Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
Natural Resources Defense Council
Northwest Energy Efficiency Alliance
National Consumer Law Center

March 27, 2023

Mr. Bryan Berringer
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Office, EE-5B
1000 Independence Avenue, SW., Washington, DC 20585

RE: Docket Number EERE-2022-BT-STD-0022: Notice of proposed rulemaking for energy conservation standards for general service lamps

Dear Mr. Berringer:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), the American Council for an Energy-Efficient Economy (ACEEE), the Natural Resources Defence Council (NRDC), the Northwest Energy Efficiency Alliance (NEEA), and the National Consumer Law Center (NCLC) on behalf of its low-income clients on the notice of proposed rulemaking (NOPR) for energy conservation standards for general service lamps (GSLs). 88 Fed. Reg. 1638 (January 11, 2023). We appreciate the opportunity to provide input to the Department.

DOE's analysis for the NOPR shows that the proposed standards for GSLs would deliver large energy savings and emissions reductions for the nation and cut costs for consumers. However, we have several concerns that we encourage DOE to address. First, we believe that DOE has inappropriately proposed to exempt circadian-friendly LED lamps. Second, we believe that DOE should reevaluate the efficacy levels of lamps available in the current marketplace and consider higher "max-tech" levels. Finally, we believe that DOE's proposed integrated metric incorporating standby power is inadequate because it does not account for total energy consumption, and, therefore, we urge the Department to set a separate standby power standard. Below we discuss these and other issues.

DOE may not exempt circadian-friendly LED lamps from the definition of "general service lamp." In the NOPR, DOE proposes a new definition for "circadian-friendly integrated LED lamp"[1] and has proposed to exclude these lamps from the GSL standards. As Earthjustice explains in their comments, DOE does not

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[1] *Circadian-friendly integrated LED lamp means an integrated LED lamp that—*
(1) Is designed and marketed for use in the human sleep-wake (circadian) cycle;
(2) Is designed and marketed as an equivalent replacement for a 40 W or 60 W incandescent lamp;
(3) Has at least one setting that decreases or removes standard spectrum radiation emission in the 440 nm to 490 nm range; and
(4) Is sold in packages of two lamps or less.

have the legal authority to exempt these lamps and doing so would violate the anti-backsliding provision. Furthermore, even if DOE did have the authority to exempt circadian-friendly lamps, we believe that such an exemption would be inappropriate and could risk opening up a loophole in the standards. While circadian-friendly lamps currently represent a small portion of the market, their sales could grow as part of a more recent emphasis to create healthy indoor environments for occupants. Furthermore, in the absence of a standard, circadian-friendly lamps could potentially become a low-cost alternative to regulated GSLs, undermining the standards.

We understand that the Department has determined that circadian-friendly LED lamps should be exempt based upon an abbreviated review of this nascent market. The NOPR states that DOE identified LED lamps that are marketed as aiding in the sleep-wake (i.e., circadian) cycle by modifying the light spectrum. Because these lamps have efficacies that are lower than the proposed standard levels, the Department concluded that, to preserve the utility of such a product, the lamps should be exempt from the GSL standards.

Specifically, DOE observed circadian-friendly lamps with efficacies ranging from 47.8 lm/W to 85.7 lm/W[2] and in proposing an exemption for these products suggested that the lower efficacy was representative of this technology. However, this lower efficacy range is not necessarily an inherent characteristic of this lamp-type. Many common integrated omnidirectional short (IOS) lamps on the market today have efficacies of 80-90 lm/W[3]—similar to those of some of the circadian-friendly lamps identified by DOE. We understand that the same technology options that DOE identified for traditional LEDs could be applied to circadian-friendly LEDs to improve efficiency. Furthermore, even if there is an efficacy penalty associated with circadian-friendly lamps, this does not suggest that these lamps should be exempt from standards. While DOE explains that it is difficult to perform a teardown of lamps, there is detailed publicly available information on circadian technology,[4] and we encourage DOE to perform a more thorough review.

We encourage DOE to reevaluate the max-tech levels. We understand that DOE selected more efficacious substitutes by identifying lamps with features similar to those of the baseline lamp for each product class.[5] However, we note that the analysis was based on models available as of June 2020.[6] There appear to be lamps available today with efficacies beyond the max-tech in the NOPR. For instance, in the ENERGY STAR product list, there is an 800 lumen, 5.9 W integrated omnidirectional short (IOS) lamp with an efficacy of 135.6 lm/W, while DOE defined max-tech for IOS lamps with the same lumen output as 124.6 lm/W.[7] We also note that there are IOS lamps available in Europe with efficacies as high as 210 lm/W.[8] We encourage DOE to ensure that the max-tech levels evaluated in the analysis are true max-tech levels.

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[2] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0001 . p. 3-5.

[3] 10 W and 9 W 800 lumen IOS LEDs have efficacies of 80 and 88.9 lm/W, respectively. DOE estimates that these lamps make up more than half of sales in the no-new-standards case: 88 Fed. Reg. 1674. Table VI.18. Efficiency levels (ELs) 3 and 4 represent the 10 W and 9 W lamps, respectively.

[4] For example: https://patents.google.com/patent/US10324250B2/en?oq=10324250

[5] E.g., initial lumens, CCT, CRI, and lifetime

[6] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0005 . p. 1659.

[7] https://www.energystar.gov/productfinder/product/certified-light-bulbs/details-plus/2393595#PriceAndLocation. Accessed 3/20/2023.

[8] https://www.lighting.philips.com/main/prof/led-lamps-and-tubes/led-bulbs/master-ultraefficient-led-bulb

We encourage DOE to set a separate standby power standard. DOE has proposed an efficacy metric that integrates standby power and active mode power. DOE explains in the NOPR that because the measurement of active mode power for lamps with standby mode inherently includes standby power, the integrated metric approach is appropriate. However, the integrated metric fails to capture the total energy consumed by not reflecting the significantly greater number of operating hours in standby mode compared to active mode. A combined metric could be constructed in a way that captures total energy consumption; for instance, the total energy consumed is captured for room ACs with an integrated metric by apportioning the annual standby mode energy consumption to the active mode operating hours.[9] However, with the proposed metric for GSLs, DOE is ignoring standby mode energy that is consumed outside of active mode hours.

To demonstrate the inadequacy of DOE's proposed approach, consider an 800 lumen IOS with and without standby power. Per the proposed standards, such a lamp without standby power must meet an efficacy of 124.3 lm/W, while the lamp with standby must meet an efficacy of 115.5 lm/W (i.e., an efficacy that is 7% less stringent). However, as shown in Table 1, if the lamp with standby consumed 0.5 W in standby mode,[10] it could use 48% more energy annually than the lamp without standby.[11] It follows that the annual energy use of lamps with higher standby power is even larger.

DOE states in the NOPR that "It is possible for a lamp with standby mode power consumption greater than the assumed value[12] to comply with the applicable energy efficiency standard, but only if the decreased efficiency of standby mode was offset by an increased efficiency in active mode."[13] However, because DOE's proposed metric does not capture annual energy use, such a tradeoff between standby mode and active mode would significantly increase annual energy use due to the much larger number of operating hours in standby mode compared to active mode. For example, as shown in Table 1, an 800 lumen IOS lamp with 0.6 W of standby power—with the same active mode wattage (which includes standby) as the 800 lm lamp with 0.5 W of standby power—would consume 10% more energy annually than a lamp with 0.5 W of standby power and 63% more energy than a lamp without standby. A 800 lm

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[9] For room ACs, the energy efficiency metric CEER is calculated as: CEER = capacity/[(AEC_{cool} + $AEC_{ia/om}$)/0.75]; where $AEC_{ia/om}$ is the annual energy consumption in inactive mode or off mode and 0.75 represents the annual active mode operating hours (in thousands of hours). https://www.ecfr.gov/current/title-10/chapter-II/subchapter-D/part-430/subpart-B/appendix-Appendix%20F%20to%20Subpart%20B%20of%20Part%20430

[10] In the TSD, DOE explains that it "assumed a typical wattage constant for standby mode power consumption of 0.5 W and added this wattage to the rated wattage of the non-standby mode *representative units* [emphasis added] to calculate the expected efficacy of lamps with the addition of standby mode functionality. DOE then used the expected efficacy of the lamps with the addition of standby mode functionality at each EL to calculate the corresponding A-value." However, since the efficacy equation applies to the entire lumen range of covered lamps, the assumption of 0.5 W does not reflect the standby power at higher lumen output–for instance, at 3,300 lm output, the non-standby IOS lamp active mode power would be 25.7 W, while the standby IOS lamp active mode power would be 27.6 W, which suggests the standby power is 1.9 W.

[11] AEC (lamp without standby) = active mode hours x wattage x hours per year in active mode*;*
AEC (lamp with standby) = [active mode wattage*(1.0-0.3) x hours per year in active mode] + [standby mode wattage x hours per year in standby mode], where 0.3 reflects DOE's assumption that lighting controls (including smart lamps) reduce energy consumption by 30%.

[12] We understand the 'assumed value' to be 0.5 W at around 800 lumens. However, as a consequence of how the pair of efficacy equations was constructed, this value appears to increase with increasing lumens, as described in footnote 10.

[13] 88 Fed. Reg. 1667.

lamp with 1.3 W of standby power—reflecting the highest value in DOE's test sample[14]—would consume almost 80% more energy annually than a 800 lm lamp with 0.5 W of standby and nearly *three times* the energy of a 800 lm lamp without standby.[15]

Table 1. Annual energy consumption of an 800 lumen IOS lamp with and without standby power

	Lumens	**Proposed standard (lm/W)**	**Hours per day (active mode)**	**Wattage (active mode), W**	**Hours per day (standby mode)**	**Wattage (standby mode), W**	**Total annual energy consumption (kWh/yr)**
IOS no standby	800	124.3	2.3	6.44	n/a	n/a	5.41
IOS standby	800	115.5	2.3	6.93	21.7	0.5	8.03
	800	115.5	2.3	6.93	21.7	0.6	8.82
	800	115.5	2.3	6.93	21.7	1.3	14.37

From these numerical examples we conclude that a seemingly small tradeoff between active and standby mode wattage would result in a large percentage increase in annual energy consumed due to the significantly greater number of operating hours in standby mode compared to active mode. Given that DOE estimates that 50% of lamps will have standby by the end of the analysis period,[16] failing to incorporate standby power in a way that captures its contribution to total energy use could have significant implications for national energy consumption associated with GSLs. While DOE could refine the lumen/Watt metric to reflect total annual energy consumption, similar to the combined CEER metric for room ACs, we encourage DOE to consider setting a separate standard for standby mode. Specifically, we believe that a standby power limit of 0.2 W, consistent with current standards in California, would be appropriate for GSLs.

If DOE elects not to set a separate standby standard, the Department should use a standby value of 0.2 W in setting the efficacy levels for lamps with standby power. In the NOPR, DOE presumed that manufacturers would sell the same lamp models across the U.S. Therefore, DOE explained that because California requires state-regulated LEDs to have a standby power less than or equal to 0.2 W,[17] the Department elected to use this value in the calculation of lamp unit energy consumption for all lamps with standby power.[18,19] However, when determining the standards for products with standby power, which involved scaling the efficacy equation for non-standby classes, DOE instead used 0.5 W for the representative units as a conservative estimate of standby power. While we acknowledge that DOE performed testing of lamps available in the U.S. marketplace, there are nearly 2,400 models of GSLs in the Modernized Appliance Efficiency Database System (MAEDBS) that meet the California standby power

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[14] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0001. p. 5A-3.
[15] We understand that significantly lower active mode wattages are achievable. For instance, see the 4 W lamps in footnote 8 that deliver 840 lumens. Therefore, the proposed standards could allow for significantly higher standby powers than DOE assumed.
[16] 88 Fed. Reg. 1679.
[17] https://www.law.cornell.edu/regulations/california/20-CCR-1605.3
[18] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0005. p. 1679.
[19] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0001. p. 9-8.

limit of 0.2 W.[20] Should DOE maintain the integrated metric as proposed, DOE should use a standby power value of 0.2 W to set the standards.[21]

We encourage DOE to reassess the assumption of the impact of controls on energy use in the residential sector. DOE referenced a study of commercial buildings[22] to impart a 30% reduction factor to the active mode energy use of both residential and commercial applications for lamps with any type of lighting controls (i.e, traditional lighting controls or smart lamps).[23] At the February 1, 2023 public meeting, DOE clarified that this reduction is attributed to dimming-type controls (and not occupancy sensors that would impact the operating hours of the lamp).[24] Given the significant differences between lighting controls employed in commercial buildings and smart lamps used in the residential sector, we are concerned that applying an energy use reduction derived from a commercial building study to all GSLs likely overestimates the impact of controls in the residential sector.

DOE should <u>not</u> adopt Trial Standard Level (TSL) 5 as an alternative to TSL 6. In the NOPR, DOE proposed to adopt TSL 6, but the Department also requested feedback on consideration of the adoption of TSL 5. In the NOPR, DOE notes that "EPCA requires DOE to adopt the standard that would represent the maximum improvement in energy efficiency that is technically feasible and economically justified."[25] We believe that DOE has demonstrated that both of these criteria are satisfactorily met, and thus, adopting a lower level would not fulfill DOE's statutory obligations. Furthermore, as described above, we encourage DOE to evaluate higher max-tech levels, which could allow for the consideration of even higher standard levels than those represented by TSL 6. We therefore urge DOE not to further consider the adoption of a lower TSL, which would needlessly result in additional energy waste and greenhouse gas and other emissions.

Thank you for considering these comments.

Sincerely,

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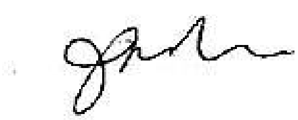

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[20] https://cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx
[21] We recognize that even with a separate standby standard, the active mode efficacy equations would need to incorporate standby power since the measurement of active mode power includes standby.
[22] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0005. pp. 1670-1671.
[23] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0001. p. 9-8.
[24] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0027. p. 79-80.
[25] https://www.regulations.gov/document/EERE-2022-BT-STD-0022-0005. p. 1708.

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