What Are Industry Associations Doing to Provide Guidance and Pave the Way for Change?

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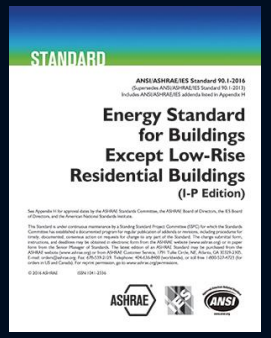
Lighting Standards Development Organizations

- ASHRAE (90.1)
- CEC
- CIE
- IEEE
- IES
- NEMA
- NIST (supports standards development)
- USGBC

ANSI/ASHRAE/IES Standard 90.1 / Eric E. Richman

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?



"The 90.1 subcommittee (LSC) that deals with lighting issues in commercial buildings is connected to IES as a co-sponsor of the 90.1 Standard and through other committees with IES (Energy management) as well as individual IES members on the LSC and representation of IALD on the LSC. This group continuously seeks to modify and improve the lighting sections of the Standard to reflect current practice, new technology, design trends, controls advancements, and lighting quality."

ANSI/ASHRAE/IES Standard 90.1 / Eric E. Richman

2. Which standards have you recently completed or are working on that respond to or provide guidance for connected lighting?

- "90.1-2016 and currently working on 90.1-2019"

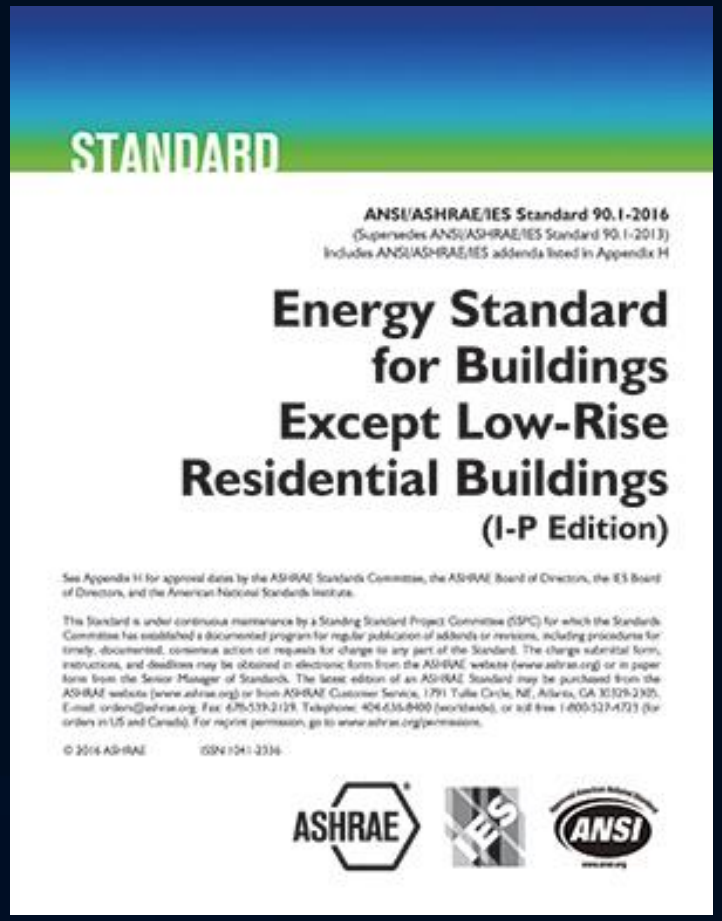
3. Do standards drive lighting industry change or are industry changes driving standards?

- "Both. Standards are based on effective industry practice (and beyond) which drives better quality and efficient design across all parts of the country and all areas of design (contractor design-build to individual unique projects"

ANSI/ASHRAE/IES Standard 90.1 / Eric E. Richman

4. Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?

"none I am aware of"

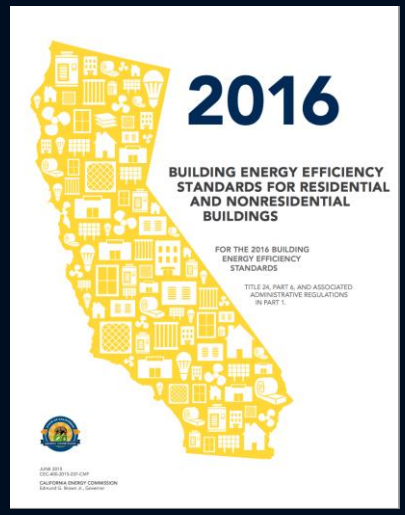


California Energy Commission -Title 24 / Simon Lee

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

The 2019 version of California's Building Energy Efficiency Standards (Title 24) will revise and update indoor and outdoor lighting power, using LED as the baseline.

ASHRAE 90.1 has done this, but the expectation is that Title 24 will be more aggressive.



California Energy Commission -Title 24 / Simon Lee

2. Which standards have you recently completed or are working on that respond to or provide guidance for connected lighting?

- New building and appliance standards were adopted in 2016
- We are working on revisions to align Title 24 with Title 20
- Title 20 is also working with the industry on adaptive lighting.

3. Do standards drive lighting industry change or are industry changes driving standards?

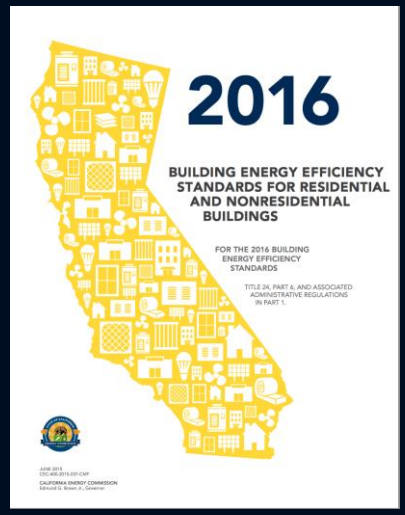
- Neither – we see it as a partnership and a joint effort . By working collaboratively with industry we are able to advance LED efficiency to the next level.
- There are products that are still needed to be developed to meet existing standards.
- We need to ensure critical features are not “value engineered” out.

California Energy Commission -Title 24 / Simon Lee

4. Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?

There is a lack of standards addressing driver compatibility with controls. The lifetime of LEDs in terms of what happens after L70 is also a concern.

How connected lighting will impact our industry and standards is a part of the T24 - 2019 thought process for both interior and exterior applications



International Commission on Illumination
Commission Internationale de l'Eclairage
Internationale Beleuchtungskommission

CIE – Yoshi Ohno

CIE Research Strategy / August 2016

The research topics listed here are those judged by the CIE as needing immediate attention by the research community in support of developments in lighting technology and application. Publications in the peer-reviewed literature on these topics will provide the basis for the next generation of CIE technical reports and standards.

Top Priority Topics

- Recommendations for Healthful Lighting and Non-Visual Effects of Light
- Colour Quality of Light Sources Related to Perception and Preference
- Integrated Glare Metric for Various Lighting Applications
- New Calibration Sources and Illuminants for Photometry, Colorimetry, and Radiometry
- Adaptive, Intelligent and Dynamic Lighting
- Application of New CIE 2006 Colorimetry
- Visual Appearance: Perception, Measurement and Metrics
- Support for Tailored Lighting Recommendations
- Metrology for Advanced Photometric and Radiometric Devices
- Reproduction and Measurement of 3D Objects

http://www.cie.co.at/index.php/Research+Strategy

CIE – Yoshi Ohno

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

Keeping up with the industry prompted the CIE Research Strategy prioritizing areas needing immediate attention and encouraging participation from allied fields, medicine, engineering, information technology and others.

CIE – Yoshi Ohno

2. WHICH STANDARDS HAVE YOU RECENTLY COMPLETED OR ARE WORKING ON THAT RESPOND TO OR PROVIDE GUIDANCE FOR CONNECTED LIGHTING?

- CIE 224 addressing the color fidelity index. The gamut index is being evaluated by TC1-91 and they will publish a report on a study of metrics beyond color fidelity including perception effects/preference. Must be accepted unanimously.

3. DO STANDARDS DRIVE LIGHTING INDUSTRY CHANGE OR ARE INDUSTRY CHANGES DRIVING STANDARDS?

- Both. ANSI C78-377 Chromaticity Specifications identifies a point below black body that may be preferred by people but not in current ANSI boxes. This option could drive more products that customers would prefer.

International Commission on Illumination
Commission Internationale de l'Eclairage
Internationale Beleuchtungskommission

CIE – Yoshi Ohno

4. Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?

The priorities noted in the CIE Research Strategy.

Some issues would especially benefit from cooperation and joint efforts with IES and other organizations such as on the disparate efforts for flicker evaluation and standards. The CIE would like an international flicker format.

Institute of Electrical and Electronics Engineers / Steven Townsend

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

"We recognize that IES is the recognized lighting authority in North America and IEEE generally does not have the expertise to keep up with the changing lighting industry . We have decided to work jointly with IES to create a Recommended Practice for Industrial and Commercial Lighting Systems with the intent of referring the reader to the appropriate IES recommended practices, and only include specific lighting system design recommendations that are not already covered by IES. Document will focus on the aspects of the power system to support a well-designed lighting system and other topics as appropriate."

Institute of Electrical and Electronics Engineers / Steven Townsend

2. Which standards have you recently completed or are working on that respond to or provide guidance for connected lighting?

- "3001.9 Recommended Practice for the Lighting of Industrial and Commercial Facilities"

3. Do standards drive lighting industry change or are industry changes driving standards?

- "It appears to be that both are happening with LED lighting. IES standards are being driven to address the unique aspects of LED lighting and these standards are driving the LED luminaire manufacturers to comply and publish the data required by the standards. From an end user prospective we look towards IES standards to define our benchmarking metrics including expected life and performance."

Institute of Electrical and Electronics Engineers / Steven Townsend

4. **Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?**

"The one area that seems glaring to me is that fact the industry is still promoting and publishing L70 hours for luminaires. The L70 hours are only beneficial when comparing LEDs to obsolete sources like T12 fluorescent and metal halide sources which have similar low lamp lumen depreciation factors. The other aspect of using L70 hours is that it would logically drive the designer to base the lighting design on a light loss factor (LLF) using a lamp lumen depreciation LLD) of 0.7 which would result in a very low LLF. I believe the industry needs to focus on publishing L90 hours (which match T8 and T5 LLDs) which makes facilitates comparisons with energy efficient fluorescent systems and allows a reasonable LLD to be included in the LLF."

Institute of Electrical and Electronics Engineers / Steven Townsend

“At my company we have decided to specify only LED based lighting systems where feasible as the efficiency and cost generally provide a better payback as compared to fluorescent and HID sources. We are also incorporating lighting controls to maximum energy savings and comply to state and federal energy requirements. The one application were we feel that LED luminaires are generally not available are in the burner compartment of air handling units where the luminaire may be near the flames from the burner unit. In this case we are still specifying an incandescent globe and cast aluminum guard type luminaire that has proved to be a reliable choice.”

Illuminating Engineering Society / Brian Liebel

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

The IES is changing rapidly to make more of our Standards ANSI/IES "continuing maintenance" Standards, which allow for more frequent and rapid changes to adapt to newer technologies faster. We are also engaging with more people and organizations to ensure that we are representing wider constituencies and forming broad collaborations to expand the breadth of our Standards.

Illuminating Engineering Society / Brian Liebel

2. Which standards have you recently completed or are working on that respond to or provide guidance for connected lighting?

- RP-28, RP-29, RP-7: New updates that will be ANSI/IES and in continuing maintenance.

3. Do standards drive lighting industry change or are industry changes driving standards?

- The IES Standards are based on consensus of technical committees, and therefore are driven by industry changes. However, IES Standards do play a role in driving change by validating industry changes by virtue of the consensus acceptance of products, strategies and design methods.

Illuminating Engineering Society / Brian Liebel

4. Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?

The evolving revolution of lighting as a means of collecting and disseminating information (IoT) has tremendous ramifications that are yet to be realized. Market "shifts" are becoming more tectonic and difficult to anticipate and keep up with. The key is to maintain and expand contact with the network of involved parties so that we can be better prepared for the changes that will be coming… and they are coming.

National Electrical Manufacturers Association / Karen Willis & Clark Silcox

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

"NEMA and its member companies have endeavored to anticipate and understand as much as possible the issues potentially inhibiting adoption and acceptance of solid state lighting technology that consumers, lighting professionals, and the public might face with the rapid introduction of new products that replace incumbent lighting technologies. We engage with end users, government agencies engaged in research as well as regulatory activity, testing laboratories, and others in the lighting value chain to that end, and we investigate whether standards or other informational material can be developed and/or disseminated to address those issues or provide solutions to possible problems. "

NEMA / Karen Willis & Clark Silcox

2. WHICH STANDARDS HAVE YOU RECENTLY COMPLETED OR ARE WORKING ON THAT RESPOND TO OR PROVIDE GUIDANCE FOR CONNECTED LIGHTING?

"NEMA Standards include NEMA SSL 7A-2015 Phase-Cut Dimming for Solid State Lighting: Basic Compatibility, NEMA 77-2017, Temporal Light Artifacts: Test Methods and Guidance for Acceptance Criteria and upcoming NEMA SSL7B, Phase Cut LED Dimming Performance. White Papers in progress include LSD 55, an industry evaluation and collection of research on short wavelength light, LSD 74- 2016, Considerations of Field LED Driver Replacement , and the upcoming guidance on LED Replacements for Type A lamps.

As Secretariat of 5 ANSI Committees, NEMA is directly involved in the following connected lighting standards for indoor and outdoor lighting:

Proposed C136.48, For Roadway and Area Lighting Equipment—Wireless Networked Lighting Controllers

Proposed C136.50, For Roadway and Area Lighting Equipment—Revenue Grade Energy Measurement within a Locking Type Control Device

Proposed C136.52, For Roadway and Area Lighting Equipment—LED Drivers with Integral Energy Measurement Means

Proposed C136.54, tentatively entitled, Occupancy Sensors For Roadway and Area luminaires

Proposed C137.1, For Lighting Systems—0-10V Dimming Interface for LED Drivers, Fluorescent Ballasts, and Controls

Proposed C137.2, Cybersecurity Requirements for Lighting Systems for Parking Facilities

Proposed C137.3, For Lighting Systems— Minimum Requirements for installation of Energy Efficient Power over Ethernet (PoE) Lighting Systems"

NEMA / Karen Willis & Clark Silcox

3. Do standards drive lighting industry change or are industry changes driving standards?

"Both.

Historically, changes in technology or the marketplace for lighting products have driven standards and standards endeavor to solve issues arising because of those changes. However, as the lighting industry moves to become part of a more connected universe, standards for interconnectivity and interoperability might be expected to drive change to some current practices."

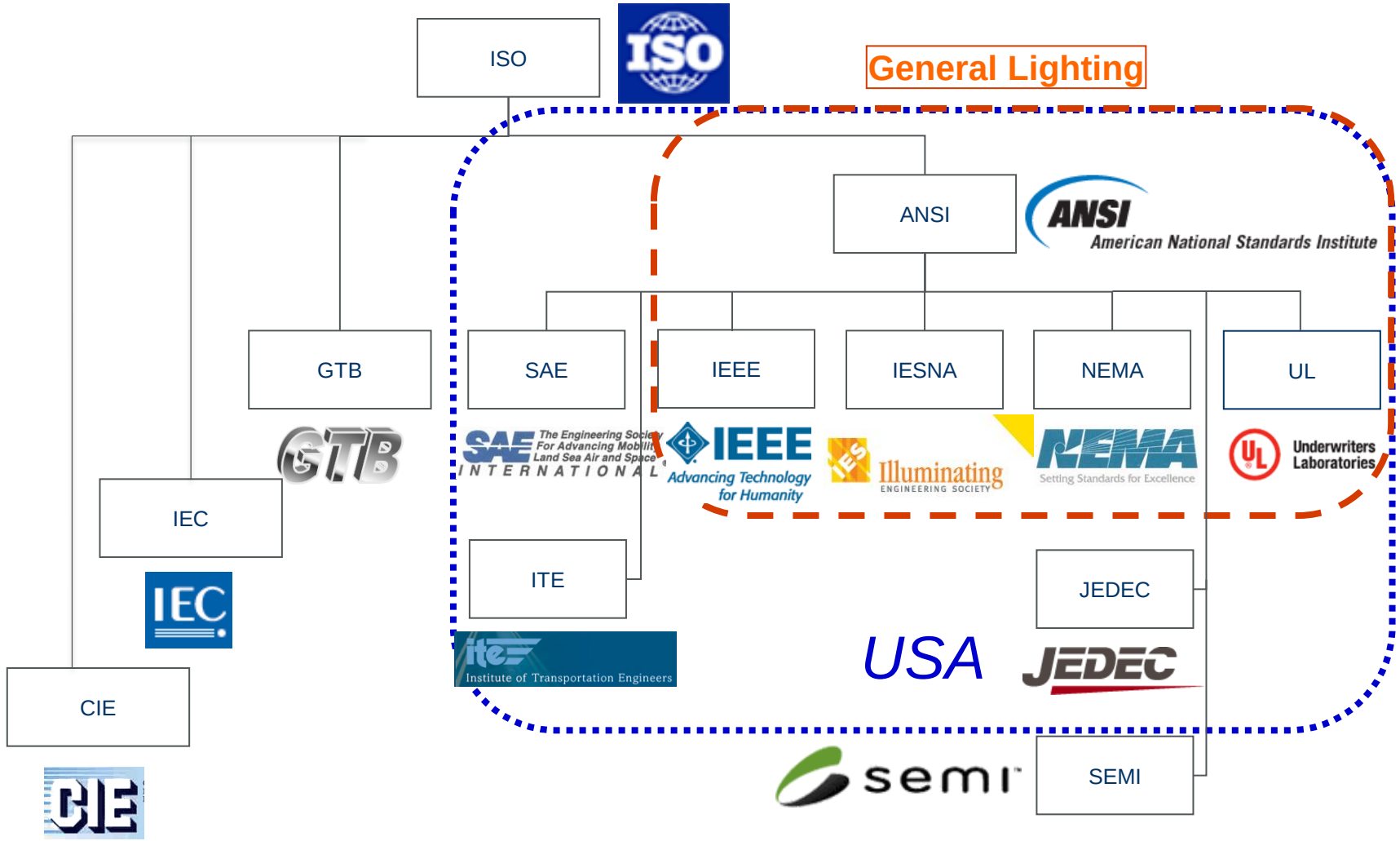
National Institute of Standards and Technology / IES TPC / Cameron C. Miller

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

NIST is not considered a standards developing organization. We work on research and dissemination of scales to support the development of standards. Given that NIST is working on research to improve IES and CIE standards including the effect of impedance on the operation of solid-state lighting products (LM-79 support) and the development of a high accuracy lumen maintenance measurement facility to provide public data in support of LM-80 and TM-21. In support of the implementation of IES standards NIST works with NVLAP (National Voluntary Laboratory Accreditation Program) in training and assessing laboratory to the Energy Efficient Lighting Program. As part of the EELP, NIST conducts Measurement Assurance Programs (MAP or proficiency testing) of testing laboratories. NIST also participates in the International Energy Agency (IEA) Annex 4E on solid-state lighting.

The IES/Testing Procedures Committee is working on many topics (while maintaining documents on older technologies) in the support of the development of solid-state lighting products. The figures I presented at the Lightfair trade show summarize these efforts. Please ask me if you have any specific questions concerning these topics.

Standards Developing Organizations



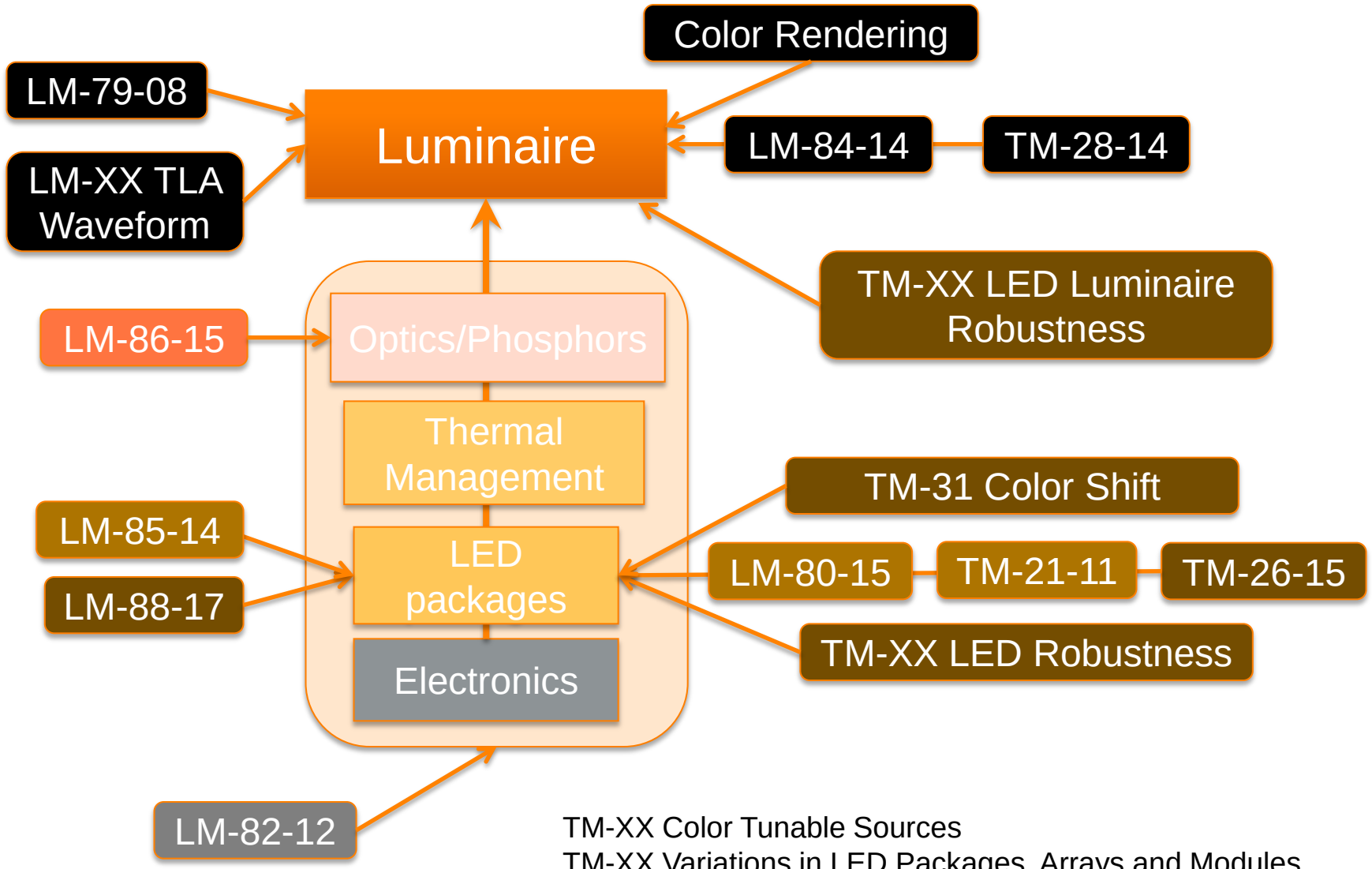
NIST & IES TPC –Cameron C. Miller

2. WHICH STANDARDS HAVE YOU RECENTLY COMPLETED OR ARE WORKING ON THAT RESPOND TO OR PROVIDE GUIDANCE FOR CONNECTED LIGHTING?

NIST -"Nothing yet. There have been discussions at NIST between the Photometry Project which is in the Sensor Science Division or the Physical Measurement Laboratory and the Advanced Communications Laboratory in preparation when industry needs NIST to assist in the development of standards."

"The TPC has discussed connected lighting but have not started standards related to this topic. The TPC feels that the communication between system (if it is not LiFi) may be outside the scope of the TPC, but we are always willing to work on new topics if the industry or IES deems that they are in our scope. We have been communicating with the companies represented within the TPC to ensure we have technical experts when the time comes for this topic."

Solid State Lighting



TM-XX Color Tunable Sources
TM-XX Variations in LED Packages, Arrays and Modules

IES TPC / Cameron C. Miller

3. Do standards drive lighting industry change or are industry changes driving standards?

"Industry changes drive standards. A standard is not required unless a third party wants to compare two items of similar function. The TPC has attempted to respond to inquiries brought to the committee by industry or organizations that need to make these comparisons like regulators."

IES TPC / Cameron C. Miller

4. **Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?**

"Within the TPC we would like to move faster on the topics that have been brought to us. Many times, we are limited by the availability of technical experts (volunteers to this process). Another aspect is the availability of data. A standard cannot be developed without data from measurement processes the industry is currently using. We have tried to collect this data through the use of government representatives that can purge the company association, but many companies are still resistant to releasing potentially proprietary information. "

U.S. Green Building Council / Wes Sullens

1. What is your organization doing to maintain relevance during our rapid lighting industry transformation?

We launched LEED version 4 a few years ago and it included numerous updates to maintain relevance, raise the bar, and streamline the certification and review processes. One of the major themes of LEED v4 was to "focus on performance," and lighting was a good example of that. In the past rating systems, LEED had included prescriptive lighting requirements that were about daylighting and efficiency. But now in v4 there's more about lighting quality as well.

Furthermore, the LEED rating system and WELL have strong connections, so I can see the pathways that WELL encourages for lighting quality and health will make their way into LEED and other leadership standards over time. USGBC is working on WELL equivalencies in LEED, and the lighting credits in LEED v4 are already pretty aligned with some of the WELL strategies. Lighting and the connections to health, cognitive function, and improved performance are the trends we are seeing.

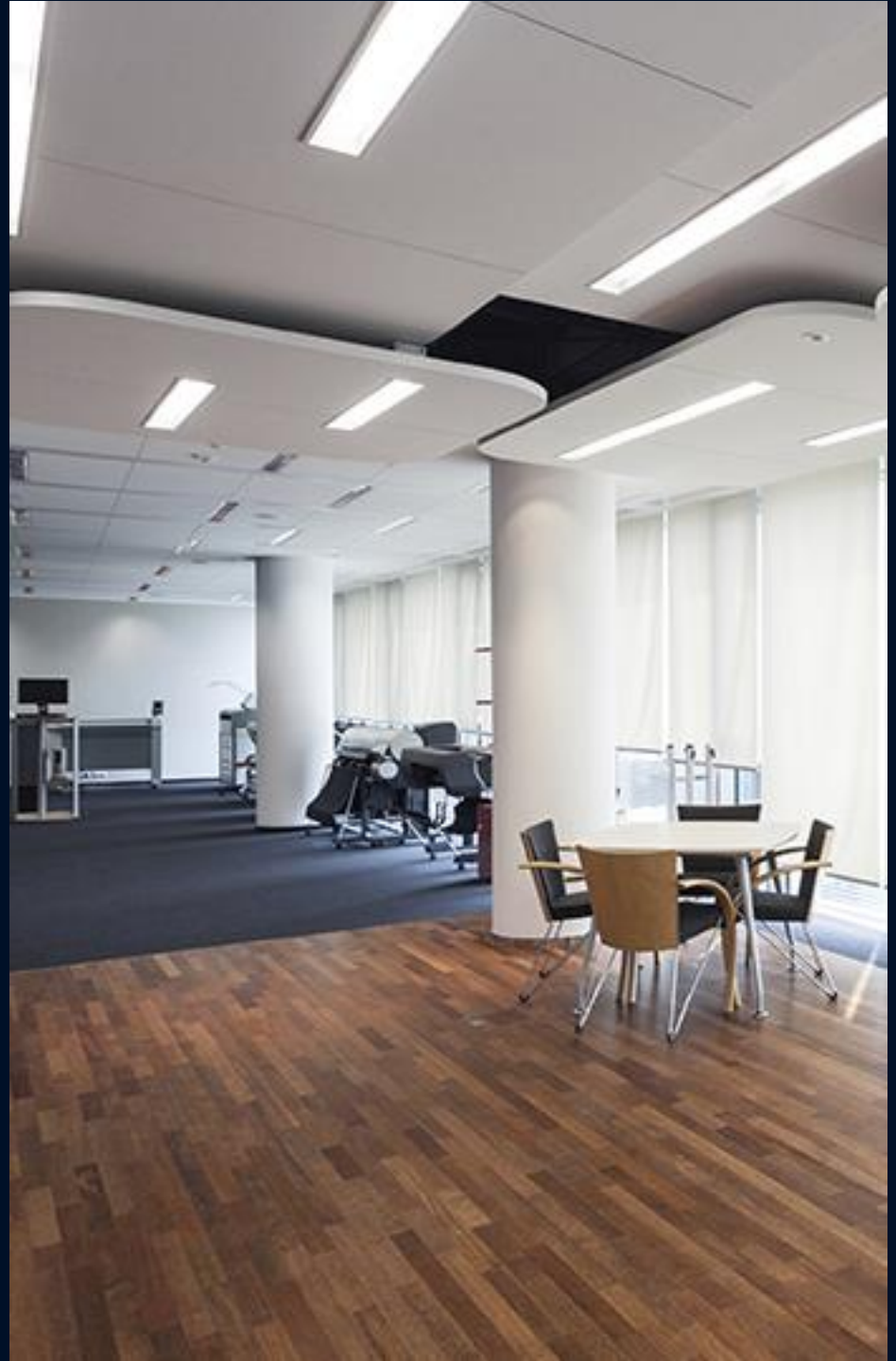
USGBC / Wes Sullens

2. WHICH STANDARDS HAVE YOU RECENTLY COMPLETED OR ARE WORKING ON THAT RESPOND TO OR PROVIDE GUIDANCE FOR CONNECTED LIGHTING?

"Not really applicable - we refer to other standards. I'm not sure if there are standards about lighting quality in terms of circadian lighting, color temperature, etc., but that seems like important areas for refinement in standards. "

3. DO STANDARDS DRIVE LIGHTING INDUSTRY CHANGE OR ARE INDUSTRY CHANGES DRIVING STANDARDS?

"Both. Things like energy efficiency can be driven by standards, but other trends like lighting quality, dimming, color temperature, etc. are driven by consumer choice and studies that find health connections to daylight/lighting. That's the biggest driver now (health/comfort/performance of occupants). "



Indoor Environmental Quality

Interior Lighting

Credit: 1-2 points

Intent: To promote occupants' productivity, comfort, and well-being by providing high-quality lighting.

Option 1: Lighting control

Option 2: Lighting quality

Option 1:

For at least 90% of individual occupant spaces, and for all multi-occupied spaces, provide lighting controls that enable occupants to adjust the lighting to suit their tasks and preferences, with at least three lighting levels or scenes (on, off, midlevel).

USGBC / Wes Sullens

4. Are there areas of our industry that you feel are not being addressed or not keeping pace with market shifts? If so, do you have a recommendation on resolving this?

Energy codes are not necessarily keeping pace with the lighting technology changes. The fact that many lighting systems are now wifi capable is a radical shift that unlocks a lot of potential, but also energy consumption. Further, color changing LEDs may require more energy under some conditions, but they could represent health benefits that are far beyond the incremental energy penalty. This dimension of health/energy/quality is not necessarily reflected in codes today because they are still focused on LPDs and efficacy of lamps, and don't take into consideration the other benefits of quality lighting.

WORLD ECONOMIC FORUM

Agenda Initiatives Reports Events About

30 May 2017

Jaideep Bansal
Energy Access Leader, Global Himalayan Expedition

1.1 billion people still lack access to electricity, how can we bring energy to all?

According to the World Bank, over 1.1 billion people have no access to electricity, and a billion more only have intermittent access. These people rely on costly, outdated technologies that are harmful to their health, and hinder their opportunities for social and economic advancement.

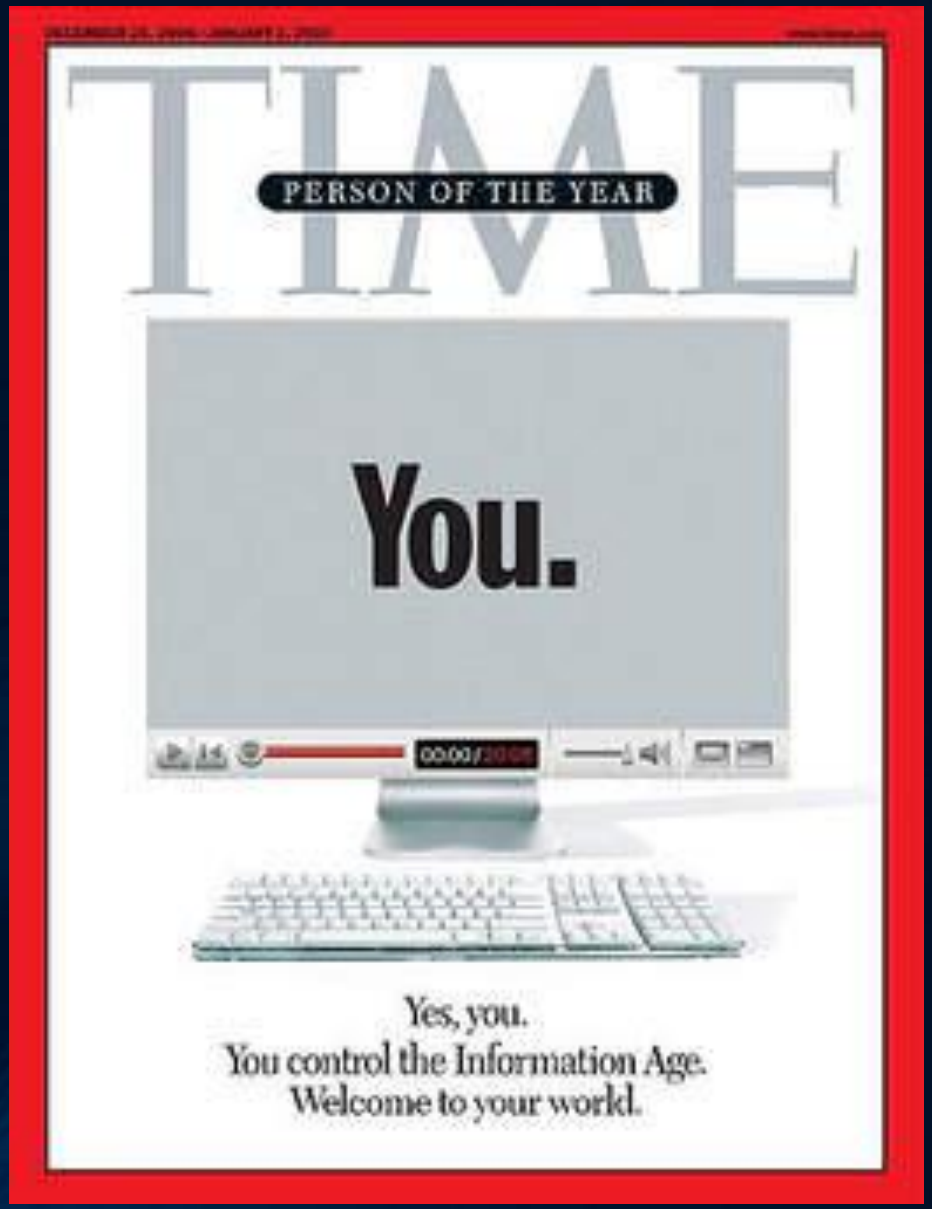
The people resort to kerosene lamps, candles, and smoky, inefficient cookstoves, which cause more health damage and environmental damage.

https://www.weforum.org/agenda/2017/05/while-people-live-without-electricity-how-can-we-bring-energy-to-all?utm_content=buffer82853&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

What will ultimately make the difference in how relevant our industry, organizations and standards are is…

YOU

Get Involved



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