PHILIPS

Mr. Andrew McAllister
Commissioner
California Energy Commission
Dockets Office, MS-4
Re: Docket No. 14-BTSD-01
1516 Ninth Street
Sacramento, CA 95814-5512

Philips Lighting Comments on Staff Workshop on Proposed Lighting Efficiency Measures for Residential and Nonresidential Buildings

Date: 2014-06-25

Dear Commissioner McAllister,

Philips Lighting appreciates the opportunity to provide the attached comments on the California Energy Commission Proposed Lighting Efficiency Measures for Residential and Nonresidential Buildings.

As you may know, Philips North America is headquartered in Andover, Massachusetts. The U.S. Philips companies are affiliates of the Netherlands-based Royal Philips N.V., a diversified health and well-being company, focused on improving people's lives through meaningful innovations. Our long history in North America began in 1933, and today, it is the company's largest single market in the world, with approximately 22,000 employees and operations at 55 major facilities in 25 states and across 3 Canadian provinces. Sales for the region in 2013 was more than $9.5 billion*, which accounts for more than 30% of Philips global revenue.

Philips is a diversified technology company, focused on improving people's lives through meaningful innovation in the areas of Healthcare, Consumer Lifestyle and

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Lighting. Innovation has been a cornerstone of the company's strategy for over 120 years, creating a strong and trusted Philips brand with market access all over the world. Philips is a leader in cardiac care, acute care and home healthcare, energy efficient lighting solutions and new lighting applications, as well as male shaving/grooming and oral healthcare. Philips lights 65% of the world's top airports, 30% of offices and hospitals and landmarks such as the Empire State Building, the Sydney Opera House, the New Year's Eve Times Square Ball and the Great Pyramids. Philips owns more than 64,000 patent rights, is one of the world's top-50 most valuable brands, one of the world's top-50 most innovative companies, and ranked as one of the Best Global Green Brands by Interbrand.

Please find our detailed comments below. We look forward to working with you further on this important effort. If you have any questions on these comments, please contact me.

Sincerely,

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Below are Philips' comments and recommendations regarding the development of the 2016 Title 24 Standards. We are submitting comments for the following:

1) Topics discussed at the June 24, 2014 Staff Workshop
   A. Nonresidential Lighting Controls: Partial-On Occupancy Sensors
   B. Outdoor Lighting Controls (including bi-level controls)
   C. Color Rendering Index
   D. Recessed Downlights only luminaire type not allowed to use JA-8 compliant screw base lamps
2) Additional topics not specifically on the June 24 agenda
   E. TLED Replacements
   F. Add provisions for "intelligent luminaire" functionality in open offices
   G. Clarify Demand Response Requirements
   H. LPD's with LED technologies and lighting control requirements
   I. Alterations vs Luminaire Mods in Place

Item A. Nonresidential Lighting Controls: Partial-on Occupancy Sensors (Agenda Item 3)

Proposal

Add provisions to Section 130.1(c)5 whereby a Partial-On Occupant Sensor would have the automatic on level set between 50-70 percent of full rated power.

Philips Comment

Philips disagrees with the proposal to set a minimum automatic on level to 50%. This limits the amount of energy savings possible with today's control technologies. We propose to only set a maximum limit for the partial-on function, or, if a minimum is deemed necessary, then we propose to change this minimum limit to 10%. (We refer to the September 27, 2013 PG & E report for the Ace Hardware LED High-Bay Lighting and Controls Project, by Mutmansky and Berkland, which demonstrates the savings possible with occupancy sensors.)

Recommendation

Language to Read: Partial-On Occupant Sensor would have the automatic-on level set to no more than 70% of full rated power, OR, Partial-On Occupant Sensor would have the automatic-on level set to between 10 and 70%

Item B. Outdoor Lighting Controls (including bi-level controls) (Agenda Item 5)

Proposal

Reduce the wattage threshold for pole and non-pole mounted fixtures from their current levels of 75 watts and 30 watts respectively. Current proposal proposes that ALL luminaires mounted 24 feet and lower be controlled with automatic lighting controls.

Philips Comment

The size and form factor of these lower wattage products poses a significant challenge when attempting to integrate controls from a manufacturing perspective. These particular wattages are already small in scale and size and hence the available room to integrate the subject technology becomes difficult or impossible based on available technology. Philips further maintains that the cost burden to implement such control systems on already low wattage, typically smaller and many times lower cost products, undermines goals to reduce cost of ownership, specifically if one would attempt to include controls on very low cost commodity products. Depending on the type of technology required, the control solution for a low wattage product may match or exceed the cost of the product itself.

Recommendation

Keep current exceptions in place.

Item C. Color Rendering Index

Proposal

Simplify the Residential Code Requirements

Philips Comment

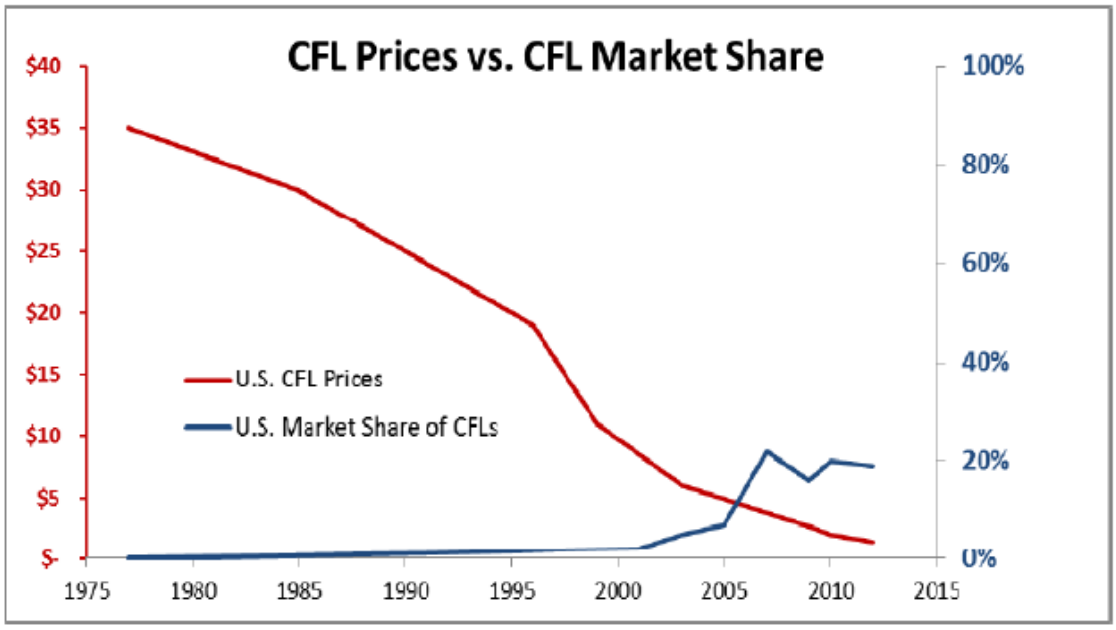
As you may be aware, Philips has been and continues to be a major advocate for energy savings. Philips is recognized as a major advocate of energy savings and initiated the lamp portion of the Energy Independence and Security Act of 2007 and worked very closely with California on AB1109. In that regard, we believe our objectives are aligned. We would like to see market adoption of SSL technology occur as quickly as possible just like California due to the energy saving potential. But how we get there is where we differ. In the presentation that was given during the workshop on June 24, 2014, it was noted that 79% of residential lighting remains incandescent and that adoption of high efficacy lighting in California is still low.

During the presentation, it was noted there are several barriers to high efficacy lighting. These included quality of high efficacy sources, limited sources,

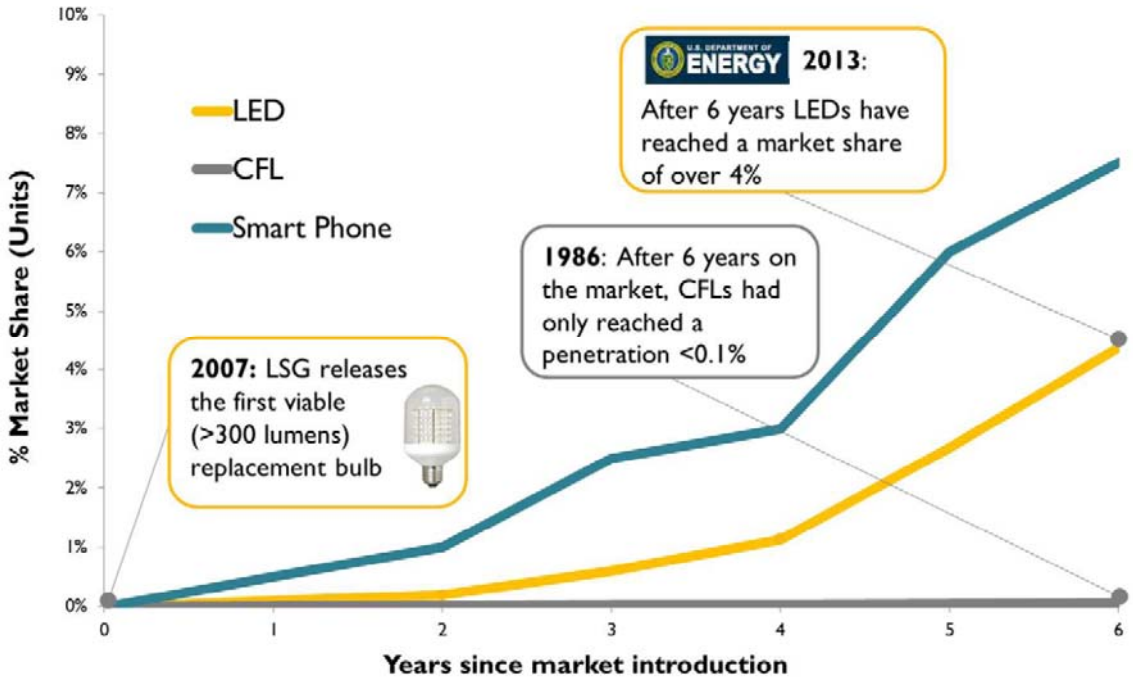
unfamiliar sources and higher costs. But the comment regarding quality of high efficacy sources only pertained to CFL's. There was no data presented that showed a concern with the quality of light for LED fixtures even though the majority of them today are less than 90 CRI.

It is also noted that one of the barriers to high efficacy sources is the higher costs. Yet, the proposed standard for higher CRI and higher power factor only increases the cost further. The argument against the higher price is that the prices will come down and the differential is decreasing. But the differential will always exist and will maintain slower adoption of the technology as a result.

The presentation would also lead one to believe that the lighting industry is converting to high quality, high efficacy light sources anyway. The industry has always noted the need for higher CRI in particular applications such as retail where it might make a difference in choosing particular products for purchase to be able to differentiate minute differences in color or clarity. So, yes, new products have been coming to market to meet the needs of those applications. But typically there is a premium price associated with those applications. Furthermore, it does not mean that level of performance is needed in all applications either. Why would one have to have that level of performance to read a book or walk down a hallway?



Now, just to show that comparing LEDs to CFLs may not be appropriate, a chart was given in the presentation that showed what happened to the market penetration of CFLs over time and the corresponding price. It would lead one to believe that price alone may not drive penetration and that may have been true for CFLs due to all the other problems associated with CFLs such as color quality, startup time, dimmability, etc. But this is far from the case for LEDs as demonstrated in the following chart:



Theme	Specific Concerns
Compatibility	CFLs don't fit in existing sockets, and are not compatible with existing sockets with dimmers.
Light Quality	CFLs have poor light levels and harsh, cold, or "unfriendly" light. CFLs provide inconsistent light color. Consumers experience headaches under fluorescent lighting.
Performance	CFLs don't live up to their long life claims; early failure. CFLs buzz, hum, or flicker. CFLs have a delayed start and a slow run up time (to full brightness).

Although CFLs have come a long way over the years and the Energy Star approved products do not exhibit many of the problems cited, consumers have a long memory and still associate these problems with CFLs. Fortunately, LEDs don't have that bad rap and the DOE has strived to make sure it doesn't happen through such efforts as the Lighting Facts Label, CALiPER and Gateway. Even so, unless California or nationally, a minimum standard is adopted, there is nothing to prevent low performing LED products from entering the market and developing a poor image for LED products. NEMA developed SSL-4 as a potential minimum standard to address this situation and it has been adopted by Mexico and Canada.

The next point that was made is very concerning. It points out that consistently, light quality is a major determinant for light fixture installations. What is alarming is the title of the slide is Consumer Preference and Color Quality. But color quality is only a part of light quality. According to the IES, IALD and ALA. The standard for lighting quality is:

- Comfortable, with Americans having the ability to live and work in spaces that provide required levels of visual comfort, lighting intensity and color quality; and

- Energy efficient, reducing operating costs while reducing consumption of natural resources and output of carbon emissions

The point is lighting quality is a whole lot more than just color quality so the chart places an over importance on just color quality which is very misleading.

Consumer Preference and Color Quality

McKinsey & Company. *Lighting the Way: Perspectives on the Global Lighting Market*. July 2011

Decision criteria for fixture installation in new buildings/structures

What are the most important criteria when deciding on the type of light source technology in a new fixture installation?
Percent; No. of respondents[1] who selected this response as their 1st decision criterion

	Residential N = 338	Office N = 399	Industrial N = 261	Shop N = 259	Hospitality N = 127	Outdoor N = 232	Architectural N = 235
Lifetime of light source	9	12	16	8	14	12	9
Purchasing price of light source	22	11	17	10	9	14	9
Fixture design affected by light source[2]	10	10	8	19	14	5	20
Shape of light source	10	7	5	6	6	11	7
Light quality[3]	20	30	23	30	25	21	26
Light controllability[4]	8	9	8	7	16	6	12
Life cycle cost/ energy efficiency	14	14	17	15	13	21	12
Easy installation	8	8	5	5	2	10	5
Other	0	0	1	0	0	0	0
Total	100%	100%	100%	100%	100%	100%	100%

1 1 respondent could answer up to 3 applications in the survey
2 Incl. design flexibility
3 CRI, color temperature, color consistency, and light distribution
4 Dimmability, color controllability, etc.

- International survey based on over 650 lighting professionals
- Over 1,000 lighting product consumers
- Light quality is ranked high on lighting selection criteria, in all sectors

[1] Lighting Research Center, Increasing Market Acceptance of Compact Fluorescent Lamps (U.S. Environmental Protection Agency, September 30, 2003), http://www.lrc.rpi.edu/programs/lightingTransformation/colorRoundTable/pdf/MarketAcceptanceOfCFLsFinal.pdf.

In the Southern California Edison LED Trial Study that was cited, again it was noted that the LED market is very price sensitive. Unfortunately, the slide is also used to potentially confuse. It states, “Participants in the in-home trial conveyed a number of dissatisfying aspects of LED products once installed in their homes, some of which were light quality issues.” You are left to believe that people are dissatisfied with the CRI but that may not be the case. It may simply be they bought a 60W equivalent lamp when they needed a 75W. Again, let’s not confuse lighting quality with just color rendering.

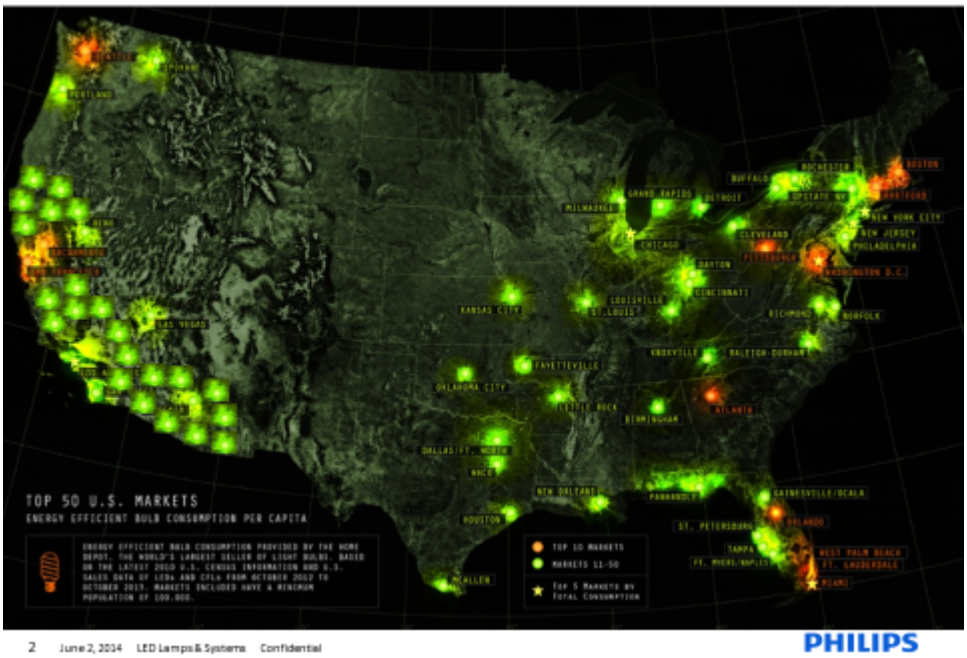
The next point in the study is huge. “The goal of influencing consumers to purchase existing ambient LED products can dominate the vision of the industry. Perhaps an equally desirable goal would be to prevent consumer dissatisfaction with ambient LED products once installed.” In other words, let’s make sure we have the right products in the right applications at the right price. Let’s not over specify or mislead.

And the next point was also extremely important. “It could do harm to the reputation of LED technology to compromise the drive toward higher quality and efficacies. That high pursuit has promise to achieve greater long term market penetration, rather than the short-lived profits of products at lower prices and quality.” We agree that high quality is extremely important as well as the efficacy. So why are we sacrificing efficacy at the expense of color rendering index when there is no data that supports a CRI of 90 is any better than a CRI of 80 for most applications?

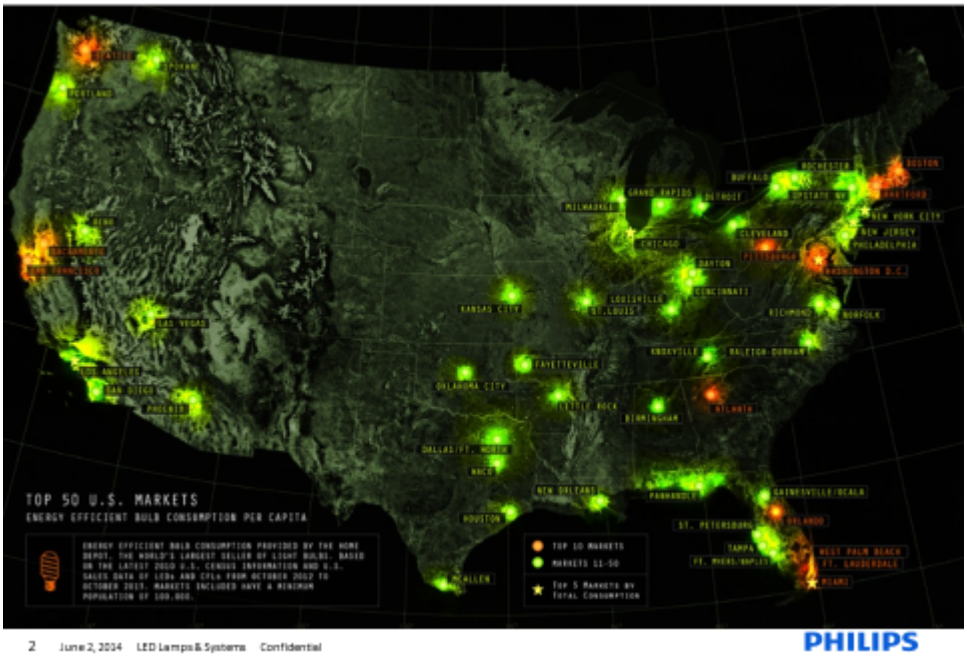
The cited Penn State study was also very interesting. To fully understand the study you need to look at how it was performed. Objects were compared under 2 different light sources with CRI of 97 and 84 and asked which one they preferred. Of course, the preference was the higher CRI. If they were asked which one would be acceptable to them with differing prices and efficacy, the results would have been substantially different. The study is the same as asking consumers to compare a Cadillac to a Chevrolet. The majority would prefer the Cadillac but if they were asked which one they would most likely buy, the answer would be the Chevrolet. California needs to ask itself if it wants to lag the country in market adoption of the LED technology based on this scenario.

In fact, California already is lagging the rest of the country in market adoption of LEDs. This is shown in the following charts.

Home Depot Sales Information – What we wish it was



Home Depot Sales Information – What it really is



The first slide shows equal adoption rates across the country. The second slide shows reality. As can easily be seen, California is significantly lagging the rest of the country in adoption of LED lamps.

The power factor requirement of greater than .9 is also a concern. First, there was no data presented that justified this requirement. Second, power factor is a determination of imaginary power versus real power. But it is more complicated than that. As it turns out, there is positive and negative imaginery power depending on the source, whether it is caused by a capacitor or inductor. Most LED drivers have capacitors in the input whereas motors in compressors or fans are inductive. They, essentially, can cancel each other out. By reducing the capacitive loads we are reducing the ability to offset the inductive loads and the power line disturbances can actually increase. Also, data needs to be developed or provided to substantiate that outside of a building or home a power factor issue actually exists. Power factor correction increases the cost of drivers and lamps while reducing the efficacy since there are some losses associated with them.

Another concern exists with dictating a color temperature of less the 3000 Kelvin. Multiple studies have shown that color temperature preference is influenced by cultural heritage. Some continents prefer higher color temperatures while others prefer lower. By specify a preference, California is showing a bias which may by problematic for some cultures.

Another point that was made during the presentation was the R9 values have been increasing but there was not data presented to support this argument. Is this truly an industry trend?

The bottom line, all of our experience has shown that a CRI greater than 80 meets the majority of the market needs while providing a cost effective, efficacious product. We also believe a power factor of .7 for most applications is more than satisfactory, especially in consumer applications when the power usage is lower.

Philips Recommendation
Set the CRI minimum at 80, same as Energy Star.

Item D. Recessed Downlights only luminaire type not allowed to use JA-8 compliant screw base lamps

Proposal

JA8 dedicated luminaire, or use quick-connect or Zhaga base

Philips Comment
Medium base LED downlights have recently come to market that are very cost effective versus traditional lamps for those applications. Maintaining the existing requirements in California that precludes screw in sockets for downlights will further hamper the adoption of energy efficient LED lamps.

Recommendation
Allow LED lamps designed for downlights that meet Energy Star requirements to be used.

Item E. Provisions and requirements for TLEDs in Title 24 non-residential section

Proposal
We urge the CEC to maintain the current understanding that installation of Type A TLEDs is not considered a Luminaire Modification-in-Place and, as such, are not covered by the lighting requirements of Title 24 2013, and will not be covered by 2016.

Philips Comment
We have noticed that there is considerable confusion regarding tubular LED (TLED) products and their applicability to the requirements of Title 24 Part 6, which we believe stems in part from a lack of clarity in the standard regarding the different types of TLED devices, and how they are installed in luminaires. In particular, we are concerned with the treatment of HF TLEDs, defined by UL at a “Type A” TLED, which requires no modification of the luminaire and is a simple swap out of a fluorescent for a TLED. We propose that the CEC adopt the UL TLED terminology and definitions in the Standard, so that a common, industry definition is used and applied. Underwriters Laboratories (UL) has categorized TLEDs into three Types (A, B, and C), in their standard (UL 1993 “Self-Ballasted Lamps and Lamp Adapters”) that covers LED products.

Our understanding, based on email correspondence and conversations with several sources at the CEC, has been that installation of Type A TLEDs is essentially a “replacement in kind”, not a Luminaire Modification-in-Place and, as such, the lighting requirements of Title 24 do not apply. This interpretation is based on the following sections from the standard:

Section 140.1 b 2 I iii (p. 208)

iii. **Luminaire Modifications-in-Place** shall meet the applicable requirements in TABLE 141.0-F and the following:

a. To qualify as a Luminaire Modification-in-Place, luminaires shall only be modified by one or more of the following methods:

1. Replacing lamps and ballasts with like type or quantity in a manner that preserves the original luminaire listing.

2. Changing the number or type of light source in a luminaire including: socket renewal, removal or relocation of sockets or lampholders, and/or related wiring internal to the luminaire including the addition of safety disconnecting devices.

3. Changing the optical system of a luminaire in part or in whole.

4. Replacement of whole luminaires one for one in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire.

According to the above, installation of a Type A TLED does not seem to qualify as a Luminaire Modification-in-Place. None of items 1-4 describe a simple lamp replacement.

Section 141.0 b 2 I vii of Title 24 (p. 209):

vii. The following indoor lighting alterations are not required to comply with the lighting requirements in Title 24, Part 6:

a. Replacement in kind of parts of an existing luminaire that include only new lamps, lamp holders, or lenses, when replacement of those parts is not a Luminaire-Modification-in-Place in accordance with Section 141.0(b)2Iiii.

This section appears to apply to devices such as Type A TLEDs, and indicates that they are not required to comply with the lighting requirements of Title 24.

Section 130.0 (c) 6 of Title 24 (p. 138):

6. Luminaires with permanently installed or remotely installed ballasts. The wattage of such luminaries shall be determined as follows:

A. Wattage shall be the operating input wattage of the rated lamp/ballast combination published in ballast manufacturer's catalogs based on independent testing lab reports as specified by UL 1598.

B. Replacement of lamps in a luminaire manufactured or rated for use with linear fluorescent lamps, with linear lamps of a different technology such as linear LED lamps, shall not be recognized as converting the fluorescent luminaire to a different technology for compliance with Part 6.

As TLEDs *"are not recognized as converting the fluorescent luminaire to a different technology"*, it is our understanding that replacement of a fluorescent

lamp by a Type A TLED is considered a "*replacement in kind*" in reference to Section 141.0 b 2 I vii, and is not required to comply with the lighting requirements of Title 24.

This interpretation has also been confirmed by former CEC staff.

Further to this interpretation, and in regard to Multi-level Controls and Uniformity requirements described in Table 141-0 F, we refer to Note 2 in the table which indicates *"Multi-level controls are required only for luminaires for which there are Luminaire Modifications-in-Place."*

In regard to the proposed FAQ to be published in an upcoming edition of CEC *Blueprint,* we refer to the March-April edition section on Tubular LED Lamps, which includes a note that indicates *"…that for lighting alterations which do not qualify as a Luminaire Modification-in-Place, reclassification of wattage in accordance with 130.0(a), is not necessary."*

We believe that there needs to be clarification provided in the standard to identify the different types of TLEDs. We suggest that the CEC adopt the existing UL definitions to harmonize with industry, clarify the requirements of Title 24 Part 6 in reference to each of these types, and provide clear language to define what constitutes a retrofit, an alteration, and a Luminaire Modification-in-Place.

We believe the interpretation that installation of Type A TLEDs is a Luminaire Modification-in-Place will eliminate the benefits of low investment for this technology, and will burden California citizens with additional costs for installation of Multi-level controls. It will slow adoption of SSL technology and its associated energy savings, with the most likely end result that cost-sensitive consumers (who make up the largest portion of the market) will choose not to upgrade their fluorescent fixtures to SSL.

Item F. Add provisions for "intelligent luminaire" functionality in open offices

Proposal

Add and exception in 130.1(a) area control for open office applications when partial-on luminaires are used with controls embedded in each luminaire.

Rationale

These systems provide embedded occupancy and daylight control in each luminaire. Upon occupancy, lights turn on to a background level which is at 20% power, then once occupancy is stable, lights increase to a higher “task” level for providing task illuminance at the desk. The task level for open offices is preset at approximately 90% of full power. These granularly controlled systems save more energy than “auto-on to 50%” systems because they turn lighting on to 10% power, and operate at an individual luminaire level, rather than grouped control. In these cases, a manual-on switch is not needed, nor is manual-off because lights turn off when the area is vacant below the luminaire, and automatically turn on to background level upon occupancy..

Recommendation
Add a second exception to read as follows:

EXCEPTION to Section 130.1(a)1: In open offices, luminaires using embedded occupancy and daylight sensors in each luminaire, together with continuous dimming drivers/ballasts, that operate in a manner where each luminaire has:

1) Integral occupancy sensors that automatically turn on to no more than 30% power upon initial occupancy, turn to a higher level when fully occupied, and automatically turn off when unoccupied, and
2) Integral daylight sensors that automatically calibrate at each activation,

need not be controlled using manual-on and off lighting controls.

Item G. Clarify Demand Response Requirements

Proposal
Rewrite the Demand Response section for lighting.

Rationale
Current language is confusing and provides little guidance for compliance methodologies. Compliance manual latest revision changed the intent of the code from 15% reduction from “total installed power” to 15% reduction from “current power level.” In other words, originally, the code implied that the reduction was from the total maximum load, but was modified to require the reduction from wherever the power is at the time of the demand response event. Furthermore, the code requires that a DR controlled power calculation be made, and excludes counting areas with LPDs <0.5 W/SF in that calculation. This essentially lowers the total load required to be controlled using DR. However, the DR measurement is typically taken at the main distribution panel, which is measuring the total building electrical load.

Item H. LPD's with LED technologies and lighting control requirements

Proposal
Exclude designs that are <0.5 W/SF from all control requirements except auto-off, local control, and daylighting controls.

Item I. Alterations vs Luminaire Mods in Place

Proposal
Clarify language describing the difference between the two. It is confusing and ambiguous. Since the core requirements are the same, just have the same set of requirements for both.