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Mr. Andrew McAllister
Commissioner
California Energy Commission
Dockets Office, MS-4
Re: Docket No. 14-AAER-1
1516 Ninth Street
Sacramento, CA 95814-5512

California Energy Commission

DOCKETED

14-AAER-01

TN 74009

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November 14, 2014

**Cree Comments on Draft Staff Report on Appliance
Efficiency Pre-Rulemaking for Title 20 Standards --
Analysis of Small Diameter Directional Lamp and Light
Emitting Diode Lamp Efficiency Opportunities**

Dear Commissioner McAllister

Cree welcomes the opportunity to participate in the standards process with the CEC, and to provide the attached comments on the Proposed Title 20 efficiency recommendations for Small Diameter Lamps and LED Lamps.

Cree (Nasdaq: CREE), headquartered in Durham, N.C., is the leading U.S.-based developer and manufacturer of LEDs and LED Lighting products. Cree is leading the widespread adoption of LED lighting and making energy-wasting traditional lighting technologies obsolete through the use of energy-efficient, mercury-free LED lighting. Cree is a leading innovator of lighting-class LEDs, LED lighting and semiconductor products for power and radio-frequency (RF) applications.

As of October 14, 2014, Cree, Inc. owned or was the exclusive licensee of approximately 1,400 issued U.S. patents and 2,450 issued foreign patents. Cree innovation developed the TW Series LED Bulb that was First to Meet California Energy Commission Quality Lighting Specification in September of 2013. Cree's product families include LED fixtures and bulbs, LED lighting control systems, blue and green LED chips, high-brightness LEDs, lighting-class power LEDs, power-switching devices and RF devices. Cree products are driving improvements in applications such as general illumination, electronic signs and signals, power supplies and solar inverters.

LED Lighting provides California the opportunity to achieve unprecedented energy savings in residential and non-residential applications. Studies commissioned by the U.S. Department of Energy have shown that widespread adoption of LED lighting can remove as much as 10% of the total electrical load in the U.S. Key to realizing these savings is driving adoption, and widespread adoption requires lighting that does not force consumers and businesses to compromise on light quality and their lighting experience.

Our detailed comments follow, and we welcome the opportunity to contribute to this important effort.

Regards,

A handwritten signature in blue ink, appearing to read "Greg Merritt", is written over a light blue circular stamp.

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Following are Cree's comments and recommendations on the Draft Staff Report for 2014 Appliance Efficiency Pre-Rulemaking, Docket Number 14-AAER-1 – Analysis of Small Diameter Directional Lamp and Light Emitting Diode Lamp Efficiency Opportunities. We address the following items for LED Lamp Recommendations:

1. Compliance Equation, Efficacy, Color Rendering Index and R9
2. Dimming and Flicker
3. Energy Star v1.1 standards
4. Decorative lamp labeling

Item 1) Compliance Equation, Efficacy, Color Rendering Index and R9

The current proposal to have a 2-step standard with minimum CRI and minimum Efficacy as outlined in Table K-13 introduces unnecessary complexity, and in being divergent from the proposed Title 24 standards outlined in JA8 will hinder manufacturers' ability to develop a common set of products to drive down costs and increase availability.

Cree's Recommendation is to align the light quality requirements, as well as most of the other performance requirements, between Title 20, Title 24 and the Voluntary California Quality LED Lamp Specification. Require CRI minimum of 90, R9 minimum of 50 and Efficacy minimum of 55 lpw (higher than the current 45 lpw number). Manufacturers can design and build to a common set of requirements, consumers and businesses will enjoy a consistent experience, and California will facilitate greater energy-efficient lighting adoption.

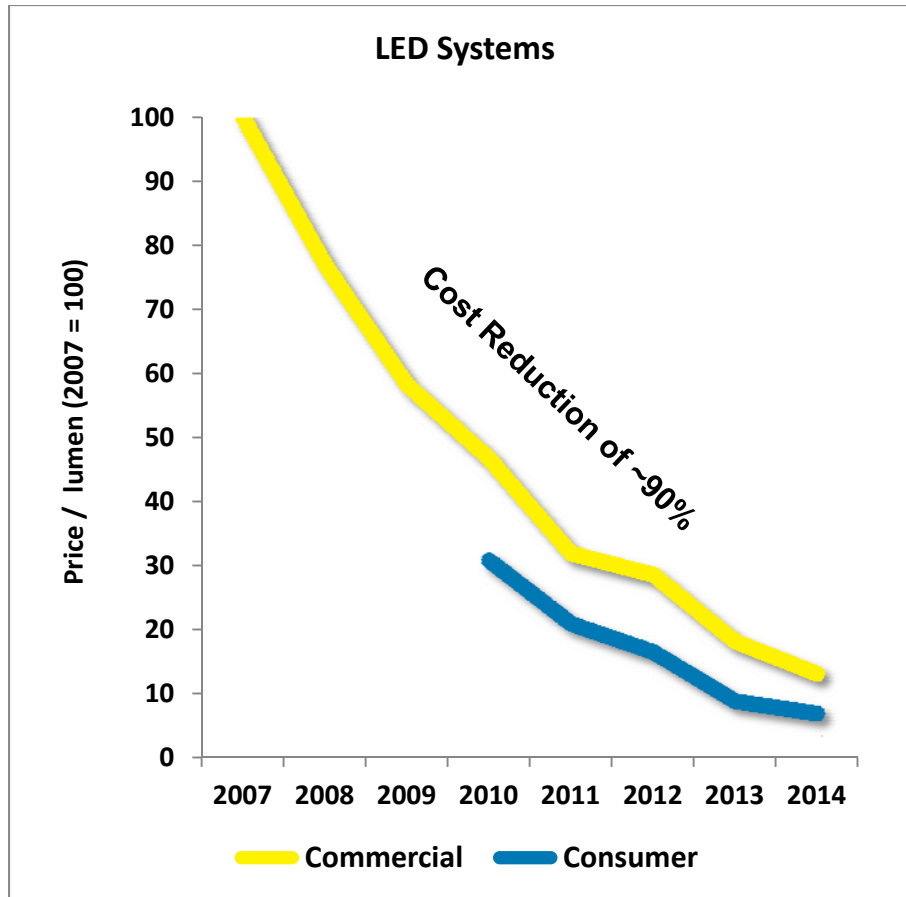
Comments: The primary objective of these standards is to drive energy savings in California. To maximize savings, we need to maximize adoption. Traditional lighting companies have repeatedly demonstrated that they are satisfied with limited adoption of energy-efficient lighting, as they continue to sell inefficient lighting to the rest of the market. Cree is solely focused on LED lighting, and our target is 100% adoption of energy-efficient LED lighting. 100% adoption requires lighting that's better, not compromised in important elements. Efficient lighting products that aren't installed and used deliver zero energy savings.

California should set the light quality bar high enough to facilitate adoption across the market. Committed manufacturers will innovate to deliver low-cost, high efficacy lamps with great light quality. Cree has delivered products to market using multiple technical approaches to achieve high-CRI, high-efficacy performance at competitive prices. Innovation is what is driving the LED lighting market adoption, and California should leverage coming improvements to achieve available energy savings.

Some parties have recommended against using CRI in energy efficiency standards. CRI is the accepted and well-understood metric available today, and at higher values, when used in conjunction with an R9 requirement, is an accurate measure of light color quality. While the industry works to develop, approve and gain acceptance for an improved measure, standards should continue to specify CRI with R9. If CRI minimum is set to 90, the requirement for each sample component of the CRI to be greater than 75 is fine with us.

To comments that a higher CRI causes excessive costs, we would argue that all product design elements require tradeoffs and impact cost. Requirements for dimming, power factor, efficacy, lumen output, lifetime, and others all impact product cost. It's critically important that the standards don't compromise on the elements that drive adoption and product satisfaction. High CRI is not hard to do with today's LED technology, and adds minimal cost. Efforts by some industry members to drive down the CRI requirements use arguments that are outdated, irrelevant or outright disingenuous and are focused on "dumbing down" the performance of LED lighting to protect other technologies and to maintain revenue streams from obsolete products.

Cost is not an excuse for not delivering a superior product to market. For example, Cree introduced our 80 CRI down light in January, 2014 at a retail price of \$26.97, and recently introduced a new 90 CRI down light at \$24.97 with equivalent efficacy compared to the earlier version. Also, Cree recently debuted a new LED MR16 lamp with 92 CRI/R9 >50 at equivalent efficacy and a lower price (\$10 reduction at retail) than the previous 80 CRI version. As shown in the diagram below, Cree has consistently delivered significant cost decreases, while improving performance, and targets similar future improvements.



Failure to align the requirements of the multiple standards or compromising on light quality or other important performance elements will reduce adoption in California and decrease realized savings.

Item 2) Dimming and Flicker

Current recommendation is to require a dimmable lamp to dim to 10% of its full light output and pass a flicker test without audible noise using a standard phase-cut dimmer, or alternatively using an “LED dimmer”. This requirement needs more specificity to be useful, and to prevent disappointment among consumers.

Cree’s Recommendation is to leverage the NEMA SSL7 specification and test procedures for SSL7A compliant dimmers and lamps, and to align with the Title 24 recommendations:

Dimming light sources shall meet the following requirements:

- (a) The light source shall be dimmable down to 10 percent light output.
- (b) LED-based light sources shall meet the requirements of NEMA standard SSL 7A as Type 1 or Type 2 products.

EXCEPTION to JA8.7(b): LED based light sources designed to be dimmed by controls other than phase cut dimmers.

- (c) The light source in combination with the dimmer control shall provide "reduced flicker operation" when tested at 100 percent and 20 percent of full light output, where low flicker operation is defined as having percent amplitude modulation (percent flicker) less than 30 percent at frequencies less than 200Hz, tested according to the requirements in Reference Joint Appendix JA10.

Requiring NEMA SSL7A compliance will establish a reasonable baseline of performance, and will help to align lamp and dimmer/controls manufacturers on compatibility. This specification is solid, and represents agreement across a broad set of

industry players. In addition, by not specifying specific dimmers for compatibility, this requirement will reduce the opportunity for interpretation and gamesmanship.

Not all lamps need to be dimmable, as typically only 20% of bulbs are on dimmers. Consumers are becoming more familiar with the new technology of energy-efficient lamps (e.g., CCT, lumens, etc.), and they will likely be able to select between dimming and non-dimming lamps. However, we recommend that if non-dimming lamps are allowed, **the lamps** and the packaging must be labeled “Non-Dimming” to avoid confusion.

Item 3) Energy Star v1.1 Standards

Current recommendations are to align with Energy Star v1.1 for light distribution.

Cree’s Recommendation is to align with Energy Star v1.1 for audible noise, light distribution, incandescent equivalence (lumen output) and the Elevated Temp test. For the Elevated Temp test, we recommend a requirement for 9 or 10 lamps to be working at 3,000 hours with average lumen maintenance of 93%.

Item 4) Decorative Lamp Labeling

Current recommendation is that for lamps certified with light output of less than 150 lumens for candelabra bases or less than 200 lumens for other bases, they shall be marked as “for decorative purposes only.”

Cree’s Recommendation is to more accurately label as “not a viable light source,” as “decorative” does not adequately convey that these lamps are not useful in providing illumination.