PHILIPS

Ms. Taylor Jantz-Sell
Energy Star Lighting Marketing Manager
Environmental Protection Agency
1200 Pennsylvania Ave., MC 6202J
Washington, DC 20460

Philips Lighting Comments on Energy Star Luminaires V2.0

Date: 2014-11-14

Dear Ms. Jantz-Sell,

Philips Lighting appreciates the opportunity to provide the attached comments on the Energy Star Luminaires V2.0.

As you may know, Philips North America is headquartered in Andover, Massachusetts. The U.S. Philips companies are affiliates of the Netherlands-based Royal Philips N.V., a diversified health and well-being company, focused on improving people's lives through meaningful innovations. Our long history in North America began in 1933, and today, it is the company's largest single market in the world, with approximately 22,000 employees and operations at 55 major facilities in 25 states and across 3 Canadian provinces. Sales for the region in 2013 was more than $9.5 billion*, which accounts for more than 30% of Philips global revenue.

Philips is a diversified technology company, focused on improving people's lives through meaningful innovation in the areas of Healthcare, Consumer Lifestyle and Lighting. Innovation has been a cornerstone of the company's strategy for over 120 years, creating a strong and trusted Philips brand with market access all over the world. Philips is a leader in cardiac care, acute care and home healthcare,

Philips Lighting
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energy efficient lighting solutions and new lighting applications, as well as male shaving/grooming and oral healthcare. Philips lights 65% of the world's top airports, 30% of offices and hospitals and landmarks such as the Empire State Building, the Sydney Opera House, the New Year's Eve Times Square Ball and the Great Pyramids. Philips owns more than 64,000 patent rights, is one of the world's top-50 most valuable brands, one of the world's top-50 most innovative companies, and ranked as one of the Best Global Green Brands by Interbrand.

Please find our detailed comments below. We look forward to working with you further on this important effort. If you have any questions on these comments, please contact me.

Sincerely,

Keith R. Cook
VP – Technology Policy & Standards
Philips Lighting
1050 K Street NW, Suite 900
Washington, DC 20001
Keith.cook@philips.com
202-962-8559
847-274-0891

Below are Philips' comments and recommendations regarding the development of the Energy Star Luminaires V2.0. We are submitting comments for the following:

- Streamlining Requirements, Testing and Certification
- Changes to Efficacy Levels
- Changes to Product Category Scope

Streamlining Requirements, Testing and Certification

We support changing the color angular uniformity to match the Energy Star Lamps specification: Variation of no more than 0.006 Δu'v' from the weighted average within the beam angle.

We support eliminating start time from the requirements.

We support eliminating CCF from the requirements.

We agree there are some downlights (such as wall washers) where you may want to have more light in the upper zones.

Testing burden – The following tests require a minimum 3 samples. As type tests, a single sample would be sufficient. During a product development phase, creating three samples is a logistic problem, adding extra time and expense.

- Source start time. If start time is not removed, suggest changing sample requirement from 3 to 1.
- Dimming. We have seen no value in testing 3 samples as compared to 1. Test results for 3 are typically consistent.
- Power factor. We have seen no value in testing 3 samples as compared to 1. Test results for 3 are typically consistent.
- Transient protection. We have seen no value in testing 3 samples as compared to 1. Test results for 3 are typically consistent. Also, since the driver is the functional item protecting the system from transient voltages, and drivers are typically tested as components for transient resistance, eliminating the need to include the LED module/array in the test should be considered.

Lumen Maintenance – When applying LM-80 data to lumen maintenance projections, test currents are currently applied as limits. When a test shows negligibly higher drive current (i.e. A 3mA system measures 3.15 mA), TM-21 calculations are now forced to be conducted at the next higher drive current tier. An interpolation between values is not now allowed. Since in practice, drive current of a system has a reasonable tolerance (approx. 5%), we suggest that Program Guidance allowing interpolation between values be issued.

Changes to Efficacy Levels

For those products that overlap Design Lights Consortium, we recommend setting the efficacy levels to the same value as DLC. This may lead to elimination of redundancy between the two specifications and eliminate significant manufacturer testing/reporting burden in those product lines affected.

The analysis of efficacy in the Discussion Document, showing that luminaires are generally substantially above the specified levels, is interesting. In general, improvements in LED efficacy are driving the entire LED market to lower prices (fewer LEDs, less heatsinking, less powerful electronics, less optics), so manufacturers are strongly motivated to continue to increase efficacy, even without tighter goals in Energy Star. If efficacy specifications are set too high, however, it could lead to undesirable light distributions. For instance, a streetlight can be more efficacious if its light is more focused, resulting in localized pools of light underneath the streetlight, and a tighter required spacing of poles. The luminaire may be more efficacious, but the “application efficacy” is actually lower – more power is required to light the street, and the non-uniform lighting is not preferred. Optics that spread the light evenly result in more uniform lighting, wider pole spacing, and lower power requirements. It will be a little tricky for Energy Star to balance the need to increase the efficacy requirement to keep poor/lagging products out, without causing compromise in other performance areas.

We are in favor of allowing screw base luminaires to qualify for Energy Star. The concern that people will purchase a high-efficacy luminaire, perhaps with a rebate, and then convert it to low-efficacy, by replacing the lamp with an incandescent, is fading, as LED Lamp prices decrease, acceptance and adoption increase, and incandescents are disappearing from the market. Also, as efficacy increases, the need for better heatsinking and strong thermal contact from light source to luminaire, is decreasing. Allowing screw bases will reduce the multiplication of products, allowing higher volumes and lower cost for

manufacturers and customers, and enable easy replacement of failed light sources without having to replace the entire luminaire.

Discussion Question #1: "Why are SSL retrofit products performing at much higher efficacies than recessed downlight luminaires?"

Retrofits are often one high-reflectance cone barely recessed into the ceiling (or sometimes not recessed at all). This means the efficacy of the retrofit luminaire is not that different from the efficacy of the light engine itself.

In contrast, recessed downlight products made for new construction typically have many different cone options: Specular, Semi-specular, Wheat, White, Diffuse, Bronze, Pewter, Black, etc. Some manufacturers have more options than others. Some of these finishes are more efficient reflectors than others.

Secondly, the cones in new construction are typically deeper than the retrofit luminaires. This has the advantage of reducing glare from the luminaire in the room, increasing user comfort and satisfaction, but has the disadvantage of reducing efficacy.

Third, new construction offers typically a range of choices of both CRI and CCT.

As an example, consider the following fictitious data that are all using the same light engine:

50° Cutoff

	Black	Pewter	Diffuse	White	Semi-specular	Specular
90CRI 27K	20	26	33	36	38	39
80CRI 27K	24	32	41	45	47	49
80CRI 30K	27	35	45	50	52	53
80CRI 35K	27	36	46	51	53	55
80CRI 40K	28	37	47	52	54	56

65° Cutoff

	Black	Pewter	Diffuse	White	Semi-specular	Specular
90CRI 27K	23	30	37	40	41	42
80CRI 27K	29	37	47	50	51	52
80CRI 30K	31	41	51	55	56	57
80CRI 35K	32	42	53	57	58	58
80CRI 40K	33	43	54	58	59	60

85° Cutoff

	Black	Pewter	Diffuse	White	Semi-specular	Specular
90CRI 27K	41	44	47	48	49	49
80CRI 27K	50	55	58	60	61	61
80CRI 30K	55	60	64	66	66	66
80CRI 35K	57	62	66	68	68	68
80CRI 40K	58	64	67	70	70	70

For making a retrofit, let's say the manufacturer decides to make one product with one cone finish, one cone depth, one CCT, and one CRI (highlighted in pink). That one product is tested (circled in red) and qualified under Energy Star.

For making a new construction downlight, let's say the manufacturer decides that deep 50-deg cutoff is valued by certain customers. So the manufacture decides to produce a product that has 50-deg cutoff, and offers the six finish colors shown above. For the Energy Star submittal, the engineers look for the finish with the lowest efficacy that still meets the Energy Star limit of 42 lm/W (so that the company can claim Energy Star for as much of the product line as possible). They choose the product circled in green (45 lm/W), meaning everything highlighted in light green passes Energy Star. It means only 40% of the product line options are Energy Star certified, but some of the line is better than none.

Things to note about this example:

For products with lots of trim options, the efficacy submitted to Energy Star is always going to be at or close to the limit set. If the limit was set to 30 lm/W, the manufacturer would submit a different trim option (maybe Pewter at 32 lm/W), and thus qualify a larger range of the product offerings. If the efficacy was set higher (say 50 lm/W), then the manufacturer would be forced to submit a higher-reflectance trim (such as white 30K at 50 lm/W). The manufacturer wouldn't be able to claim Energy Star on the pewter cone, even though they may still offer it. Or, the manufacturer may choose to go with a shallower cone, forcing customers who want Energy Star to have to endure discomforting glare from the luminaire.

Just because the worst-case trim submitted to Energy Star is close to 42 lm/W (45 lm/W in this example circled in green), it doesn't mean the whole product line is at that worst-case efficacy. Sometimes a different set of CCT, CRI, cone finish, and cone depth can give you a much better efficacy.

It is important to note in this example the retrofit (at 70 lm/W) and the new construction downlight submitted (at 45 lm/W) could conceivably be using the same light engine. So the difference in efficacy is due to the lighting quality approach and the number of options offered.

One solution would be to measure the output of the light engine itself (before adding the cone).

Changes to Product Category Scope

The aims in the scope seem appropriate and desirable. The document is well written.

Regarding questions 2 and 3 in the discussion document, it does seem that the present definitions of separable and inseparable luminaires limit the options for interchangeability. For instance, a luminaire with a driver and a replaceable LED module (RP-16 definition of LED module) would not be considered separable, by Luminaires V1.2, even though the module may be readily replaceable. One can also imagine scenarios where part of the power supply/driver would be in a separate driver module, and part (electronics associated with thermal sensing, or AC-DC rectification, for instance) would be integrated with the light source. It is not clear if such a light source would meet any definition in RP-16, since RP-16 describes an LED array or module as containing only “electrical interfaces”, and an LED Light Engine as “intended to connect directly to the branch circuit”. As pointed out in the Discussion Document, approaches without “LED light engines” must presently be qualified as inseparable. We agree that changes to the specification to increase flexibility in this regard are desirable. We agree that there may no longer be a need to distinguish between separable and inseparable luminaires. Do the utilities who use Energy Star to grant rebates make distinctions in their rebates between inseparable and separable luminaires? If not, then this provides additional motivation to eliminate the distinction.

We suggest that Energy Star make the luminaire specification consistent with the Lamp specification, by increasing the allowed CCTs to correspond to the allowed CCTs in the Lamps specification. There may be some other specifications where similar alignment is needed. We understand that Energy Star is already considering adding a standby power allowance to the Lamps specification, which will correct the present difference in this parameter between the specifications.