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Vice President, Government Relations

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VIA EMAIL TO: lamps@energystar.gov

Mr. Alex Baker
Environmental Protection Agency
ENERGY STAR Lighting Program Manager
1200 Penn. Ave NW 6202J
Washington, DC 20460

NEMA Comments on Draft ENERGY STAR® Program Lamp Specification

Dear Mr. Baker,

The National Electrical Manufacturers Association (NEMA) appreciates the opportunity to provide the attached comments the subject proposal. These comments are submitted on behalf of NEMA Lamp and Solid State Lighting Section companies.

As you may know, NEMA is the association of electrical equipment manufacturers, founded in 1926 and headquartered in Arlington, Virginia. Its member companies manufacture a diverse set of products including power transmission and distribution equipment, lighting systems, factory automation and control systems, and medical diagnostic imaging systems. Worldwide annual sales of NEMA-scope products exceed \$120 billion.

Thank you for your consideration of these comments. We look forward to working with you further on this important project. If you have any questions on these comments, please contact Alex Boesenberg of NEMA at 703 841 3268 or alex.boesenberg@nema.org.

Sincerely,

A handwritten signature in black ink that reads "Kyle Pitsor". The signature is written in a cursive, flowing style.

**National Electrical
Manufacturers Association**

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**NEMA Comments on ENERGY STAR® Program Requirements
Product Specification for Lamps (Light Bulbs)
Eligibility Criteria Version 1.0, DRAFT 1**

General Comments

The specification as written is far from technology neutral. It is more of a consolidated standard. As written, some technologies are still given unfair advantage over others. In some cases it eliminates certain technologies from providing valuable solutions to the customer. We will illustrate specific examples of this conflict below.

Additionally, there are several requirements in the subject draft that Energy Star is proposing that a) slip into the area reserved for manufacturers' marketing decisions or b) which might tighten requirements to the point of limiting innovation and consumer choice. One example of the former is the proposal that a phone number be printed on the lamp itself. This is impractical and a decision each manufacturer should make individually. With products lasting several years, this proposed requirement dictates how manufacturers must interact with their consumers by requiring them to fund, maintain and operate a dedicated phone line for the longest projected life of their products. In today's world of ever-changing technology and communications options, manufacturers may not find a dedicated phone number to be the most effective and/or cost efficient method to communicate with their own customers. Additional examples are provided below.

Timing and the Effective date

As previously mentioned, these proposed requirements would require changes to existing qualified products for them to remain qualified under the combined lamps specification. Furthermore, manufacturers are not going to begin the redesign effort until the specification is finalized. Thus, we have two comments regarding the publication date of the final requirements and the effective date. We ask that the final requirements not be published until all the test methods are defined and labs are accredited to the new requirements. Regarding the effective date, we would like to propose a window. This process is similar to the process which UL uses for their standards. Their effective date takes into account redesign/retesting that would be required and gives manufacturers ample time to comply. Depending on the extent of the changes, the effective date can be anywhere from 12-36 months after the publication date.

We propose that once the final requirements are published, Partners may begin qualifying products against them. The effective date, which is the manufacturing date by which products must comply with the requirements, would be set 24 months after the publication date. After the effective date, any products which have not been requalified would be disqualified.

Specification Scope & Lamp Classification

The document is confusing with respect to ANSI standard shapes. The specification scope and lamp classification section on page 1 refers to ANSI standard shapes for several lamp types. CFL and SSL products are commonly made in A, G, and T shapes that do not meet the ANSI standard shapes. Is it the intent of the specification to exclude these shapes from the scope? Also, on page 26, the section on lamp shape dimensions and tolerances appears to indicate that a lamp only need to comply with the relevant ANSI dimensions if it claims of equivalency to an incandescent or halogen lamp are made. Is this interpretation correct? Furthermore, the Lamp Packaging Requirements on page 27 require an incandescent equivalency claim, contradicting the statement on page 26.

We suggest that the spirit of page 26 govern. If a manufacturer wishes to claim an incandescent equivalency, then they must comply with the ANSI outline for a product and follow the light output requirements on page 9, or have a letter from ANSI recognizing the particular IEC base and lamp type. We wish to point out that GU10 and GU5.3 bases are already referenced in the ANSI base standard.

In Scope

- Non-standard shapes
 - The non-standard category should include non-standard shapes in all technologies, not just CFL. For example, SSL lamp types/shapes need to be clarified.
- GU10 and MR16 (GU5.3 base) lamps should remain in the Energy Star program. The desire would be to add both lamp types to the directional lamp category. As to characteristics, NEMA recommends the IEC MOL be cited for GU10 since it is the accepted industry practice, rather than wait for the ANSI standard which is being started. Energy Star should solicit partner feedback on adopting the policy of accepting IEC dimensional standard, since these are being harmonized actively with ANSI standards.
- S-shape lamps typically have lumen packages less than 100 lumens. These lamps are of a niche nature and as such should be removed from the scope of the Energy Star program.

Out of Scope

- Lamps with GU10 bases should be included in the scope. Energy Star has referenced developmental documents (TM-21 for instance) in the previous specification, therefore GU10 based lamps can be added and the spec updated as needed should the reference change more than anticipated. This is not unusual as most references evolve over time.
- MR16s were previously allowed in the Energy Star program. Changes that had been suggested to that program were deferred to this new Lamps spec, but they are now out of scope, along with other low voltage lamps. MR16 Lamps should be eligible for Energy Star. Any device, component or system can be misused and misapplied, the device must be judged on its own merit. Here are some specific thoughts on how to incorporate MR-16 lamps into the specification:
 - Regarding Energy Star's concern about the difficulty to determine the MR16 energy savings for the low voltage lamp. The lamp's efficiency between the input mains (input power) and MR 16 load (output power) is constant regardless of the transformer type ($P_{eff} = P_{out} / P_{in}$). For example, a 50 W MR16 Halogen lamp can be replaced by a 7W MR16 (an 86% energy savings). If the MR16 is connected to a transformer that is 50% efficient, the 50W Halogen lamp will consume 100 watts and the 7W LED lamp will consume 14 watts. The energy savings still remains the same at 86%. The transformer does not influence the percent energy savings of the lamp.
 - To measure the MR16 lamp's efficacy in a consistent manner will require the use of a lab supply that can provide both 12V AC / DC. Measure the performance of candidate lamps on both 12VAC and 12 VDC. Operation on both voltages must meet the Energy Star requirements, unless the product is rated for only one voltage in which case it must meet Energy Star requirements only for that voltage.
 - The MR16 is a very popular lamp in the professional channel and offers significant energy savings to the customer.
 - MR16 labeling, if we follow the FTC labeling (medium base) and Regulatory body label requirements, all requirements should be able to fit on the lamp.

Future Specification Revisions

- The Lamps Spec states that, "EPA may amend the program requirements by adding additional requirements, method of measurement and reference documents." NEMA disagrees with this blanket statement.
 - First, a formal specification revision process is recommended to prevent the adoption of an unacceptable reference or method. Speaking to partners one-on-one is not sufficient. We recommend the sentence "EPA reserves the right to change..." be revised to say "EPA may open for discussion changes to this specification..."

- Second, such changes may have drastic impact on laboratory accreditation requirements, and costs. Due to the substantial increase in 3rd party testing and certification costs, potential increases must be met with the careful scrutiny afforded by the formal open review process.
- Third, rapid changes in the Energy Star program will impact manufacturing costs, labeling, and product availability.

Product Qualification

- Product considerations – the characteristics below must be allowed to vary moderately so as to not hamper innovation and product family listing:
 - Color point (and therefore color temperature)
 - CRI
 - Beam spread, i.e., spot, flood, etc.
 - Some base variations (identical product with different bases)
 - LEDs sourced from the same suppliers, provided they act essentially identical in performance (similar or equivalent LM-80 performance)
- Regarding topics carried forward from the existing SSL specification (v1.4):
 - Update the Appendix F of the existing specification to include use of long term lumen maintenance data across multiple models (same lamp family) for adjacent color temperature (ANSI C78.377) within the categories of Warm (2700-3000), Neutral (3500-4100) and Cool (5000) . Contingent on the variation of TMP being no more than +1.1°C.
 - Use of rapid cycle data across multiple models (same lamp family) regardless of color temperature should be permitted, contingent on the variation of TMP being no more than +1.1°C.
- Significant Digits and Rounding
 - The rounding rules proposed are different than those used by DOE. When an accepted industry practice is available, Energy Star should reference that rather than create a new divergent requirement. EPA and DOE rounding rules need to be harmonized before the Lamps Spec is finalized.
- Values that appear on the Energy Star website should be the same as the rated values of the product. This is currently the case for screwbase CFLs. This would avoid consumer confusion, as the actual measured value is typically slightly different than that of the rated value.

Photometric Performance Requirements – Luminous Efficacy

- Seasoning should be addressed for all applicable technologies.

Photometric Performance Requirements – Light Output Requirements

- Light Output Requirement Table
 - The equivalency charts may work short term, but will not make sense in the future. If equivalency is to be an issue for this specification, equivalency methods and tools must be developed before proposing any requirements to the partners for consideration for addition to the Energy Star Lamps program. Until such time as sufficient, accepted equivalency tools exist, this topic must remain out of the specification.
- The minimum levels in Light Output requirements should be single values and not ranges.

Correlated Color Temperature (CCT) Requirements: All Lamps

- Regarding Solid State products, ANSI C78.377 was originally formulated with 7-step quadrangles to provide a reasonable color basis while maintaining cost effectiveness for LED manufacturers and is currently the standard in place. Per Energy Star's policy to reference existing standards, C78.377 should be referenced in this current proposal and a 7-step quadrangle should be used in the Energy Star specification

for sake of consistency and practicality. The increased cost and proportional cost increase of a 4-step Quadrangle could reduce SSL lamp adoption.

- The CCT of 6500K is removed from the new draft and no reason is given. This CCT should be retained since it is an established product and in demand. We request the subject of allowing 6500K for SSL (thus a technology neutral CCT portion) be added to the agenda of the next public partners meeting.

Color Rendering Requirements

- For the general color rendering index, Ra, NEMA agrees with Energy Star that the value should remain at 80. Higher values would discourage LPW performance.
- Referencing LM-9 (Tubular fluorescent lamps) makes no sense here, as it is not relevant to CFL.

Color Maintenance and Angular Uniformity Requirements – SSL

Manufacturers have not received significant consumer complaints about this issue for SSL or CFL lamps. Thus we see no reason to tighten the color maintenance requirements at this time. Such a change will increase cost of both the LED / Lamp and nullify any cost savings associated with the lower life expectations (i.e. 10k hrs for SSL). This could negatively affect SSL adoption in the marketplace. While producing to 4-steps is a performance feature that might allow one manufacture to differentiate itself from others, it should not be a minimum to receive certification for energy efficiency. This is a topic which is best left alone, so as to encourage competition and product variety/choice.

We would like to point out that there are no referenced measurement standards for color uniformity measurements. Because the testing of color uniformity is only possible in a goniophotometer equipped with a spectrometer (or X-Y photocell) and because such devices are limited in availability and could not be accredited until sufficient measurement standards exist, this requirement should be removed for the time being.

Lumen Maintenance (LM) Requirements: All Lamps

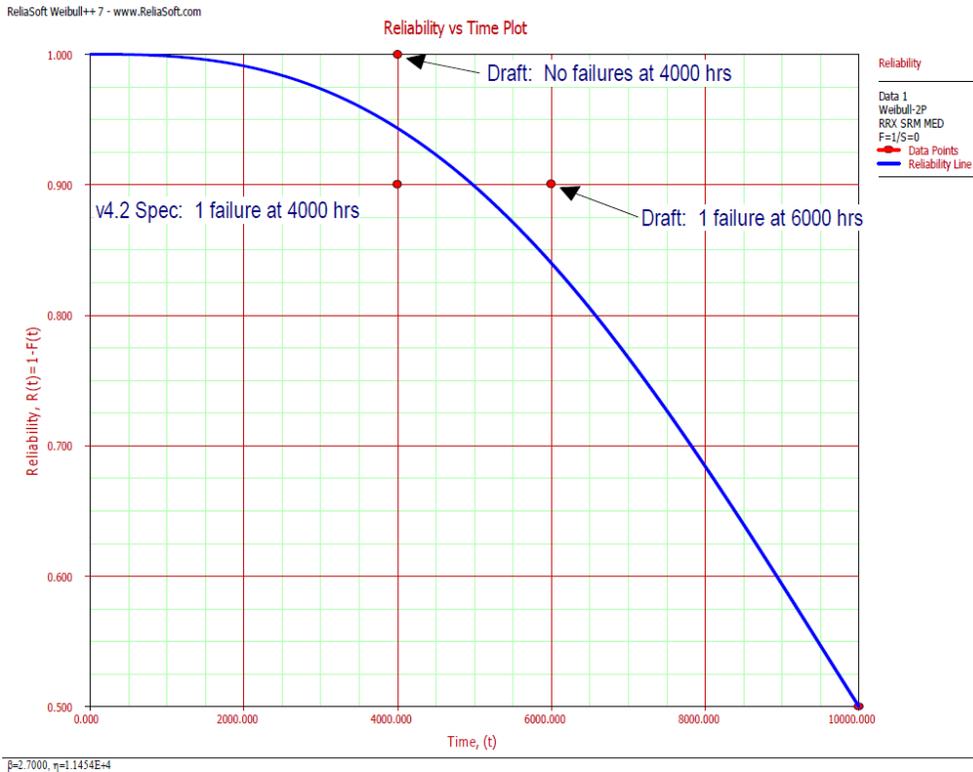
- Remove LM-9 as a reference under self-ballasted CFL product requirements.
- Early Interim Qualification for technologies other than Solid State Lighting should be allowed in the spirit of a technology neutral document.
- Typical LM measurement variation is 2-3%. The majority of LM values in all tables are within the expected measurement variation. We suggest the subject of acceptable measurement variation be added to the next public partners discussion.
- Testing time should be proportional to the rated lifetime hours, e.g. 6000 hours for 25000 hour life claim. $6000 * 10000 / 25000 = 2400$ hours for 10,000 hour life. This is consistent with TM-21.

Reliability Requirements: CFLs

- The issue of 10,000 hour lamp life is, as you witnessed at the November 30th Roundtable, an important one to manufacturers. You will receive individual responses to this issue from NEMA members.
- It appears that Energy Star is trying to address consumer behavior through product design, which is out of their scope. Manufacturers design products to operate in particular applications and use labeling to tell consumers where the lamps should or shouldn't be used. Requiring elevated temperature testing on all products is, by definition, requiring all products to be designed (and in some cases redesigned) to meet the worst case scenario. This is a manufacturer's decision, and if this is a concern for Energy Star, we suggest they address this issue through consumer education rather than de facto product design standards.
- We note that Energy Star has expanded the elevated temperature testing which first appeared in CFL Spec v4.0 to include all CFL types and not just indoor reflectors. The consequences of this are as follows: 1) the current Energy Star lifetest data represent lamp life at an ambient temperature of 25C. It is known that as the ambient temperature in which the lamp is operated increases, the life of the lamp decreases. Thus, while data for the current designs show they can meet 10,000 hrs life at 25C, most qualified products will need to be redesigned to achieve a 10,000 hr life at an elevated temperature, 2) Manufacturers will not begin to

work on the required design changes until the specification is finalized, which will require at least 7 months of testing, 3) The DOE lifestest protocol follows what is essentially the existing Energy Star procedure for bare lamps, i.e., they are tested at an ambient of 25C. If the draft specification continues without change, it will require a separate, parallel lifestest. This will increase testing expense and strain existing lab capacity.

- In the draft, Energy Star attempts to define a reliability curve for CFLs with specific reliability targets at 40% of life and 6000 hours. Such a curve is shown in Figure 1 for CFLs tested under nominal conditions, i.e. 25C with a B50 life of 10,000 hours. Using this as an example, the figure shows that 6% failures could be expected at 4000 hours. Thus, it is not realistic to expect zero failures, i.e., 100% reliability, at 4000 hrs. The existing specification acknowledges this by allowing at least 1 failure at 4000 hrs for a 10,000 hr lamp. NEMA recommends the CFL reliability requirement be maintained from the Energy Star CFL 4.2 specification. Please see the chart below.



NEMA Comments Figure 1

Reliability Requirements: SSL

LED lamps draw less power than CFLs, and test temperature of 50°C does not reflect the actual application environment for most installations. Therefore, keep the current test condition requirements (45°C for W>10W lamps and 25°C for W<10W lamps). The higher test temperature requirement is counter intuitive to lowering the life rating to 10k hrs. An advantage of a lower rated life claim is the ability to lower the product cost. To reduce the cost of the product, the LEDs may be driven harder, in turn increasing the Tj of the LED. Testing at the higher temperature will increase the opportunity for lamp failure for a test condition not representative in the field application. In addition, the higher wattage products may have active cooling devices to help with the cooling the product in enclosed spaces.

Rapid Cycle Stress Test

- In additional, since LED lamps are normally rated with 25000hr the corresponding required test duration would be greater than 4100hr. This is time consuming and adds no additional knowledge for product performance. Also this would contradict the intention of Energy Star to allow a minimum 3000hr lumen

maintenance test for early interim certification. Keep the number of power cycles to 1/2 the rated life. Keep the SSL rapid cycle stress test as it is currently in the v1.4 spec.

- For LED products there is no difference in long or short term product performance if the lamp is cycled at 5 minutes or 2 minutes. Moving to 5 minutes only increases test time and cost. We recommend the cycle times remain at 2 minutes on / 2minutes off. Keep the SSL rapid cycle stress test as it is currently in the v1.4 spec.
- Due to the test duration for lifetime required and the advancement of the LED technology, the next generation product would be launched before the test is concluded. This must be addressed.

Luminous Intensity Distribution and Center Beam Candle Power Requirements

- For an omnidirectional intensity distribution, keep the same requirement as the current SSL spec v1.4. The intensity distribution and CBCP should be tied back to the targeted lamp. This is the established expectation from the customer.
- We defer the final discussion of CBCP and lamp equivalency for the new Energy Star Lamps specification to the NEMA/LRC/EPA working group on this subject and suggest to table further discussions and inputs on this subject pending their results.

Dimming

For self-ballasted products (CFL and SSL, currently) any requirement of good performance of dimming on legacy incandescent dimmers is problematic for a variety of reasons.

- Requiring acceptable performance on legacy products will limit innovation. If new self-ballasted products are required to work on the majority of legacy dimmers this will certainly hamper new features that may otherwise become available when new products are designed to operate with next generation controls. Effectively requiring backwards compatibility will increase cost and complexity of future designs.
- Guidance for dimming and lamp/dimmer compatibility is being developed. Once this guidance is available the Energy Star spec can be reviewed, but until then dimmability should remain largely out of scope of this program. Dimming is a concern on a much larger scale than the Energy Star program and the solution should be left to those working groups.

Electrical Safety Requirements

As written, the current draft implies one sample per model should be tested against UL 1993, and pass, for the model to be qualified with Energy Star. In practice, UL 1993 already defines the number and type of samples to be tested. The NRTL performing the evaluation will follow that guidance. The intent from the perspective of Energy Star is that the model has a safety certification.

To that end, the supplemental testing guidance shall be modified as follows:

“Lamp model shall appear on list of approved/qualified products of an NRTL accredited to evaluate the relevant product against UL1993, 3rd Edition.”

Power Factor

- NEMA members did not reach agreement on the issue of power factor and what, if any, changes to suggest. This subject is recommended to a public partners meeting for further discussion and direction.

Operating Frequency

We recommend that for CFLs the operating frequency remain 40KHZ or greater (as is the current spec) to avoid interference with television remotes operating in this frequency band.

Starting Time

Starting time changes from 1.0 sec to 0.5 sec may have impact on the cost for self-ballasted CFL and HID products. While NEMA recognizes starting time as a consideration, the time required of current products is a balance of technology, price and consumer satisfaction. We suggest the market has found the balance and it should not be interfered with.

In the case of self-ballasted CFLs, starting time and rapid switching are inversely proportional; they cannot both be optimized without conflict.

Run-ups

NEMA members did not reach consensus on this subject and we suggest this be added to the agenda of the next public partners meeting for discussion. NEMA proposes the requirement be carried forward from the existing specifications as-is.

Noise Requirement

The industry does not receive many, if any, consumer complaints on this issue. The requirement should be eliminated from the draft.

Lamp Toxics Reduction Requirements

- Mercury content is already governed by other programs, such as the NEMA voluntary commitment. It also is not related to energy savings. We recommend that Energy Star defer to the NEMA commitment, which includes documentation upon request.
- ROHS is the accepted benchmark for toxicity reduction. Energy Star should defer to it and remove other requirements from the spec. If the draft Toxics requirement is maintained in the spec, we agree that documentation only be required to be supplied on request. However, we argue against maintaining the requirement in the spec since Toxic substances are not directly related to energy savings. Furthermore, some substances, like mercury in fluorescent lamps, are essential to the light generation process and are already regulated by other entities.
- p25. Note is incomplete. Typo – please fix.

Dimensional Requirements

The existing CFL and SSL requirements indicate that qualified products must use a base as described in the ANSI standard, however, no further documentation is required by either specification. The CFL specification allows manufacturers to self-certify. The draft indicates that the lamp base "shall fully comply with ANSI C81.61-2009". The rationale behind this change is not clear to Partners. We would like to point out that with the exception of the GU24 base, the referenced ANSI document does not contain any dimensions for the bases listed in the scope, i.e., E26, E26d, E12, and E17. The ANSI standard refers to and incorporates IEC 60061-1 by reference.

- We suggest that in the absence of a clear rationale, the text in the current v1.4 SSL specification be used, i.e., "Must be a base listed by ANSI", subject to the limitations listed in the scope and in our previous arguments regarding GU10.
- The consequence of keeping the existing draft text is that every base dimension, including the radius of the threads would be subject to measurement. Unless Energy Star wishes to begin checking the dimensions of lamp sockets, it is not clear what purpose measuring the base will serve.

Lamp Labeling

- Lamp labeling requirements should be limited to those that are absolutely necessary. For example, the marking of lamp input watts is already covered by UL 1993 and the FTC already mandates that lamp lumens appear on certain lamp types.
- We object to the phrase "contains mercury" as a label on the CFL as such a phrase is not currently required by any entity (it is important to note that other mercury markings are already required).

- Furthermore, adding a phone number to the lamp seems unnecessary as the consumer could easily find manufacturer contact information on the web.
- Manufacturers are still addressing changes resulting from the new FTC labeling requirements. Increasing the amount of labeling for Energy Star products does not add value but it does add burden. Energy Star should avoid unnecessary new labeling and marking requirements as a service to its partners.

Lamp Packaging

- A column for supplemental testing guidance should be added. For example, one draft requirement is that packaging for Energy Star lamps shall comply with the FTC requirements. As this is already a Federal requirement, compliance is an issue between the FTC and the manufacturer. Thus, the supplemental guidance should be that the certification body shall confirm the presence of the required FTC front panel disclosure and the Lighting Facts label. Certification bodies should not be in the position of interpreting law. Actual product ratings are the responsibility of the manufacturer.
- As written, the section on Incompatible Applications requires the manufacturer to know which applications would result in a lamp's noncompliance with any of the Energy Star requirements. This is unnecessarily vague and could result in a manufacturer being asked to test the product in various applications to determine to what extent the lamp's performance could be comprised. This matter should be left to the manufacturer's discretion and the section removed from the spec.
- We take exception to the requirement to put the model number on the package, and that the model number must be different from an earlier, non-qualified version. The rationale behind this is that manufacturers routinely market a product before it has the Energy Star mark. Changing the model number once the testing is completed is an unnecessary burden on both manufacturers and on retailers. This practice is already allowed in the SSL v1.4 specification.
- p.27. There is a typo in the "Restricted Position" row of the table. The word "indicated" should be "indicate".
- Due to the tight constraints on the lamps themselves, packaging inserts should be accepted as an alternative location for marking to satisfy Energy Star labeling requirements.
- The use of 3 "names" (Warm white, Neutral White and Cool White) to cover 5 CCT ranges (2700, 3000, 3500, 4000/4100 and 5000K) can only create confusion. Industry, Advocacy and Governmental guidance is educating consumers on CCT and how to choose a lamp based on the CCT value. Energy Star must remain consistent and only use CCT markings regarding color to reduce consumer confusion.
- Another example of inconsistency between Federal agencies is the Energy Star incandescent lamp equivalency claim. With the phase-out of incandescent lamps, the FTC determined that equivalency claims are impractical – and certainly if we are trying to educate consumers to purchase by lumens, not watts the proposed Energy Star requirement perpetuates incorrect behavior. Equivalency claims on packaging are a marketing decision made by each manufacturer and should at best be allowed ("should a manufacturer choose to...") but should not be required in the Energy Star Lamps specification. They should especially NOT be required on the front panel which already has limited real estate.
- We understand the rationale behind the color spectrum educational tool; however, we feel that this tool will lead to additional consumer confusion since there is already a similar FTC mandated scale on the package. For example, the middle of the proposed scale, which is ~ 4000K, could be interpreted to be 'white' light. A consumer could be very surprised if they purchase a 4100K lamp expecting 'white' light. Similarly, a consumer purchasing a 5000K lamp could think it is a 'blue' lamp.
- Additional labeling in regards to color should be left to manufacturer/partner discretion.