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Philips Lighting Comments on draft CASE Report NR Indoor Light Sources

Additional submitted attachment is included below.

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July 23, 2017

Submitted via website: https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=17-BSTD-01

Mr. Andrew McAllister
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Docket No.: 17BSTD-01

Philips Lighting Comments on the Draft CASE Report (June 2017) Light Sources/LPDs for the 2019 California Building Energy Efficiency Standards, California Code of Regulations, Title 24, Part 6

Dear Commissioner McAllister,

Philips Lighting appreciates the opportunity to provide the attached comments on the Draft CASE Reports of June 2017 for the Nonresidential Lighting provisions of the 2019 California Building Energy Efficiency Standards California Code of Regulations, Title 24, Part 6. We also send our thanks to the California Energy Commission and recognize the CEC's efforts as well as that of the CA IOUs and consultants to involve industry in the development of the CASE Reports.

Philips Lighting is a global leader in lighting products, systems and services. Our understanding of how lighting positively affects people coupled with our deep technological know-how enable us to deliver digital lighting innovations that unlock new business value, deliver rich user experiences and help to improve lives. Serving professional and consumer markets, we sell more energy efficient LED lighting than any other company. We lead the industry in connected lighting systems and services, leveraging the Internet of Things to take light beyond illumination and transform homes, buildings, and urban spaces.

Please contact me if you have any questions about these comments.

Sincerely,

Kelly M. Seeger, MSc, LC, LEED AP
Technical Policy Manager, Building Codes & Standards
Standards and Regulations - Americas
Philips Lighting
Tel: +1 (781) 825-3312
email: kelly.seeger@philips.com

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Philips Lighting Comments on the Draft CASE Report (June 2017) Light Sources / LPDs for the 2019 California Building Energy Efficiency Standards, California Code of Regulations, Title 24, Part 6

General Comments

We believe that the lighting power density (LPD) values proposed in this draft CASE report go beyond that of a traditional update since a new methodology is being used. We believe that further stakeholder input and applications research into variable CCT systems should be explored.

The authors of the draft CASE Report note that the proposed LPD revisions are '*similar to the recent revisions to ASHRAE 90.1-2016 … that also aims to replace incumbent lighting technology with LEDs*[1]'. We respectfully disagree that the proposed lighting power density revisions on the whole are similar in scope to those being considered for ANSI/ASHRAE/IES 90.1 -2016. The LPDs in 90.1-2016 are on average 25% lower than those in the ANSI/ASHRAE/IES 90.1-2013 Standard and will likely remain somewhat higher than most proposed in this draft CASE Report.

While it is true that the excel models used to set the lighting power allowance limits in ANSI/ASHRAE/IES 90.1 -2016 are becoming more LED-based, we believe it is unlikely that the 2019 version of the Standard will feature a 100% LED baseline. We believe the intent is to consider lighting design practice and application of the code across the country as well as to consider future developments in technology and design, and then to review the current LPD models and make updates as appropriate. The baseline for Standard 90.1 – 2016 is approximately 60% LED.

ANSI/ASHRAE/IES Standard 90.1 is the model energy code for commercial buildings in the U.S. As a minimum code, it is not reasonable to compare its LPDs to those in Title 24 Part 6. There are also differences in the consideration of technologies, the inputs to the models, and the baseline assumptions to consider when comparing Standard 90.1 with Title 24 Part 6.

Section 100.1 Definitions and Rules of Construction

We applaud the CEC's and the Statewide CASE Team's efforts to align the language in Title 24 Part 6 to national standards such as ANSI/ASHRAE/IES 90.1-2016 and recommend that the definitions also be aligned with national standards. We propose that the CEC adopt ANSI's definition of electronic driver as the definition of solid state lighting driver:

"Devices that use semiconductors to control and supply dc power for LED starting and operation. The drivers operate from multiple supply sources of 600 V maximum at a frequency of 50 or 60 hertz[2]."

Section 110.9 Mandatory Requirements for Lighting Control Devices and Systems, Ballasts, and Luminaires

We support the removal of the requirements for current limiters and agree that it is no longer necessary to include them in the code.

Section 130.0 Lighting Systems and Equipment, and Electrical Power Distribution Systems

[1] Draft CASE Report, pg. 3
[2] ANSI C82.SSL1-2010, Section 1.1

We appreciate the Statewide CASE Team's proposed language improvements and clarifications within this section and applaud the use of industry-recognized Standards-based measurements. We support the proposed changes to the requirements below and believe they will simplify both interpretation of the code and code compliance.

- Removing the requirements for current limiters,
- Allowing the use of screw-based LED lamps in nonresidential spaces, and
- Removing the 50-watt per line-voltage socket rating for recessed luminaires and instead allowing the wattage to be counted as the maximum input watts or the maximum input Volt-Amp rating of the luminaire or solid state lighting device as specified by UL 1598, UL 2108, UL 8750, or LM-79.

Section 140.6(c)2.A

We strongly support the inclusion of language that permits the user to select a reasonably equivalent type if the primary function area type is not listed in Table 140.6-C when determining the lighting power allowance for an indoor space. We commend the alignment of this language with ANSI/ASHRAE/IES 90.1-2016, as it will make the determination of indoor lighting power allowances easier for all users of the code.

Efficacy and Variable CCT Systems

We do expect that tunable white systems are likely to be readily available in the market in 2020.

However, because the market is in a very early stage of development now on these systems, we urge the CEC and the Statewide CASE Team to delay setting rigorous requirements for the 2019 Building Energy Efficiency Standards. Instead, we suggest increased focus on further research to broaden knowledge and understanding of tunable white systems and their application within indoor environments from hospitals and healthcare facilities to retail and hospitality spaces to offices. We urge caution in establishing requirements and setting lighting power density values that may be too low to accommodate yet-to-be-released tunable white systems.

We agree that variable CCT systems could potentially result in lower luminaire efficacy relative to fixed CCT systems. Typically, board efficacy is highest for single channel LED systems, while efficacy decreases with additional channels. To illustrate the issues with luminaire efficacy and multichannel LED systems, we have included three graphs and descriptions.

Following are graphs showing the performance of three existing Philips Lighting products. The first two graphs show efficacy data for static LED (fixed CCT) luminaires, while the third graph shows efficacy for a tunable white (variable CCT) luminaire.

Figure 1 shows luminaire efficacy for a single channel static LED platform at three different CCTs (3000K, 3500K, and 4000K) and two lumen output (3600 lm, 4400 lm) packages. The data in this graph is for one LED board and measured at six discrete points.

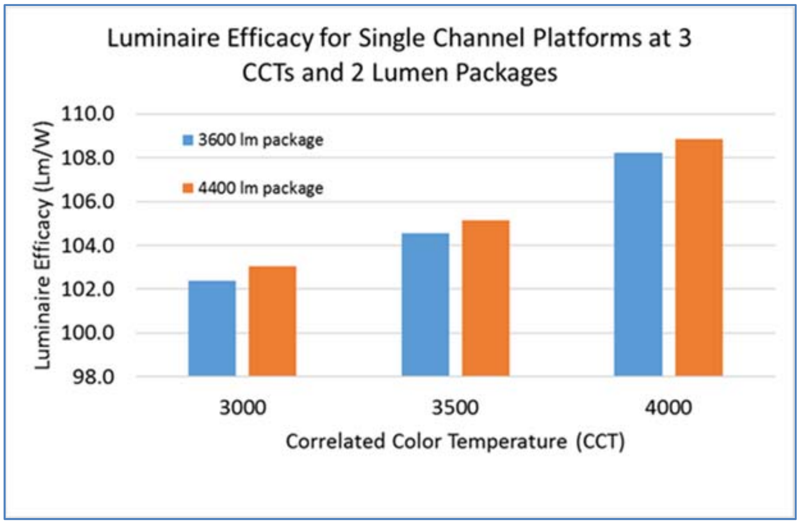

Figure 1

Figure 2 shows luminaire efficacy for a different single channel static LED platform at three CCTs (3000K, 3500K, and 4000K) and three lumen (1500 lm, 2200 lm, 3000 lm) packages. The data in this graph is for one LED board and measured at nine discrete points.

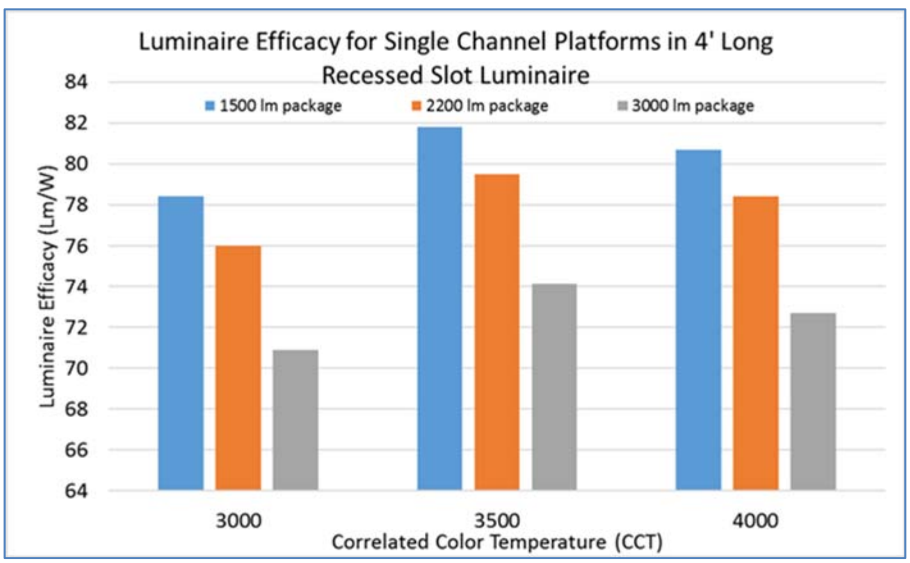

Figure 2

Both of these graphs show efficacy data for static LED (fixed CCT) luminaires, while the third graph shows efficacy for a tunable (variable CCT) luminaire. The relationship between luminaire efficacy and light output is predictive and depending on the design of the system efficacy, either increases or decreases with light output for single channel LED systems.

Figure 3 below shows luminaire efficacy for a two channel tunable white LED platform. The measured data and the line connecting the data points show the expected trend for luminaire efficacy for this particular tunable white luminaire when light output is held constant at 5000 lm.

Examining the trend line clearly indicates that the luminaire efficacy does not follow a predictable pattern. From the measured data, we also know that the relationships between efficacy, light output, power, and color are also not constant in a variable CCT system.

As a result, it is not possible to make assumptions about luminaire efficacy for multi-channel LED systems without knowing the details of the electrical circuitry and board design, and the number of channels at a minimum.

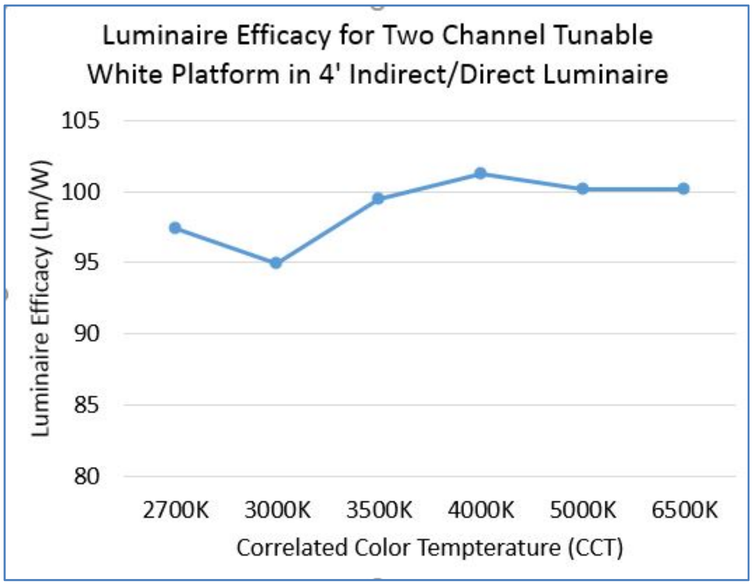

Figure 3

Based on this knowledge, we urge the Statewide CASE Team and the CEC to do further research into multichannel LED systems and caution the setting of requirements that may be too stringent or lighting power density values that may be too low to accommodate yet-to-be-released tunable white systems. We agree that variable CCT systems could potentially result in a lower efficacy because efficacy is not intuitive nor predictable in a multi-channel LED system.

Proposed Lighting Power Density Limits and Variable CCT Systems

The Draft CASE Report states "*the proposed LPDs for all space/area types were assumed to be met using LEDs. Models for hospitality, museums, liturgical, some retail, dining, and some specialized office spaces include options for LEDs employing dim-to-warm and color tuning technologies*"[3].

We believe that healthcare facilities and hospitals should be included among the application categories and space types whose models include options for LEDs employing spectral tuning strategies[4] [5]. There is no doubt that patients, caregivers, and visitors in hospital care applications may benefit from these

[3] Draft CASE Report, pg. 13

[4] See Legacy Health and Pacific Northwest Laboratory's Webinar: "Nurses' Perspective on Hospital Patient Room Lighting" which discusses the major considerations when designing the next generation of patient room lighting systems.

[5] See GATEWAY Demonstration Project: "Tuning the Light in Senior Care", https://energy.gov/sites/prod/files/2016/09/f33/2016_gateway-acc.pdf

dynamic systems and the non-visual benefits of lighting, and should be taken into consideration when developing realistic LPDs.

In reviewing *Table 14: Proposed Table 140.6-C Area Category Method – Lighting Power Density Values (watts/square foot)*[6] of the draft CASE Report, we have concerns regarding the proposed LPD of 0.55 watts/square foot for the patient room, which is expected to be the primary location for the installation of spectrally tuned lighting systems for circadian support and wellbeing.

Proposed Lighting Power Density Values for Healthcare Facility (Hospital) Spaces

Healthcare Facility (Hospital)	Exam/treatment room	1.15	See exception for specialized medical lighting [14]
	Imaging room	1.00	
	Medical supply room	0.55	
	Nursery	0.95	
	Nurse's station	0.75	
	Operating room	1.90	
	Patient room	0.55	
	Physical therapy room	0.85	
	Recovery room	0.90	

We believe that this low LPD threshold for the patient room is premature given the fact that spectrally tuned lighting systems are presently in a very early stage of development. Over the next several years, these systems will develop more fully and become commercialized, and will continue to undergo refinement. Any new technological innovation that offers increased energy savings and efficiency, while addressing occupant needs, should be afforded sufficient time for development and refinement in the marketplace prior to strict limits being set.

Furthermore, the specification of a static LPD of 0.55 watts/square foot in a patient room, that in 2020 is likely to have a dynamic lighting system installed, is problematic. At this point, an in-use maximum energy consumption limit such as watts/square foot will no longer be the correct and appropriate metric to measure the energy consumption of an intelligent lighting system. This is because the energy usage will fluctuate during a 24-hour period depending on the functionality the system is providing at any given time in a continuous, dynamic, adaptive way.

To bridge the gap between in-use energy consumption metrics like LPD and an outcome-based building energy use metric such as energy use index (EUI), we encourage the CEC and the Statewide CASE Team to consider the development and adoption of average room-level LPD thresholds for Title 24 Part 6 2019. As an example, in a patient room, the in-use LPD would not exceed an average of xx watts/square foot over the course of a 24-hr period. This would enable the design team to implement variable CCT and color systems that vary power, intensity, and CCT by time of day, and still ensure that energy usage is kept to an average consumption level. We recognize that new simulations would need to be developed as little data exists to create a series of average LPDs from and would be willing to support the CEC and assist in creating this data set.

Thank you for your consideration of Philips Lighting Comments on the Draft CASE Report Light Sources for the 2019 California Building Energy Efficiency Standards, California Code of Regulations, Title 24, Part 6.

[6] Draft CASE Report, pg. 46