

June 26, 2009

**NEMA-NGLIA Comments on
Draft #2 of Energy Star Technical Requirements for Integrated SSL Replacement
Lamps**

Thank you for the opportunity to provide the following comments on the letter and draft specification issued on May 19. In addition, thank you for the recent message sent by Energy Star regarding improper and unauthorized use of the Energy Star logo on promotional materials for integrated SSL replacement lamps.

DRAFT CRITERIA

All Lamps

Correlated Color Temperature

CCT requirements are important for indoor applications but tolerances need to be large for outdoor units since LED manufacturers are finding it difficult to meet these requirements. In addition, CCT requirements have a large impact on price and volume of available parts. Tolerances should be increased to +/- 10 percent.

DOE should consider allowing all 8 color bins specified in ANSI C78.377-2008 for products intended for outdoor applications.

DOE should consider deleting the proposed nominal CCT of 4000K in favor of 4200K, with a target CCT of 4200 +/- 275.

The Lighting Facts label should be used to indicate the lamp's CCT.

Color Rendering Index

The proposed minimum value of 80 is also an indoor-type requirement and is difficult to meet. Lamps for outdoor applications should have a minimum of 65.

Color Maintenance

We propose the following: The change of chromaticity over 2000 hours shall be within 0.006 on the CIE 1976 (u', v') diagram. If the data is not available at time of submission, then product should be pre-qualified for Energy Star. Final Energy Star approval will be contingent upon test completion and data submitted.

Measurements over the lifetime of the lamp are impractical. We suggest the following alternative: The change in chromaticity over 2000 hours shall be within 7 McAdam steps. If data is not available at time of submission, then product shall be pre-qualified for

Energy Star. Final Energy Star approval will be contingent upon test completion and data submission.

Dimming

DOE should consider that a test protocol be provided to prove a unit is “dimmer safe” before this rating becomes a requirement for Energy Star. Partners should also be given the option, in addition to the website listing, to provide dimmer compatibility information with lamp packaging. Lamp manufacturers should only be required to maintain information on existing lamps that are marketed at the time under Energy Star.

Warranty

Warranty should exclude labor costs and be based on date of manufacture unless proof of date of purchase is provided. An electrolyte capacitor may not survive 3 years in hot conditions; a product should specify operating temperature such as 25, 30 or 40C.

Lamp Life/Lumen Maintenance

Data submitted for this specification shall be based upon predicted values. We recommend the metric be set at L70/B50 at 25°C.

- Minimum of 1000 hr with at least 10 samples under temperature conditions that closely represents the test and operating condition from the LM 80 data.
- Following the 1000 hr measurement, the average lumen maintenance of the 20 samples tested must be greater or equivalent than the applicable LM 80 data set identified above. No lamp can catastrophically fail during the 1000 hr test.

Power Factor

Power factor should be based upon the wattage rating of the lamp. For example <5 W would have no requirement, 5-25W a power factor of .55, and greater than 25W> .7. This is consistent with PF categories for other products. Requirement should state clearly that it applies at 120V, 60Hz.

Minimum operating temperature

A requirement of -20 °C or below may be irrelevant for indoor applications. A more application specific minimum operating temperature would benefit both the consumer and the manufacturer as long as the operating conditions were clearly stated. Operating temperature is clearly something that an end user can understand and adjust their selection accordingly. Therefore, we suggest having minimum operating temperature requirements divided into application specific categories, such as indoor, outdoor, freezer or the like.

LED Operating Frequency

DOE should consider changing this requirement from 120 Hz to 100 or 110 Hz. In other words, The definition ≥ 120 Hz is dangerous because if the line frequency varies to say 59 Hz, then the lamp is operating at 118 Hz and might be out of the spec. Also, as far as the intention of this is to “address the problems with visible flicker”, the shape of the wave matters as much as the frequency. DOE needs to look at something different like the ratio of DC to 120 Hz component or something called the “flicker index” (which itself is a poor measure).

EMI and RFI

Energy Star for CFLs require FCC Part 18 to be followed. Why would manufacturers need to change FCC requirements for LEDs vs. CFLs? If CFLs work with Part 18 and cause no interference, then LEDs should cause no interference with Part 18. If DOE wants to also invoke Part 15, then Class B should be indicated.

Transient Protection

Failure is OK if transient limits are exceeded, but the unit must fail in a safe way. This section requires that the power supply shall comply with IEEE C.62.41-1999, Class A operation. Many power supplies are testing to EN standards for line transient, not to the IEEE C.62.41 standard. Meeting the EN standard would allow development of a worldwide product platform rather than a U.S.-only power supply. Thus, Energy Star should allow testing to either the IEEE or the EN standard.

Operating Voltage

The proposed value assumes 60 Hz; this should be stated. For commercial applications a 277V or other voltage product could be provided. Why limit Energy Star to 110-130V?

Packaging Requirements

Incompatibility with controls and application exceptions

It may be difficult, if not impossible, for manufacturers to label packaging with all known incompatibilities, as opposed to identifying compatibilities. Further clarification is needed to understand if this is a reference to classes of controls or specific controls from specific manufacturers. Labeling packaging with all the things that something doesn't work with seems backwards. Similar requirements are not required on incumbent technologies.

Dimmable lamps

We recommend that DOE advocate for the standardization of transformers for use with low voltage LED integral lamps.

Caution notices may also be allowed in supporting documents such as product inserts.

Recessed applications

The proposal does not include a requirement to indicate whether a unit is suitable for recessed applications. The packaging should clearly mark if it is or is not suitable for recessed applications and further if it is or is not suitable for recessed insulated ceiling applications. In addition there should be a note stating that there could be considerably reduced and light output life from the use in these types of applications.

Non-Standard Lamps

DOE should reevaluate whether non-standard lamps should be included in the scope of the program at this juncture. Energy Star should apply only to standard lamps that comply with ANSI outlines and Energy Star. Introducing non-standard lamps into the Energy Star criteria only complicates the market.

If they are kept in, minimum efficacy should be 50 lm/W.

Minimum efficacy should be linked to CCT:

40 lm/W for min 80CRI @ 2700K & 3000K
35 lm/W for min 85CRI @ 2700k & 3000K
50 lm/W for the rest of the colors

Energy Star should consider not specifying minimum light output or luminous intensity distribution for non-standard lamps. Alternatively, minimum light output at 80 CRI and 2700K or 3000K could be regulated based on replacement wattage:

200 lm for 25W replacement
350 lm for 40W replacement
400 lm for >40W replacement

Replacement Lamps

Beam angle should not be a requirement for the package. It can be a requirement for the literature. Energy Star should define a specific beam angle for directional lamps to become Energy Star (e.g. 25 degrees +/- 3 degrees OR 15 degrees +/- 3 degrees). Candle performance criteria for directional lamps should be placed in a table with the targeted beam angle. The potential for Energy Star on multiple beam angles shall be avoided.

Omnidirectional Lamps

Applicable lamp types

Lamp types should include BT.

Minimum luminous efficacy

The proposed values should be reduced to 45 lm/W and 50 lm/W.

The charter for Energy Star is to reduce energy consumption within the U.S. As such, we would like to convert as many households to lower wattage products as fast as possible. If Energy Star is to do this, then we need to have realistic targets for efficacy. The maximum heat dissipated by the form factor of an A-lamp is roughly equivalent to 7 watts. All manufacturers will design to a 7 watt maximum. Is this low enough for industry to be considered acceptable for Energy Star?. Note, as shown today, to gain Energy Star for a 25 watt replacement will require a 4 watt bulb (at 50 lm/W efficacy), which is less than 7 watts. Are we really going to exclude a 7 watt replacement for Energy Star, just because a specification wants us to go to 4 watts? Why?

We suggest that Energy Star lower the requirements to 45 lm/W so that Energy Star can be achieved by lower wattage products earlier in the life cycle. Because the light benefits of LEDs are preferred (i.e. long life, no mercury, and instant turn-on), getting Energy Star earlier for these products will help lower the overall environmental impact of lighting.

Alternatively, in addition to segmenting via wattage (10W) lamps, consider the following:

Lamps < 10W

50 lm/W for min 80CRI @ 2700K & 3000K
45 lm/W for min 85CRI @ 2700k & 3000K
55 lm/W for the rest of the colors

Lamps 10W and greater

45 lm/W for min 80CRI @ 2700K & 3000K
40 lm/W for min 85CRI @ 2700k & 3000K
55 lm/W for the rest of the colors

Nominal wattages and minimum light output

The proposal for 250 lumens should be reduced to 200 since 250 is too high for a 25W equivalency. A line should be added for 35W replacement at 325 lumens since this level will help to gain broader acceptance of LEDs.

Luminous intensity distribution

Luminous intensity distribution on omnidirectional lamps is almost never done. DOE should consider removing this measure from the specification.

Alternatively, this category should be specified for LED lamps intended to replace coated (diffuse) incandescent/halogen. The incumbent technology – clear incandescent with axially mounted filament – cannot meet the proposed requirement. In addition, there needs to be an accepted procedure for measuring luminous intensity over different planes.

Decorative lamp requirements

Applicable lamp types

Delete BT, add G.

Minimum luminous efficacy

This should be reduced to 35 lm/W.

Alternatively, DOE could choose to segment via color:

35 lm/W for min 80CRI @ 2700K & 3000K
30 lm/W for min 85CRI @ 2700k & 3000K
55 lm/W for the rest of the colors

Minimum light output

We recommend that a table be developed similar to a table for the Omni-Directional Lamps. Decorative lamps do not have a linear relationship between lumens and equivalent wattage. As such, a table is a much better method for showing equivalency. This table can be as follows:

15W	90 lumens
25W	150 lumens
40W	300 lumens
60W	500 lumens

Directional lamp requirements

Minimum luminous efficacy

Reduce from 45 to 40 lm/W.

Color spatial uniformity

Variation should be changed from .0004 to .0006. The variation of chromaticity in different directions shall be within 0.006 from the weighted average point, when measured according IES LM-79-08.

The proposal does not specify a minimum measurement threshold. Even if color change at a certain angle is measurable, if the quantity of light at that angle is sufficiently low it may not be noticeable to a user. Thus, there should be a certain lumen level required for the viewing angle where the color change occurs before the color change is objectionable.

PAR and MR-16 Lamps Only

Minimum center beam intensity

We disagree with the use of models for defining PAR Lamps and MR16 lamps. A table should be used to define all equivalencies. This table should be defined for one beam angle (nominal 25 degrees +/- 3 degrees). [If required, we can add a lower beam angle of 15 degrees +/- 3 degrees]. This table would require specific center beam candela values for equivalency points. An example of the table follows:

For the MR-16 table of equivalency, we suggest the following @ 25 degrees:

20W equivalent	500 MBCP (Max Beam Candle Power)
35W equivalent	1000 MBCP
50W equivalent	2500 MBCP

For the R20s table of equivalency, we suggest the following @ 25 degrees:

40W	500 MBCP
50W	600 MBCP
60W	800 MBCP
75W	1000 MBCP

For BR30, BR40, PAR30s, and PAR38 table of equivalency, we suggest the following @ 25 degrees:

35W	1500 MBCP
45W	1750 MBCP
60W	3000 MBCP
90W	5000 MBCP

Beam pattern for all lamps should be smooth and uniform without having high center beam pattern and low beam pattern at the edges.

The suggested online tool is too sensitive to beam angle fluctuations and should be removed from the specification.

Alternatively, DOE could consider, for PAR lamps only

For >20/8" diameter PAR lamps:

40 lm/W for min 80CRI @ 2700K & 3000K
35 lm/W for min 85CRI @ 2700k & 3000K
55 lm/W for the rest of the colors

For <20/8" diameter PAR lamps:

35 lm/W for min 80CRI @ 2700K & 3000K
30 lm/W for min 85CRI @ 2700k & 3000K
55 lm/W for the rest of the colors

Field angle requirements

DOE should consider excluding this because beam cut-off is a customer preference, especially lighting designers.

Alternatively, use total lumen within specified spread angle instead. Also, propose lumen values for 3 different spread beams.

For BR, ER, K, and R Lamps Only

Minimum light output

Lamp lumens are not linear. BR and R lamps should follow the same tables as above for equivalency. LEDs provide a direct beam of light. BR is a shape, not a distribution pattern. LEDs may look like BRs, but the beam and equivalency point should be similar for 25 degree lamps.

Luminous intensity distribution

DOE's proposal does not specify if the value reported is an average, does not specify tolerances on beam claim and does not specify pass/fail criteria.

BR and R products should follow the same as PAR and MR lamp tables shown above. LEDs provide directional light. Eliminating beam angle from the discussion is inconsistent with the intent of Energy Star. Energy Star should define equivalency points at defined beam angles.

Testing and Documentation

Reliability

We do believe a suggested standard would be beneficial for the industry but, ultimately the manufacturer should be able to follow or modify it based on their knowledge of their unique products. Manufacturers should ensure the reliability of their own products.

Regarding the proposal in the cover letter for the short-term burn-in test at 60°C, many manufacturers run the test at only 40°C. It is also an issue whether the test is made in an environmental chamber since the ability to bring the room to 60°C. The environmental chamber has a huge impact because during burn-in, all product is tested at ambient. If an environmental chamber is used for a T8 fluorescent replacement lamp, for example, a chamber that size will be quite large.

Some products are only rated to operate up to 50°C. The high temp burn-in should be rating dependent. If the manufacturer only rates to 50°C then they should not have to burn-in at 60°C.

Regarding the WHTOL, DOE should consider removing the wet condition but keeping high temperature testing for indoor applications.

Elevated temperature and rapid cycling stress testing will add to the manufacturing cycle time and require investment in equipment. What would the sample size be – at least 20 units? Is the expectation that 100% of production will be tested?

We agree that reliability testing of this sort will catch infant mortality. However, the lifetime of the product may be reduced significantly and the manufacturer may not be able to guarantee the three years on its product.

Also, 3 years means 26,000+ hours. If one assumes that a light fixture is turned on 40% of the time during the day on average, that means the manufacturer needs to run the lights 10,000 hours continuously. That is almost 15 months. We need details on how the tests are performed to make a full assessment so the proposed requirements seem a bit premature and underdeveloped.

Audible Noise

Is the metric db or dbA?

If you have questions on any of the above, please contact Craig Updyke at 703 841 3294 or cra_updyke@nema.org.

END COMMENTS