



August 24, 2012

Taylor Jantz-Sell
US Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Subject: ENERGY STAR® Lamps V1.0 Specification Draft 1

Dear Ms. Jantz-Sell,

Cree has reviewed the ENERGY STAR Lamps v1.0 Specification, Draft 2 received via email on July 6, 2012. We recognize the importance of the DOE/EPA efforts to develop and release a technology neutral ENERGY STAR specification for Lamps in an effort to promote energy efficiency within the lighting industry. CREE respectfully submits the following comments and request that each be carefully considered when revising the document.

Thank you in advance for your consideration. Please contact Tim Henning at (919) 407-5047 with any further questions that you may have.

Sincerely,

A handwritten signature in blue ink, appearing to read "Tim Henning". The signature is stylized and includes a large, sweeping flourish at the end.

Tim Henning
Specialized Testing Manager | ENERGY STAR Program Manager



Existing Product Qualifications (General): Cree would like to obtain further clarification on what additional testing will be required for LED lamps that are already listed on the ENERGY STAR Qualified Product List. It would be valuable if the EPA could provide a comprehensive list of the requirements that will have to be demonstrated on these products along with a timeline when they will have to be completed by.

MR-16 Lamp Addition (Page 2 & Page 19): During the Webinar held on August 8th, and in the “Notes” section on page 2, the EPA cites that MR-16 low voltage lamps were added back into the specification due to the strong demand within the commercial segment of the market. By categorizing the MR-16 product as a commercial product, the lamp must now satisfy requirements for no less than 35,000 hour rated life claims.

There are still significant energy savings that can be realized by replacing the existing Halogen technology with LED drop in replacements that are rated out to 25,000 hours. For example, a 50 watt Halogen MR-16 bulb will last anywhere between 2,000 and 5,000 hours before the product will have to be replaced. A 50 watt LED-based MR-16 replacement will last 25,000 hours or longer and will consume 80% less energy. The end user, whether it be a residential or commercial customer, will experience significant energy savings as well as bulb replacement and maintenance costs.

Cree strongly recommends that the EPA consider keeping the lifetime requirement at 25,000 hours. If this requirement is increased to 35,000 hours, there will be a considerable number of LED based products which would otherwise provide great value to the end user that will be excluded from qualifying from the ENERGY STAR program.

Scope (Page 2): Under the “Excluded Products” section, it could be read to exclude 12VAC products that use an external ballast, driver, or transformer. Suggested wording change: “Excluded products: Lamps that operate only on an external (i.e. not integral to the lamp) ballast, driver or transformer, e.g. pin-based fluorescent lamps (linear and compact)... and do not have an internal driver, ballast, or transformer.”

Product Variations (Page 5): Is there a reason that product variants listed in Table 2 can only reference lumen maintenance, rapid cycle and transient protection test data? For example, if a product being qualified has two unique beam angles, this will have no impact on the results obtained from Audible Noise testing. A similar argument could be made for variations that are not listed in the table. If a product offering has two different types of lenses (glass versus plastic), this again will have no impact on transient protection or audible noise test data. Cree recommends that this be revisited to ensure that manufacturers are not limited on the data that they can re-use.

Product Variations (Page 5): The Integral LED Lamps 1.4 specification only required a single sample to verify the temperature differences between product variations. Is there a particular reason that five units were selected to show temperature differences between the representative model and the product variant? One could easily argue that five samples will not provide any statistical significance and could achieve the same result by using a single data set.

Additionally, the new requirement also specifies that ten total samples will be required to validate a product variant, five of the original model and five of the product variant. This will certainly increase the overall cost of qualifying a product by requiring more samples and additional testing. Cree recommends that the requirement for in-situ validation of product variants remain unchanged from the Integral LED Lamps 1.4 specification.

Product Variations (Page 6): Cree would recommend that the Allowable Variations be expanded to include the additional categories that are outlined in the Luminaires 1.1 specification. This would include categories such as finish, diffuser, light source, CCT, and ballast / driver. The same logic that was applied in the Luminaires 1.1 specification should be leveraged in the Lamps 1.0 specification.

Luminous Efficacy Requirements (Page 8): As LED & CFL technologies continue to improve and products become more efficacious, the requirements surrounding efficacy should also continue to increase. The efficacy requirements for directional lamps have not increased from their current levels since the original release of the Integral LED Lamps specification back in 2009. Cree recommends increasing the minimum lamp efficacy requirements for directional lamps by 5 lm/W.

Center Beam Intensity (Page 11): Table values do not specify beam angle whereas the ENERGY STAR Center Beam Intensity Benchmark Tool does. Values listed appear to be lumen level, not candelas as labeled.

Luminous Intensity Distribution (Page 12): Under lamp type, the specification calls out for ANSI Standard PAR Shapes and Low Voltage MR Lamps but excludes line voltage MR lamps. Is there any reason that line voltage MR lamps are excluded from having to meet the Luminous Intensity Distribution Requirements? It would be expected that both the low voltage and line voltage lamps would have to meet the same requirements.

Color Angular Uniformity (Page 17): In the comments box, it is noted that the EPA has received input from testing laboratories that measurements taken between a lamp's beam and field angles – where luminous intensity values are considerably lower than the beam itself - may suffer from excessive noise, calling into question the reliability of the measurements. It is



also stated that this is a known issue and that it is actively being worked by other working groups in an effort to develop a new measurement methodology.

It should be noted that even in light of those comments that the requirement for Color Angular Uniformity has been made much more stringent by expanding the measured area to include the entire field angle (originally was beam angle only) and reducing the allowable variation of chromaticity to 0.004 (was 0.006). Cree strongly believes that the original requirement should be maintained until more progress is made in the working groups researching the subject.

Lumen Maintenance and Rated Life (Page 19): In the Lamps 1.0 Draft 1 specification, the EPA had proposed a technology neutral lumen maintenance life requirement of 10,000 hours for both CFL and LED bulbs. In the most recent draft, this requirement has been removed due to a number of reasons including: the possibility that qualified lamps may be perceived as low quality, unknown cost benefits, as well as utilities ability to claim savings.

We do not believe that the consumer will perceive that ENERGY STAR qualified bulbs rated for 10,000 will be lower quality. Assuming that the bulbs are operated for the number of hours that are outlined in the warranty section (3 hours per day), a 10,000 bulb would last for approximately 9 years. We think that a consumer who paid a significantly lower price for a 10,000 hour bulb would not feel as though they received a low quality product if it lasted as outlined above.

Additionally, we firmly believe that the cost benefits are well understood and Cree would be happy to work with the EPA to get a better understanding of what the potential cost savings could be. Cree strongly supports the lower lifetime requirement and believes that the EPA should incorporate this back into the specification. Alternatively, the lifetime requirement on CFLs could be raised to 25,000 hours to ensure that this requirement is technology neutral. The cost of a CFL bulb that would be required to meet 25,000 would certainly be higher than one designed to meet 10,000 hours.

Lumen Maintenance and Rated Life (Page 19): Supplemental testing guidance states “All directional and semi directional lamps, and all omnidirectional lamps \geq 10 watts, shall be tested in accordance with the Elevated Temperature Test. Directional Lamps to be marked as commercial grade shall be tested per Annex A, option A. All decorative lamps, and omnidirectional lamps $<$ 10 watts, shall be tested in accordance with the Ambient Temperature Test.” Clarification requested: For commercial directional lamps $<$ 10 watts, Ambient or Elevated test?

Power Factor Requirements (Page 23): The revised specification indicates that for residential applications that CFLs must only meet a power factor of 0.5 or greater. If this is truly intended



to be a technology neutral specification, we would recommend increasing the power factor requirement to 0.7 to be consistent with solid state lighting.

Start Time (Page 24): Cree fully supports reducing the start time requirement from 1 second to 0.5 seconds. We do not believe that the increase in rapid cycle stress testing would directly conflict with tightening up this requirement.

Lamp Packaging (Page 30): Under the Application Exceptions section, the revised specification indicates that the packaging must state specific applications that would potentially compromise the performance of the lamp. There are certainly an infinite number of cases that someone could argue would compromise the performance of the specification. Given that space on the exterior of the product packaging is extremely limited as is, Cree is opposed to having to detail out this information on the packaging.

Annex A: Elevated Temperature Life Test (Annex A-1): Under the Test Details for All Options -> Operating Cycle section, the specification requires that all lamps shall be operated for three hours on and 20 minutes off. Is this required for CFL only or is this for all products? If for all products, is this considered more stringent and nullify previous lifetime testing done on LED lamps when the units were left powered on the entire duration? Cree strongly recommends modifying the requirement to allow for LED products to be left on the duration of lifetime testing.

Annex A: Elevated Temperature Life Test (Annex A-5): The ambient conditions outlined in Option C have increased from 45°C to 55°C. Is there a particular reason that the chamber temperature is being increased by 10°C? Many manufacturers and test labs have made significant investments and are currently operating chambers at 45°C and may not have the capability to increase to these higher levels. Cree strongly recommends keeping the chamber temperature at 45°C.

Annex A: Elevated Temperature Life Test (Annex A-5): The temperature measurement locations require that the testing area be equipped with at least four ambient temperature measurement devices. Many manufacturers and laboratories will have to make a significant investment to comply with this requirement for every product that is submitted for the ENERGY STAR program. Some thermal chambers have a single temperature measurement point and then a supporting 9 point thermal profile generated to highlight the temperature variations throughout the chamber. Cree recommends removing this requirement entirely or providing alternative solutions for validating the temperature within the thermal chamber during test.

Annex B: Ambient Temperature Life Test (Annex B-1): Under the Test Details for All Options -> Operating Cycle section, the specification requires that all lamps shall be operated for three hours on and 20 minutes off. Is this required for CFL only or is this for all products? If for all products, is this considered more stringent and nullify previous lifetime testing done on LED lamps when the units were left powered on the entire duration? Cree strongly recommends modifying the requirement to allow for LED products to be left on the entire duration of lifetime testing.

Annex C: Elevated Temperature Initial Light Output Ratio (Annex C-1): Step 2 under the Test Procedure section indicates that the temperature at the “test point” should not vary by more than $\pm 1^{\circ}\text{C}$. Further definition is requested as to where the test point should be located on the lamp (i.e. LED junction, driver case temperature, temperature one inch down and away from the lamp, etc...)

Annex C: Elevated Temperature Initial Light Output Ratio (Annex C-2): Step 5 under the Test Procedure section points to Option A, Annex A for additional guidance as it relates to the test configuration. The ambient conditions defined under Option A dictate that the temperature around the housing must be $30^{\circ}\text{C} \pm 5^{\circ}\text{C}$. Where exactly does the temperature “around” the housing need to be measured? Additionally, why does the temperature around the housing need to be at $30^{\circ}\text{C} \pm 5^{\circ}\text{C}$? Cree would recommend that the temperature around the housing be changed to $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ to accommodate more standard lab environments.

Annex C: Elevated Temperature Initial Light Output Ratio (Annex C-2): The applicability section under Method 1 states that this test method is applicable to omnidirectional LED lamps whereas the main requirement on page 11 states that omnidirectional bulbs are exempt. Additionally, the applicability section also excludes directional lamps which would only allow for these products to be tested using an integrating sphere. Cree strongly recommends including directional lamps under the applicability section of Method 1.



Hardware Requirements Table (General): It would be very helpful if a Hardware Requirements Table were to be added to the specification. This would help the Manufacturer identify the hardware that is going to be required and what samples can be used across the different tests. Below is an example of a format that could be used.

	Test Group #1 (LM-79)		Test Group #2		Test Group #3		Test Group #4		Test Group #5		Test Group #6		Test Group #7 (in-situ)		None Required
	1 unit	1 unit	≥ 3 units	≥ 3 units	3 units	3 units	≥ 3 units	≥ 3 units	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit	
Photometric Performance Requirements	Directional	Non-Dir	Directional	Non-Dir	Directional	Non-Dir	Directional	Non-Dir	Directional	Non-Dir	Directional	Non-Dir	Directional	Non-Dir	
Luminous Efficacy Requirements	x	x ¹													
Luminous Output Requirements	x	x ¹													
Luminous Zonal Lumen Density Requirements	x	N/A													
Light Source Life Requirements															x
Lumen Maintenance Requirements					x ²	x ²							x ²	x ²	
Correlated Color Temperature (CCT) Requirements	x	x ¹													
Color Rendering Requirements	x	x ¹													
Color Angular Uniformity Requirements	x	N/A													
Color Maintenance Requirements					x ²	x ²							x ²	x ²	
Light Source Shipment Requirements															x
Electrical Performance Requirements															
Source Start Time Requirements			x	x											
Source Run-Up Time Requirements			x	x											
Light Source Replaceability Requirements															x
Dimming Requirements (Only Dimmable Luminaires)			x	x											
Power Factor Requirements			x	x											
Transient Protection Requirements (Surge)							x	x							
Lamp Current Crest Factor Requirements															x
Off-State Power Consumption Requirements			x	x											
Operating Frequency Requirements			x	x											
Ballast/Driver Replaceability Requirements															x
Noise Requirements									x	x					
Electromagnetic and Radio Frequency Interference											x	x			
Thermal Performance Requirements															
Maximum Measured Ballast or Driver Case													x	x	
Recessed Downlight Thermal Performance															x
Minimum Operating Temperature Requirements															x
Safety Requirements															
Indoor Luminaire Safety (Portable)															x
Indoor and Outdoor Luminaire Safety (Hardwired)															x
Electronic Ballast or Driver Safety Requirements															x
Product Labeling & Packaging Requirements															
Lighting Toxics Reduction Requirements															
Warranty Requirements															