156 people and had $44 million in sales in 2007. High End's products include a range of LED luminaires including Showpix, an LED wash light on a moving yoke. It has an 18-inch diameter head featuring a circular array of 127 homogenous 3-watt LEDs with an output of 24,000 RGB lumens. This is the merger of two strong industry players that will be very well positioned to address the growing convergence of lighting and video technologies. The deal provides Barco with an additional patent portfolio in the digital lighting market, along with increased distribution channels and product offerings worldwide. It also strengthens Barco's position in North America, another strategic goal for the European company. ◄

MORE DETAILS: www.ledsmagazine.com/news/5/6/11

PATENTS

Nichia files patent lawsuit against Seoul's Acriche

Japanese LED maker Nichia has filed a patent infringement lawsuit in Germany against its Korean rival, Seoul Semiconductor Co. Ltd. The lawsuit claims that Seoul's Acriche white LED product infringes the Nichia patent EP(DE)622858. This follows a similar lawsuit filed in the UK, claiming that Acriche infringes two patents EP(UK)599224 and EP(UK)622858. In response, a Seoul Semiconductor official said that Nichia's patent has already been examined by experts who determined that Acriche technology is different from Nichia's patent. Therefore, Seoul Semiconductor is confident that Acriche does not infringe Nichia's patent. Both companies have filed numerous lawsuits against one another in the US, Japan and Korea.

In related news, Seoul's Acriche A2 and A3 series have been awarded the Underwriters Laboratories Inc. (UL) Component Recognition Mark, an important global safety standard. UL compliance is seen as particularly important for manufacturers attempting to penetrate the US market, and the lack of a UL mark had been previously acknowledged as a barrier for the Acriche product. ◄

MEDICAL

Enfis wins $2.15m contract for surgical lighting

Enfis, the UK-based provider of intelligent high-power LED arrays and smart light engines, has signed a three year contract worth $2.15 million to supply, high color-rendering index (CRI) LED light engines to Chongqing Tianhai Medical Equipment Co. Ltd. (C-THME), a worldwide manufacturer and distributor of high-tech medical materials, devices and instruments. Enfis will supply self-calibrating, high-CRI

New Age of LED Lamps Coming

Introducing new halogen type Lumidas-H LED lamps from FAWOO TECHNOLOGY

- Saving electricity consumption up to 90%
- As bright as existing halogen lamps
- Long lifespan up to 50,000 hours
- Low temperature as touchable by hand
- Superb heat dissipation technology applied
- Use existing fixtures
- Price affordable to customers and unmatchable to others

Introducing Lumidas-H 3W, 5W, 8W Lamps (16W, 22W, 35W Coming soon)

Fawoo Technology, the leader of the next generation LED lighting industry,
proudly presents the world the most efficient and affordable LED lamps at the lowest prices no one can offer.

Fawoo's long-life **Lumidas-H 3W 5W 8W 16W 22W 35W lamps can instantly replace halogen lamps.**
They will save your energy expense as well as maintenance cost dramatically.
Extremely low temperature of the halogen type Lumidas-H LED lamps will also save your air conditioning cost and make your work environment comfortable.

In addition to Fawoo's existing LED lamp LUMI series(LumiDas, LumiSheet, and Lumi-M-Stick),
Lumidas-H will bring more eco-friendly and energy saving alternatives to the world.

LH-3ZY-GU5.3/
LH-3ZY-EZ10 / LH-3DC-EZ10
for
20W&35W Halogen lamp

LH-5DC-EZ10
for
50W Halogen lamp
(LH-5DC-GU5.3-Optional)

LH-8J-E27/
LH-8K-E27
for
80W Halogen PAR30 lamp

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news+views

light engines that will enable operating theatre lighting units to provide tuneable white light for the surgical team in theatre. Up to eight white-light colour temperature settings can be utilised to gain maximum clarity, depending on the type of surgery being performed.

Shaun Oxenham, CEO of Enfis, said, "Operating theatre lighting specifications are the most demanding white light application in the lighting industry. Our light engines have been chosen for this application by C-THME because of the quality and tuneability of the light delivered." ◄

MORE DETAILS: www.ledsmagazine.com/news/5/7/4

LED PERFORMANCE

Osram provides LED ray data

Osram Opto Semiconductors has become the first LED manufacturer to provide direct web access to the ray data files for its LEDs, which can be downloaded from www.osram-os.com/ray-files. The ray files indicate the pattern in which light is emitted from an LED. They include the coordinates of the emission point, the direction of emission, the intensity and the wavelength. Specifications can be viewed for most of the company's LED portfolio, including infrared emitter diodes (IREDs). "Our customers have access to all the latest data, so it is now even easier for them to plan their lighting systems, test the LEDs and produce their lighting concepts," said Wolfgang Lex, head of the LED Business Unit. "Our data also gives new customers a chance to develop LED solutions themselves without having to rely on external partners." ◄

MORE DETAILS: www.ledsmagazine.com/news/5/6/38

INTERIOR LIGHTING

Office building lit entirely using Philips LEDs

Philips has used LED fixtures to light an entire office building in Paris, France. Owned by Generali and located at 100 Champs-Elysées Avenue, the office "marks a milestone in lighting history" according to Philips. The company claims that, for the first time, functional office lighting powered entirely by LEDs has been installed hand in hand with scenic and atmospheric effects that are also based on LEDs. Architect Anthony Béchu was commissioned by Generali to design "an innovative window in the world of LEDs." LED lighting gives designers more flexibility in the layout of open spaces and ceiling design, and can remove the restrictions on the position and orientation of lighting that is often dictated by the use of fluorescents tubular lamps.

Throughout the office spaces, the functional office lighting is realized through 422 luminaires integrated in a false ceiling with 600 x 600 grids. Each luminaire is powered by 16 or 12 high power (2.6 W) LEDs, depending on their location in the office space. This provides an average of 300 lux everywhere, and 500 lux on the working planes. In addition, recessed SpotLed 3 K2 luminaires, each with 3 Luxeon high-power LEDs, are applied in the corridors. The solution complies with lighting norms and standards on energy consumption (12 W/m^2 maximum), illumination levels and visual comfort. To create the desired ambiance, Generali chose a scenario of LED-based color-changing light effects. The glass façade of the top two floors is lit, communicating the image of the building towards the outside world like a beacon in the night.

Philips expects the world market for LED luminaires to grow rapidly by more than 30% per year driven by the entrance of LEDs in general lighting, from about EUR 700 million last year to EUR 1.5 billion in 2010. ◄

MORE DETAILS: www.ledsmagazine.com/news/5/6/34

EVENTS

Fall LED events in Toronto

A number of LED and lighting events in Canada are taking a prominent position on calendars this fall. IIDEX/NeoCon Canada, the country's largest exposition and conference for the design, construction and management of the built environment, takes place on September 25-26, 2008 at the Direct Energy Centre in Toronto. As part of this event, Light Canada (www.iidexneocon.com/2008/index.php/highlights/light_canada) will include a lighting keynote by AWA, an architectural lighting design firm headquartered in New York City and founded by Abhay Wadhwa, as well as a seminar program with over 10 accredited educational programs targeted to lighting designers and lighting engineers, as well as architects, interior designers and facility managers. Over 100 lighting exhibitors will participate in

Light Canada with a diverse range of lighting products from decorative and architectural to outdoor, commercial and industrial as well as the latest technologies, such as LED. The seminar program will include LEDs Magazine's own Brian Owen moderating a panel of colleagues in a presentation entitled "LED City Living," which describes Toronto's Palace Pier Condominium project.

On September 24, Lightshift will be held in conjunction with IIDEX/NeoCon and Light Canada, as a part of the pre-conference program. "Lightshift – LED Solutions Mean Business" is a unique opportunity to explore LED signage, and will discuss technology, markets and energy savings. It will show participants, through a series of case studies, how LEDs can be used for their business or property. The program includes a manufacturers' forum, a panel discussion on LED Market Transformation including Standards and Legislation, and the launch of PATHway (Providing Assistance & Technical Help), a program to assist in the change to LED signage. The keynote speaker is Richard Kirk, CEO of Polyphotonix, who will give a presentation on new trends in lighted graphics displays. Lightshift registration starts July 30, 2008 at www.iidexneocon.com/2008/index.php/registration. Lightshift is a photonics initiative led by the Ontario Photonics Industry Network (OPIN) in conjunction with IIDEX / NeoCon, Light Canada and greenTbiz. The PATHway assistance program will be implemented by Toronto's greenTbiz.

LightSavers (www.toronto.ca/taf/lightsavers.htm), Toronto's municipal initiative to accelerate the market transformation of LED and Adaptive Lighting Technology (ALT), will host a Symposium on October 7, 2008. This takes the next step from LEDiscovery, held in March, for both manufacturers and municipalities to further engage discussions regarding the application of the technologies. The full-day forum program will highlight initiatives and projects locally, throughout North America and internationally. Toronto's greenTbiz, known for their LED expertise and pilots as well as for being the facilitator of LED City Toronto, is extensively involved in the LightSavers program. During the October 7 event, the selected LightSavers pilots to be undertaken in and around the Greater Toronto Area (GTA) will be announced. For these pilots, a global expression of interest has been issued through the City of Toronto. The deadline for submission has been extended until 22 August. ◄

LED standards from page 7

The standard defines chromaticity coordinates and correlated color temperatures for white LEDs. There are eight nominal CCT categories ranging from 2700K to 6500K, plus a "flexible CCT" category. Coordinates define quadrangles on the CIE (x,y) diagram, which are based in part on ANSI C78.376 on chromaticity specifications for fluorescent lamps. The sizes of the quadrangles correspond to a 7-step MacAdam ellipse.

The standard applies to LED-based SSL products with control electronics and heat sinks incorporated (meaning it excludes LED chips, LED packages, and LED modules). Also, the standard covers fixtures incorporating light sources as well as integrated LED lamps, and excludes fixtures sold without a light source. The same also applies to LM-79 below.

LM-79 (Photometry): In June 2008, the Illuminating Engineering Society of North America (IESNA) published a documentary standard LM-79 entitled "Electrical and Photometric Measurements of Solid-State Lighting Products." This describes the methods for testing SSL products for their photometric characteristics such as total luminous flux (lumens), luminous efficacy (lm/W), luminous intensity (candelas) in one or more directions, chromaticity coordinates, correlated color temperature (CCT) and color rendering index (CRI).

The most substantial part of LM-79 describes test methods for total luminous flux measurement, which is to be carried out with an integrating sphere or a goniophotometer. Crucially, LM-79 specifies absolute, rather than relative, photometry (see p41).

For other light sources and luminaires, there are separate standards for the measurement of lamps or luminaires. However, because in many current SSL products the LED light source(s) in the luminaires are not easily separable as replaceable lamps, the existing standards cannot be applied directly to SSL products. The LM-79 document says that "since SSL technologies are still at their early stages, requirements for measurement conditions and appropriate measurement techniques may be subject to change at any time."

The standard can be purchased from the IESNA bookstore at www.techstreet.com/cgi-bin/detail?product_id=1566105 ($25 for PDF, $29 for hard copy). ◄

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funding + programs

Philips teams with Dutch government to provide off-grid LED lighting

Philips has signed a public-private partnership (PPP) agreement with the Dutch government to develop a new generation of sustainable, LED-based, solar-powered lighting products for sub-Saharan Africa. The new PPP agreement aims to provide 10 million people in 14 countries with affordable, appropriate and sustainable energy solutions and services by 2015.

As part of the agreement, the Dutch government will provide funding for awareness creation and entrepreneurial training, as well as support for finance mechanisms and project management. Philips in turn commits to provide a balanced investment in new product development for African people and households deprived of access to modern energy services.

Philips is also involved in Lighting Africa, the World Bank Group initiative to provide new, non fossil fuel lighting products, such as fluorescent light bulbs and LEDs, to the 250 million people in sub-Saharan Africa who have no access to electricity. At the Lighting Africa 2008 event held in May in Ghana, 16 companies and organizations were awarded up to $200,000 to implement projects that offer affordable, clean, safe, off-grid lighting and improve access to lighting.

Philips has recently been testing a new solar-powered "Uday" lantern that provides bright white light. Each day's charge will provide 250 lm for 4–5 hours.

Benefits of solar lighting include significant cost savings, less fire risk compared with kerosene-type lanterns, no direct carbon footprint and the use of a sustainable natural commodity (sunlight or manpower) to generate electricity. In addition, there are economic and social benefits from being able to undertake activities in the evening hours. ◄

Ledon Lighting, Zumtobel Group's LED brand, has built a 220,000-LED, 1500-sq m video installation for the Africa pavilion at Expo 2008 in Zaragoza, Spain, as part of a contract worth EUR 350K for builders Nüssli.

UK government focuses on energy-efficient lighting

As part of its drive towards higher energy efficiency and lower CO_2 emissions, the UK government is taking steps to evaluate and facilitate public procurement of ultra-efficient lighting, defined as any light source with an efficiency >100 lm/W (or ~7× more efficient than 60W incandescent bulbs). This technology area has been targeted for several reasons including:

- the technological readiness of alternative light sources such as solid-state lighting (SSL)
- the significant potential impact on achieving carbon reductions
- the scale of the market opportunity
- the scope for public sector procurement to have a material impact on the market

New industrial advisor

As part of this effort, Geoff Archenhold has been seconded as an industrial advisor to the Department of Business, Enterprise and Regulatory Reform (BERR). His role is to stimulate and assist the UK solid-state lighting supply chain to be ready for future public procurement opportunities, to stimulate cross-government partnerships and to provide an action plan to introduce sustainable lighting within the public sector. With more than 15 years experience in both traditional lighting and SSL, Archenhold is well known in the UK as the founder of the EuroLED conference. He is also a member of the influential Photonics Leadership Group (PLG) think-tank.

The UK's Climate Change Bill was introduced in Parliament in November 2007, and is expected to receive Royal Assent this summer. This Bill puts into statute the UK's targets to reduce CO_2 emissions through domestic and international action by at least 60% by 2050, and by 26–32% by 2020, against a 1990 baseline.

"The public sector accounts for approximately 40% of the UK's construction industry and is a large procurer of lighting, so it is important we ensure that new ultra-efficient lighting technologies are adopted as soon as possible," said Archenhold. ◄

funding + programs

Ready, Set, Glow! Let the L Prize competition begin!

The U.S. government's L Prize was officially launched at LightFair this year, and presents a fantastic opportunity for US-based LED and fixture manufacturers, writes **BRIAN OWEN**.

The L Prize is the first government-sponsored technology competition designed to spur lighting manufacturers to develop high-quality, high-efficiency solid-state lighting products to replace the common light bulb. Whether the L stands for "LED" or "Light", it will certainly result in "Lots" of "Loot" for the winning SSL manufacturers.

Headlined as Transforming the Lighting Landscape, the L Prize competition will substantially accelerate America's shift from inefficient, dated lighting products to innovative, high-performance products that will save significant amounts of energy and millions of metric tons of greenhouse gas emissions (see sidebar). Just as Thomas Edison transformed illumination over a century ago, the L Prize will drive innovation and market adoption.

The Department of Energy's Deputy Assistant Secretary David Rodgers announced the L Prize competition at LightFair in late May. The competition challenges industry to develop high-performance SSL products to replace two of today's most widely used and inefficient products: 60W incandescent lamps and PAR 38 halogen lamps. It also calls for development of a 21st Century Lamp that delivers more than 150 lm/W.

The L prize was mandated in the 2007 Energy Independence and Security Act (EISA) – see LEDs Magazine Jan/Feb 2008, p12. The legislation authorizes up to $20 million in cash prizes; the exact amount of the cash prize for each category will be determined based on DOE Congressional appropriations and supplemental contributions from foundations and utilities. DOE will contribute up to $1 million to the cash prize purse, subject to enactment of the fiscal year 2009 appropriation. In addition, potential opportunities for future federal purchasing agreements, utility programs, and other incentives for winning products may far exceed the value of the cash prize.

The L Prize program announcement includes technical specifications to ensure compliance with the general requirements outlined in the EISA legislation, with additional details specified for quality, performance, and mass manufacturing. The plan also includes a rigorous evaluation process, including testing of proposed products by independent laboratories conducted through DOE's CALiPER test program, as well as field evaluations by DOE and utility partners to assess products in real world conditions. Field evaluations will be conducted using criteria established by DOE's Gateway Demonstration program.

Eligibility Requirements: As this is a US-based and US-funded initiative, there is also a domestic economic mandate; in other words, fixture manufacturers are required to be US-based companies. However, the restrictions are much more severe; the LED die or chip (i.e. the semiconductor material that converts electrical energy into light) must be manufactured in the United States as well. This really narrows the industry bandwidth but certainly is welcome news to the select few.

Competition Process: Manufacturers must submit a complete entry package that includes the required technical information, product samples, and a commercial manufacturing plan describing their capability for mass production and distribution of proposed products.

Product Promotion: Four California utilities – Pacific Gas & Electric, Sacramento Municipal Utility District, San Diego Gas & Electric, and Southern California Edison – have signed a Memorandum of Understanding with the DOE, agreeing to work cooperatively to promote high-efficiency SSL technologies. These utility leaders have provided valuable input to the competition planning process. While performance testing will be conducted by independent test laboratories, program partners will play a critical role in the evaluation process by conducting field assessments of proposed products in real-world conditions.

Program partners will also play an important role in promoting and developing markets for the winning L Prize products. Product promotions might include utility incentives, collaborative marketing and educational campaigns, retail partnerships, and demonstrations. Energy-efficiency program partners from states and regions other than California will be invited to participate in product evaluation and promotion of the winning L Prize products. Since the launch, Nevada Power and Efficiency Vermont have joined as Program Partners, and more are expected on board in the near future.

Selection of Winners: Proposals will be accepted for each product category until a winner is declared in each category, or until 24 months have elapsed since the first award in a given category, whichever comes first. In each category, all prizes will be awarded to the winner, the first entrant to successfully meet the full competition requirements. Up to two additional qualifiers may be determined to have met or exceeded the L Prize criteria, and may be eligible for program partner promotions. Whatever the outcome, the true winner will be the marketplace and, consequently, the consumer or end-user. ◀

Energy Savings and Environmental Impact

60W Incandescent Replacement

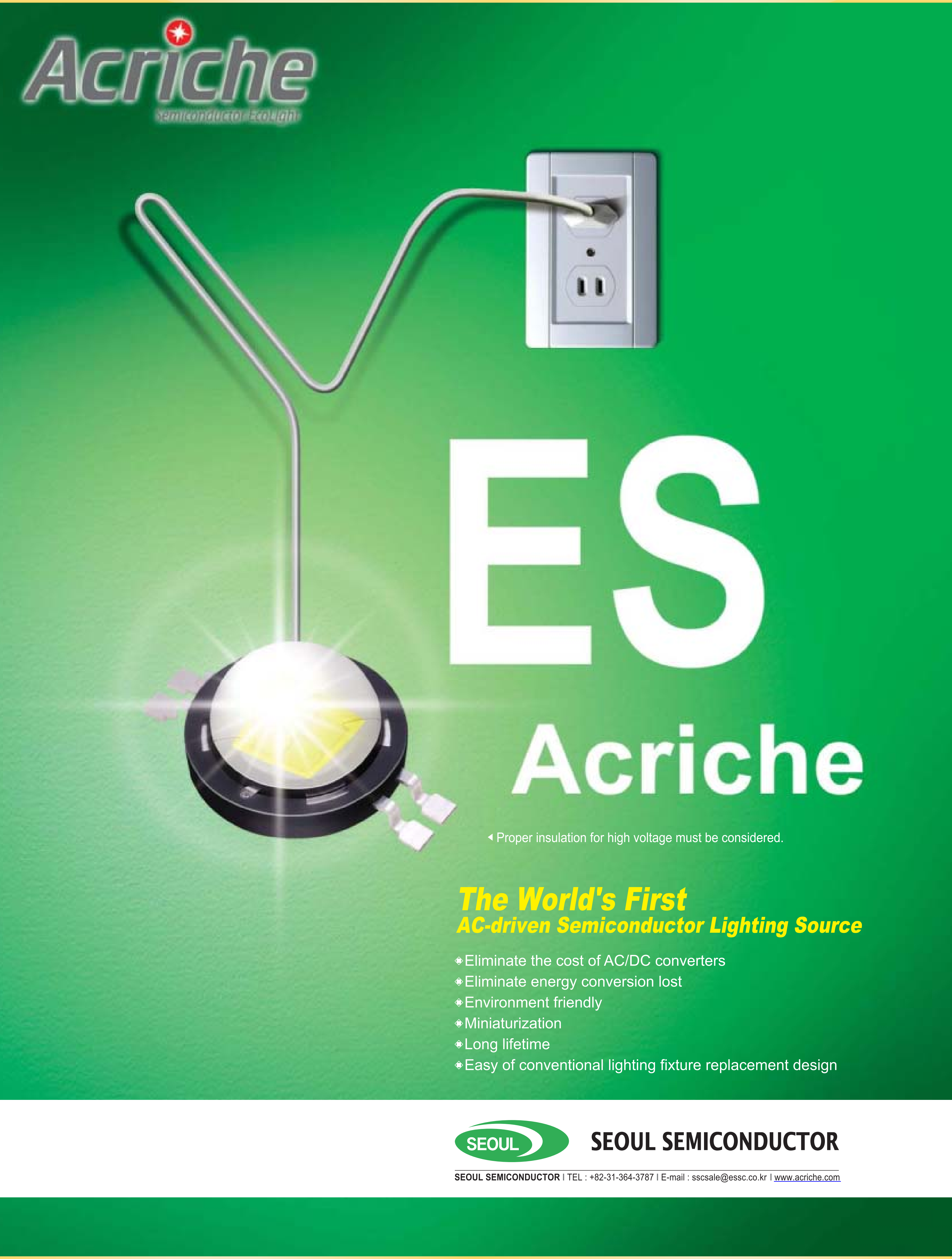
In 2010, DOE projects that the national installed stock of 60W A-19 lamps will be approximately 971 million. In the residential sector, where the vast majority of these lamps are used, the average socket operates for about 1.9 hours per day, or about 700 hours per year. The L Prize competition seeks an SSL replacement for the 60W A-19 lamp that uses only 10 watts (a saving of 83%).

If every socket in the U.S. converted 60W incandescent lamps to the 10 W LED-based L Prize winner, the country would save approximately 34.0 Terawatt-hours (TWh) of electricity in one year, and avoid 5.6 million metric tons of carbon emissions. That's enough electricity to power the lights of 17.4 million U.S. households, or nearly twice the annual electricity consumption of the city of Las Vegas.

PAR 38 Halogen Replacement

DOE estimates that the installed stock of PAR 38 halogen reflector lamps (90W, weighted average) will be approximately 141 million in 2010, across both the residential and commercial sectors. The L Prize seeks SSL reflector lamps that use only 11 W (87% savings) per socket while producing the same amount of light.

If all such sockets in the U.S. converted overnight to use the new L Prize lamp, the country would save 15.6 TWh per year and avoid 2.6 million metric tons of carbon emissions. ◀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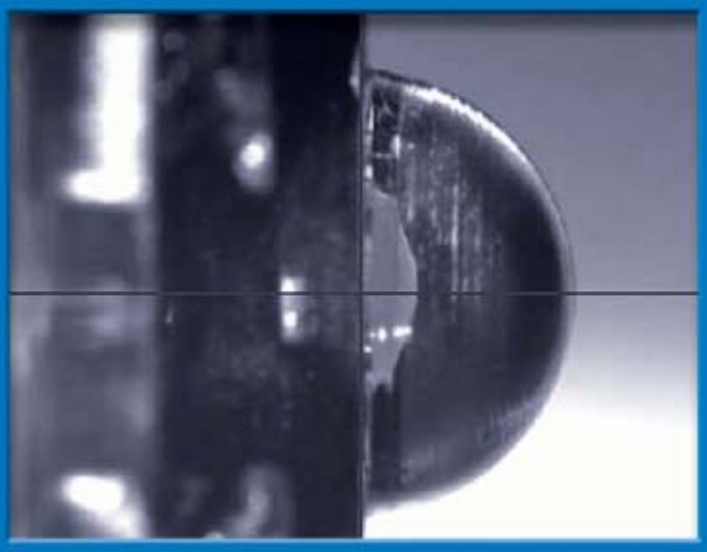
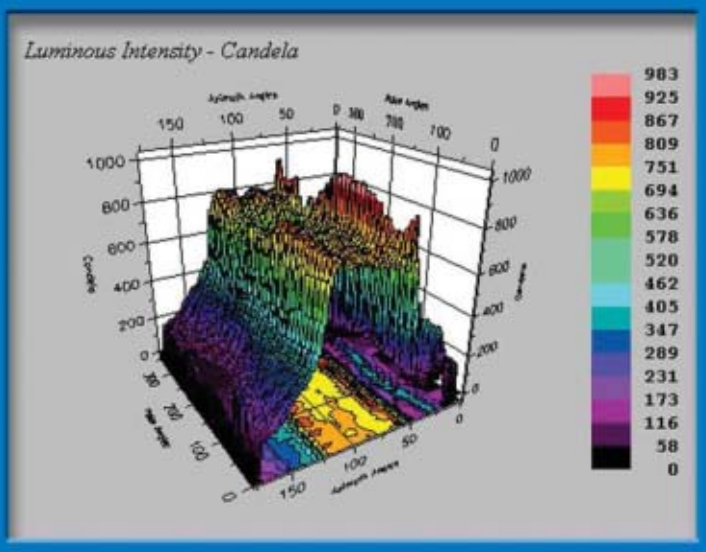


Industry Standard Near Field Models



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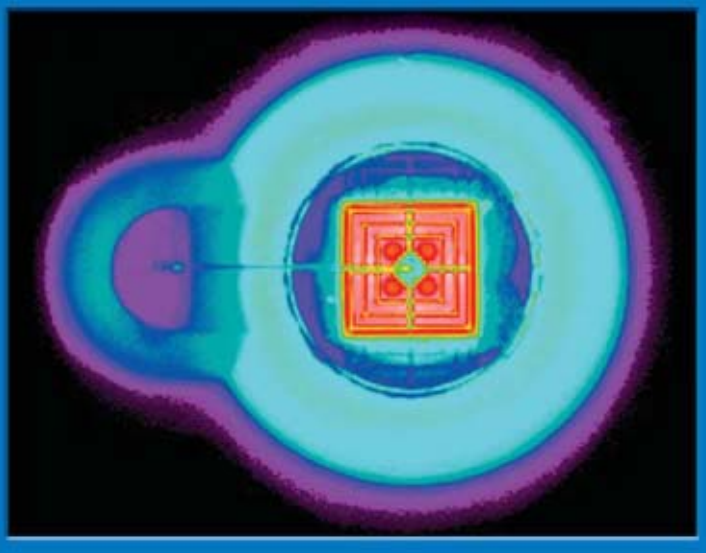

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Energy Star Wars: the Phantom Menace

The decision by EPA to include LEDs in its Energy Star specification for residential lighting fixtures has resulted in widespread disapproval. **TIM WHITAKER** and **BRIAN OWEN** report.

The big story of the past month has been the controversy over Energy Star criteria for solid-state lighting, or "Energy Star Wars" as our magazine dubbed the dispute between two branches of the U.S. government, the Environmental Protection Agency (EPA) and the Department of Energy (DOE). To say this has caused uproar is an understatement, and we have certainly devoted many column inches (or the web equivalent) to a subject we feel strongly about. Some of the key happenings, and links to the appropriate stories on our website, can be found in the Timeline sidebar.

Energy Star is a voluntary labelling scheme that recognizes energy-efficiency products that meet criteria set by either EPA or DOE. Before getting into the details of the dispute, it's worth noting that this is mainly relevant to the U.S. and Canadian markets. Lighting designers at a meeting in mid-June in the UK were not much interested in the news from across the pond. But perhaps they should have been; one of the biggest benefits of the Energy Star program is, through the promotion of energy-efficient products, to prevent the insidious infiltration of low-quality products into the marketplace. The phantom menace indeed. This is a particular problem for the SSL market, at a time when the DOE's own CALiPER program — which tests commercially available SSL luminaires — has highlighted a worrying tendency for some manufacturers to vastly overstate the performance of their products. To quote Kevin Dowling of Philips/Color Kinetics, "Nothing will kill an industry faster than expectations that cannot be met. Performance must be realistic and factual."

To some extent, the Energy Star controversy has overshadowed the work being done by the DOE in other inter-related strands of its Solid State Lighting program. For example, round 5 results from CALiPER were released mid June — see www.netl.doe.gov/ssl/comm_testing.htm — and the DOE is also heavily involved in the L Prize and other initiatives. The dispute has also distracted attention from the work being done to develop standards in areas such as luminous flux measurement, as described on page 7 of this issue. In fact, the DOE's Energy Star criteria, developed over several years of consultation with and feedback from the industry, and announced in September 2007, are intimately linked with standards such as LM-79 and many others.

Out of the blue

DOE's Energy Star requirements will come into effect on September 30, 2008, and in preparation the DOE has been educating and informing potential participants about the coming changes. "Energy Star Wars" kicked off on June 2 with a letter from the EPA's Alex Baker, Energy Star Lighting Program Manager,

TIM WHITAKER *is Editor of* LEDs Magazine *and* BRIAN OWEN *is a Contributing Editor, and Program Advisor to greenTbiz.*

Energy Star Wars - timeline

DECEMBER 2006
DOE publishes first draft of Energy Star for SSL criteria (DOE SSL v1.0), initiates public review.

SEPTEMBER 12, 2007
Final SSL v1.0 is published, to come into effect on September 30, 2008.
www.netl.doe.gov/ssl/energy_star-criteria.html

MAY 15, 2008
DOE hosts Energy Star workshop in Washington, DC, as reported in "Energy Star for SSL gets energetic start." www.ledsmagazine.com/features/5/5/2

JUNE 2, 2008
EPA announces a technical amendment to its Energy Star Residential Lighting Fixtures specifications (RLF version 4.2).

JUNE 6, 2008
LEDs Magazine is first to publish this important story (www.ledsmagazine.com/news/5/6/8), following up with a detailed review entitled "Energy Star Wars and the battle to label LED fixtures" (www.ledsmagazine.com/features/5/6/1).

JUNE 13, 2008
DOE responds with a statement saying it is "aware of the confusion" and that "efforts to resolve this confusion are on-going."
www.ledsmagazine.com/news/5/6/16

JUNE 16, 2008
Efficiency Vermont is the first energy efficiency organization to say it will not use RLF v4.2.
www.ledsmagazine.com/news/5/6/22

JUNE 24, 2008
EPA hosts first of two poorly-attended webcasts on RLF v4.2, fails to address participants' questions.
www.ledsmagazine.com/news/5/6/32

JUNE 26, 2008
DOE hosts webcast on Energy Star. PG&E says it "does not plan to include products qualified under the EPA RLF 4.2 specification in our incentive programs."
www.ledsmagazine.com/news/5/6/36

JULY 2, 2008
Consortium for Energy Efficiency (CEE) writes to EPA and DOE, calling for a suspension of RLF v4.2 until matters discussed in the letter are resolved.

JULY 9, 2008
EPA invites interested parties to comment on RLF v4.2, with responses requested by August 25.
www.ledsmagazine.com/news/5/7/11

JULY 10, 2008
Jim Brodrick of DOE's SSL program circulates email highlighting DOE's concerns over the Energy Star issue. www.ledsmagazine.com/news/5/7/13

SEPTEMBER 30, 2008
DOE Energy Star for SSL v1.0 goes into effect

informing manufacturers and other interested parties that EPA had issued a technical amendment to its Energy Star specifications for residential lighting fixtures (RLFs), ceiling fans and vent fans. This amendment, known as RLF version 4.2, was "effective immediately."

RLF v4.2 raised many issues, firstly procedural. The Energy Policy Act of 2005, section 131, discusses Energy Star and mandates DOE and EPA to "solicit comments from interested parties prior to establishing or revising an Energy Star product category, specification or criterion." They must also "provide reasonable notice to interested parties of any changes" and "provide appropriate lead time [usually 270 days] prior to the applicable effective date." EPA has apparently ignored all these procedures; most interested parties, not least the DOE, first heard about the EPA's plans when the June 2 letter was circulated. In contrast, the DOE's Energy Star requirements were put together after extensive, and very well documented, consultation with anyone that cared to express an opinion.

The second major point concerns overlapping specifications. EPA claims that RLF v4.2 is complementary to the DOE specifications, but the two sets of criteria are clearly in conflict. EPA says its criteria only apply to decorative residential fixtures, but only "recessed canisters" are explicitly excluded, meaning all other types of RLF are within scope. DOE's criteria apply to all general illumination luminaries, including decorative fixtures that provide functional illumination. The consequences of overlapping specs are obvious; widespread confusion, and an unseemly haste to use the least difficult spec in order to gain Energy Star recognition by the easiest route. Likely results include a flood of inferior products into the marketplace, a backlash from consumers in terms of negative perceptions of SSL, and a general dilution in the value of the Energy Star brand.

> "Nothing will kill an industry faster than expectations that cannot be met. Performance must be realistic and factual." —KEVIN DOWLING

On July 10, Jim Brodrick, who runs the DOE's Solid State Lighting program, circulated an open email expressing his opinions on the issue. In part, his email said that DOE has developed "a technically rigorous and market-appropriate path that would lead to a strong SSL market." To the greatest extent possible, he said, this will avoid the pitfalls suffered by CFLs during the early years of their market introduction. One such pitfall was consumer dissatisfaction with color appearance. "EPA, in essence, has bypassed this type of process by rushing out criteria that lack the technical requirements that would prevent the qualification of dim, bluish light products that we know will 'turn off' consumers," said Brodrick. "Adopting the EPA process portends the very real possibility of inferior quality products becoming Energy Star-qualified."

Testing times

A third major concern is that EPA's performance verification of products is based on test procedures that have not been considered or adopted by industry standards

organizations. EPA's criteria reference a life-testing procedure developed by ASSIST (the Alliance for Solid-State Illumination Systems and Technologies) to measure the performance of LED light engines, but this remains unproven. In contrast, said Brodrick, "Part of the rigor of the DOE SSL Program has been to work closely with industry standards organizations (including IESNA, ANSI, UL, NEMA, CIE, CSA, and NIST) in the development of concrete test procedures that will assure accurate assessment of luminaries. These test procedures were established in accordance with accepted industry procedures, and with extensive review and comment."

Fourthly, there are a host of technical issues with the EPA's criteria. For example, there are minimum efficacy requirements, but no minimum light output. Conceivably a product with high efficacy but producing only 40 lumens, or less than 5% of the light from a 60 W incandescent, could earn an Energy Star label. Clearly, this is nonsense.

EE organizations

The effect of conflicting specs has far-reaching implications. Energy efficiency (EE) organizations and utility companies are deeply involved in promoting energy-efficient products, technologies, and services and use Energy Star to help allocate budgets for rebate programs and other initiatives. Efficiency Vermont, an EE organization, was first to say it would not use the RLF v4.2. Likewise, Mary Matteson Bryan, Lighting Portfolio Manager for Emerging Technologies at Pacific Gas and Electric Company (PG&E), said during the June 26 DOE webcast, "PG&E is very concerned about potential marketplace confusion with two different SSL Energy Star specifications in place…until the current issues are resolved, PG&E does not plan to include products qualified under the EPA RLF 4.2 specification in our incentive programs."

This was followed by a letter to both EPA and DOE from the Consortium for Energy Efficiency (CEE), a highly influential grouping of EE organizations and utilities from the U.S. and Canada. The CEE said that it was submitting comments on RLF 4.2 because "the review process used to develop version 4.2 did not consider the program interests that we represent." The letter also called for "the suspension of the Energy Star Residential Light Fixture Specification, version 4.2, until the matters described in this letter are resolved." As far as we are aware, the EPA has not complied, although it did circulate a letter on July 9 inviting comments on its RLF v4.2 specifications. We are reminded of horses and stable doors. Comments can be sent to RLF@icfi.com before August 25, 2008 — EPA should be prepared for a deluge. As Jim Brodrick's July 10 email said, this situation is far from being decided, and new developments may have taken place by the time you read this article. You can follow the latest twists and turns on our website!

> "Adopting the EPA process portends the very real possibility of inferior quality products becoming Energy Star-qualified." —JIM BRODRICK

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focus on

Displays

Comcast Center hosts integrated 10-million pixel LED display

An 83.3 x 25.4 foot wall composed of 6,771 Barco NX-4 LED modules with 4 mm resolution has been installed in The Comcast Experience at Philadelphia's Comcast Center. Situated in a 7-story high glass atrium, The Comcast Experience is a gift to the citizens of Philadelphia from Comcast Corp. and Liberty Property Trust, and combines sculpture, architecture and technology. With 10 million pixels mounted in a seamless flat array, the wall provides an extremely high degree of photo-realism and shows how audio and video technology can be incorporated into the design of a major urban building: The LED wall includes rectangular cutouts for the lobby's three banks of elevators.

MORE DETAILS: www.ledsmagazine.com/news/5/6/18

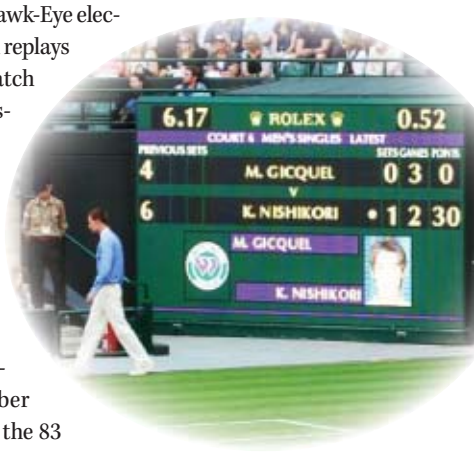
Forecast for LEDs in signs and professional displays

In 2007, the global consumption value of LEDs used in signage and professional displays was US$1.04B and is forecast to increase to $1.19B in 2012, with firm quantity growth partially offset by a continuing decline of average prices, according to a new market forecast by ElectroniCast Consultants. The American market share is forecasted to increase from 39% in 2007 to 44% by 2012. Europe, in 2007, represented nearly a 26% share of the worldwide consumption value. The Asia Pacific region is forecasted to increase in value from $365.19M in 2007 (35% market share) to $404.36M (34% market share) in 2012.

MORE DETAILS: www.ledsmagazine.com/news/5/6/21

LED displays featured at UK sports venues

LED display maker Barco says that 10 of its OLite 612 LED panels were used by Creative Technology to replace the dot matrix scoreboards on Centre Court and No. 1 Court at this year's All England Lawn Tennis Championships at Wimbledon. LED screens not only kept tennis fans on both courts abreast of on-court scores but also entertained them with Hawk-Eye electronic line-calling system replays and other additional match information such as statistics and player profiles.



Also in the UK, the Nottinghamshire County Cricket Club's new Diamond Vision screen made its international debut at Trent Bridge last month. Architect Huw Evans of Maber Associates incorporated the 83 sq m ODQ10 Mitsubishi LED screen as an integral part of the new administration building that adjoins the stand at Nottingham. The 10 mm pitch screen is driven at its native resolution of 864 x 960.

MORE DETAILS: www.ledsmagazine.com/news/5/7/6

Second Chinese skyscreen project for Opto Tech

Taiwan-based LED display maker Opto Tech Corp. has announced a second major "skyscreen" contract following the success of its installation at The Place in Beijing (see www.ledsmagazine.com/features/4/1/5). The new contract is for a skyscreen in Suzhou, China. Opto Tech says that in response to the demand from the Chinese market due to the 2008 Summer Olympics, the company has taken steps to respond to the increasing market needs. "Opto Tech's capacity to meet large demands from China has increased since expanding its facility in Ninbo, China," said Huang Yung-Chiang, CEO of Opto Tech.

MORE DETAILS: www.ledsmagazine.com/news/5/6/21

LTP installs media wall for UK consumer publisher

A low resolution video media wall was supplied and installed by Lighting Technology Projects (LTP), and designed and specified by Speirs & Major Associates (SaMA), for the atrium of IPC Media's new London headquarters. The 40 x 3 m media wall is made up of 9500 nodes of Color Kinetics RGB Flex SL. SaMA came up with the concept of a LED media wall to act as the main illuminated feature within the space, spanning the entire length of the atrium. IPC Media, a UK consumer publisher, will use the 'live' media wall to produce its own constantly changing content.

MORE DETAILS: www.ledsmagazine.com/news/5/6/21

LightFair: Riding the wave of

During LightFair 2008, most attendees were caught up in the waves of excitement and opportunity washing in and around the booths featuring LEDs and LED fixtures, reports **JULIE MACSHANE**.

General Electric's Tetra MAX LED lighting system was developed for use in channel letter applications. The same power supply is used for all colors and allows up to 54 feet for the two-LED module system and 80 feet for the three-LED module system.

More than 19,800 attendees flooded LightFair 2008, and it seemed like most spent their time pooling in the booths of LED exhibitors. Once there, architects, designers and specifiers jammed together in the small spaces and asked big questions about using LEDs in their products and applications: How bright? What colors? How much money can I save? Many visitors were looking at LEDs as the long-term lighting strategy to save energy and thus money, a more urgent quest with the price of oil rising ever higher.

Exhibitors galore

Along with attendees, there were 510 exhibitors spanning more than 157,000 square feet — LFI's largest show floor to date. As usual, the exhibitors made their own piece of real estate into a totally unique space. From Belfer Lighting's showy, bar-inspired booth to the tough metallic lines of Albeo Technology's troffers, there was something for everyone interested in LED fixtures, not to mention the latest options in LEDs.

JULIE MACSHANE *(juliem@pennwell.com) is managing editor of* LEDs Magazine.

Above the booths, area and street lights were aglow. If the convention center had turned off its lights at the back of the hall, visitors would have had no problem navigating the area, what with the high displays mounted at Cree, Beta/Ruud and Acuity Brands Holophane, said *LEDs Magazine* contributing editor Brian Owen.

Along with the bright overheads, there were stars of another kind. A delegation from the Clinton Foundation's Clinton Climate Initiative led by Lighting Domain director Michael Cavallo toured LightFair to assess solid-state lighting (SSL) technology and products for CCI's outdoor public space and commercial building initiatives (see www.ledsmagazine.com/features/4/11/1).

The DOE was also there to announce its new Bright Tomorrow 'L' Prize competition designed to spur lighting manufacturers to develop high quality, high efficiency SSL products to replace the common light bulb (see www.ledsmagazine.com/news/5/6/7 and p. 14).

Nexxus Lighting's selective heat sink

At the Nexxus Lighting booth, CEO Mike Bauer and CTO/inventor Zdenko Grajcar introduced the company's new "Array" LED lamp line, which they said is lighter and cooler than other bulbs due to their selective heat sink technology, which dissipates heat effectively. When asked about the layout of the LEDs in the Array line, Grajcar would only say that the lamps all have the company's proprietary symmetrical array of low power, high luminous efficacy LEDs. He did reveal that the new PAR30 has 108 LEDs; the MR-16 has 40 LEDs; and the G4 lamp has 15 LEDs. The lamps are lightweight because there are no screws or wires, and less metal and solder go into their manufacture. The products emit 95+ lm/W in bright cool white light and 80 lm/W in color-rich warm white.

In the Renaissance Lighting booth, a visitor could control the new ED-04 4-inch downlights, available in RGB and white. The company also showed the 6-inch model, which CEO Barry Weinbaum said is much brighter than last year's prototype in part because the fixture's domed mixing chamber has been made more efficient and the white coating on the dome interior now produces 98.5% reflectivity.

KramerLED indoor lighting deployed

Ruud Lighting, Beta Lighting and Kramer Lighting were a big presence at the show. The major news from Ruud was that Kramer Lighting has launched a new brand, KramerLED, for commercial indoor lighting using the new multi-chip X-Lamp MC-E LED from Cree. Besides using

LEDs

This Osram Sylvania booth display shows the LED system story, from chip to board to heat sink to optics to power/controls to light source and finally fixture.

powerful new packages, Ruud said two important technologies for their products involve heat dissipation and controlling light. The company uses proprietary NanoOptic refractors, which provide better light distribution by minimizing wasted light outside the target area, and total internal reflection, where light is reflected back to the desired area. The company uses heat pipes, attached to the back of the engine, that move heat away from the LEDs and the circuit board so the heat sink assembly can work more efficiently.

Heat modeling: Future Lighting Solutions

Displayed on a laptop screen at Future Lighting Solutions' booth was the company's new QLED thermal design and simulation software. This product is said to reduce or eliminate the amount of thermal modeling needed in the design of fixtures using LEDs. However, the software right now can only model LEDs from Philips Lumileds' high-power line and it uses real-time thermal simulations of solid-state lighting systems. The company said that this is the only available thermal simulation software that includes accurate LED models. Future Lighting also launched its LED Light Engine Selector Webtool that allows users to easily specify a plug-and-play solution for a light engine.

Philips' Lumiramic technology

Using its patented Lumiramic phosphor technology, Philips Lumileds has reduced the number of white color bins for its warm-white Luxeon Rebel LEDs. The technology enables

Carmanah Lighting announced a new partnership with BetaLED via which BetaLED has developed a fixture designed specifically for Carmanah's EverGEN solar engine. It is a stand-alone unit that can illuminate parks, paths, kiosks and other outdoor areas. Carmanah Lighting also won a LightFair Innovation award for its solar area lighting solution.

Using its Tempr heat-removal technology, Albeo Technologies has introduced a modular family of LED light fixtures: the Constellation line of high bay, low bay and heavy duty linear fixtures as fluorescent upgrade lighting. Tempr combines proprietary techniques including the mounting of LEDs and PCBs, and the ultimate design of the fixture.

specific targeting for correlated color temperature (CCT), which enables Lumileds to control the color temperature and tint, and minimizes production variance (see www.ledsmagazine.com/news/5/6/2). Philips Lumileds also launched Luxeon Rebel efficient modules for building solid-state recessed lighting and the new Fortimo downlight modules (see www.ledsmagazine.com/press/16312.)

Cree throws party for new LEDs

If you must introduce a new LED, you might as well throw a party. Perhaps this was Cree's thinking as it hosted a reception at the New York, New York hotel on Tuesday evening of LightFair. There, Ron Hall, Cree sales manager, presented the MC-E LED (multi-chip LED using four EZBright chips) — announced earlier in the day — to a crowd of about 100, which included Brian Owen, *LEDs Magazine* reporter. The MC-E has the same footprint as the XLamp XR family of LEDs, yet provides 4× the light output of an XR-E and is targeted for general lighting applications. Cree plans to make the new LEDs available for purchase next quarter (see www.ledsmagazine.com/news/5/6/4). LightFair visitors were able to view the XLamp MC-E applied in indoor and outdoor luminaire demonstrations on the show floor by Acuity Brands Lighting, KramerLED and Light Engine, added Owen.

Luminus Devices adds white

At the show, Luminus Devices announced that it will be adding white LEDs to its PhlatLight LED lineup in 3Q08. Like other products in the PhlatLight family, Luminus' white LEDs feature large chip sizes, photonic lattice technology for maximum light extraction and advanced PhlatLight packaging to provide good thermal performance for high power operation. The white LEDs are phosphor-converted. The PhlatLight CBT-90 uses a single 9 mm^2 chip that can produce over 1600 lm and the CBM-360 (>6000 lm) has a 36 mm^2 LED surface area.

Other LED manufacturers

Intematix has introduced two lines of patented chip-on-ceramic LEDs and LED arrays available through its subsidiary, Intematix Technology Center (ITC): the Apus line of single-chip packages and the Cetus line of chip-array-on-ceramic packages (see www.ledsmagazine.com/news/5/5/15). PerkinElmer Optoelectronics added a full line of all-white LEDs and multi-color/white LEDs under the ACULED VHL (very high lumen) brand name (see www.ledsmagazine.com/press/16319). Seoul Semiconductor introduced its 3.2W pure white Acriche AC-driven solid-state light source with improved 80 lm/W luminous efficacy, its 1.25 W warm white Acriche with ~60 lm/W, its P5-II full-color power LED and its P4 narrow light source with 100 lm/W and 70° viewing angle.

Arrow Electronics shows off LED partners

The Arrow booth was end-product driven, with a half-dozen displays focusing on different locations where LED products can be used, and how Arrow has partnered on them with other companies. Taking a walk through the booth you could see a depiction of aircraft systems lighting from Heads Up Technologies. Turn a corner and you were in a hospital room seeing an Everbrite downlight for a hospital MRI suite or in a ship where Newport PowerLEDs and Imtra Corp.'s systems light up the cabin. One more step and you were on the streets of Ann Arbor, MI, where Arrow and Relume Technologies are developing an alternative lighting option by replacing metal halides with LEDs, a 50% energy savings with a payback over 3.8 years. "It's all about saying that LEDs are a viable option, that they can be used in normal settings," said Arrow's Diane Harris.

Cooper introduces new fixtures

New Cooper Lighting products included the io line series 1.5 LED exterior linear accent luminaire for floodlighting and sign lighting applications; Lumière's new LED family with additions to its existing product lines, including accent/flood, pathway, wall, sign and underwater luminaires; the LED shelf light for display lighting in tight spaces under shelves and cabinets; the Shaper series (see photo) with two recessed housing sizes (5- and 7-inch) and a 2.5-inch profile off the finished surface; and finally the edge-lit combo series, an architectural grade emergency fixture that combines an LED exit sign with MR11 emergency lights.

Optek Technology unveiled the Optimal 1 1W Star Series LEDs in cool, daylight, warm white, and other colors, for general and architectural illumination. Optek also introduced the Power Line design kit (shown at right).

Everbrite improves MRI product

Everbrite Lighting's improved downlight fixture — the MedLux XLS II for MRI rooms in hospitals — will be available in 3Q08. Jeff

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S14 DecorLED™ Lamps
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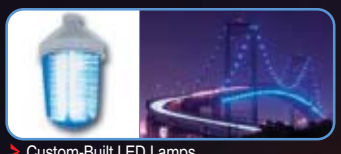
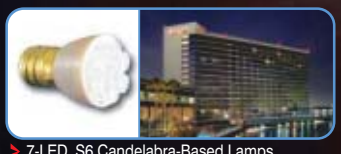
Round, Flexible RopeLED
Tortilla Jo's, Anaheim, CA



Custom-Built LED Lamps
Vincent Thomas Bridge, San Pedro, CA

S14-Styled DecorLED Lamps
Bardavon Theater, Poughkeepsie, NY

4-LED, 9mm Miniature Wedge-Based Lamps
Hillsboro Arch, Hillsboro, OR



7-LED, S6 Candelabra-Based Lamps
Hyatt Regency, Long Beach, CA

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Gatzow, ELT product manager, said the drive circuitry is noiseless to avoid bothering the patient. And, since there is a huge magnet in MRI machines, the reduced maintenance needed on LED lights is useful in avoiding accidents involving lethal metallic flying tools. Finally, the light in the can is equivalent to a 75W light but sheds less heat.

General Electric Lighting goes outdoors

In its large intricate booth, GE introduced four new LED products. Only two of them, however, were actually released: the LED cove lighting system and the Tetra MAX LED lighting system, while the other two (the outdoor LED area light and LED StreetDreams) will be rolling out in the upcoming months. GE Lighting Systems is entering the outdoor market with these lights. The outdoor LED area light, currently in testing with a large retailer, improves visibility and quality of light vs. standard HID systems by providing a comparatively higher color temperature (5500K), a 70+ color-rendering index and a low-glare optical design. The new LED StreetDreams post-top fixtures were recently displayed at the 76th Annual Conference of Mayors in Miami, FL. GE expects that LED StreetDreams will appeal to mayors and other municipal authorities because of its energy-efficient LED technology and post-top design. LED StreetDreams fixtures will be introduced to the broader market in 2009 (see www.ledsmagazine.com/news/5/7/2).

Ilumisys shows realistic and artistic sides

Ilumisys Inc. had a small booth, but it was a popular one, perhaps because it has launched the first product in a series of patented LED tubes designed to directly replace standard T-8 and T-12 fluorescent tubes. The ilumisys MK1 product uses high brightness LEDs to provide efficient and effective light, and is available in color temperatures ranging from 3500K to 5000K, with a variety of optical diffusion options. Or perhaps the booth was popular because at the back hung four of the five luminaires in ilumisys' Designer series. These elegantly designed, contemporary LED lighting fixtures that drew in the eye and the body have light outputs ranging from 600–1000 lm, but consume 10–18 W of electricity.

Seminars raise awareness of LEDs

During the week, reporter Brian Owen participated in various workshops as described in his LightFair Daily reports (www.ledsmagazine.com/features/5/5). Here is a brief summary of highlights:

Photometrics workshop

A Monday workshop detailed the process of interpreting and understanding photometrics data presented by solid-state luminaire manufacturers. Greg Subisak of Holophane, Acuity Lighting group, said that characterizing each LED (in a light engine) with drivers is essential. "There should be tighter binning to characterize the LED with finer detail. It will be an industry effort, but it is possible and (LED) manufacturers know this information."

LED technology for lighting folk

Lighting designer Kevan Shaw said the challenge for lighting folk is obtaining the 'real' information or story with LEDs. He outlined what designers should know and where the pitfalls can be found. In an interview, Shaw was positive about the controllability of LEDs and the relative efficiency of color, but still concerned about getting usable quantities of light.

Lighting fundamentals for architects

Architect Lisa Petterson commented that she is using LEDs more and more, particularly in exterior landscape applications and that she is looking forward to future opportunities in indoor applications. She cautioned the participants to question and understand lamp life and lumen maintenance claims.

Sustainability vs. lighting quality

Presented by Nancy Clanton and Naomi Miller, this engaging and enthusiastic presentation cautioned the attendees to beware of LED claims and test the product in the application. It was added that designers have to embrace the total opportunity for LEDs in the future and not restrict the application potential by perception.

Kichler Lighting: modular undercabinet lighting

Jeff Dross, senior product manager, said that Kichler Lighting is introducing new LED undercabinet lighting and landscape lighting as part of the Design Pro series. "I'm excited about the design of the undercabinet lighting because it's only 0.5-inch wide and it has a four-position switch that allows for flexibility. It is also modular; the switch can be removed and placed on either end of the fixture" so it's versatile, he said. The company also showed LED landscape lighting consisting of 20W, 30W and 50W MR16 varieties. Kichler has also been busy developing eight new accent lights, three new deck lights and a variety of step and brick lights.

Philips SSLS (Color Kinetics)

Philips SSLS introduced three new LED exterior lighting fixtures and two new interior fixtures. ColorReach Powercore, which has more than 4000 lm of output and 400-foot projection, brings saturated color and dynamic effects to large buildings, monuments, bridges and towers. The ColorGraze Powercore and eW Graze Powercore are designed for exterior grazing and wall washing applications using color and color-changing light, and high-quality white light, respectively. eW Downlight SM Powercore is a downlight with a low-profile housing in 2700K and 4000K color temperatures options and eW Profile Powercore is a low-profile, linear fixture for common undercabinet lighting, task lighting and display case lighting.

Osram Sylvania: No room too small

Osram Sylvania won an award of distinction at LightFair for its booth, which was separated into the home and retail settings where LED

This color-changing wall art was created by the Sylvania Linearlight Power Flex LED module (for white light) at top and the Linearlight Flex Top Colormix LED module at the bottom.

100,000 hours of life and other LED fairytales

Over 600 attendees packed the room, making this the highest subscribed workshop at LightFair 2008. Presented by John Curran of LED Transformations, it dealt with the current reality and state of the technology, from binning to heat and from lumens to lifetimes.

Bye bye incandescent

The presentation addressed the controversy, confusion and relevance of technology for today's and tomorrow's environmental concerns and needs, as well as current and proposed legislation and standards. Discussed were the US Energy Independence and Security Act of 2007 (HR6), the Bright Tomorrow 'L' prize for LED innovation, the CFL mercury and recycling issues, IES light levels, ASHREA, and a comparison of energy codes, including California's Title 24.

David Irvine-Halliday, Light up the World Foundation

The Light Up The World Foundation (LUTW) is an international humanitarian organization dedicated to illuminating lives of the world's poor. LUTW has improved the quality of light and thus improved the quality of life in the remote villages of the developing world. This David has met this Goliath of a challenge and has devoted himself along with his wife, Jenny, to this effort. "With the unlikely ability of providing free food, you can provide light for free," said Irvine-Halliday, who closed his presentation to a standing ovation, further comments and a plethora of questions, including "How can we as an industry help?"

David Gottfried, the US and World Green Building Council (USGBC)

Parallel to SSL development, global transformational change in how we conduct business, make products and manage our organizations is undergoing explosive growth. Understanding and embracing the principles of sustainability and life cycle value fuel this societal cultural change. The core of value includes efficient use of precious resources, environmental restoration and protecting our health. Gottfried's passionate presentation closed with him emphasizing that although we are dealing with technology change, it is all about people, as people create and use the technology. ◄

lighting was shown to fulfill everyday lighting needs. The company introduced more than 10 new LED products, including a directional lighting module (DLM) product line. The DLM line has two fully integrated DLM modules: the DLM700 — intended for use in residential recessed down lighting, track lighting or wall washing applications and can be incorporated in both 5-inch and 6-inch aperture fixtures — and the DLM1100 — developed for more commercial applications, provides 1100 lm and performs best in 6-inch aperture fixtures. Also introduced were the INSPIRELED LED module for lighting jewelry cases, retail display cases, and salad bars, and the HF²Linear Colormix LED module that replaces traditional light sources in many applications and incorporates six sets of three hi-flux RGB LEDs for dynamic color changing effects.

Belfer Group's innovative booth

In Belfer's innovative booth with flowing white curtains and side seating area in a bar-like setting, the company's Radiant Lighting LED multiples and downlights were shown. This year, the company introduced field curvable and linear varieties of engineered LED products. They

Top Nanosys's Lumisys transparent LED signboard won a LightFair Innovation Award in the Specialty Luminaires: Theatrical and specialty luminaires category. The flexible, transparent signboard is created with proprietary transparent conductive coating technology.

also displayed LED festoon lamps for existing low-voltage strips for users who want to convert for energy efficiency.

Khatod's new blade lens

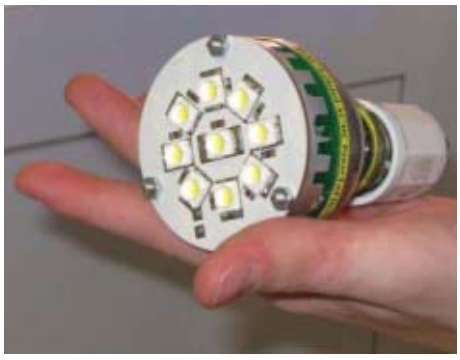
Khatod showcased its new product, Blade Lens, the first in a series of cutting edge products for high-power LEDs to be released this year. The lens shapes the light like a blade for use in wall washing, architectural lighting, and other areas where compact light is required. Beam angle is 100° × 8.5° (see www.ledsmagazine.com/press/16459).

Magtech shows off its flexibility

A maker of LED drivers since 2000, Magtech showed off the myriad of drivers it custom-manufactures by layering them artistically across the booth's back wall. Although the company's latest designs are the LP4100 100W quad LED driver and the LD1026 26W buck-boost design LED driver, the company specializes in flexible configurations.

Rohm's driver modules

At the Rohm Electronics booth, representatives introduced AC/DC-isolated LED driver modules that utilize constant-current circuits optimized for driving LEDs. The new BP58xx series integrates LED-driving control circuits, switching elements, isolation transformers and constant-current circuits into a single SIP package. The six new AC/DC isolated driver modules' constant-current output and adjustable brightness control offer designers an accurate, high-performance device for simplifying designs while saving board space (see www.ledsmagazine.com/press/16324).



A prototype concept employing Rohm's power module LED drivers in an illumination application.

Looking ahead to the next wave

Next year, LightFair heads back to the city that never sleeps, New York. It is scheduled for May 3–7 at the Jacob K. Javits Convention Center, with the Daylighting and Institute programs to be held on May 3 and 4, and the trade show and conference to run from May 5–7. In 2010, LightFair will be held May 10–14 in Las Vegas.

LED predictions coming true at SID 2008, while OLED displays surge forward

LED backlit LCDs are setting clear standards for flat panel display performance, while commercial AMOLED displays bring hope for sustainable product entries, writes **STEWART HOUGH**.

FIG. 1. Samsung SDI's 31-inch, full high-definition, active matrix (AM) OLED displays.

Continuing its role as the premier electronic display technology conference and exhibition in North America, the Society for Information Display (SID) 2008 Exhibition, Symposium and Conference was held at the Los Angeles Convention Center on May 19–23, 2008. Curiously, the promotion of the event as a Hollywood affair—and its immediate proximity to the movie capital—failed to entice any celebs to come to see how good they will look on the latest electronic display technologies, be they handheld or wall-size. Apparently, the Nokia Center finale of American Idol one block north was a bigger draw.

SID2008 found a truce of sorts in the decidedly high-tech, macho contest for size supremacy that has been on-going for the last five years between plasma and LCDs. This was much to the chagrin of many surveyed attendees who enjoy the prospect of seeing the latest, biggest display in the world. Last year, 108-inch diagonal Sharp LCDs and 103-inch diagonal Samsung plasma displays won bragging rights. This year saw a shift in display focus from sheer size to higher resolution and improved image performance. Many full high-definition televisions (HDTV - 1920 column x 1080 row pixel format) LCDs were exhibited with the latest image processing and display design approaches to make them even more enticing. The largest LCD at the show was an 82-inch full HDTV Samsung LCD.

There was also an increase in exhibitors drawn from the many component and materials suppliers whose technologies support the continuing expansion of the display market e.g. optical filters, diffusers, driver devices, backlight providers, and especially touchscreens. In fact, more companies were listed (over 62) under touchscreens than any other category, most likely because of the resurgence in this technology based on the success of the Apple iPhone, which won the SID2008 Display Application of the Year Gold Award.

OLED displays

More strategically, the commercial release of Sony's 11-inch XEL-1 active matrix (AM) OLED TV (www.ledsmagazine.com/news/4/11/31) and Samsung SDI's 2.2-inch AMOLED cellphone displays provided a renewed emphasis on OLED technology. After a number of false starts, 2008 may be the year that AMOLEDs finally engage mainstream commercial display markets.

Sony did not exhibit at SID2008, but Yoshito Shiraishi, GM of the E-Products and Business Development Department, TV Business Group, Sony Corp, delivered a keynote speech titled "Sony's Challenge to be the First Out with OLED TVs," discussing history, performance and future prospects of Sony's OLED panel development. In February 2008, Sony announced a capital investment of ~JPY22 billion ($213 million) for volume production of 20-inch OLED panels (see www.ledsmagazine.com/news/5/2/16). While this does not represent enough investment for a price-competitive production launch, it appears Sony is targeting premium market opportunities. By the end of the conference, Sony announced it plans to release a 27-inch AMOLED display within 12 months.

Samsung SDI shared their OLED and plasma display exhibition space with Samsung Electronics, the major Korean LCD manufacturer.

STEWART HOUGH *(stewart@driven-technologies.com) is a 20-year veteran of the display industry and vice president of engineering for Driven Technologies Inc. (http://driven-technologies.com), a southern CA developer and manufacturer of LCD displays, cockpits and avionics components for simulation, training and commercial avionics.*

Allegro's New Multi-Channel Constant-Current Drivers for LED Displays, Signs and Architectural Lighting

Features

- Output current up to 150 mA per channel (A6281)
- 10-bit PWM per channel (A6281)
- 7-bit current-control DACs for color calibration (dot correction) (A6281 and A6285)

Benefits

- Precise current control for high quality images
- Accurate color balance and white point
- Remote diagnostics

Applications

- Full-color LED video displays
- Monochrome and color message and graphic displays
- Channel letter signs
- Architectural and decorative lighting

Allegro's new family of LED driver ICs offers solutions for signs, large video displays, architectural and decorative lighting and control panels.

The ***A6281*** typically drives a cluster of red/green/blue (RGB) LEDs for one pixel in a large display or a lighting fixture. You can precisely control LED brightness via 10-bit pulse-width modulation (PWM) per channel, and adjust color balance via 7-bit analog current control. The ***A6281*** requires only three external passive components to operate. The high level of integration and tiny 3 x 3 mm QFN package enable compact board designs. The ***A6281's*** unique clock-regeneration technique allows hundreds of devices to be cascaded on a single cable.

The ***A6282*** and ***A6285*** have 16 constant-current output channels. They can be cascaded to create megapixel text or video displays. They can also be used in smaller applications such as LCD backlighting or controlling LEDs in an instrument or control panel. Both the ***A6282*** and ***A6285*** operate with LED supply voltages up to 12 V, which allows stacking of three or more LEDs per channel. The ***A6282*** is available in 24-lead surface-mount packages: QFN, SOIC, and TSSOP. The ***A6285*** features open-LED detection and dot correction and comes in a 32-lead QFN.

All of these devices operate over the -40 to +85°C temperature range.

Model	Number of Channels	Current per Channel	LED Voltage	PWM	Dot Correction
A6281	3	150	17	10-bit	7-bit
A6285	16	80	12	External	7-bit
A6282	16	50	12	External	-

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FIG. 2. Toshiba notebook computers with LED-backlit LCDs.

Samsung has announced a 12.1-inch notebook with an AMOLED display, and consumer giant Panasonic recently announced that it believes OLED will eventually replace LCDs. The $3 billion revenue mark for OLEDs has been forecasted to be five years in the future for the last seven years. It remains to be seen if the new product releases and announcements will stimulate other entrants or be the real thing this time, but expectations have now risen.

Passive-matrix OLEDs have been in production for a decade, but are limited in size and resolution, with the only major market being the cover displays on cellphones. AMOLED is now the latest serious commercial incarnation of electronic displays offered to the electronics product markets, even if only through limited sources. In recognition of the AMOLED product market launches, SID2008 awarded the Display Device of the Year Gold Award to Sony for its XEL-1 OLED TV and the Silver Award to Samsung SDI for its 2.2-inch QVGA AMOLED display.

Samsung SDI had arguably the most impressive display of the conference/exhibition: several 31-inch, full HD, AMOLED displays (Fig. 1). The viewing angle, contrast, video motion, and thinness were quite stunning. Information about commercial production plans was lacking and, of course, pricing disclosure was out of the question. The color rendering seemed almost surreal, although the appearance of moving flesh tone—the real test of display moving image performance—was excellent.

To highlight OLED's advantages, OLED displays should be placed next to plasma and LCD running the exact same content. Samsung SDI has been working with Universal Display Corp. (UDC) for several years on progressively more serious display demonstrations. In SDI's display demos, the red and green were UDC's phosphorescent materials, while the blue is of the Kodak fluorescent type. By contrast, fluorescent red, green, and blue comprise the Sony XEL-1 active layers.

Chi Mei Optoelectronics displayed their 20-inch WXGA low-temperature polysilicon (LTPS) AMOLED display, which was originally developed in 1994. LTPS provides higher electron mobility due to fewer crystalline silicon grain boundaries for higher drive currents, however it has uniformity issues for large-scale displays. A 25-inch display announced in late 2006 was not present. Ignis Innovation, a University of Waterloo, Canada, start-up, has developed a unique amorphous silicon backplane circuit that offers measurable improvement for the voltage threshold drift that is intrinsic with amorphous silicon and is strongly needed for higher current OLED drives.

OLED lighting

OLED technology has the potential to significantly influence the solid-state lighting paradigm through the creation of area lighting devices of almost infinite shapes on rigid and flexible substrates. It can exceed the limitations of present flat panel or area emissive offerings. OLEDs are potential competitors in many LED applications, including small display backlights, automotive interior and running lights, signage, and interior and exterior building design and accent lighting. Although nothing so dramatic was shown at SID, GE recently demonstrated a roll-to-roll flexible substrate with around 30 lm/W white efficiency, a 2× improvement over previous demonstrations (see www.ledsmagazine.com/news/5/3/9). A clear milestone, but not a commercial breakthrough, the stated plans are to introduce an OLED lighting panel of some type by the end of 2010 with full specifications to be determined.

Even though SID is about displays, much of the OLED materials and device technology under development is intended for lighting as well. OLED lighting demonstrations were more subdued this year compared with last year. Osram has retired their passive matrix polymer OLED display products in favor of lighting technology development and products, and they did not exhibit any OLED devices of any type.

In a booth close by, OLED supplier CDT showed an Osram demo of a five-panel hanging pendant of white polymer OLEDs about 8 × 10 cm each in size (similar to the Ingo Maurer luminaires shown at Light+Building—see LEDs Magazine, April 2008, p14). None of the OLED companies exhibiting at SID felt OLEDs would be a major supplier of backlights, expect possibly in small displays.

Kodak's policy of core patent licensing and technology support has fundamentally enabled both the Sony and the Samsung display offerings, as Kodak is the dominant IP owner for small-molecule OLED technology. Kodak continues to develop their RGBW OLED structure and deposition technology tools and is still seeking to partner with a critical volume display maker/active matrix backplane provider to pursue what continues to be the goal to have commercial product influence on displays for Kodak licensees and Kodak's digital imaging business.

FIG. 3. PVI showed a selection of LED-backlit LCDs.

Novaled, a German company that has set the pace for OLED materials advancement over the last several years, published white OLED material efficiency of 38 lm/W, CRI of 90 (1931 CIE 0.43, 0.44) with lifetime >100,000 hours from 1000 nits. Novaled again exhibited an automotive headlight assembly with white OLED running lights this year, and anticipates this will move forward into a production design and release by 2011.

UDC has also made substantive materials performance progress, publishing white

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OLED efficiency around 30 lm/W, but with the big improvement over last year of extension of lifetimes to over 200,000 hours from 1000 nits. UDC stated they also have a 72 lm/W white (1931 CIE 0.35, 0.47) in test. [Since this article was written, UDC announced a white OLED with an efficacy of 102 lm/W—see www.ledsmagazine.com/news/5/6/23.]

The Ingo Maurer demonstration aside, there still have been no major OLED lighting product announcements nor any major manufacturing line investments that could launch OLED lighting products in any lighting markets, meaning technology demonstrations and improvements will continue, and volume production is at least two years away.

LED backlighting predictions confirmed, trends continue

Predictions made last year on the decline of CCFLs and the further increase of LCD performance using LED backlights over plasma are holding true. There were no major plasma display exhibitors in the hall this year, except for Samsung SDI, which was emphasizing OLEDs. In general, as the FPD TV display market becomes more mature, exhibitions of display technology

FIG. 4. The 21-inch portrait-mode NEC display uses selectable LED backlight white color.

innovation will become less important. LCDs are still actively improving, while plasma improvements have been more subtle and difficult due to the nature of the technology. Specifically, the large constituent component content of LCDs—e.g., polarizers, color filters, backlights, etc.—have long been held up as a weakness of LCDs, but have actually enabled independent component technology advancement that is more easily assimilated into LCD products. LCD's ability to continually reinvent itself in this way has strongly contributed to LCD display market domination.

The new "Green Religion" paradigm has increased focus on power consumption in all displays. SID2007 decisively thrust LED backlit large screen LCD TV performance into the spotlight, with higher contrast, improved image motion effects and reduced power consumption. Backlighting in all LCDs, from cell phones to large screens, has established that LEDs can reduce power consumption compared to CCFLs. LEDs have become the virtually exclusive choice for backlighting in mobile phone screens, as well as iPods and other handheld devices (some phones and MP3 players have OLED displays) and the next portable device market actively switching to LED backlights is notebook displays.

Thinner, more power efficient, higher brightness/contrast, longer backlight life and reduced motion artifacts are turning the balance for LEDs despite their intrinsically higher cost. Savings of up to 2W (~40%) have

been published by notebook display suppliers for medium-sized displays. Toshiba exhibited an assortment of smaller portable products as well as several notebooks (Fig. 2) equipped with LEDs (see www.ledsmagazine.com/press/16247). While not committing to total elimination of CCFL displays, Toshiba is strongly focused on LED solutions and plan to develop their own LEDs, consistent with their historical vertically integrated technology business model.

FIG. 5. Chi Mei Optoelectronics demonstrated LED backlight advantages over CCFL using side-by-side comparisons.

LCD display suppliers Sharp, PVI (Fig. 3) and NEC (Fig. 4) differentiated product offerings by backlight choice, while indicating that, eventually, virtually their full product lines will offer LED backlight options. The 21-inch portrait-mode NEC display for medical radiology shown provides intrinsically higher contrast and image detail optimization through selectable LED backlight white color.

Optrex was somewhat less bullish about the transition to LED backlighting, stating that they see the trend clearly in favor of LEDs, but are not as aggressively switching to LED backlit displays. On the other hand, Tianma, a Shanghai producer of smaller (2.2- to 7.0-inch diagonal) TFT LCD displays has converted all of its products to LED backlights with no plans to offer CCFL unless requested by an OEM company. Smaller suppliers like Vertex LCD, as well as display solution providers and integrators White Electronics, Q-Vio and JACO Electronics, have developed white LED backlight products, are working on RGB versions, and see the next 3–5 years resulting in LED domination of backlights.

Side by side LED demos

SID 2008 LCD exhibitors AU Optronics (AUO), Chi Mei Optoelectronics (CMO) (Fig. 5) and Samsung Electronics took the next step in highlighting LED backlight advantages over CCFL by doing side-by-side demonstrations with digital power meters to show the dynamic power savings of LED backlights with different video image content. The potential lifetime power savings are compelling.

The flexibility of LED backlight designs allows for progressive levels of complexity and performance. Four levels of LED integration have been identified, designated D0 thru D3:

D0: Area or edge-lit full display white dimming
D1: Horizontal zone area white dimming
D2: Area 2-dimensional zone white dimming

D3: Area 2-dimensional zone color dimming

Average power reduction of up to 60% with LEDs was shown with the D3 approaches used in the AUO, CMO and Samsung demonstrations. Dolby, which purchased Brightside technology last year (see www.ledsmagazine.com/news/4/12/8), demonstrated a side-by-side comparison of their D2 technology with a standard LCD. The extremely high contrast of the Dolby technology on the left caused the image bloom due to camera focus on the middle of the two displays. Exhibitors demonstrating D2 and D3 area modulation techniques similar to Dolby's are apparently under secret license from Dolby or using methods free and clear of Dolby's IP. A number of chip makers are stepping up to develop D1-D3 drive solutions, including Microsemi, Austriamicrosystems and inSilica.

A joint D3 collaborative demonstration was exhibited by chip maker Microsemi and demonstrated by CMO on a 42-inch LCD. Designated by Microsemi as Digital Advanced Zone Lighting or DAZL!, the SMT device incorporates a flexible D0-D3 capability. With a 60% demonstrated power saving over a 42-inch CCFL-backlit LCD rated at 188 W, the D3 technology can realize power savings of just over $270. This assumes a conservative 30,000 hour operating life and electricity costs of $0.08 per kilowatt-hour. This justifies the increased cost of the RGB LEDs and added signal processing circuitry. If promoters of LED backlight technology will highlight this advantage, the transition to LEDs will be greatly facilitated. Contrasted with plasma power efficiency, LCD's advantages are even more compelling.

On the high power side, the LED technology with the greatest potential impact on solid-state lighting as well as LCD backlighting was shown by Luminus Devices, who again chose to only provide private demonstrations off-site. Luminus was awarded the Display Component of the Year Gold Award for their PhlatLight LED Backlight Unit. Phlatlight is an LED-based technology using photonic lattice structures that can generate extremely high light output at high currents, up to 30A. In the Global Lighting Technologies (GLT) booth, a 46-inch edge-lit PhlatLight LED backlight unit with GLT's MicroLens diffuser gave impressive results with only 8 Phlatlight RGB modules.

Projection

Also, a stunning 67-inch PhlatLight LED DLP TV by Samsung Electronics (shown in private) could possibly breathe new life into rear projection TVs if the pricing is right. Samsung replaced a 132-watt mercury arc lamp and color wheel with a single PhlatLight RGB chipset, eliminating the problem of lamp replacement and improving picture quality.

A home theater front projector prototype powered by PhlatLight LEDs was also shown, producing over 700 ANSI lumens, and the company anticipates >1,000 lumens by 2009 (see www.ledsmagazine.com/news/5/6/28). Luminus demonstrated four new pocket projection models and prototypes from LG Electronics, Samsung Electronics, Innoswell and Upstream Engineering, along with a unique new pico projector, a 3 LCD projector, and several projectors that are being introduced using the recently announced PhlatLight PT54 chipset. This increases the brightness to >150 lumens, or 10 times the level of previous products using conventional LED technology. Luminus Devices is now in intermediate production and planning to ramp up by year's end to >10,000 per month on the new device.

FIG. 6. Ostendo Technologies Inc.'s CRVD ultra-wide 42-inch curved display.

LED makers on display

As ever, LCD exhibitors at SID either did not know whose LEDs were in their LCD displays or they were not saying. Osram was the only LED manufacturer exhibiting, and with a decidedly different offering this year. The large Sony Bravia was gone and replaced by an Ostendo Technologies Inc. CRVD ultra-wide 42-inch curved display (Fig. 6).

Billed as "the ultimate immersive desktop display," the CRVD-42 is intended for simulation, gaming, financial analysis, digital imaging, web-content creation or any desktop computing application needing multiple seamless displays. The display uses multiple rear-projection DLP MEMs, producing 2880 x 900 pixels with 68.7 billion colors, >300 nits brightness, and a contrast ratio of >10,000:1 from four Osram Ostar-Projection six-chip LED light sources. In response to sidelit LED backlight business opportunities, Osram demonstrated its new MicroSIDELED, an RGB multichip, 0.6 mm-high top-emitting SMT package with >1.0 cd green and >100% NTSC color gamut. Top emission allows for better registration to the edge diffusion film. (See www.ledsmagazine.com/news/5/5/24 for more on both these products.)

Trend summary

All LCD display exhibitors at SID, from tier-one display manufacturers to specialized market integrators, have released LED backlit LCD displays. Whole ranges within the product lines of major LCD suppliers now offer LED backlights. Notebooks are rapidly transitioning to LED backlights and cost of ownership advantages are expected to increase with predicted LED efficiency improvements and advanced LED drive approaches.

OLEDs may have turned the corner towards mainstream display market production. Material improvements have reached the point that nagging reluctance by potential suppliers should disappear. OLED lighting products are still not to be found, but improvements in white performance and other necessary technology support issues can only speed the day that area-lit panels will appear on the market.

LINKS

LEDs move from supporting role to defining advantage at SID2007
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Luminus, Sony, Samsung products win SID Display of the Year awards
www.ledsmagazine.com/news/5/5/17

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** Photo 1,2: P30, AR111, and TD26 at Guangzhou International Lighting Exhibition.*

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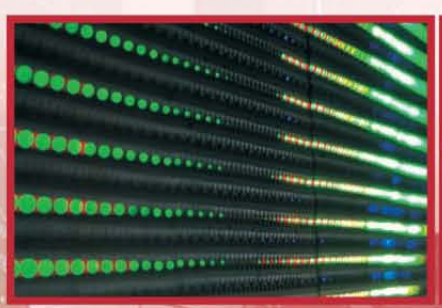

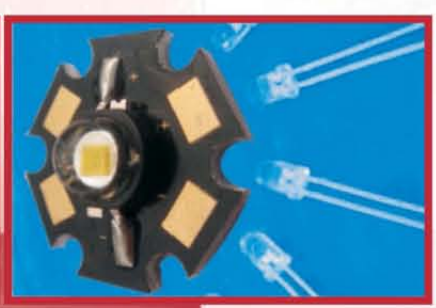

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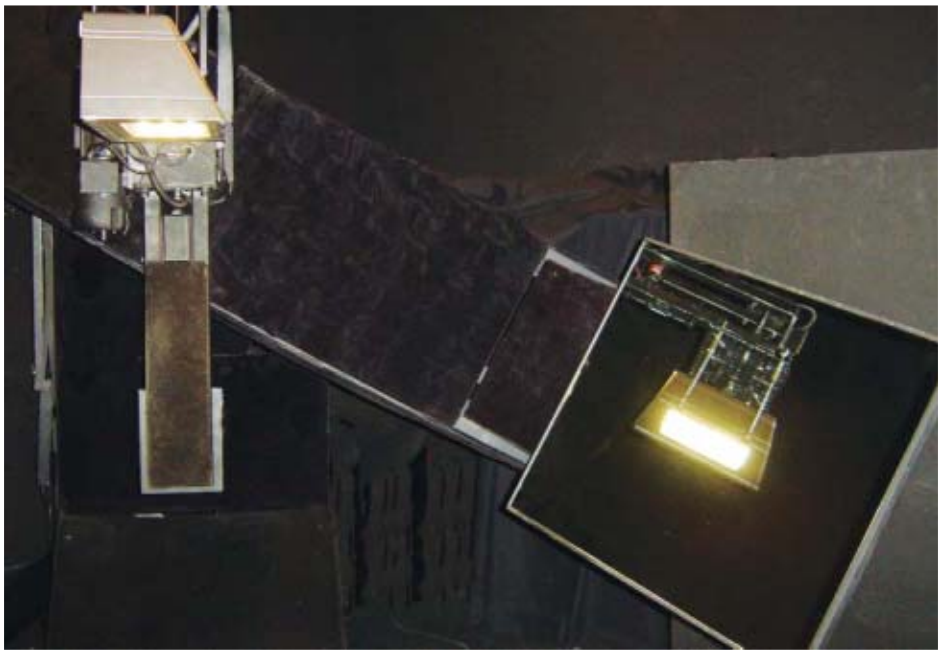
Absolute photometry has relative benefits for LED and SSL performance evaluation

Photometric testing methods are changing in response to the increased adoption of solid-state lighting, explains **IAN LEWIN**.

The lighting industry is buzzing with excitement: solid-state lighting (SSL) is being celebrated as the solution to many of today's energy and lighting application challenges. Available lumens per watt (otherwise known as the efficacy) of commercial white LEDs now far exceeds that of incandescent sources. In the laboratory, LEDs have been developed with efficacies similar to fluorescent and certain high-intensity discharge (HID) sources.

However, we do not yet know to what extent such devices will become viable in the future as a replacement for existing high efficiency sources; issues such as manufacturability, cost and temperature stability must be addressed. Until these issues are sufficiently answered within the lighting industry, replacement costs and procedures will remain a reasonable concern to commercial purchasers.

Even if today's SSL performance results are as good as the industry ever produces, a wide range of applications can be satisfied already. With performance increases actually coming at a surprising pace, and with anticipated reductions in manufacturing costs, LEDs certainly appear to be a major light source of the future.



A moving-mirror goniophotometer at Lighting Sciences Inc.'s Scottsdale, AZ, laboratory, with an LED luminaire under test.

New standards

The lighting industry has always adapted to engineering innovation, and as such has sought to characterize the performance of the newest lamps and the applications that might use them. The introduction of new forms of light generation has historically demanded the development of new test procedures, such that the Illuminating Engineering Society (IES) is now celebrating 102 years of understanding and communicating these lighting procedures and policies. Testing of fluorescent lamps and luminaires required the rethinking of photometric testing in the 1940s, and metal halide sources were a major challenge in the 1970's. With the advent of the LED for commercial lighting, the problems of correct photometry are perhaps even greater.

As the relevant standards, policies and procedures are released in 2008, the lighting industry will know precisely the performance goals each of its LED products must meet in order to have competitive value. Beginning September 30, 2008, every product developer will know the electrical, photometric and life requirements needed to qualify under Energy Star for SSL. Meanwhile, photometric standards and procedures are evolving just as quickly as the product lines featuring SSL applications.

Manufacturers and product developers will benefit from understanding the shift in testing procedures imposed by SSL/LED sources. Thermal issues have become vital to performance reporting, but the lighting

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industry's most historically critical number, luminaire efficiency, has all but disappeared in the SSL market.

Relative or absolute

It is likely that today's most fundamental change in photometric test procedures and product performance reporting comes as a result of the switch to "absolute testing" for LED luminaires. Conventional fixture types, including those using incandescent, fluorescent and HID sources, rely on "relative photometry."

Photometric testing of luminaires has almost always involved relative testing, most commonly performed on a "moving mirror goniophotometer." As the mirror moves around the luminaire, light rays at different angles of emission from the test source are redirected to a silicon photodetector. A computer connected via an electronic interface to the photodetector records the voltage generated by the detector. This voltage is proportional to the intensity in candelas, or candlepower, produced by the luminaire at each particular angle of interest.

At the end of the test, a data file is generated that contains a candlepower reading for all of the desired emission angles from the luminaire. This computer file is built in a standard industry format, normally the ".ies" format, which allows it to be used with lighting system design software.

Relative photometry

When relative photometry is being performed, a test is also run on the bare lamp. For example, if the luminaire uses a high pressure sodium (HPS) lamp, separate tests are run on the luminaire and the HPS lamp. The actual lumen output of the lamp is then calculated from its candlepower data. Say that this lumen output is 40,000 lm. Say also that the manufacturer's rated lumen output of the lamp is 50,000 lm. A multiplying factor is calculated, in this case 40/50 = 1.25. All candlepower measurements taken on the luminaire are then multiplied by 1.25. The luminaire test data that are produced then apply to the luminaire as if it had used a lamp operating at manufacturer's rated output.

This test procedure is referred to as "relative photometry" because all candlepower data that are provided in the data file are relative to the rated lumen output of the lamp. In fact, the actual or absolute candlepower values that the luminaire produced during the test are not reported.

Note that once the relative candlepower data are known, the computer can calculate the luminaire lumens. Dividing this by the rated lamp lumens and multiplying by 100 provides that formerly magic number, the luminaire's efficiency.

How does this relate to LEDs?

The answer to this question is precisely the reason why photometric procedures must evolve to meet the SSL market: in most cases, relative testing cannot be applied to LEDs.

LEDs cannot be conveniently removed from the luminaire and individually tested as bare lamps. Even if it were possible to separate the LED individually, far too many LEDs would need to be measured per test; the task would be so monumental that it would render LED testing financially unreasonable.

Therefore there is no method available to prorate the luminaire candlepower values such that the data apply to a manufacturer's lumen rating for the LEDs. Relative photometry, at least in most cases, is not possible.

Absolute testing

Absolute testing is the photometric procedure where actual intensity values in candelas (or candlepower) are recorded and presented in the report. These are the actual intensity values generated by the luminaire during the test, and are not relative to any particular rated lumen output produced by the LEDs.

A calibrated standard lamp is placed on the goniophotometer. Its intensity in a particular direction is known very accurately. That intensity is measured, producing a certain photodetector voltage. A calibration factor, in candelas per volt, is thus established for the goniophotometer. Each photodetector voltage reading from the luminaire test for all the different angles of interest is converted into an actual candlepower value by multiplying by the calibration factor. An absolute test report can then be created that contains the actual candlepower values that the luminaire provided when tested.

However, using absolute testing, luminaire efficiency cannot be determined. This is because the lumen output of the individual bare LEDs has not been measured, so there is no basis by which to determine the luminaire's output as a percentage of the rated lamp lumens of the luminaire.

Comparing approaches

Relative photometry has been used as an industry standard because it provides consistency in photometric testing, and therefore comparable reporting data. Two different laboratories, testing similar luminaires but using two different lamp samples that may have quite different lumen outputs, should produce near-identical results. This is because the lumen outputs of the lamps that are used are factored out; both tests can be based on identical rated lamp lumen output. The test report provides information on the luminaire rather than the lamp that is used.

With absolute testing of an LED luminaire, two different luminaire samples will vary by whatever extent the LEDs employed vary in their cumulative lumen output. Therefore we can expect greater variation, perhaps substantially, between tests on different luminaire samples.

The advantage of absolute testing is that it reports the true performance of the tested package of the luminaire and its LEDs. If, for example, the LEDs that are employed are producing a lower lumen output than expected, this will be reflected in the reported data. With relative photometry, such an effect will be disguised because of the prorating to rated lamp lumens. This becomes particularly important in view of the differences in LED performance that can be produced when using LEDs from different manufacturing bins that might otherwise be identical.

The new approach to photometric testing necessitated by LEDs raises some interesting questions: If luminaire efficiency is no longer available, what might replace it? If testing is not based on manufacturer's rated lamp lumens, as with conventional luminaires, and each sample of a luminaire when tested produces different performance results, what extra caution is required in using the data? Are there yet still other factors that might affect how the performance of an LED luminaire is reported? What new competitive issues are created by these evolving changes in testing procedures, and how will the lighting industry respond?

Global industry, governments and regulatory groups are wrestling with these questions as they develop a body of standards that will allow the expectations of SSL to be fulfilled. By understanding the requirement for absolute testing of LED luminaires, manufacturers will be able to release products that deliver the benefits of long life, damage resistance and low power usage to consumers. The future of SSL is truly exciting, but now more than ever before, comparable photometric data will drive real-world purchasing decisions.

EuroLED 2008 offers European perspective on low-carbon lighting

Among the talks at EuroLED were discussions of European R&D funding for LEDs and OLEDs, Ireland's initiatives for energy-efficient lighting, and the issues surrounding disposal of LED fixtures, writes **TIM WHITAKER**.

In its fifth year, EuroLED moved to a new and improved venue at the Ricoh Arena, Coventry that could accommodate a larger number of exhibitors (87) compared with last year. The technical conference had a strong speaker line-up, although a surprisingly small number of delegates. This article covers talks from the first session on low carbon lighting.

R&D funding in Europe

The European Commission funds a huge amount of R&D work in many diverse areas including LEDs, OLEDs and solid-state lighting, which all fall under the Photonics banner. Photonics has recently attained a higher profile within the EC, and funding for this area was increased by 40% to EUR 90 million for 2007-2008. John Magan, part of the EC's dedicated Photonics Unit, said that he expects this level of funding to be maintained in 2009-2010. The value of photonics production in Europe in 2005 was EUR 43.5 billion, representing 19% of the world market. Within Europe, lighting accounted for 15% of the total production output (the global figure was only 8%). Magan said that, relative to technologies such as flat-panel displays and IT, Europe is very strong in lighting, so this will continue to be an area of focus for EC funding.

The EC has funded several high-profile projects particularly in OLEDs; these include OLLA, which has just finished (see page 7), as well as CombOLED and OLED100.eu, which have started recently. Magan listed a number of research priorities for both LEDs and OLEDs. The next call for ICT funding for Photonics Applications will include an emphasis on lighting and efficient light sources (including LEDs, solid-state lasers and light engines). There will also be a demand for international cooperation activities, such as benchmarking LED/OLED prototypes, exchanging info on LED/OLED trials, and developing LED/OLED standards. More opportunities will come in the call for Organic Photonics and Disruptive Technologies, including OLEDs and lasers for lighting, illumination, projection and display. Magan said that the call for Organic/Disruptive is likely to be issued in December 2008, with the Applications call to follow in June 2009.

In conclusion, Magan emphasized that SSL is a key area for European photonics, and that EU support for LED and OLED technology is set to continue. "Energy efficiency is a real driver within Europe," he said. "We need to consider regulations and legislation, and what is needed and what can be done at the European level." Finally, Magan asked "Are we following the best strategy?" and "Any suggestions for what we could do better?" before leaving with a thought-provoking query; "Given that many key SSL patents are held by the major players, is public funding of SSL research justified?"

EBV Elektronik's booth featured LED lighting and displays, and a Nintendo Wii to entertain visitors.

Ireland promotes efficient lighting

David McAuley said that Sustainable Energy Ireland (SEI), a non-profit organization, aims to promote and assist the development of sustainable energy. This means energy efficiency first, followed by integration and innovation, and the use of renewable energy. The conference chair stated before McAuley's talk that Ireland is one of the first countries to announce its intention to "ban the bulb", but McAuley emphasized this was inaccurate. Earlier in 2008, Ireland's Minister for the Environment announced an energy-efficiency standard for lighting that would be implemented by January 1, 2009, after which it will be "illegal to market inefficient lighting." The standard is not yet defined, but will not be specific to any lighting technology.

TIM WHITAKER *is Editor of* LEDs Magazine.

McAuley said that SEI's vision for lighting is "for every lighting application to be effective and energy efficient." The way to achieve this vision is to ensure that the supply chain promotes and pushes energy-effective lighting solutions, and to create demand for energy-effective lighting. One of SEI's initiatives is to develop a common reference manual for all involved in the supply chain, which should focus on core concepts and contain reference data. "We'd like to see one on every desk, in every van, everywhere where lighting might be designed and specified," said McAuley.

He also described Ireland's Accelerated Capital Allowance (ACA) scheme, part of efforts to reduce carbon emissions in line with meeting EU targets by 2020. The ACA enables businesses to write off the entire cost of a limited set of energy efficient products — including lighting and controls — in the first year of purchase. The list of qualifying equipment is maintained by SEI. The first round of ACA product submissions is closed, but SEI is now accepting submissions for the second list to be published later this year (see more information at www.sei.ie/aca).

End of life and recycling

LED lifetime may be long but it is not infinite, and at some point LED lighting fixtures will reach end of life. For many current LED fixtures, this will mean removal and replacement of the entire luminaire, including the LEDs, drivers and housing. What's not clear is what will happen after that.

Demonstration of color rendering using LEDs on the Pacer booth at EuroLED 2008.

Peter Lees, commercial manager of Recolight Ltd, explained that the disposal of many electrical and electronic products is governed by the Waste Electrical and Electronic Equipment (WEEE) regulations. Recolight was established by the UK lamp industry in 2005 primarily for the purpose of operating a WEEE Compliance Scheme on behalf of lamp producers in the UK. Based on an EU Directive, WEEE came into force in the UK on July 1, 2007, and there are similar regulations in all other EU countries. Producers are required to join a Producer Compliance Scheme (PCS) or to form one of their own, and each PCS sets up systems for users to dispose of their end-of-life products. The "Producer" is defined as the first party to sell the new product into the UK market and therefore could be a manufac-

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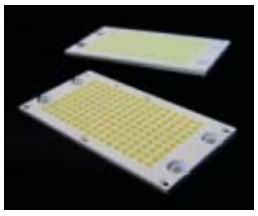

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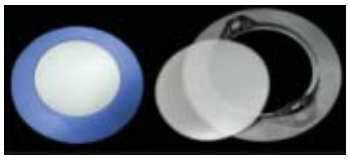

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turer, an owner-brander or an importer. The disposal system can be in the form of collecting such products directly from the user or providing a reasonable collection network. The cost is borne by the producer.

WEEE covers 10 different categories of electrical and electronic products. Section 5 covers lighting, but specifically excludes incandescent and halogen lamps — commonly termed GLS lamps, these don't contain hazardous materials — as well as domestic luminaires. A new sub-category (13) covers gas discharge lamps such as fluorescents. These can be recycled to extract mercury and sodium, although the mercury is not recycled in the sense of being reused — it is just diverted from the landfill.

Jonas Stålhandske, CEO of Aluwave AB, demonstrates the Nova headlamp from Mila, with a light output of more than 2000 lumens and a combination of different lenses to shape an optimized beam. The headlamp, successfully demonstrated at a nighttime running competition, uses Alunat ceramic-based PCB material from Aluwave.

Importantly, said Lees, LEDs are not specifically mentioned — yet. There is a tentative agreement by the industry, awaiting government approval, to categorize LED lighting products as household luminaires, which are presently exempt from WEEE. LED lamps are components, and are also exempt. But changes could be on the way, driven by some familiar market pressures. 150-watt GLS lamps will be taken off the market voluntarily by mid-2008, moving to 40 W by 2010, and then there will be a virtual ban on manufacturing and sales as a result of minimum energy standards that GLS lamps will not be able to meet. A review panel is considering bringing filament lamps within the scope of WEEE under category 13, which would further disfavor this type of lamp (because of the cost of setting up disposal/recycling processes) and hasten its departure.

But what about LEDs? Lees highlighted their growing role as a replacement for decorative incandescents and reflector halogen products. He also mentioned certain negative factors, such as lack of government understanding of the products or market; the perception that they are similar to other electronic devices so they should be considered as such, and included in WEEE; and that rapid market growth could lead to fears for the impact on the waste stream.

Lees said that the success of LEDs could be their "downfall" in terms of being brought within the scope of the WEEE Directive. "I think this is inevitable at some point," he said. However, the timing will relate to how well the industry can argue that its development should be protected by continued exemption.

last word

Secrets of smart CO_2 reduction

ROY BURTON is CEO of **DIALIGHT**, a leading manufacturer of LED fixtures. In late May, he made a presentation to the Confederation of British Industry (CBI) Scotland.

The UK Government has committed to the ambitious goal of reducing CO_2 emissions in 2010 to 20% below 1990 levels, with a longer-term goal of 60% reduction by around 2050. So how can you reduce CO_2 levels without having a negative impact on your bottom line? LED lighting provides opportunities today for cutting CO_2 while saving energy and saving money.

Lighting is responsible for over 20% of world electricity consumption, most of which is consumed in non-domestic applications. Investors and futurists love to chat about solar, wind and bio-fuels for energy generation. Energy efficiency gets a lot less attention, but the potential for savings is significant. Wholesale adoption of LED lighting could cut world electricity consumption by 10% — that's a lot of CO_2.

London has over 5000 traffic intersections, each one comprising an average of 10 traffic signals, making ~50,000 signals. If London were to convert those to LED lights the resulting saving in electricity alone, assuming a cost of 6 pence per unit, turns out to be almost £1 million, with a consequent reduction in carbon emissions of more than 9.5 million kg. In addition to the obvious environmental benefit, these lights are guaranteed for 5 years and could be expected to last for up to 10 years. Presently, light bulbs in conventional traffic lights are changed every year, so these new lights would avoid up to 8 maintenance visits over their lifetime and would therefore result in further significant savings for the city.

It's time to throw away light bulbs and to think about replacing them with a controllable, directional light source. We can make much bigger energy savings by thinking differently about lighting. Why are lights at industrial installations on 24/7 through the day? Because light bulbs don't like being switched on and off frequently. With LED lighting utilizing proximity switches and intelligent control you can imagine the benefits in terms of reductions in cost, CO_2 emission and lightspill. Why should we light tunnels, or empty car parks, or walkways when there are no vehicles or people present? Street lights, for example, could be dimmed when they're not needed. LEDs switch on instantly, when a person comes into range, and they also provide superior color rendition — important where CCTV is in use or for finding your car in the car park at night.

LEDs are highly suited for a wide range of commercial uses and environments, and it's not just their energy saving potential that makes them attractive. Maintenance is expensive, can be dangerous and causes downtime. All other energy-efficient light sources don't last long — they're too fragile to withstand shock and vibration, and they don't like being switched on and off either. LEDs are inherently safe due to their low voltage operation, so they're highly suited to hazardous environments.

Long lifetime means you save on replacement light fixtures. It also means we don't have to manufacture the same volume of fixtures, so we're saving more energy and CO_2 emissions.

What is happening in the UK? By talking about CFL bulbs we are missing the point. The right technology is already here, but we're not moving to it. Take traffic lights — currently only a small percentage of them in the UK use LEDs, despite the proven efficiencies they deliver, while LED traffic lights are mandatory in many US states. Why not change the existing lights now?

An added bonus is that, under Kyoto, a company switching to LEDs can actually generate revenues from the CO_2 emissions it displaces; this pays for the investment in new light sources. And in Scotland, SMEs can get interest-free loans to improve energy efficiency.

Dialight has begun discussions with CABE, the Commission for Architecture and the Built Environment in the UK, to explore the opportunities of trialling LED lighting in specific urban situations for demonstration purposes. We will also seek to work with urban partners and utilities for these joint demonstration projects currently in the planning stage.

In terms of Capex savings, the US tends to look for a 1.5 year payback, while in the UK it's more like 3.5–4 years with a longer payback period being hard to justify. Potentially, banks could offer leasing packages for LED lighting as the lights can last as long as 10 years if they're not in use 24/7. LED device costs have come down a lot over the last 2 years (and will continue to do so), while the fixture cost is dominant. LED fittings for hazardous locations carry a 30–40% premium, but there's zero maintenance, so payback is achieved easily. Local authorities will accept payback periods that fall within their political term.

Aside from cost, there are other barriers to energy-efficiency investment. There are clearly vested interests in any channel to market, and conventional lighting manufacturers with existing market share have little incentive to reduce CO_2. We have to break though these attitudes. Where there's a strong value proposition people find a way to get the investment; Dialight has seen this in the US and it's now starting in mainland Europe. Adoption of standards can help as it allows you to sell around the existing channel.

While we can't dictate to people which technologies to use, we can put technology on approved lists showing its whole life costs. We should be lobbying government. The UK's Climate Change bill is pushing for 80% CO_2 reduction by 2050. The public sector will get carbon budgets, and that will be a real driver for change.

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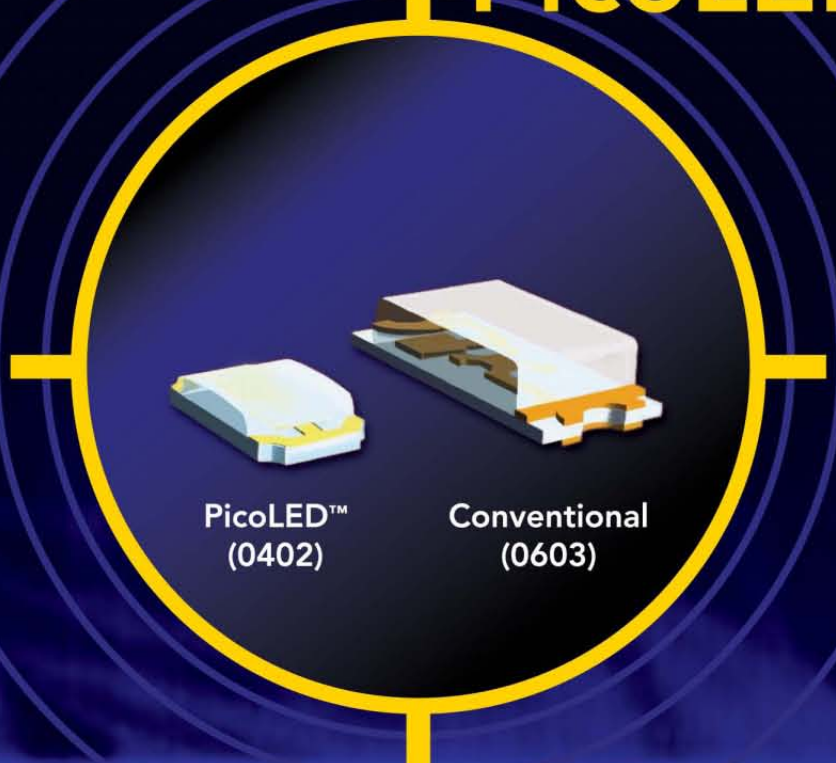

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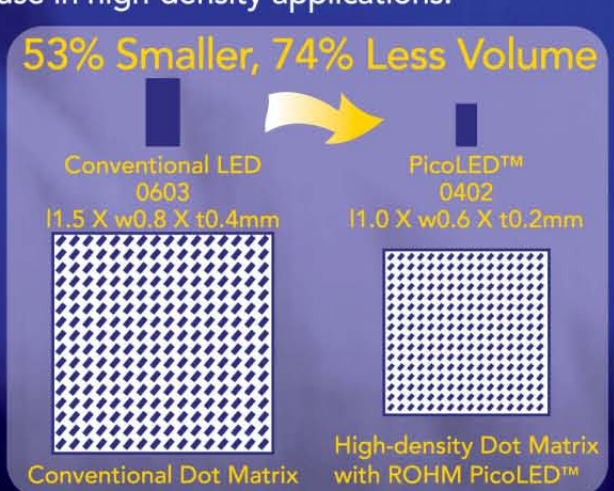

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