July 28, 2023

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Washington, DC 20460

Re: NEMA and ALA Comments Regarding ENERGY STAR® Recessed Downlights V1.0 Draft 2

Submitted electronically to lighting@energystar.gov

Dear Taylor,

The National Electrical Manufacturers Association (NEMA) still represents nearly 325 electrical equipment and medical imaging manufacturers that make safe, reliable, and efficient products and systems serving building systems, building infrastructure, lighting systems, industrial products and systems, utility products and systems, transportation systems, and medical imaging. Our combined industries account for 370,000 American jobs in more than 6,100 facilities covering every state. These industries produce $124 billion in shipments and $42 billion in exports of electrical equipment and medical imaging technologies per year.

The American Lighting Association (ALA) represents over 1,300 member companies in the residential lighting, ceiling fan and controls industries in the United States, Canada, the Caribbean and Mexico. Member companies are manufacturers, manufacturers' representatives, retail showrooms and lighting designers.

Members of NEMA's Lighting Systems Division and ALA members reviewed the latest draft with appreciation for EPA's apparent consideration of our previous input. We ask you to carefully consider the following input in the development of your next draft.

Scope and Title

We applaud EPA's decision to include other downlight installation configurations beyond ceiling-recessed mounting alone, as these are largely the same products providing the same performance advantages over incumbent products. With this expanded scope, for simplicity, EPA should consider eliminating "Recessed" from the title of the specification.

cont'd

Product Families

Table 1 allows for the addition of a diffuser as an allowable variation but does not allow for the reduction of light output that any diffuser would introduce. If the representative tested model meets specification requirements, and the additional family member with a diffuser has the same input power as that tested model, would it not be certified with the rest of the family? The same restriction disallows reductions in air flow; is that intended to refer to the air handling capabilities of some downlights, or is it in reference to heat dissipation of the LED source? For the diffuser allowance, we recommend using the same Allowable Variation language proposed for the Reflector/Trim attribute.

The Luminaires V2.2 specification included an allowance for variations in product finish ("Luminaire body color/pigment"). Our members make frequent use of this allowance; we request its inclusion it in the new specification.

Efficacy

We note with concern EPA's decision to maintain a luminous efficacy threshold of 90 lumens per watt, measured at luminaire level. While NEMA member manufacturers appreciate EPA's need to balance the interests of consumers, electric utilities, retailers, and manufacturers, this higher performance threshold will increase costs to produce the products, costs which will be borne by consumers and installers. We firmly believe these predictable higher costs will negatively impact adoption of these certified luminaires and slow market transformation in this space. While 90 lm/W may be an attractive numerical target that engages members of the efficiency community, we urge EPA to consider a more balanced, cost-effective threshold of 80 lumens per watt and the increased *market engagement* that we expect will result. We should not lose sight of the economical recessed can and low-performance A-line lamp combination that certified downlight products will compete against.

An example where lowering the efficacy requirement will benefit various consumer interests is in the category of color tunable lighting. Luminaires capable of color tuning (including tunable white) comprise a growing percentage of the expanding smart lighting category, but they have lower luminous efficacy. Color tuning offers the opportunity to enhance the appearance of products, generate unique appearances in a space, highlight specific elements of a work of art, assist in signage and wayfinding, create moods, and add entertainment features to a user experience.

The ability to accurately match color points is achieved with the use of multiple primary LED packages – typically a combination of white, red, green, and blue – within a given light source. For example, if a consumer selects a "warm white" setting corresponding to nominally 2700 K on the blackbody locus, in addition to output from white LEDs, to get the color point exactly right may require some of the lower efficacy LEDs, such as red and blue, to also emit light. This reduces efficacy of the light source compared to a single-chromaticity light source containing only nominally 2700 K LED packages.

Primary color LEDs are placed farther out in color space. This expands the gamut area, which represents the number of colors, including shades of white, the light source can produce. While consumers value this functionality, the farther the primaries are located from the blackbody locus, the lower their luminous efficacy, and the lower the efficacy of the light source at any given target color point.

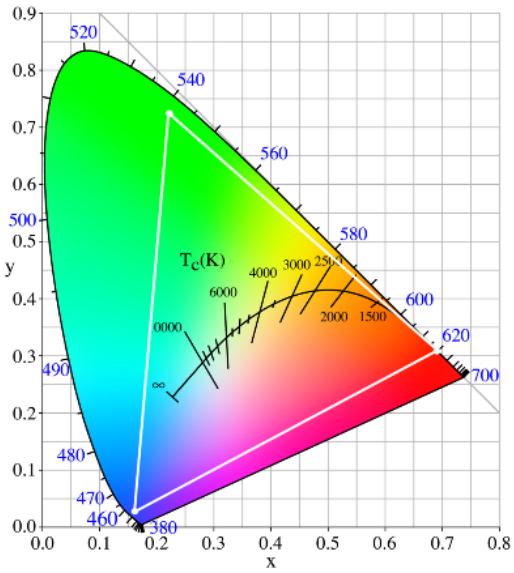

Figure 1: The Planckian locus drawn on the CIE 1931 color space. The triangle denotes the color gamut area created by the red, green, and blue chromaticities that comprise the triangle's corners. Image from Wikipedia.

Definitions of tunable white and full-color tunable provided by NEMA in response to the Department of Energy's Notice of Proposed Rulemaking, Energy Conservation Standards for General Service Lamps (docket EERE-2022-BT-STD-0022) are as follows:

> **Tunable white**: A feature allowing the end user to adjust the light output to create different colors of white light. This tuning must be capable of altering the color appearance along the black body curve from two or more LED colors, where each LED color is inside one of the ANSI defined (ANSI C78.377-2017[i]) white correlated color temperature ranges (between 2700 K and 6500 K) inside of the seven step MacAdam ellipse or the ANSI quadrangles.
>
> **Full-color-tunable**: A feature allowing the end user to adjust the light output to create white or colored light. This tuning must include white light that can alter the color appearance along the black body curve by dynamically tuning color from three or more colors of LEDs, where at least one LED extends to colors beyond the ANSI defined (ANSI C78.377-2017) white correlated color temperature ranges (between 2700 K and 6500 K) outside of the seven step MacAdam ellipse or the ANSI quadrangles.

We propose that the efficacy requirement be lowered to 80 lm/W for all products to accommodate consumer preferences such as color-tunable downlights.

Electrical Performance Requirements

Our members recommend several updates to the way EPA is requiring the measurement of electrical performance, to leverage American National Standards developed and refined since the Luminaires V2.2 specification was published. To accommodate the recertification of products using existing test reports, the following are offered as additional pathways parallel to those proposed by EPA in Draft 2.

Source Start Time

We recommend augmenting the reference to the ENERGY STAR Start Time Test Method with an alternate reference to ANSI C82.16-2022, sections 3.7 and 13. This ANSI standard improves upon EPA's test method, enhancing it with additional technical details including source impedance, source distortion, instrumentation details and others that increase reproducibility and repeatability. This standard has been adopted in Canada already.

Power Factor

We recommend supplementing the proposed ≥ 0.7 requirement with this alternative approach to certifying the same performance:

> *Alternatively, the luminaire shall comply with the requirements in ANSI C82.77-10.*

This change would enhance the specification by:

- Incorporating harmonic current requirements which are equally critical for power quality purposes.
- Acknowledging the power factor and harmonic currents relationship.
- Establishing power factor and harmonic current limits for programmable (adjustable) LED drivers.

This ANSI standard has also been adopted in Canada.

Transient Protection

We recommend supplementing the references to ANSI/IEEE C62.41.1 and C62.41.2 with an alternate pathway referencing ANSI C82.77-5. Though still commonly used, the IEEE documents have not been maintained since 2003. Further, they are not standards but rather guides that must be interpreted for testing and applications. The ANSI C82.77-5 standard is a document maintained by an actively engaged committee. ANSI C82.77-5 describes how to test lighting equipment specifically without the need for additional interpretations. It provides concise technical details and test setups that foster repeatability and reproducibility and is therefore ideal for the ENERGY STAR specification.

Standby Power Consumption

We recommend adding a second, alternate method of measurement: ANSI C82.16, section 15. The proposed reference to IEC 62301 is a generic appliance test method requiring extensive reinterpretation to adapt it to lighting equipment. The IEC itself has recognized the need for a different IEC standard for lighting equipment and in turn published IEC 62303, adopted as ANSI C137.62303 in the United States. That standard, however, still lacks some specific details better described in the ANSI C82.16 standard, including determination of standby power for connected devices, especially for those products capable of providing a wide range of light output, and those operating across a wide input voltage range.

Similarly, we recommend improving the proposed ENERGY STAR requirements with an alternate compliance pathway referencing ANSI C82.18. This standard has similar standby power limits to those described in the current ENERGY STAR requirements and provides clarity on the evaluation of luminaires incorporating functions other than lighting.

Operating Frequency and Flicker

Similarly, we recommend the addition of ANSI C82.18 standard as an alternative pathway to compliance for operating frequency and flicker requirements.

Thermal Performance Requirements

NEMA and ALA members have long understood that ENERGY STAR product certification requires safety testing and certification, as articulated in section 13 of the draft specification. The performance requirements captured in section 12 are entirely redundant to section 13. That is to say, the requirements outlined in sections 12.1 and 12.2 are part of the testing and certification requirements detailed in section 13. For simplicity, we recommend EPA eliminate section 12.

Product Labeling and Packaging

NEMA and ALA members appreciate the newly presented options for fulfilling packaging requirements. The Draft 2 proposal appears intended solely for "*…models destined for e-commerce online internet sales only…*". The note box preceding the requirement further clarifies the intent to inform purchases *"…shipping directly to customers…to help ensure that online marketing claims are consistent with the model's certification.*" We support this targeted shift of information to ensure consumers are well informed no matter the sales channel.

However, our members request these provisions be available for all sales channels for which product packaging does not inform the consumer's decision-making process. A participant in EPA's 12 July webinar raised 'made to order' products as an example of this need. Another example is 'made to stock' products not intended for retail shelves. These products are staged at warehouses and distribution centers, behind the counter at electrical distributors, and are also drop shipped from manufacturers to job sites. These modes of product delivery are far more common with light commercial and hospitality projects where ENERGY STAR certified downlights are often specified and installed.

The commonality between online sales and these other sales channels is a lack of intent for packaging to influence purchasing decisions. We recommend changing section 15.1 text as follows:

> "For units of certified models <u>not intended for retail shelf stocking</u> ~~destined for e-commerce online internet sale only~~, these requirements may be fulfilled by providing a supplemental performance summary that includes all of the applicable requirements below."

Editorials

For clarity, we offer the following editorial suggestions, and questions:

- We note the shift away from using "*shall*" to using "*must*" for many specification requirements. Historically, absolute requirements have been expressed with "shall". Does this change in language denote any change in meaning?

- All instances of **Driver** (only) should be replaced with **LED Driver** to ensure full alignment with ANSI standards. We request this for all instances throughout the specification, including several instances noted in Table 1.
- Instances of **wattage** throughout the specification are better expressed as **input power**, defined in section 4 of the specification.
- The **Lumen Maintenance** definition should be replaced with a definition of **Luminous Flux Maintenance** noting the historical misnomer.
- The IES Handbook 9th Edition is not available for purchase; a better reference for the definition of **MacAdam Color Ellipses** may be the 1942 paper itself. Alternatively, the Agency should consider striking this definition from the specification and relying instead on the existing **Standardized Color Ellipse** definition which references an ANSI standard.
- The definition for **Rated Lumen Maintenance Life** should be replaced with a definition for **Rated Luminous Flux Maintenance Life**, with notation acknowledging the historical misnomer.
- Given that products within the scope of this specification are destined for residential, hospitality, and light commercial installation, the reason for inclusion of the **Residential Downlight** definition is unclear. We recommend removing it.
- The definition of **Optics**, as drafted, refers to materials commonly understood to be secondary optics (i.e., optical materials not integral to the light source). We recommend removal of the **Optics** definition, and inclusion of the parenthetical ("Optics") at the start of the **Secondary Optics** definition.
- The **Standby Mode** definition reference is unclear; we recommend clarifying which US DOE documentation is being referenced, and ensuring it is well aligned with other related references.
- In Table 1:
    - "*Integrating sphere scan*" is unclear. Is an IES LM-79 test report intended?
    - "*Lumen output*" is better expressed as "Light output".
- In section 6.3, we recommend reviewing the referenced document for outdated terms and references that do not align with the draft specification.
- In section 7, standards references, hyperlinks, and descriptions should be updated to reflect inputs above.
- In section 8.1, the backslash is better expressed as a forward slash.
- In section 9.2, we thank EPA for calling users' attention to the 2022 NEMA white paper and ask that it be formally included in the specification itself for their future reference.

We again thank EPA for the collaborative process to develop this specification and look forward to working with you to refine it further.

Warm regards,

Alex Baker
Director, Regulatory Affairs