



GE Lighting

1975 Noble Road
East Cleveland, OH 44112
USA

via e-mail: docket@energy.ca.gov

October 24, 2012

Ms. Karen Douglas
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

California Energy Commission

DOCKETED

12-BSTD-03

TN # 68116

OCT 25 2012

GE Lighting Comments re: Docket 12-BSTD-03 “California Quality LED Lamp Specification”

Dear Commissioner Douglas,

GE Lighting appreciates the opportunity to comment on the proposed voluntary California quality Light-Emitting Diode (LED) lamp specification (CEC-400-2012-016-SD). GE supports efforts to further accelerate the adoption of energy efficient technologies. These comments are meant to clarify and illuminate our concerns regarding the specification and the detrimental effects that GE believes it can have on consumer adoption and program success. It is our hope that we can continue the dialog on these different parameters in an effort to produce a successful program.

Per the specification, critical items will be addressed individually regarding technical feasibility, cost and timing. The timing assumptions given in the comments are based on ensuring ENERGY STAR® qualification as a minimum including the reliability testing associated with it.

Color appearance/Color Angular Uniformity – The proposed CEC specification limits lamp “beam” variation to a minimum of 4 steps based on the current draft of the Energy Star specification. The effect of this level of color consistency on every LED lamp is dramatic since it reduces actual LED selection, changes optical design choices and complicates the manufacturing/ testing process. This level of appearance uniformity will contribute an additional ~15% to product costs and take 9-12 months to qualify and meet all Energy Star requirements.

Color consistency – The proposed CEC specification is asking lamp to lamp variation to a minimum of 4 steps based on only 2 specific color temperatures at 25 and 55C. The effect of this level of color consistency on every LED lamp is dramatic since it reduces actual LED production distribution selection to significantly tighter LED binning and complicates the manufacturing/testing process.

In addition to the technical issues described, there is no current standardized test procedure at the system level to understand the change in color with respect to increase in temperature (25 to 55 C). The current test for color must be done inside of a sphere, there are no spheres today that have the ability to increase the ambient of the device under test to 55C. How does the CEC believe this test will be conducted? Currently there is some data from an LED package supplier. This data does not take into account the total system but merely one component.

While not a critical issue, we note that preliminary results from a current Assist study have shown that a color temp of 3500K can also be acceptable to consumers.

Meeting the 4-step color consistency specification is an approximate 15% cost adder per lamp and could take 9-12 months to ensure Energy Star qualification.

Color Rendering – The proposed CEC specification is asking for a minimum of 90 CRI. Based on the public meeting, there seems to be an assumption that a 90 CRI automatically means a quality product will be produced and that consumer satisfaction would be greater. This technically is incorrect. Simply judging product color quality on CRI has been shown in studies by independent parties like NIST, ASSIST and others to be limiting and potentially misleading. Metrics like CQS, R9 (positive and negative), and GAI need to be more fully researched and understood to see their effect on consumer satisfaction and adoption prior to arbitrarily introducing a CRI of 90 as a minimum specification.

LED lighting products exist on the market at a 90+ CRI today but they come at a severe price premium and are available on a limited scale. In addition, there are potential drawbacks that might not be visible. The efficacy of the 90+cri LED package(s) are on average 10-15% lower than 80 CRI LEDs that meet the Energy Star specification today. This reduction in efficacy will cause **additional** LEDs to be used in addition to redesign of the optical, thermal and electrical systems to ensure that the final lamp can meet the other equivalency claims found within the current Energy Star specification, thus further increasing costs.

The cost increase for this proposed minimum specification is approximately 15% and truly is greater than 12 month process including Energy Star certification. There is a somewhat linear increase in cost with each point of CRI increase. For example, an increase to 85 CRI will have half this cost increase.

Dimming– Dimmer/Lamp compatibility is a very misunderstood requirement within the Energy Star specification since it has many different aspects and unknown interactions especially when focusing on backwards compatibility. Extensive work is currently being done with the EPA and GE is committed to developing products that will increase customer satisfaction with respect to performance. One key topic of dimming is light output level, or minimum level. The proposed CEC specification asks the minimum proposed light level to achieve 10%. The design changes needed to the lamp electronics conflict with other proposed CEC specifications, particularly an 0.9 power factor. The overall technical requirement of a 0.9 power factor implementation will cause compatibility issues that could be visually seen as a flicker or unstable operation.

Two other factors, flicker and noise, do not have standard procedures for measuring and therefore would be very difficult to ensure consistency from manufacturer to manufacturer. If consistency cannot be guaranteed from manufacturer to manufacturer then these items should be handled in an update to the specification once they are available.

It is not possible to estimate the costs of dimming until the definitions of dimming parameters have been established and the scope of required dimmable systems defined. GE Lighting does not believe that 100% backwards compatibility is achievable based on the great difference in overall dimmer design over time and from one manufacturer to the next.

Power Factor – The CEC specification of having a power factor of 0.9 has no technical justification or effect on consumer adoption or consumer satisfaction. GE strongly encourages the CEC to research power factor and see that there has been no evidence of high THD or low PF causing power grid disturbances or power quality issues. A good reference point is the NEMA paper LS-8 1999 Power Quality Implications for CFL's in Residences.

The additional cost of upgrading the electronics and minimizing the dimming compatibility affects is ~5%.

In total, the CEC specification, that exceeds the still evolving Energy Star lamp specification, would increase product cost by approximately 40% and take >12 months from the start date of a new product program to introduce into the market with no guarantee that consumers adoption would be increased. There are currently no lamps that meet all of the proposed specifications on the GE roadmap in the next 12 months. The increase in cost based on current products or products slated for public launch in the next 12 months will be too much for the consumer to accept based on GE's research and multiple third party reports like Consumer Reports (<http://www.consumerreports.org/cro/resources/streaming/PDFs/Consumer+Reports+Lightbulb+Review+Facebook.pdf>).

It is interesting to note that consumer reports research indicates that the number one consumer dissatisfier for LED lighting is a high product cost. Greatly increasing already perceived high product costs may not be the best path to program success. While a consumer that buys such a lamp is likely to be satisfied with the product performance, this high cost path is likely to generate very few product sales and therefore produce a very minor impact on reducing California's statewide energy consumption.

Other options to consider are to: 1. Implement these ideas slowly over time as product costs are reduced as expected in the future; 2. Implement a tiered rebate structure that would allow higher rebates as products meet more and more of these proposed features; 3. Allow the current ENERGY STAR program in 2013; Rebate on the new ENERGY STAR program in 2014; Evaluate the results of these efforts prior to proposing a higher standard for CA to determine if it is truly needed in the future.

Please contact David Szombatfalvy at (216) 571-7430 if you have questions or need clarification regarding these comments.

Sincerely,

GE Lighting NELA Park

