DOCKETED	
Docket Number:	17-AAER-07
Project Title:	General Service Lamps
TN #:	224731
Document Title:	GE Lighting Comments On Appliance Efficiency Pre-rulemaking for General Service Lamps (Expanded Scope)
Description:	N/A
Filer:	System
Organization:	GE Lighting
Submitter Role:	Public
Submission Date:	9/17/2018 1:47:27 PM
Docketed Date:	9/17/2018

Comment Received From: GE Lighting
Submitted On: 9/17/2018
Docket Number: 17-AAER-07

On Appliance Efficiency Pre-rulemaking for General Service Lamps (Expanded Scope)

Additional submitted attachment is included below.

GE Lighting

1975 Noble Road
East Cleveland, OH 44112
USA

September 17, 2018

California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Docket Unit, MS-4

Re: Docket No. 17-AAER-07

Email: docket@energy.ca.gov
Subject Line: **17-AAER-07 - "Appliance Efficiency Pre-rulemaking for General Service Lamps (Expanded Scope)"**

California Energy Commission,

GE Lighting appreciates the opportunity to comment on the CEC pre-rulemaking proposal to expand the scope for General Service Lamps. GE supports the comments submitted by the National Electrical Manufacturers Association. Our shipment data supports NEMA's position that the installed base of incandescent and halogen products has been greatly overstated leading to greatly overstated energy savings.

In general, GE opposes the proposal and does not believe the proposal is needed in order to move the market to more energy efficiency LED technology. Market forces are already moving the lighting market to solid state lighting technology at a rapid pace. Such regulations can slow the adoption of LED technology by requiring unique California solutions, while producing unanticipated negative consequences for specialty lamp types. Statements at the workshop that sales of older technologies will explode without immediate government action are exaggerated. In fact, the exact opposite has been happening to any incandescent or halogen lamp technology that has an acceptable LED alternative. The consumer market is making the switch to solid state technology regardless of what manufacturers or regulators do. The reason that some A-line incandescent lamps are still available in CA stores is that sales of these types of products continue to decrease in favor of LED technology, which means it is taking longer to exhaust old inventory of these lamp types from store shelves. Regardless, inventories of halogen A-line lamps will soon be depleted.

Last year, DOE requested additional information on the general service lamp rule especially concerning incandescent and halogen technology and market size. The general service lamp definition was modified in a short period of time without adequate information or analysis. As is well known, DOE was also hampered by a Congressional amendment that did not allow them to allocate funds necessary to fully analyze the technology used for the existing incandescent or quartz lamp product lines nor properly analyze the market size or market direction for these products. For this reason, it is critical that CEC await DOE's final decision based on their collection of more data concerning these product lines and allowing them more time to fully analyze the definition. While is it possible no changes will be made to the definition, it is even more likely that changes or adjustments will be made to reflect the new data.

SALES BAN

A Sales ban in meaningfully problematic for manufacturers. Every energy efficiency rule passed for lighting products at the federal or state level has been based on a product manufacturing date. This is because, unlike other products that have low sales volumes or unique distribution channels, the lighting supply chain is worldwide and extremely complicated. It involves thousands of suppliers operating in many countries, shipping to hundreds of manufactures who sell in tens of thousands of stores and commercial distribution businesses. The number of lighting products sold dwarfs most other product categories by many millions of units per week. While it may be possible to create a sales ban for products with much lower unit sales, it is not possible or practical to implement a sales ban for millions of light sources at one single point in time.

The reasons a manufacturing date is always used, is the large number of products sold each day, and that Manufacturers can only control when a product is produced. Once it is sold into the retail or distribution channel, manufacturers have no control over the product or how or when it is sold. Likewise, it would be impractical for CEC to enforce a sales ban on tens of thousands of stores in the state simultaneously. If enforcement cannot be achieved in a practical manner, it simply cannot be implemented. The regulation must have a reasonable chance of being implemented fairly. Such would never be the case with a sales ban.

The Department of Energy has never issued a Sales ban for any efficiency regulation concerning a lighting product. It is a fact that the Department of Energy has not published a notice in the federal register that implements a sales ban on general service lamps, and we do not expect them to publish such an unenforceable regulation in this situation. Moreover, in the past when industry has indicated they would have trouble meeting a product energy efficiency regulation date, DOE has granted enforcement discretion to manufacturers allowing needed time. The federal government has never forced an impractical or unworkable requirement on manufacturers and neither should California.

ANSI COLOR STANDARD

As mentioned in the workshop, there are 5 basic LED color options available in the United States today. Only 2 can be sold in California due to stringent color requirements.

The 5 types are:

Soft White	Daylight			Modified Spectrum
2700K	5000K	2700K	5000K	2850K
80 CRI	80 CRI	90 CRI	90 CRI	90 CRI

The 80 CRI products cannot be sold, and the Reveal, modified Spectrum lamp cannot be sold due to the lamp requiring a color point within Table B1 of the ANSI C78.377-2015 color standard. Modified spectrum lamps have shown that they are preferred in color preference studies, but their color point in below the black body curve, in the “white” area of the spectrum and outside of Table B1.

GE recommends that CEC update their reference to the 2017 color standard, ANSI C78.377-2017, and allow the modified spectrum tables to be used for compliance. GE prefers if CEC allows use of Table 2, “Extended Nominal CCT Specification”, for modified spectrum lamps (see Appendix A). For certain types

of modified spectrum lamps, it is useful to use the color space just below the 7 Step “MacAdam Ellipse” defined by the standard color space. Table 2 allows use of this space.

Alternatively, CEC can allow the 4-step Table E2, Extended Specification for 4-Step Quadrangles, in Appendix E for modified spectrum lamps. However, this table forces the lamp further below the black body curve and we believe unnecessarily limits the color space the can be used. However, it still would provide a much-needed option to use the modified spectrum color space if the option to use Table 2 is not allowed.

ANY ANSI BASE

The most troubling part of the proposed definition change is the language that states a general service lamp can have any ANSI base. There are well over 100 bases described in the ANSI Base standard. General service lamps only use a few of them, most notably the medium screw Edison Base.

The Department of Energy did not analyze every base type in this standard and determine if LED lamp technology could be adapted to replace incandescent or halogen lamps using dozens of specialty base types. The California Energy Commission only analyzed a few base types covering Large Diameter Reflector lamps (medium base), Decorative Lamps (medium or candelabra base), Globe Lamps (medium base), EISA Exempt (medium base), and low-lumen lamps (Medium or Candelabra base). Until and unless CEC analyzes each of 100 different base types and determines lamp capability and availability, CEC should not blindly adopt regulations that neither CA or DOE and thoroughly analyzed. DOE only provided two base exemptions, lamps that have a pre-focus base or a wedge base. Such a blind adoption is likely to produce significant harm. As was already mentioned, DOE is re-analyzing the definition they quickly put together at the end of 2016.

As CEC only analyzed a few base types, the definition should be limited to only these few base types commonly found on general service lamps. The CEC has a responsibility to analyze each unique product they are seeking to regulate. Such is not the case with the adoption of definition that includes every ANSI base. CEC must change this part of the definition, or, initiate an analysis of every ANSI base type.

Raising the lumen range to 3300 lumens is also problematic. Some lamp and base types can only be produced with LED technology with very low lumen output. Each base and lamp type may need different lumen range.

Take for example a lamp passed around at the workshop, a single ended pin-based LED lamp designed to replace a single-ended quartz (SEQ) halogen lamp. The LED version only produced 195 lumens due to the very small size. The possible upper-end lumen range for such a lamp would be very low, and certainly not 3300 lumens. The statement made at the workshop indicated that if LED can be made in such a small shape, any LED lamp is possible. Such logic is flawed. The issue has never been making an LED small; the first LED lamp invented in the 1960s was a red indicator light – it was very small. The issue was obtaining enough usable white light lumen output to offer a practical light source.

As the light output increases, the number of chips increases, the size of the electronics increases, and the need for thermal dissipation increases. This leads to the need for larger and larger lamp types as lumen output is increased. This is not true for Halogen lamps that can get very high light output from very small sources. The quartz glass can withstand very high temperatures, electronics cannot.

ONE EXAMPLE - SEQ

Some of the Single-Ended Quartz Halogen lamps are offered:

Watts	Lumens	ANSI Base	Length (Inches)	Volts
5	60	G4	1.25"	12
10	140	G4	1.25	12
20	350	G4	1.25	12
35	550	GY6.35	1.75	12
50	950	GY6.35	1.75	12
75	1400	GY6.35	1.75	12
100	2350	GY6.35	1.75	12
25	240	G8	1.59	120
35	350	G8	1.77	120
50	700	G8	1.77	120
75	900	G8	1.77	120
100	1300	G8	1.77	120

The LED lamp shown at the workshop is only capable of replacing 3 of the 12 listed lamps and it only offers a little more than half of the light output of the 20-watt halogen version. Due to the technical inability for an LED lamp to generate significant light output in such a small lamp shape, none of the other lamps with significant light output can be made with LED technology. An entire luminaire would have to be replaced to covert to LED technology in high lumen applications using small quartz halogen lamps. Forced replacement of an entire luminaire is not cost effective and has not been analyzed by CEC. This example also shows three of the non-analyzed base types out of the more than 100 base types in the ANSI standard. As shown here, analysis of each base type would lead to a different conclusion.

The comment period is too short for industry to analyze over 100 base types and determine each product problem with the definition. (See Appendix B for some of the uncommon incandescent or halogen lamps sold today that would be covered under the new definition.) If CEC were to ignore comments, and push ahead with this definition, some products would be banned for which there is no practical LED solution, either because the technology does not permit it, or there is no business case for a manufacture to invest in new LED products in a niche product area. If CEC pushes ahead despite comments, CEC must create a mechanism to request lamp exemptions when it is discovered that a product cannot be made with LED technology.

It is also critical for CEC to clearly indicate that specialty lamps, such as miniature, stage studio, photo, auto, airport and any lamps designed for use in equipment or transportation vehicles are not included in the scope of this regulation. These products use any ANSI base but are clearly not general service lamps.

For clarity, CEC needs to exempt the following categories:

a. Lamps designed for airway, airport, aircraft or other aviation service.
b. Lamps designed for photo, projection, stage, studio, or television service.
c. Lamps designed for headlight, locomotive, street railway, traffic signal, or other transportation service.
d. Lamps designed for medical, dental or other specialty equipment service.
e. Lamps designed for marine, marine signal, swimming pool or other water or underwater service.

ADDITIONAL DEFINITION COMMENTS

VOLTAGE
Voltages should be limited to just those analyzed, which are all 120-volt lamps. CEC should remove 12v, 24v, 220v, 240v, and 277v, from the definition. These are primarily specialty or commercial voltages.

LUMENS
The lumen output range should not be increased to 3300 lumens. Increasing light output with small lamp shapes is not possible with LED technology.

PIN-BASED CFL
The new scope proposal would include pin-based compact fluorescent lamps. Pin-based compact fluorescent lamps should not be included in the scope of the definition and should be clearly excluded. There is no energy saved by including these products in a 45 LPW regulation. All of these, mainly commercial products, are already more than 45 LPW and the technology is mature. This product area is declining each year as new fixtures primarily use LED technology. Regulations must show they produce energy savings for CEC to defend bringing a new product into the scope. Inclusion of Pin-Based compact fluorescent lamps will produce no energy savings.

Odd Lamp Exemption

One of the exclusions in the proposed general service lamp definition uses non-standardized nomenclature not typically used in the United States.

The exclusion states that: J, JC, JCD, JCS, JCV, JCX, JD, JS, and JT shape lamps that do not have Edison Screw bases are excluded.

While used by some companies as a name for certain lamp types, the letters used to describe certain lamps by some companies are not standardized lamp shapes in the industry and do not exist in any USA industry standard for lamp shapes or lamp bases. While some manufacturers use these letters to describe their own specialty halogen lamp types, other manufacturers use different naming conventions. For consistency in interpretation, CEC should not use non-standardized nomenclature. Instead, CEC should describe specific ANSI lamp shapes that do not have a medium screw base that are to be excluded from the definition.

CERTIFICATION, LABELING AND EXPANSION OF LED REQUIREMENTS

If CEC decides to move forward, GE strongly supports CECs proposal to not include any certification, labeling or extended LED requirements, such as stringent color specifications, to any new products covered by the definition. Such requirements would produce significant costs to industry while not producing any additional energy savings for the state. This is especially true for newly added products, such as pin-based compact fluorescent lamps. Comments at the workshop that a few pages of training material would have to be edited if no certification is required are extremely minor objections.

FINAL RECOMMENED DEFINITION

If CEC moves forward, GE recommends modifying the definition in the following way. This same definitional change comment was provided to the DOE.

General service lamp means a lamp that has a medium screw base ~~an ANSI base~~; is able to operate ~~at a voltage of 12 volts or 24 volts,~~ at or between 100 to 130 volts, ~~at or between 220 to 240 volts, or of 277~~

~~volts for integrated lamps (as defined in this section), or is able to operate at any voltage for non-integrated lamps (as defined in this section);~~ has an initial lumen output of greater than or equal to 310 lumens (or 232 lumens for modified spectrum general service incandescent lamps) and less than or equal to ~~3,300~~ 2600 lumens; has an omnidirectional light distribution, is not a light fixture; is not an LED downlight retrofit kit; and is used in general lighting applications. General service lamps include, but are not limited to, general service incandescent lamps, compact fluorescent lamps, general service light-emitting diode lamps, and general service organic light-emitting diode lamps. General service lamps do not include:

(1) Appliance lamps;

(2) Black light lamps;

(3) Bug lamps;

(4) Colored lamps;

(5) G shape lamps with a diameter of 5 inches or more as defined in ANSI C79.12002 (incorporated by reference; see §430.3);

(6) General service fluorescent lamps;

(7) High intensity discharge lamps;

(8) Infrared lamps;

(9) ~~J, JC, JCD, JCS, JCV, JCX, JD, JS, and JT~~ Any lamp shape ~~lamps~~ that does not have an Edison screw bases;

(10) Lamps that have a wedge base or prefocus base;

(11) Left-hand thread lamps;

(12) Marine lamps;

(13) Marine signal service lamps;

(14) Mine service lamps;

(15) MR shape lamps that have a first number symbol equal to 16 (diameter equal to 2 inches) as defined in ANSI C79.1-2002 (incorporated by reference; see §430.3), operate at 12 volts, and have a lumen output greater than or equal to 800;

(16) Other fluorescent lamps;

(17) Plant light lamps;

(18) R20 short lamps;

(19) Small Reflector lamps (as defined in this section) that have a first number symbol less than 16 or a (diameter less than 2 inches) as defined in ANSI C79.1-2002 (incorporated by reference; see §430.3) ~~and that do not have E26/E24, E26d, E26/50x39, E26/53x39, E29/28, E29/53x39, E39, E39d, EP39, or EX39 bases;~~

(20) S shape or G shape lamps that have a first number symbol less than or equal to 12.5 (diameter less than or equal to 1.5625 inches) as defined in ANSI C79.12002 (incorporated by reference; see §430.3);

21 Sign service lamps;

22 Silver bowl lamps;

23 Showcase lamps;

24 Specialty MR lamps;

25 T shape lamps that have a first number symbol less than or equal to 8

(diameter less than or equal to 1 inch) as defined in ANSI C79.1-2002

(incorporated by reference; see §430.3), nominal overall length less than ~~12~~ 10 inches, and that are not compact fluorescent lamps (as defined in this section.);

26 Traffic signal lamps;

27 Incandescent reflector lamps.

28 Decorative Lamps including a B, BA, CA, F, G16–1/2, G–25, G30, S, or M–14 lamp (as defined in ANSI C79.1–2002 and ANSI C78.20–2003) of 40 watts or less.''

29 Directional Lamps

30 Special Service Lamps

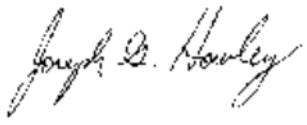
31 Shatter- Resistant Lamp

32 3-Way Incandescent Lamp

SUMMARY

Thank you for consideration of our comments. Please contact me if you have any questions.

Sincerely,



Joseph Howley
GE Lighting
Manager-Industry Relations
1975 Noble Road
E. Cleveland, OH 44112

216-266-9729
joseph.howley@ge.com

APPENDIX A
ANSI C78.377 – 2017 TABLES
MODIFIED SPECTRUM LAMPS

GE would prefer if CEC added the following Table (2) for modified spectrum lamps. For certain types of modified spectrum lamps, it is useful to use the color space just below the 7 Step MacAdam ellipse defined by the standard color space. Table 2 allows use of this space.

Table 2
Extended Nominal CCT Specification

Nominal CCT Category	Center CCT and Tolerance (K)	Center Duv	Duv Tolerance
2200/012	2238 ± 102	−0.0120	**T_x: CCT of the source** **For T_x < 2870K** **−0.0120 ± 0.0060** **For T_x ≥ 2870K** **$D_{uv}(T_x)^4$) ± 0.006**
2500/012	2460 ± 120	−0.0120	
2700/012	2725 ± 145	−0.0120	
3000/012	3045 ± 175	−0.0119	
3500/012	3465 ± 245	−0.0115	
4000/011	3985 ± 275	−0.0110	
4500/011	4503 ± 243	−0.0105	
5000/010	5029 ± 283	−0.0100	
5700/010	5667 ± 355	−0.0095	
6500/009	6532 ± 510	−0.0089	
Flexible CCT xx00/zzz[7])	TF^1) $\pm\Delta T^3$)	$D\text{uv}(TF)^4$)	
Flexible CCT/Duv[6]) xx00/yyy[5])	TF^2) $\pm\Delta T^3$)	−0.yyy[5])	

1. T_F is chosen to be at 100 K steps (2300, 2400, …., 6400 K), excluding the first ten CCTs listed in Table 2.
2. T_F is chosen to be at 100 K steps from 2200 to 6500 K.
3. $\Delta T_F = 1.1900\text{x}10^{-8} \text{ x } T_F^3 - 1.5434\text{x}10^{-4} \text{ x } T_F^2 + 0.7168 \text{ x } T_F - 902.55$
4. $D_{uv}(T) = -0.012$ for $T<2870$K, $D_{uv}(T) = 57700 \text{ x } (1/T)^2 - 44.6 \text{ x } (1/T) - 0.00346$ for $T \geq 2870$K
5. yyy represents the three decimal digits below the center Duv (e.g., “010” for $D_{uv} = -0.010$). yyy shall be in the range from 002 to 010, and chosen at an increment of 002.
6. CCT and Duv may be flexible independently or combined.
7. zzz represents the three decimal digits below the center D_{uv} (e.g., “011” for $D_{uv} = -0.011$) for the rounded $D_{uv}(T)$ value.

Alternatively, CEC can add the following 4-step table (E2) in Appendix E for modified spectrum lamps. However, this table forces the lamp further below the black body curve and we believe unnecessarily limits the color space the can be used. However, it still would provide a much-needed option to use the modified spectrum color space if the option to use Table 2 is not added to the specification.

ALTERNATIVE TABLE

E.4 Extended Specifications for 4-Step Quadrangles

Table E2 shows the expected 4-step quadrangle specifications using the same center points in Table 2. The size of quadrangles corresponds to the size of 4-step MacAdam ellipses used in ANSI C78.376.

Table E2
Extended Nominal CCT Categories with 4-Step Quadrangles

Nominal CCT (K)	Center CCT and Tolerance (K)	Target Duv	Duv Tolerance
2200/012	2238 ± 58	−0.0120	**T_x: CCT of the source** **For T_x < 2870K** **−0.0120 ± 0.0033** **For T_x ≥ 2870K** **$D_{uv}(T_x)^4$) ± 0.0033**
2500/012	2460 ± 69	−0.0120	
2700/012	2725 ± 83	−0.0120	
3000/012	3045 ± 100	−0.0119	
3500/012	3465 ± 124	−0.0115	
4000/011	3985 ± 154	−0.0110	
4500/011	4503 ± 185	−0.0105	
5000/010	5029 ± 220	−0.0100	
5700/010	5667 ± 269	−0.0095	
6500/009	6532 ± 340	−0.0089	
Flexible CCT xx00/zzz[7])	TF^1) ±ΔT^3)	$D\mathrm{uv}(TF)^4$)	
Flexible CCT/Duv[6]) xx00/yyy[5])	TF^2) ±ΔT^3)	−0.yyy[5])	

1. T_F is chosen to be at 100 K steps (2300, 2400, …., 6400 K), excluding the first ten CCTs listed in Table 2.
2. T_F is chosen to be at 100 K steps from 2200 to 6500 K.
3. $\Delta T_F = 5.4500\text{x}10^{-10} \text{ x } T_F^3 - 2.63\text{x}10^{-6} \text{ x } T_F^2 + 5.49\text{x}10^{-2} \text{ x } T_F - 58.0$
4. $D_{uv}(T) = -0.012$ for $T<2870$K, $D_{uv}(T) = 57700 \text{ x } (1/T)^2 - 44.6 \text{ x } (1/T) - 0.00346$ for $T \geq 2870$K
5. yyy represents the three decimal digits below the center Duv (e.g., “010” for $D_{uv} = -0.010$). yyy shall be in the range from 002 to 010, and chosen at an increment of 002.
6. CCT and Duv may be flexible independently or combined.
7. zzz represents the three decimal digits below the center D_{uv} (e.g., “011” for $D_{uv} = -0.011$) for the rounded $D_{uv}(T)$ value.

APPENDIX B

An example of some of the newly covered Incandescent or Halogen Lamps under the proposed Scope with uncommon shapes or Bases. All have very low sales volume and may not be made with an LED option today. If not made, more research needed to see if they technically viable or if the sales volume would support develop of LED version.

Incandescent

25R14/SC/SP - Single Contact Bayonet Base
25T10 - Medium Base
25T10/F – Medium Base
40/R14/N – Intermediate Base
40/S11/N/1 – Intermediate
40T10/F - Medium
40T10/CL - Medium
40T10/RVL – Medium
50PAR36/WFL – 12V -Screw Terminal Base
50PAR36/VNSP – 12V - Screw Terminal
50PAR36/NSP – 12V - Screw Terminal
50PAR36/VWFL – 12V - Screw Terminal
150PAR/3FL/120WM – Medium Side Prong
150PAR46/3MFL – Medium Side Prong
240PAR56/VNSP – 12 V – Screw-Terminal
240PAR56/MFL – 12 V – Screw-Terminal
240PAR56/WFL – 12 V – Screw-Terminal
200PAR46/3NSP – 120V – Medium Side Prong
200PAR46/3MFL – 120V – Medium Side Prong
200PAR56/MFL -120V – Mogul End Prong

Halogen

40T10/H – Medium Screw
35PAR36/H/SP5 – 12 Volt - Screw-Terminal
35PAR36/H/SP8 – 12 Volt - Screw-Terminal
35PAR36/H/FL30 – 12 Volt - Screw-Terminal
35PAR36/H/VWFL – 12 Volt - Screw-Terminal
50PAR36/H/SP5 – 12 Volt - Screw-Terminal
50PAR36/H/SP8 – 12 Volt - Screw-Terminal
50PAR36/H/FL30 – 12 Volt - Screw-Terminal
50AR70/SP8 – 12 Volt – DC Bayonet Base
35AR111/SP4 – 12 Volt – G53 Base
35AR111/SP8 – 12 Volt – G53 Base
35AR111/FL24 – 12 Volt – G53 Base
50AR111/SP4 – 12 Volt – G53 Base
50AR111/SP8 – 12 Volt – G53 Base
50AR111/FL24 – 12 Volt – G53 Base
75AR111/SP8 – 12 Volt – G53 Base
75AR111/FL24 – 12 Volt – G53 Base
75AR111/FL45 – 12 Volt – G53 Base