Philips Electronics North America Corporation

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Mr. Richard Karney
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Mr. Karney:

We are pleased to offer comments from Philips on the 4/09/07 draft of the ENERGY STAR specification for Solid State Lighting Luminaires. Unfortunately, we are too late to combine our comments with those of the NEMA Lamp Section, but we copy Craig Updyke of NEMA on this letter so that he can be up-to-date on the thinking of the various Lamp Section member companies.

At the outset, we want to congratulate you on the improvement in this draft over the previous one. This draft is markedly better, in our judgment, and reflects your willingness to hear and consider the comments made to the previous draft. Thank you. We hope that the next draft reflects further substantial improvements, based on the feedback you receive.

Our comments are organized in two groups: we give the six comments that are most important to us, and that we think should be of most importance to ENERGY STAR. This is followed by a listing of the others organized by page number. Some comments are substantive. Others are aimed to stimulate you to reconsider and/or re-justify the provisions of the specification.

Most important comments

p. 3, top box
The rationale for near-term requirements is that the LED systems perform at least as well as fluorescent (CFL) systems. For applications where fluorescent lighting is well suited, this makes sense to us. For applications where incandescent lighting is best suited (for example, reflector lamps in recessed cans), the “fluorescent” rationale is unduly restrictive, since there are a lot of energy savings from substituting LED systems for incandescent or halogen systems.

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p. 3, scope
Philips Lighting is of the opinion that, already as early as 2008, retrofit LED lamps will become available that allow existing installed downlights (when equipped with such a retrofit LED lamp on a simple exchange base) to fulfill the eligibility criteria of downlights (minimum luminaire efficiency of 35 lm/W). In this case there will be no new special LED luminaire to qualify for the ENERGY STAR Program. There is no separate driver and no separate optics in the luminaire, since these have been integrated in the retrofit LED lamp. Does such a retrofit lamp qualify as an ENERGY STAR luminaire? It seems to meet the definition of a luminaire given on p. 20.

We assume that existing luminaires equipped with a retrofit LED lamp (replacing an existing incandescent or halogen reflector lamp) will be part of the overall ENERGY STAR Program. This may even become the fastest way to achieve tangible energy saving on the short term.

Acceptance of the addition of Retrofit LED lamps as an element of the ENERGY STAR program could imply that the text of various eligibility criteria has to be reviewed and amended. If nothing else, clarification is needed.

Lumen depreciation, lifetime (several pages)
We realize the use of L70 is tied to the LM-80 standard, and this is probably not going to be changed for this ENERGY STAR version. Still, L70 is a very limited one dimensional view of lifetime, and does not provide designers and users the information they need to design a system robustly and per the actual application needs. In particular, L70 does not provide information about lifetime performance (lumen maintenance and actual LED failure rates) as a function of forward current and junction temperature. We have recently published a White Paper on the subject, and suggest the use of a single chart that gives much more useful information. We will work to have such an approach incorporated into LM-80 in the future, and invited your attention to this approach. We will separately send our white paper.

p. 16-17: Qualification process for product groupings
The text describes a process for qualifying a family of products, but says nothing about adding members to that family after the initial qualification is made. We can visualize manufacturers modifying existing designs on a routine basis to meet customer needs. Many of the changes could be considered minor, and manufacturers will need a method to append or modify the ENERGY STAR listings to include such new "minor" variations. A method could be as follows: Once an ENERGY STAR file is set-up with an identified base model and acceptable variations, manufacturers could append the file by providing evidence that a new variation is essentially the same as the listed model. The ENERGY STAR file will be appended with the addition, and the new variation would be ENERGY STAR qualified.

A similar "adding members to a qualified family" process is needed even when the changes are not minor, but when the changes are clear improvements (due to the substitution of a more efficient driver with the same allowed driver case temperature, for example, or of more efficient LEDs of the same spectral output and flux but with lower input power and the same permitted junction/case temperature). Will increased luminous flux, better lumen maintenance, and/or better thermal management be required to be recertified? If a manufacturer can show that a change materially does not detrimentally affect performance, can a change simply be a file update? (Similar to UL process).

p. 18: Quality Assurance testing
With regard to product failing a DOE QA test, there is no process for appeal to address a variation due to a manufacturing/component defect. No manufacturing process is perfect, and at some time, a temporary manufacturing or component hiccup will occur. Then product or groups of product potentially would be de-listed and the manufacturer would suffer significantly. There needs to be a process where the manufacturer can respond and correct (recall if necessary) an unforeseen and unintentional manufacturing/component hiccup without the penalties of delisting, the expense of retesting products, and/or being barred from the ENERGY STAR program for some time. Perhaps the ENERGY STAR CFL appeal process can be used as a model.

p. 13: NVLAP accreditation
It is unclear to us if, after the 1-year suspension of the NVLAP requirement, products approved before then have to be re-tested. On one hand, we certainly don't want the work of re-testing, especially if our procedures haven't changed appreciably during the NVLAP accreditation process. On the other hand, we can imagine that the quality of the measurements during that 1-year interim could be very uneven or even downright suspicious since so many LED luminaire manufacturers are not experienced in light measurements. We do not believe it is at all plausible that an aggressive QA program can compensate for this; we think the required QA work load will be unmanageable when considering the program monitoring needs. While we don't have a solution, we have a couple of ideas to put forth for your consideration: (1) rather than suspend NVLAP accreditation for a year, require that all measurements during that year be made in a laboratory that has NVLAP accreditation for making measurements on some other non-LED lamp type; or (2) require that all products qualified in the 1-year interval have to be re-qualified within 2 years of the date when the NVLAP accreditation process is finalized. These are not polished ideas, but are suggested here to highlight the need, and to initiate some thinking about a solution.

Other comments

p. 5, under "Device/Arrays" [Lumen Depreciation requirement]
The requirement should be changed to say "… 35000 hours at a specified maximum temperature measured at a specified location on the device."

p. 5, under "Device/Arrays" [Lumen Depreciation requirement]
There is some confusion in the overall document about whether the "lumen depreciation" [lifetime] requirement applies to the device or to the entire luminaire. Here on p. 5, it is clear that the requirement applies to the device or array, and this section of the document applies to "all luminaires." On p. 17-18 an option #2 is given (for Category B luminaires) where the criterion applies to the entire luminaire. The document could be clarified on this point by noting on p. 5 that lumen depreciation documentation on the entire luminaire can be substituted for the "device/array" requirement.

p. 5, under "Device/Arrays" [Lumen Depreciation requirement]
Are 35,000 hours really required for residential products? At 3 hours per day, this is about 30+ years. Would more energy be saved by shortening the life (L70) of residential products

and driving them harder (higher efficiency)? By reducing the lifetime requirements to a more reasonable residential level, this could potentially help introduce more energy efficient, cost reduced lighting into the market place.

p. 5, under “Outdoor Luminaires”
The requirement for an automatic daylight control for residences at first seems to make good sense, but on more reflection may be energy wasteful. There may be many outdoor luminaires that are not intended to be used every day (patio light, porch light), or certainly not all the dark hours every day, and for these applications a simple switch could be more energy saving than an automatic daylight control. In the porch light example, there could even be good reason for (rarely) having it on before dark, and this would be precluded by the requirement as written.

p. 9, requirements for under-cabinet lighting
The requirements of “150 lumens per linear foot,” where “linear foot” refers to the fixture length, may not be appropriate for SSL luminaires. SSL does not need to be in a "rectangular" configuration. The paradigm that under cabinet lighting must be shaped like a TL lamp/fixture may not be valid for SSL. For example, one can envision several separate round SSL devices (wired together) to provide excellent under cabinet lighting. As another example, one can imagine a single circular luminaire, say 4” in diameter, that would provide excellent lighting; in this case, what is important is the spacing of such luminaires under the cabinet (i.e., how many of the luminaires per linear foot of the cabinet), and you can’t tell that from testing a single luminaire. Therefore, the "linear foot" may not be the best requirement. Would a “lumens per cabinet area (bottom surface area)” be better, or “lumens per counter top area?” What about a “zonal flux density (from a fixed distance)” requirement?

p. 12, Category B, top two boxes, and the sentence under the second box.
The text indicates that ENERGY STAR doesn’t think product will be available that meets these criteria for 3 years, and therefore no product can qualify under Category B for 3 years. That seems like a big leap. If a company can qualify sooner, why should they be penalized by having to wait? ENERGY STAR should waive the 3-year “waiting time”, or at least give a much better rationale for it.

p. 12, last entry on page:
The text says “All other requirements will be the same as those in effect for Category A at the time Category B becomes effective, except for ….” But different applications in Category A have different CRI requirements (or none at all), different allowed CCTs, etc. How do these carry over to Category B, which makes no distinction among different applications?

p. 16, bottom box
line 4: delete the “lamp-ballast” reference

p. 16, bottom box
While this paragraph justifies the ENERGY STAR position that separate LEDs and drivers have to be separately qualified, in fact the text on p. 17 (top) allows for it in some cases. The text in the box on the bottom of p. 16 needs clarifying.

p. 17 (and p. 16, top box)
ENERGY STAR is going to permit "family testing" on a single model to give ENERGY STAR coverage to the entire family. While this makes sense to us, the rationale that this "lenient approach" will be suitably compensated for by an aggressive QA program does not seem plausible to us. We think the amount of product testing would be more than ENERGY STAR could effectively manage. Is a better approach to require some written justification or evidence from the manufacturer as to why the submitted model is thought to be (conservatively) representative?

p. 17, middle paragraph (the one starting "Products qualified ….")
Why should driver substitutions be excluded just because of a change in CCT or CRI, if the LEDs are being driven at the same (or even lower) power? Likewise, if an LED substitution is made that gives the same or higher flux and the same CCT and CRI, and with less power, why is new qualification required? See the comments to pp. 16-17 on the second page of this letter.

p. 18, middle of page (paragraph after "In-situ Driver/Driver Case ….")
In the last sentence, make clear that the "warranted temperature" should be for a 35,000 L70 lifetime.

p. 18, under Quality Assurance Testing
The second sentence should make it clear that the two (or more) variations that fail QA testing do not have to be from the same family group submission (or at least this is our understanding).

p. 20, definitions
The definition given for a driver is different from the one a NEMA/ANSI group developed during the recent standardization work (with UL input). Also, no definition is given for a power supply. We give below our definitions for these two as well as some others, from the ANSI/NEMA work:

LED lamp, integrated
An LED device with an integrated LED driver and a standardized base that is designed to connect to the branch circuit via a standardized lampholder/socket.

NOTES In North America, "a standardized base" refers to an ANSI standard base. In the U.S. "branch circuit" is used to describe the "mains voltage" in IEC documents.

LED lamp, non-integrated
An LED device with no integral power source and with a standardized base designed for connection to a LED luminaire.

LED package
An assembly of one or more LED die that contains wire bond connections, possibly with an optical element and thermal, mechanical, and electrical interfaces. The device does not include a power source and is not connected directly to the branch circuit.

LED array
An assembly of LED packages on a printed circuit board or substrate, possibly with optical elements and additional thermal, mechanical, and electrical interfaces. The device does not contain a power source and is not connected directly to the branch circuit.

LED module
A component part of an LED light source that includes one or more LEDs that are connected to the load side of LED power source or LED driver. Electrical, electronic, optical, and mechanical components may also be part of an LED module. The LED module does not contain a power source.

LED luminaire
A complete LED lighting unit consisting of a light source and driver together with parts to distribute light, to position and protect the light source, and to connect the light source to a branch circuit. The light source itself may be an LED array, an LED module, or an LED lamp. The LED luminaire is intended to connect directly to a branch circuit.

Power source
A transformer, power supply, battery, or other device capable of providing current, voltage or power within its design limits.

Power supply
An electronic device capable of controlling current, voltage, or power within design limits.

LED control circuitry
Electronic circuitry to limit voltage and current, to dim, to switch or otherwise control the electrical energy to the LED array. It does not contain a power source.

LED driver
A power source with integral LED control circuitry designed to meet the specific requirements of a LED lamp or a LED array.

Respectfully,

Dale Work
Philips Lighting