

## **NEMA Comments on Final Draft of Energy Star Technical Specification for Luminaires** **January 14, 2011**

Thank you for the opportunity to provide the following comments on the Final Draft of the Energy Star technical specification for Luminaires, Version 1.0, on behalf of members of the Lamp, Ballast, Luminaire and Solid State Lighting Sections of the National Electrical Manufacturers Association (NEMA).

### **Product Qualification (page 7)** ***Significant Digits and Rounding***

Part a. of this section indicates that the calculated results should be rounded to the nearest significant digit as expressed in the specification. Part b. says that the compliance with the limit should be evaluated without rounding. These appear to be contradictory. As written, if the specification indicates 800 lumens, then 799.9 lumens would not be in compliance. This also appears to contradict common engineering practice which would allow 799.9 to be rounded and expressed as 800. We suggest that part b be stricken from the document.

### **Reference Standards and Test Procedures (page 9)**

Five IESNA documents cited as “Reference Standards and Test Procedures” are more than 10 years old, have not been re-affirmed or revised and, per IES policy, have been automatically withdrawn from the IES website and store: LM-10-96, LM-16-93, LM31-95, LM-41-98, and LM-58-94. These also have been removed from the current IES “Lighting Library” at [www.ies.org/PDF/IES LightingLibrary.pdf](http://www.ies.org/PDF/IES%20LightingLibrary.pdf) and are not generally available. Their status should be noted as withdrawn (as the status of TM-21 is shown as “in draft”).

### **Photometric Performance Requirements (pages 11-12)** ***Efficacy and Output Requirements (Non-Directional Residential)***

On page 11, in the exception under source efficacy for fluorescent and HID sources, the requirements state covered and dimmable versions of GU24 based lamps “... are required to meet reduced efficacy requirements as outlined in qualification requirements for those lamps.” Please make clear in the document where those requirements are to be found. It is our understanding that this is the RLF specification v4.2.

In the second bullet point under the second paragraph on page 12, the requirement states that the integral motion sensor shall automatically reset to sensing mode within 6 hours of a manual or testing override. Since it is not possible to know why a customer forced a manual override to the motion sensor, the time period for a return to normal operation cannot be established with any degree of logic. An override initiated because of a safety or security issue may become a larger problem if the motion sensor turns the lights off unexpectedly. As in our previous comment, NEMA would suggest erring on the side of safety and have the motion sensor return to normal operation at the end of darkness, as determined by the integral photocell. This solution would

offer the highest security while not allowing a permanent motion sensor override or excessive energy usage.

In the note box on page 12, EPA cites that a review of lamps on the NEMA/ALA matrix shows that circline and pin-based lamps will still be able to meet the requirements. We would like to point out that the data in the matrix are based on reference ballast operation. The current Luminaire specification requires that the system performance be measured with a commercial ballast, thus the number of lamps that may meet the requirements may be less than the EPA expects.

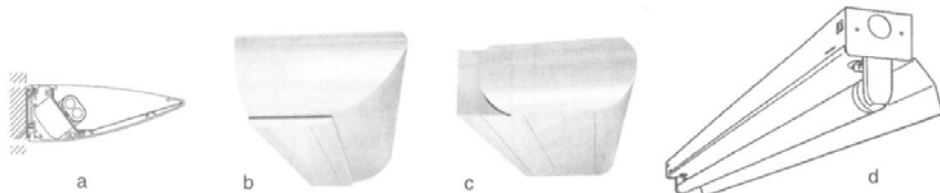
On the issue of the NEMA/ALA matrix, in the continued absence of any new Energy Star-administered tool to aid luminaire, lamp and ballast companies in qualifying components, platforms and luminaires, Energy Star should retain the NEMA/ALA matrix as a viable option and aid for Energy Star lighting partners.

***Efficacy, Output and Lumen Density Requirements (Directional Residential) (page 13)***  
***Cove Mount***

In the last bullet point for **Minimum Light Output** for Cove Mount luminaires, the length of linear track luminaires is stated to be the length of the track to determine compliance with the 200 lumen minimum.

This requirement is confusing since the track is a wiring and mounting system, not a luminaire. By imposing a minimum lumen value for a given length of track, the requirement is essentially dictating a minimum amount of wattage that must be mounted to that track for a given fixture efficacy. This not only seems contrary to the effort to save energy, but is also an application issue, not a luminaire characteristic. Track installations are normally chosen for their flexibility in luminaire mounting and the ability to mix fixture types as desired for the end application effect. It is not obvious how a minimum lumen requirement could be applied to a wiring system such as track, where the end lighting effects are intentionally left in the hands of the end user.

Separately, the **Zonal Lumen Density Requirement** for Cove Mount lighting doesn't allow for standard industry practice. The requirement is "35% of total lumens within the 30-60° zone from the zenith". This narrow (30°) beam angle would disqualify a large percentage of cove lights, including some of the cove light examples described and illustrated in the IES Handbook (9<sup>th</sup> edition, pages 7-11 and 7-12), excerpted below, and some Energy Star-approved cove lights which are advertised to have a "wide beam angle".



**Figure 7-21.** Examples of cove luminaires: (a) cove forming luminaire with biaxial fluorescent lamp, (b) and (c) cove forming luminaires with linear fluorescent lamps, and (d) fluorescent lamp strip luminaire with asymmetric reflector for mounting in a cove.

From the Energy Star qualified products list:

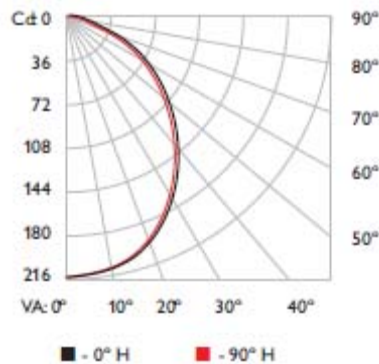
523-000050-06	Residential	Cove	45.3	12	534	25000	0.99	3000		12/31/2009
523-000050-10	Residential	Cove	48.4	12	576	25000	0.99	3500		12/31/2009

From manufacturer's information for the above products:

Color Temperature / Color	Beam Angle	Item Number
2700 K	Wide ENERGY STAR	523-000050-02
3000 K	Wide ENERGY STAR	523-000050-06
3500 K	Wide ENERGY STAR	523-000050-10

### 3500 K, wide beam

Lumens	576
Efficacy	48.4 lm/W



### Zonal Lumen

ZONE	LUMENS	%FIXT
0- 30	163	28.4
0- 40	262	45.5
0- 60	442	76.8
0- 90	565	98.0
90-120	11	2.0
90-130	11	2.0
90-150	11	2.0
90-180	11	2.0
0-180	576	100.0

*Note: This Energy-Star-rated cove fixture would not pass the draft Luminaire requirements (and it apparently doesn't pass the existing SSL Products requirements). Only 28.4% of lumens are in +/-30° zone (60° total angle), compared to 35% required in a 30° angle.*

We recommend that cove lighting be allowed to have wider beam angles. For example, a luminaire producing 65% of its lumens in a 120° symmetric beam (i.e., within 60° of the center line) should be allowed.

### Lumen Maintenance Requirements (page 18-19)

Under the Solid State options, EPA currently requires that the color temperature of the LEDs tested must be equal to or less than the color temperature of a luminaire being submitted for Energy Star. In other words, if a luminaire is 2700K, the LEDs must be 2700K. If a luminaire is 3000K, the LEDs can be 2700K or 3000K. If a luminaire is 4500K, the LEDs must be <4500K. However, if an LED company's LM-80 data is all for 3000K LEDs, a luminaire targeting 2700K cannot use the data for Energy Star approval. This is unacceptable and should be addressed in some way.

The note on page 19 refers to guidance on lumen maintenance testing. The Energy Star Manufacturer's Guide for Qualifying SSL Luminaires (page 4) allows provisional qualification after 3,000 hours of LM-80 lumen maintenance testing if the luminaire uses "successor" LEDs similar to LEDs that have passed 6,000 hours of LM-80 testing. This flexibility should be stated explicitly in the Program Requirements for Luminaires. (For comparison, the Program Requirements for Integral LED Lamps spells out requirements for interim qualification after 3,000 hours.)

### **Correlated Color Temperature (page 20)**

We would like to reiterate our concerns about blocking products from the program with CCTs higher than 4100K. EPA considers ANSI C78.377 as basic document from which CCT categories are drawn, which would suggest that the entire set of CCT categories should be included. However, we also recommend the inclusion of a 4100K category as ANSI C78.376 references, since both 4000K and 4100K are always mentioned simultaneously. The center point in ANSI C78.376 is  $x=0,380$  and  $y=0,380$ . The center point in ANSI C78.377 is  $x=0,3818$  and  $y=0,3797$ , so there is very little difference between the ANSI standards. Our suggested proposal is to replace "4000 K" with "4000/4100 K" in all instances.

More broadly, any restrictions on CCT will likely present barriers for future product developments. CCTs of 2700K – 6500K cover the current status of established conventional and LED based products, but there are already some products on the market that are going beyond these limits – in either direction.

Compact fluorescent lamps with warm white CCT of 2500 K are highly energy efficient products on the market. There are energy efficient LED products on the market with 2200K (for night time lighting with extreme low blue content to avoid biologically disturbing effects in the night). Even for CCT levels below 2000K beneficial applications have been shown on experimental levels, (e.g. for lighting during night shift), and future products are possible.

Of course, high CCT products for enhanced biological effects (8000 K and higher) and for daylight supplement in combination with controls for constant light levels (energy dimming based on available daylight) are expected to be very important in the future.

Residential and professional products can use the whole range of available color temperatures. Provided they meet the energy efficiency and performance criteria there is no reason to discourage users from benefitting from lamps tailored to the biological effects of lighting.

CCT range restrictions should be eliminated from this specification to enable future improvements and new products that can benefit human health.

Finally, under the CCT requirements for fluorescent sources, the draft specification would require that the lamp manufacturer supply color consistency data to the luminaire manufacturer. This should really be provided to the certification body as they are in a better position than the luminaire manufacturer to judge this.

## **Lamp Shipment Requirements (page 24)**

### ***Solid State***

We note that Energy Star's approach sets out an enforcement challenge that will have to be vigorously met by market surveillance, the verification testing program or perhaps other means. For example, a luminaire could be submitted for and achieve Energy Star qualification with one lamp model. Once qualification is secured, however, an unscrupulous company could switch to shipping the product with a different model that could have different performance.

## **Source Replaceability Requirements (page 26)**

Non-directional SSL luminaires (but not directional ones) are required to have consumer replaceable light engines. The extra connectors and consumer safety design requirements would greatly increase cost and reduce reliability for little apparent benefit. A luminaire lasting 25,000 hours is likely to outlast the rest of a typical home renovation project. This requirement has little if any net benefit and should be made optional or deleted.

## **Dimming Requirements for Luminaires Marketed as Dimmable (page 27)**

We recognize that setting truly technology neutral dimming requirements is a very difficult challenge to meet and that the draft specification does not meet it.

For halogen luminaires, the requirement states that they may not feature dimmability. While such a feature statement would be potentially misleading to consumers, and appear to offer a competitive advantage that is not actually available, consumers may be confused about whether halogen sources are dimmable or not. A recent study presented at the 2008 IES annual conference showed that there is no degradation in halogen lamp life under dimming conditions. In light of this, Energy Star should consider whether a statement such as "all halogen lamps are dimmable" should be allowed on the luminaire packaging to clarify the issue for a potentially confused consumer.

## **Operating Frequency Requirements (page 32)**

For Solid State luminaires, the Supplemental Testing Guidance to test operating frequency seems overly complex. Digitizing and recording an image of the photometric waveform data is not needed to measure the operating frequency; a frequency meter will suffice. It's not clear what would be done with the recorded image data, and recording and storing this data would cause unnecessary expense. (This data might have been intended to show modulation depth, but this parameter was deleted from the Requirements.) We suggest deleting the paragraph "Luminaire light output waveform ... shall be recorded."

## **Ballast/Driver Replaceability (page 33)**

SSL luminaires are required to have removable ballasts or else be classified as inseparable, with an efficacy requirement that is about double that for non-inseparable luminaires. Please see comment above regarding replaceable light engines on page 26.

In addition, it is not clear whether SSL luminaires can be made compatible with many dimmer types to meet the stringent noise spec at low light levels. This requirement puts the entire burden on the luminaire, and none on the dimmers. This requirement to meet the noise level at all dimming levels should be deleted.

### **EMI and RFI Requirements (page 35)**

Under Supplemental Testing Guidance it states that one complete luminaire is to be tested. The FCC requires that the ballast passes the EMI requirements, not the luminaire; this is reflected in the column Energy Star Requirements. Testing the luminaire would create a completely new series of tests that are currently not conducted. Clarification of the supplemental guidelines appears to be necessary. We suggest that the Sample Size be changed to one complete ballast and that the passing criteria be changed similarly.

### **Product Labeling and Packaging Requirements (pages 41-42)**

#### ***Luminaires marketed as dimmable***

Luminaire packaging is to indicate compatible dimmers/controls and known incompatibilities with dimmers, sensors and controls.

If this information is to be detailed properly, the information changes frequently and is too lengthy to fit on the packaging. Many products require a full page of information that is currently included in the specification sheet. Furthermore, this data changes rapidly as new controls are developed, retired or modified. It is suggested that such information be required on the manufacturer's web site, where the data can more easily be kept up to date. Otherwise, such data may become obsolete as product sits on distributor or retailer's shelves prior to sale and could mislead customers, leading to dissatisfaction.

To allow consumers access to current, comprehensive, legible information, we recommend instead that the packaging have a link to a manufacturer's website showing compatibility information. If further space remains, the package could also list compatibility with a few popular controls.

### **Lighting Toxins Reduction Requirements (page 43)**

For all source types, the Energy Star Requirements state that luminaires must meet the EU Restrictions of the Use of Certain Hazardous Substances (RoHS) Directive, 2003, which is more properly cited as EU Directive 2002/95/EC.

As stated in previous comments, we have some serious concerns with Energy Star setting voluntary requirements simply via reference to foreign law. Also, we are confused by the reference that the "list of RoHS exemptions ...*have been adopted by EPA*" (emphasis added). To the best of our knowledge, these requirements and exemptions have not been adopted by EPA or written into regulations by EPA pursuant to any Federal law.

That said, we are pleased that Energy Star has attempted to list out the specific substance and application exemptions to EU RoHS Directive, 2003, that have been determined by EU authorities and which are of most relevance for lighting equipment. However, the manner used in the draft of stating the requirements and exemptions in an overlapping fashion could be confusing to companies that are not familiar with the EU RoHS Directive (since they are not required to be familiar in order to supply the U.S. market).

We recommend that this portion be clarified as follows with what we perceive to have been your intent:

*Unless provided for by an exemption listed below, luminaires shall not exceed:*

- 0.1% by weight (1000 ppm): Mercury, Lead, Hexavalent Chromium, PBB, and PBDE
- 0.01% by weight (100 ppm): Cadmium

*A list of RoHS exemptions that have been adopted by EPA and may be relevant to luminaires/lamps is detailed below. Exemptions:*

1. Mercury in compact fluorescent lamps not exceeding 5 mg per lamp.
2. Mercury in single capped...(etc.)

Further to our point about the perils of referencing non-U.S. law, the exemptions approved by the EU under the RoHS Directive of 2003 are still subject to change. However, the U.S. Mission to the EU maintains a list of the current exemptions, which is currently posted here thanks to the U.S. Commerce Department and Commercial Service officials:  
[http://www.buyusa.gov/europeanunion/consolidated\\_exemption\\_list.pdf](http://www.buyusa.gov/europeanunion/consolidated_exemption_list.pdf).

#### **Warranty Requirements (page 44)**

For fluorescent and HID source types the requirements state that a GU24 base shall carry a warranty with a minimum term of three years from the date of purchase, based on at least 3 hours of use per day.

For the perspective of a lamp company: The existing RLF 4.2 specification requires only a 2-year warranty. It is not clear if this specification is intended to replace the RLF V4.2 specification, given that we anticipated GU24 CFLs will be covered in the new Energy Star lamp specification pending development. Thus we suggest that the warranty remain at two years to avoid confusion until the new Energy Star lamp specification is finalized.

From the perspective of a luminaire company: This section is not clear about how lamp warranties are to be administered. The warranting of replaceable lamps by the luminaire manufacturer can be a quite onerous task because customers can claim a lamp has failed and request replacement even though the lamp may have actually come from a non-Energy Star luminaire, the manufacturer can easily face a huge number of false warranty claims involving the lamp. It is also virtually impossible for a luminaire manufacturer to validate the number of operating hours, origin or application circumstances of a lamp. From the luminaire

manufacturer's viewpoint, warranting a commonly available lamp cannot be fairly administered or enforced.

NEMA urges the EPA to remove all consumer-replaceable lamps from the materials warranted by the luminaire manufacturer.

### **Coordination of SSL Performance Specifications with IEC**

Energy Star could consider closer coordination in specifications between Energy Star and IEC for SSL performance. Currently they are very similar but different enough to require duplication of testing at significant cost to manufacturer and delayed market entry. Examples follow:

#### *Ambient Temperature*

<b>Energy Star – LM-80</b>	<b>IEC – LED Performance requirements</b>
55 °C, 85 °C and a third temperature selected by the manufacturer	40 °C, 50 °C and 60 °C

It would be most convenient and effective if those temperature requirements are aligned, so that testing labs can use the same test data for both Energy Star and IEC. Without alignment, two complete test setups are necessary, doubling costs.

#### *Duration of Reliability Tests*

Although it is globally accepted that 25% of the claimed life time of the device should be proven by tests, the implementation for Energy Star and IEC differs:

<b>Energy Star</b>	<b>IEC – LED Performance requirements</b>
a) 25% of the claimed life time.  b) Energy Star certification can be obtained after 6,000 hours with the obligation that the remaining time of the 25% of the claimed life time is completed and reported.	a) 25% of the claimed life time with a maximum of 6,000 hours.  b) Test duration is 10% of rated life time up to a maximum of 2,000 hours provided the manufacturer or responsible vendor shall make available the reliability data of the principle components (LEDs, electronics, and diffusers). [Change accepted just before Christmas]

Again, it would be most convenient and effective if those requirements were aligned and manufacturers can use the same test data to obtain both Energy Star and IEC certification.



*Temperature of optical measurement*

Energy Star is considering requiring the optical measurement of the reliability tests to be executed on the same temperature of the setup, e.g. 55 °C, 85 °C and a third temperature selected by the manufacturer. This new requirement should be aligned with IEC or abandoned altogether.

Thank you for your consideration of and action on these comments. Please contact Craig Updyke (703 841 3294, [cra\\_updyke@nema.org](mailto:cra_updyke@nema.org)) with any questions.

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