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California Energy Commission

DOCKETED

15-BSTD-01

TN # 76119

AUG 10 2015

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Submitted via email: docket@energy.ca.gov

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

Re: Docket No. 15-BSTD-01

Lutron Electronics Co., Inc. Comments on the 15-Day Language for Section 141.0(b)2, Nonresidential Lighting Alterations Provisions for the 2016 Energy Efficiency Standards

Dear Commissioner McAllister,

Thank you for the opportunity to review and provide comments on the second 15-Day Language for Section 141.0(b)2, Nonresidential Lighting Alterations Provisions. These comments are submitted on behalf of Lutron Electronics Co., Inc.

As you may know, Lutron was founded in 1961 and is headquartered in Coopersburg, Pennsylvania. From dimmers for the home, to lighting management systems for entire buildings, the company offers more than 17,000 energy-saving products, sold in more than 100 countries around the world. In the U.S. alone, Lutron products save an estimated 10 billion kWh of electricity, or approximately \$1 billion in utility costs per year. The company's early inventions— including the first solid-state dimmer invented by Lutron's founder, Joel Spira—are now at the Smithsonian's National Museum of American History in Washington, DC.

Please find our detailed comments below. We look forward to working with you further on this important project. Please contact Michael Jouaneh at 610-282-5350 or mjouaneh@lutron.com if you have questions or would like more information on these comments. Thanks again for your consideration.

Respectfully submitted,



Pekka Hakkarainen, PhD
Vice President
Lutron Electronics Co., Inc.

The comments and suggested edits to the proposal are shown below as deleted text in ~~strikeout~~, and suggested new text in underline. The edits are shown in order of importance:

1. **141.0(b)2Iii. Entire Luminaire Alterations.** The 35% power reduction from existing luminaires is not enough to eliminate all the energy-saving lighting control requirements that have been in the Standard since 2005. This is backsliding in the 2016 Standard especially since most alteration projects will be using this path according to the CEC 2016 T-24 Lighting Alteration Savings Analysis (http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/15day_2016_LAP/additional_documents_relied_upon/Lighting%20alteration%20savings%20analysis.pdf). Also, this doesn't help meet the CEC net zero energy goal by 2030. See Appendix 1 which contains the analysis we submitted to the docket for the 45-day language. Basically, it shows the lighting controls save significant energy, cost effectively. The new LPD (lighting power density) of fixture-only retrofits have to be 60% lower than the latest LPDs for occupancy sensing not to be cost effective and 25% lower for dimming not to be cost effective.

What's more is that power reduction compliance option encourages energy hog to remain so since the reduction is from existing lighting power. An inefficient office building that uses 2.5 W/ft² of lighting power would need to only go to 1.62 W/ft² without advanced energy-saving lighting controls such as automatic daylight control. Yet an already efficient office at 1.0 W/ft² office would have a hard time complying using this power reduction path and would be required to comply with the control requirements per TABLE 140.1E. It should be the opposite. The energy hogs should have to comply with the energy-savings control requirements in the TABLE, not the already efficient project.

Exceptions for controls should be based on LPD not existing lighting power. Basing the exception on existing lighting power is not enforceable and easily gamed. Once the old fixtures are removed an inspector can't verify the previous lighting load. They can, however, verify the new lighting load and they know what the LPD allowances are per the Standard.

Furthermore, Exception 2 that exempts enclosed spaces with two or fewer fixtures eliminates any requirements from most private office spaces. This should be changed to exempting space with one fixture so that a renovation of an office building doesn't exclude requirements from private offices.

Thus, we suggest the following changes:

I. Entire Luminaire Alterations. Entire luminaire alterations shall meet the following requirements:

- i. For each enclosed space, alterations that consist of either (a) removing and reinstalling a total of 10 percent or more of the existing luminaires; or (b) replacing or adding entire luminaires; or (c) adding, removing, or replacing walls or ceilings along with any redesign of the lighting system, shall meet the lighting power allowance in Section 140.6, and the altered luminaires shall meet the applicable requirements in TABLE 141.0-E; or
- ii. For alterations where existing luminaires are replaced with new luminaires, and that do not include adding, removing, or replacing walls or ceilings along with redesign of the lighting system, all the altered spaces replacement luminaires shall collectively have at least 32.5 percent lower rated power density at full light output as compared to TABLE 140.6-C the existing luminaires being replaced, and meet the applicable requirements of Sections 130.1(a)1, 2, and 3, 130.1(c)1A through C, 130.1(c)2, 130.1(c)3, 130.1(c)4, 130.1(c)5, 130.1(c)6A, and for parking garages 130.1(c)7B.

EXCEPTION 2 to Section 141.0(b)2I. In an enclosed space where ~~two~~ one or fewer luminaires is are

replaced or reinstalled.

2. **141.0(b)2J. Luminaire Component Modifications.** The 70 luminaire threshold is too large and represents more backsliding in the 2016 Standard. Many projects will alter less than 70 luminaires and therefore be exempt from any requirements. We urge the Commission to maintain the 40 luminaire threshold that has already been in vetted in the 2013 Standard. Also, the 35% power reduction option is too low and easily gamed per our comments above. This should be removed.

Thus, we suggest the following changes:

J. Luminaire Component Modifications. Luminaire component modifications in place that include replacing the ballasts or drivers and the associated lamps in the luminaire, or permanently changing the light source of the luminaire, or changing the optical system of the luminaire, where ~~70~~ 40 or more existing luminaires are modified on any single floor of a building, shall meet the applicable requirements of Sections 130.1(a)1, 2, and 3, 130.1(c)1A through C, 130.1(c)2, 130.1(c)3, 130.1(c)4, 130.1(c)5, 130.1(c)6A, and for parking garages 130.1(c)7B, shall not prevent or disable the operation of any multi-level, shut-off, or daylighting controls, and shall either:

I. Meet the lighting power allowance in Section 140.6; or

II. ~~Collectively have at least 3035 percent lower rated power at full light output as compared to the original luminaires prior to being modified.~~

3. **141.0(b)2K. Lighting Wiring Alterations.** The 20 or more luminaire per space threshold before automatic daylight control requirements shall be met is not realistic. In one room, there are rarely 20 or more luminaires in a primary daylight zone near windows or skylights. This exception should be based on wattage of lighting power in a daylight zone rather than a number of luminaries. A project can have one very large pendant luminaire in a daylight zone that uses 300W of lighting power yet not be required to have automatic daylight controls. While a project with 21 luminaires using 200W of power would be required to use automatic daylight controls. If wattage can't be used, then make the requirement by floor not space.

Thus, we suggest the following changes:

iv. for each enclosed space where wiring alterations include ~~20 or more~~ luminaires that are located within the primary sidelit daylight zone and/or the skylit daylight zone and use more 120W of power, meet the requirements of 130.1(d).

OR

iv. for each ~~enclosed space~~ floor where wiring alterations include 20 or more luminaires that are located within the primary sidelit daylight zone and/or the skylit daylight zone, meet the requirements of 130.1(d).

APPENDIX 1

Table 1: LPD Reduction for Fixture-only Retrofits to Save the Same Energy as the Controls would have Saved

Office Building			
Allowable LPD of 0.8 for office buildings per T24 2013 and 2016			
	Occ sensor only	Full dimming	
Annual lighting hours of use	5000	5000	Hrs
LPD at which lgt ctrls have a 7 year payback or better	0.32	0.6	W/sq.ft
% savings from lighting controls	35%	55%	See references below
Energy savings	0.56	1.65	kWh/sq.ft/yr
Electricity cost	0.13	0.13	\$/kWh
Annual \$ savings	0.07	0.21	\$/sq.ft/yr
Installed cost	0.5	1.5	\$/sq.ft
Simple payback	6.9	7.0	Years
% reduction from LPD requirements in T24 2013/2016 to achieve a 7 year payback or better	60%	25%	

Notes:

1. For a lighting fixture-only retrofit (without using controls) to have the same energy savings as one that uses occupancy sensing system with a 7 year payback or better, the new LPD of the fixture-only retrofit must be 60% lower than the allowed LPD in Title 24 2013 2016.
2. For a non-dim lighting fixture-only retrofit to have the same energy savings as one utilizing a dimming system with a 7 year payback, the new LPD the fixture-only retrofit needs to be 25% lower than the allowed LPD in Title 24 2013 and 2016.
3. The 7 year payback is achieved without the help of rebates. Rebates such as from the city of LA (\$0.1/kWh saved) or from SoCal Edison (\$50/occupancy sensor) reduce installed cost significantly
4. Even conservative calculations place the cost of fixture only retrofits at a 5 year payback even with a 50% wattage reduction

References:

1. VonNieda B, Maniccia D, & Tweed A. 2000. An analysis of the energy and cost savings potential of occupancy sensors for commercial lighting systems. Proceedings of the Illuminating Engineering Society. Paper #43.
*Source 1 numbers based on 15 minute timeouts. Higher savings is possible with lower time out periods
2. Galasiu AD, et al. 2007. Energy saving lighting control systems for open-plan offices: A field study. Leukos. 4(1) pg 7-29
3. Williams A, et al. 2012. Lighting Controls in Commercial Buildings. Leukos. 8(3) pg 161-180.
4. Reinhart CF. 2002. Effects of interior design on the daylight availability in open plan offices. Study of the American Commission for an Energy Efficient Environment (ACE) Conference Proceedings. To achieve maximum lighting savings, automated shades are utilized.