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GE Lighting Comments on Title 20 LED Lamp Proposal

Additional submitted attachment is included below.

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

GE Lighting Comments on proposed 15 day language for Title 20 regulations for Light Emitting Diode (LED) Lamps and Small Diameter Directional Lamps

Dear Commissioner McAllister,

GE Lighting appreciates the opportunity to comment on the California Energy Commission's (CEC) proposed regulations for Light Emitting Diode (LED) lamps and Small Diameter Directional Lamps. GE Lighting is a leading global lamp manufacturer headquartered in the United States and it manufacturers a wide variety of products including the products covered by this proposed regulation. GE Lighting's long history of selling lighting products provides unique insight into consumer wants, needs and preferences. GE Lighting supports comments submitted by the National Electrical Manufacturer Association (NEMA).

GE appreciates the changes made in response to our comments on the 45-day language. However, the proposed changes do not go far enough to address the serious concerns raised by GE, other lamp manufacturers and LED chip manufacturers that produce high volume products for the bulk of the US market.

Even with the supplemental staff analysis the CEC still does not provide any evidence that certain proposed specifications, such as the extensive color quality metrics are necessary or even desired by consumers. Premium specialty products that could potentially meet these proposals may be appropriate for limited, niche applications, but they will not enhance the consumer experience in the vast majority of general service lighting applications and their increased cost will deter consumer adoption of LED lighting and reduce energy savings that would otherwise accrue from this product category.

Within these comments, we bring reasonable alternatives to CEC's attention that will be more effective at reducing energy use in the state, less burdensome to lamp manufacturers and their suppliers, and more cost effective for consumers. We again urge CEC to consider these alternative approaches.

LIGHT EMMITTING DIODE LAMPS

GE Lighting strongly recommends that the Commission limit its color quality specification to a CRI of 80 or greater. The primary reason is that most LED chips being manufactured today, and sold for use in indoor applications, are binned either at the 80 CRI level or the 90 CRI level. It makes no sense to create a linear equation when two discrete chip sets are being regulated. A two-step regulation would be the most effective approach, the best understood, and the easiest for the Commission to enforce without having any deleterious effect on energy savings goals. While there are specialty chips sets designed at other CRI color points, these are low volume, expensive products not commonly used in the worldwide market.

The currently proposed color specifications are conflicting, purporting to allow the sale of low 80 CRI lamps, but requiring compliance with other color specifications that will force the vast majority of LED light bulbs to use either a 90 CRI chip set that will be 15% to 25% higher in price, or a specialty chip set that will be much higher in price and which is not readily available in the marketplace. Forced use of either chip set will reduce LED product availability and consumer choice in California, increase the purchase price for the remaining products (especially those that employ specialty chip sets), and in turn significantly reduce the energy savings that will achieved by the Title 20 standard.

While we appreciate CEC's desire to push the envelope on lighting technology, concrete, practical reasons for its proposed specifications that are directly relevant to its statutory mandate to reduce energy consumption from regulated appliances are lacking. In the absence of such supporting evidence, it is unreasonable for CEC to persist with its proposed color specifications at the expense of its statutory mandate.

The alternative 80 CRI minimum with no R value requirement is a **reasonable alternative** that will sweep low performing products out of the market place as intended by Title 20, increase product availability, reduce product cost and increase cost effectiveness for consumers leading to a higher consumer adoption rate and significantly greater energy savings in the State.

We continue to urge the Commission to simplify the compliance requirements by setting one efficiency level for LED lamps with a CRI of 80 or greater and a second efficiency level for lamps with a CRI of 90 or greater. We would strongly suggest 75 LPW for 80+ CRI lamps and 65 LPW for 90+ CRI lamps as a very simple approach that will be much more effective than the convoluted compliance equations and conflicting color requirements currently proposed.

The Problem with Requiring Individual R Color Values

We continue to urge the Commission to remove the R-1 through R-8 requirements. As noted above, these requirements are in direct conflict with CEC's proposed minimum CRI, and R-1 through R-8 information is not commonly available or commonly understood in the marketplace. CRI represents an average of R1 through R8. It is a commonly understood metric and CRI data is readily available in the marketplace. Average CRI is the only color requirement that will be easily understood by the distributors and retailers importing LED products into the California market and therefore the only color fidelity requirement that assures consistent compliance and enforceability. For all of these

reasons, a minimum CRI standard is the only color fidelity requirement that should be included in this rulemaking.

However, we must reiterate that regardless of how the Commission chooses to set these specifications (e.g., whether by the compliance score method, a combination of color specifications or the simplified method suggested above), it cannot maintain ***both*** a minimum CRI of 82 and an R8 color point minimum of 72. While it is possible to produce a lamp with an R8 over 72, all such products (especially 2700K & 3000K, the most popular color temperatures) have an average CRI of nearly 90 or higher due to the naturally high R values occurring at many of the other color points. The minimum CRI we would expect from a 2700K lamp with a minimum R8 of 72 is 88.

This complex standard as proposed creates conflicts. Manufacturers cannot meet both a CRI of 82 at 2700K or 3000K and an R8 of 72. Given variability in LED chip tolerances, the minimum R8 value would need to be lowered to 50 for LED products rated at 3000K or less to allow the sale of 80 (or even 82) CRI lamps. ***This change is an absolute necessity if the Commission insists on pursuing this complex, multi-faceted approach and to avoid a standard that conflicts with itself.*** The alternative simplified approach suggested above would avoid these conflicts while achieving the same energy savings.

The supplemental information offered by the Commission to support the decision to maintain its current position is problematic. While the charts presented in the supplemental staff analysis continue to show that a few products will pass the revised compliance equation, it does not provide pass/fail information for specific products. Perhaps most importantly, the supplemental analysis ignores the additional and conflicting color requirements that must be satisfied along with the compliance score limits. If it conducted a more complete analysis, including all of the proposed color requirements, the Commission would find that the most popular 2700K lamps available today cannot pass the proposed regulations. All 2700K products would be forced to use either 90 CRI chips, or specialty chip sets, which would significantly increase costs for the consumer and significantly reduce adoption rates and energy savings in California compared to other states. While the Commission staff continues to believe this outcome can be cost-justified at the product level, the staff analyses do not consider other reasonable approaches and therefore fail to demonstrate that the CEC's proposed approach is the best alternative. The alternative presented here would be more cost effective for consumers and significantly streamline compliance while producing greater energy savings.

Power Factor and Standby Power

The EPA recently finalized the LAMPS 2.0 standard. As proposed for the Omnidirectional requirement, the Commission should simply adopt the Power Factor and Standby Power requirements specified within the new LAMPS 2.0 standard so that industry can offer consistent products throughout the US, lowering overall product costs for the consumers in California and therefore increasing LED adoption rates.

Test Methods

We urge the Commission to allow manufacturers to use either set of standards, LM-80 and TM-21, or, LM-84 and TM-28, to show compliance with the proposed standards. This increase flexibility will help manufacturers reduce costs which will directly benefit consumers, encouraging greater LED adoption and greater energy efficiency gains in California.

Scope

Although the staff analysis concentrates heavily on medium-base A-line replacement lamps, and sets efficiency standards based on this analysis, the proposed scope includes more than just medium base A-line lamps. It is not appropriate to set standards for Reflector LED lamps, Decorative LED lamps and downlight LED reflector kits, in a regulation that has been developed and analyzed primarily for A-line lamps.

Separate analysis and discussion is necessary to ensure that Title 20 standards address attributes, applications and market circumstances unique to each technology. Once properly analyzed, it is likely that the standards for these products would be set at different levels (higher or lower) than currently proposed. In this case, the Commission has not performed an adequate analysis for all lamp types subject to the proposed regulations and cannot assume the efficiency levels for A-line lamps would be appropriate for all four categories. Accordingly, we reiterate our prior recommendation that the Commission explicitly limit the scope only to medium-based A-line LED lamps at this time.

The products presumed to meet the proposed specifications as provided in the supplemental staff analysis are not the common 2700K lamps sold today. At the very least, the Commission should analyze all 2700K products as a separate class. Placing all of the color temperatures in the same graphs produces misleading results and promotes inaccurate conclusions and misguided staff recommendations.

Recommended Scope Change

GE continues to recommend the following changes to the scope:

State-regulated Light Emitting Diode (LED) lamp" means a lamp capable of producing light with Duv between -0.012 and 0.012, and that has an ~~E12, E17,~~ E26, or GU-24 base, ~~including~~ excluding LED ~~lamps~~ kits that are designed for retrofit within existing recessed can housings that contain one of the preceding bases~~.~~, and excluding LED Reflector and LED PAR lamps. State-regulated LED lamp does not include a lamp with a brightness of more than 2600 lumens or a lamp that cannot produce light with a correlated color temperature between 2200K and 7000K.

Rationale for scope changes:

1. Eliminating the E12 and E17 base types eliminates some decorative LED lamps from the scope. Due to size and thermal constraints, small base Decorative LED lamps cannot achieve the same efficiency performance as medium base A-line LED lamps. LED decorative lamps are competing against incandescent, halogen and CFL decorative lamps in the marketplace. They can compete much more effectively and deliver greater efficiency in decorative applications without significant regulatory constraints. However, if CEC continues to pursue regulations for small base LED decorative lamps, a new more simple set of specifications must be developed and based on analyses specific to these lamp types. The extensive proposed regulations for A-line LED Lamps are a poor fit for decorative LED lamps. In particular, the proposed efficiency equations are infeasible for this technology. Minimum efficiency levels must be set lower than proposed for decorative lamp types and we would support the NEMA proposal if CEC does not remove this product class from the scope.

2. We also recommend clearly excluding LED downlight retrofit kits from the proposed scope because these products have not been sufficiently analyzed such that the proposed standards are shown to be technologically feasible in these applications. In addition, these products are already covered with a different set of regulations in Title 24. Placing duplicative and potentially conflicting standards within the California Title 24 and Title 20 regulations is a mistake that will foster confusion and undermine efforts by various actors in the supply chain to comply with all applicable regulations. However, if CEC continues to pursue regulations for LED downlight retrofit kits, a new more simple set of specifications must be developed based on an analysis specific to these products. In addition, regulations in Title 24 and Title 20 must be harmonized so it is possible to simultaneously comply with both sets of regulations. The Commission should pull these "already regulated by Title 24" products from the scope of the LED A-line standard pending further analysis.

3. We also recommend excluding LED Reflector lamps and LED PAR lamps from the scope for the reasons stated above.

GE Reveal Lamps

GE Reveal lamps are designed to operate in "white color space". Reveal lamps are specifically designed to be more than 4 MacAdam steps below the black body curve in the warmer color areas less than 3000K. Previously referenced studies by the Lighting Research Center have shown a consumer preference for lamps that operate in this white color space which is below the black body curve at the lower color temperatures (above it at the higher color temperatures). The CEC Staff Report[1] supports allowing lamps in the white color space to be sold in the California market. Yet despite this acknowledgement, the currently proposed regulations would ban these products from the California market with no rationale provided by the Commission. This is because Annex B of the ANSI standard requires lamps to be within a 4-step Quadrangle, while Reveal lamps are specially designed to be more than 4 MacAdam steps below the black body curve in order to be in the white color space. To allow Reveal-type lamps to continue to be sold, the Commission should provide an exception for lamps that operate at 3000K or less and that are more than 4 MacAdam steps below the black body curve. Otherwise, manufacturers would be prohibited from providing LED lamps in the white color space preferred by many consumers. Banning preferred color points is contrary to CEC's goal of increasing adoption of LED products and thereby increasing energy savings in the state.

Recommended Standards Change for E26 or GU-24 A-line LED lamps

Per the discussion above, GE recommends the following changes in the proposed LED Lamp standard to greatly simplify the requirements while achieving greater consumer adoption and energy savings:

(C) State-regulated LED lamps with lumen output of 150 lumens or greater for candelabra bases or 200 lumens of greater for other bases, and manufactured on or after January 1, 2018 shall have:

[1] "*Analysis of Small-Diameter Directional lamp and Directional Lamp and General Service Light-Emitting Diode (LED) Lamp Efficiency Opportunities*", *2015 Appliance Efficiency Rulemaking, Docket Number 15-AAER06, October 2015, CEC-400-2015-034*, Page 58, Correlated Color Temperature, "In addition, the Energy Commission also changed the regulations to allow lamps to alternately show compliance by using the ANSI white curve in substitute of the black body locus."

(i) A color point that meets the requirements in Table 1 of Annex B of ANSI C78.377-2015 for color targets and color consistency.

(a) Lamps that are rated with a color temperature of 3000K or less and have a color target point that is more than 4 McAdam steps below the black body curve are exempt from the requirement in (C) (i).

(ii) A CRI (Ra) of ~~82~~ **80** or greater.

(iii) Individual color scores of R1, R2, R3, R4, R5, R6, **and** R7~~,~~**.** ~~and R8~~ of 72 or greater **and an R8 score of 50 or greater. {Or elimination of requirement (preferred)}**

(iv) ~~A~~ **P**ower factor **requirements of ENERGY STAR's Product Specification for Lamps Version 2.0 (December 2015)** ~~of 0.7 or greater~~.

(v) A rated life of 10,000 hours or greater as determined by the lumen maintenance and time to failure test procedure.

(vi) State-regulated LED lamps that have an ANSI standard lamp shape of A shall meet the omnidirectional light distribution requirements of ENERGY STAR's Product Specification for Lamps Version 2.0 (December 2015).

(vii) State-regulated LED lamps that have an ANSI standard lamp shape of B, BA, C, CA, F or G shall meet the decorative light distribution requirements of ENERGY STAR's Product Specification for Lamps Version **2.0 (December 2015).**

(D) In addition to the requirements in section 1605.3(k)(2)(C), state-regulated LED lamps manufactured on or after July 1, 2019 shall ~~have a~~ **meet the** standby mode power **requirements of ENERGY STAR's Product Specification for Lamps Version 2.0 (December 2015)** ~~of 0.2 watts or less~~.

Table K-14
Standards for State-regulated LED Lamps

Effective Date	*~~Minimum Compliance Score~~ Minimum CRI*	*Minimum Efficacy Lumens per Watt*
January 1, 2018	*~~282~~ 90*	*68*
January 1, 2018	*80*	*75*
July 1, 2019	*~~297~~ 90*	*~~80~~ 75*
July 1, 2019	*80*	*85*
~~The compliance score shall be calculated as the sum of the efficacy and 2.3 times the CRI of the lamp.~~		

Small Diameter Directional Lamps

GE appreciates and supports most of the changes made to the scope for state regulated Small Diameter Directional Lamps. Without further narrowing the scope of the proposed Title 20 regulation certain lighting systems and specialty equipment would have become obsolete.

SMALL DIAMETER LAMP PRODUCT EFFICACY REGULATION

GE continues to contend that the efficiency levels proposed for small diameter directional lamps are much too high. The CEC may be relying on the information submitted in support of these levels in response the 45 day language, including Table 1 in comments submitted by "*McGaraghan, Michael, 2015. Small Diameter Directional Lamps, Response to CEC's Express Terms 45-Day Language Proposals, Codes and Standards Enhancement (CASE) Initiative.*"

We note that Table 1 contains 22 small diameter lamps that are shown as meeting the proposed regulation. However on further inspection, 6 of the lamps had no lumen ratings at all, making it impossible to confirm the actual LPW levels. It is not unusual for directional lamps to only list Center Beam Candle Power (CBCP) information and not lumen data. 6 additional lamps incorrectly calculated LPW levels based on reported lumens and wattage. Of the remaining 10 lamps, 8 were just at 80 or slightly over 80 providing no tolerance for meeting the standard. This leaves data for only 2 possible lamps that were sufficiently over the 80 LPW standard to ensure compliance. Given the other errors in this dataset, the CEC should not rely on such values as the basis for regulatory standards without additional testing and verification.

We urge CEC to not base the small diameter lamp standard on a limited data set containing questionable data. To take into account considerable discrepancies within this supporting data, CEC needs to lower the LPW levels by at least 10 LPW. The CEC needs to set a minimum standard at the bottom of the bell-curve distribution for Lumen-per-Watt ratings, not a maximum achievable rating at the top of the bell-curve distribution for such values. The proposed limit is closer to a maximum expected efficiency value for 2018 and is not a value that a reasonable person would choose when looking at the range of existing products.

The average efficiency of LED MR16 lamps sold in California between June of 2014 and May of 2015 was 56 LPW based on an August, 2015 Navigant report[2]. If one assumes very aggressive 15% efficiency increase each year, the average would reach over 70 lumens per watt. As the rate of efficiency gains is expected to decline each year, reaching an average efficiency of 80 lumens per watt by 2018 is extremely unlikely. Basing efficiency standards on an extremely unlikely scenario is neither reasonable nor in the best interest of California consumers.

If CEC's current proposal is adopted without further modification, very few products would qualify at any lumen range. The proposal would set an optimal performance goal rather than a floor designed to ensure a minimum level of performance that meets consumer expectations, achieves additional energy efficiency gains and preserves product availability at a reasonable price. Only a limited number of best-in-class LED products would be available from a limited number of suppliers.

If the state wishes to have many manufacturers competing with quality products widely available for consumers with all lighting beam spread choices represented, CEC must lower the proposed levels by

[2] California LED Workpaper Update Study – August 28, 2015, Table A-12

at least 10 to 15 LPW, which would still eliminate over 75% of today's products from the market. GE recommends a 15 LPW reduction from the currently proposed levels. At a bare minimum, a 10 LPW reduction is absolutely essential. Lowering the LPW levels will produce more product availability at lower prices, leading to greater adoption and greater energy savings in the State. If only a limited number of LED MR16 products are available that do not meet consumer needs, consumers will seek acceptable alternatives elsewhere.

Recommended specification changes:

(3) State-regulated Small Diameter Directional Lamps. State-regulated small diameter directional lamps manufactured on or after January 1, 2018 must have a rated life of 25,000 hours or greater as determined by the lumen maintenance and time to failure test procedure and meet one of the following requirements:

(A) have a luminous efficacy of >= ~~80~~ 65 lumens per watt. (Alternatively a minimum of 70 LPW.)

(B) Have a minimum luminous efficacy of ~~70~~ 55 lumens per watt or greater and a minimum CRI of 90. (Alternatively, a minimum of 60 LPW.) ~~compliance score of 165 or greater, where compliance is calculated as the sum of the luminous efficacy and CRI.~~

Newly Added Voltage Language is problematic

The first 15-day proposal for small diameter directional lamp scope is workable. The term "Operates at 12 volts, 24 Volts or 120 volts" will be clearly understood by the majority of stakeholders.

The most recent proposed 15-day scope language is not workable. The term "**Capable of operating**" at 12 volts, 24 volts or 120 volts is NOT defined and therefore will be understood differently by various stakeholders. If the lamp meets all performance requirements, does that mean it is capable of operating at that voltage? If the lamp meets some performance requirements, is it capable of operating at that voltage? Which performance requirements are critical and who decides? If it meets none of the performance requirements, but still produces some light, is that considered "capable of operating?" If the lamp fails, but operated fine for 2 minutes before it exploded, is that considered "capable of operating?" The problem with the revised language is that it introduces too many possible interpretations.

Filaments operate fairly predictably when you change their operating voltage. A lamp will operate acceptably if the lamp is within +/- 5% of the rated voltage. As you get closer to 10% outside the voltage range, the performance is no longer acceptable. For example, if a 105 volt lamp was placed on a 120 volt socket, it would only last approximately 20% of the rated life. As specialty lamps are expensive, such a lamp would not be acceptable to a consumer. If a 135 volt lamp was placed on a 120 volt socket, light output would be significantly reduced and would be unacceptable to the consumer.

If the CEC is concerned about manufacturers making lamps slightly above or below the stated voltage ranges (highly unlikely as there is no design investment for new lamps in this area), they can simply state that the scope includes lamps at the specified voltages, and plus or minus 10% from these voltages. Lamps made outside of +/- 10% will not have acceptable performance.

DIMMING Issues still have not been addressed

GE is still concerned that after these standards are implemented there will be no effective solution to address dimming systems. The commission still must develop an exception that allows the use of filament Halogen MR16 lamps when required for existing sophisticated dimming systems. The simplest approach would be to allow short life 12 volt halogen MR16 lamps to continue to be sold with lamp lifetimes between 1000 and 2000 hours. Such lamps would not be cost effective in commercial applications with long operating hours. **Our 45-day comments on dimming systems are restated here.**

A recent DOE Caliper Report, Report 22.1, dated August 2015, documented many performance problems with LED MR16 lamps used on dimming systems. In most cases, the transformer and dimming system had to be replaced for the user to get full dimming performance with these lamps. While this outcome may be cost-effective in some simple dimming applications, it would not be cost-effective for advanced dimming systems used in restaurants and other commercial and custom residential applications. Some of these advanced dimming systems can cost many thousands of dollars to purchase and install. Even when replacing the components, the system will be unable to achieve the deep dimming performance of Halogen MR16 lamps required in certain applications such as home theatres, dining rooms, bed rooms, living rooms, video conference rooms, high-end restaurants and many others. The following issues documented in the Caliper report illustrate these problems:

1. LED MR16 lamp performance on actual transformers demonstrated substantial performance variation and clearly indicated the difficulty in retrofitting LED lamps into existing systems intended for use on Halogen MR16 lamps.

2. The MR16 form factor and system requirements pose substantial challenges for LED technology compared to line voltage products. The small size poses unique driver design challenges and trade-offs including greatly increased thermal challenges. Lamps that have thermal issues will have significantly shortened lamp lives.

3. The system requirements often require an electronic driver, an electronic transformer and an electronic dimmer, all designed by different manufacturers, to work together. This can lead to unwieldy compatibility issues and result in complications before, during and after installation as well as unacceptable performance. Caliper determined that most LED MR16 lamps are only compatible with certain combinations of equipment. In many cases, MR16 LED lamps exhibited undesirable dimming behavior, such as dead travel or erratic dimming performance due to incompatible electronic circuits in the driver, transformer and/or dimmer.

4. When testing an electronic transformer on an incandescent dimmer most LED MR16 lamps did not dim in a reasonable manner even though they were marketed as dimmable. Some products dimmed in a non-monotonic manner, meaning light levels could go higher when they were dimmed lower, and many did not dim below 60% light output.

5. The presence of audible noise greatly increased when dimming. In addition, the overall flicker index was quite poor with lamps exhibiting objectionable flicker when dimmed.

6. The MR16 LED lamps demonstrated irregular or unpredictable dimming, essentially showing a high level of incompatibility with the transformer-dimmer system. None of the LED products matched the dimming curve of the halogen benchmarks, and the flicker performance of most of the lamps was very poor.

7. In retrofit situations, where other system components are unknown, a significant investment in time and new equipment may be required to achieve acceptable system compatibility and performance. The likelihood that a combination of a new LED MR16 lamp, an unknown transformer, and an unknown dimmer will operate smoothly and meet halogen performance expectations is extremely low and highly unlikely.

To address these issues, the CEC must allow some types of Halogen MR16 lamps to remain on the market to be used on advanced dimming systems. Replacing systems that can cost over $10,000,

which would be necessary to preserve product efficacy[3], would not be cost-effective pursuant to Public Resources Code section 25402(c)(1). This is especially true because the lamps used in these applications draw very little power when dimmed. Halogen MR16 lamp life is also greatly increased when lamps are regularly dimmed, meaning fewer replacements and lower total cost to the consumer.

Commercial MR16 lamps used at full power, up to 16 hours a day, 7 days a week, require a long lamp life of 3000 to 6000 hours to make their use practical. These applications also use the most power and are well suited to LED conversion in terms of maintenance and product cost. Allowing continued use of some halogen MR16 lamps on dimming systems would enhance the cost-effectiveness of the proposed standard and preserve product and system efficacy for the consumer with minimal impact on statewide energy savings. This can be done by limiting the scope to MR16 lamps with a relatively long lamp life.

To address these serious concerns, and to ensure products are available that work in all applications after the regulation takes effect, the proposed definition must be changed. GE supports the industry suggestion to address these issues as follows:

a) "State-regulated small diameter directional lamp" means a directional lamp that meets all of the following criteria:

1. ~~*Capable of Operating*~~ *Rated to operate at +/- 10% of* ~~*at*~~ *12 volts, 24 volts, or 120 volts;*
2. *Has an ANSI ANSLG C81.61-2009 (R2014) compliant pin base or E26 base;*
3. *Is a non-tubular directional lamp with a diameter of less than or equal to 2.25 inches;*
4. *Has a lumen output of less than or equal to 850 lumens, or has a wattage of 75 watts or less; and*
5. *Has a rated life greater than 300 hours and less than 1000 hours, or, a rated life greater than 2000 hours*

Small diameter directional lamp includes incandescent filament, LED, and any other lighting technology that falls within this definition. State-regulated small diameter directional lamp does not include directional lamps with an E26 base that utilize light emitting diodes (LEDs) and are covered under the definition of state regulated light emitting diode lamps.

Rationale for proposed changes:

1. The proposed voltage language would provide a clearly defined technical area easily understood by stakeholders and preventing manufacturers from making products at nearly the same voltage ratings.

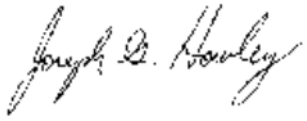
2. Limiting Halogen lamp life to 2000 hours or less will ensure that these products are only used in dimming applications. It will also ensure that specialty products designed at 12 volts or 120 volts, but which have very short lamp lives, are not affected.

[3] Public Resources Code section 25402(c)(1) also requires CEC to consider the "impact on product efficacy for the consumer" when determining cost-effectiveness.

Widespread adoption of LED lamps is crucial to the future of energy conservation in California. GE Lighting thanks you for considering these alternative approaches which would be more effective in terms of producing energy savings (and thus more responsive to CEC's statutory mandate), more-cost effective for consumers and would better facilitate compliance among all actors in the supply chain.

Thank you for addressing our concerns.

Sincerely,



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