

Topic	Comment	EPA Response
<p>Allowable Product Variations</p>	<p>Several allowable product variations, including paint color, beam angle, base type, envelope shape and envelope finish, appeared in Draft 2 along with specific testing conditions under which they would be allowed.</p> <p>A number of stakeholders requested additional product variations to be included in the specification, including the following:</p> <ul style="list-style-type: none"> • Driver – with thermal testing of each variation • Correlated Color Temperature (CCT) for CFLs if basic model has been ENERGY STAR certified <p>Draft 2 also set parameters for allowable variations. One stakeholder suggested tightening the variance for power factor to +0.05, and limiting the variance for input wattage and current to + 5%. Another stakeholder requested an edit clarifying that a change in metal lamp base material is an allowable variation and does not require a resubmission for ENERGY STAR certification.</p> <p>A few stakeholders suggested that the required 5°C buffer between the <i>in situ</i> temperature TMP_{LED} and the maximum case temperature in the LM-80 report, for the beam angle and lamp base allowable variations, unnecessarily de-rates the LED lamp. Another stakeholder requested that the cap on the average of <i>in situ</i> temperatures of critical components be increased from 2.5°C to 5°C due to varying power levels possible during <i>in situ</i> temperature testing.</p> <p>Stakeholders requested clarification on which tests could be shared amongst each allowable variation.</p> <p>A stakeholder commented on the cost of taking temperature measurements for five samples of each variation.</p>	<p>EPA's intent is to ensure that all models labeled as ENERGY STAR meet the requirements of the specification.</p> <p>EPA considered stakeholders' suggestions for product variations and requests for clarification, and refined the allowable product variations guidance in Draft 3. An additional variation, CCT for CFLs, was added to further decrease testing burden, and the Agency incorporated a column to clarify the additional test data required for each variation.</p> <p>EPA is open to exploring additional areas for reducing testing burden and requests compelling data in order to expand the allowable product variation section of the specification.</p>

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<p>Correlated Color Temperature (CCT)</p>	<p>Draft 1 proposed a color requirement for lamps to fall within a 4-step MacAdam ellipse or ANSI quadrangle of the targeted CCT. Draft 2 reverted back to 7 steps as in current specifications but with no units falling outside in order to take one step closer to tightening color and address the consumer dis-satisfier of poor CCT consistency among lamps, which could result in lamps with noticeably different shades or tints across makes, models and technologies.</p> <p>Stakeholders remarked that lamp manufacturers typically require a higher level of performance at a component level in order to achieve the target system performance, and the requirement of having 10 of the 10 samples passing, may effectively increase the cost of certified LED lamps, as lamp manufacturers will need LED emitters providing a higher level of performance to meet the lamp-level requirement.</p> <p>Some stakeholders supported a move from 7-step to a 4-step MacAdam ellipse requirement as a method of addressing a color consistency problem that has been present with compact fluorescent lamps. Of these stakeholders, one stated that a move to a 4-step ellipse would be acceptable if the price implication did not hinder adoption.</p>	<p>Draft 3 reverts to the CCT requirements found in the existing specifications but with a modification: formerly we allowed 1 of 10 samples to fall outside the 7 step macadam ellipse, now we propose that no samples be permitted to fall outside the 7 steps. EPA is sensitive to the issues with phosphor pricing and associated CFL costs argument but based on the review of data, we expect the impact to be minimal since certified product data suggests current products do not have difficulty achieving 10/10 samples within 7-steps. Since CFL color consistency is a consumer issue EPA will continue to monitor the situation and determine at a later date when moving towards better and more consistent color might be appropriate.</p>
<p>Color Angular Uniformity</p>	<p>In Draft 1 and Draft 2, the Agency proposed a stricter requirement of less than 0.004 distance from the weighted average point on the CIE 1976 (u'v') diagram across the field angle for color angular uniformity than what was required in the existing Integral LED Lamps V1.4 specification but consistent with the Luminaires specification in order to ensure that certified solid state directional lighting products provide similar performance whether a qualified ENERGY STAR certified LED lamp luminaire is installed.</p> <p>Stakeholders expressed concern with the proposed requirement of less than 0.004 distance across the field angle, and offered that laboratories using goniometers employing spectroradiometers to measure color encounter noise where the signal strength is too low, especially near the edge of the field angle. Stakeholders also acknowledged that the proposed requirement will be difficult to meet with the current lamp optic designs, and questioned whether there was adequate justification for the tightening of the requirement.</p> <p>Stakeholders also cited the efforts of the IES LM-79 working group and the Lamp Testing Engineers Conference (LTEC), who are exploring the reliability of color angular uniformity measurements. These stakeholders requested that the Agency remove the color angular uniformity requirement until the industry work has been completed and a resolution determined.</p>	<p>Based on stakeholder comments and discussions with laboratories, the Agency has adjusted the requirement in Draft 3 to measure the uniformity across the beam angle, and adjusted the variance level requirement from 0.004 to 0.006 to be consistent with the existing LED lamp specification.</p> <p>EPA proposed scanning resolution according to beam angle to ensure consistent measurement from lab to lab.</p> <p>EPA will continue to follow the work of lighting industry groups and their progress on fine-tuning the test measurement.</p>

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Color Maintenance	<p>Consistent with existing requirements for LED lamps, to address concerns of color shift over LED lamp lifetime, Draft 2 contained a requirement for lamps to have color maintenance fall within 0.007 distance on the CIE u'v' diagram over the 6,000-hour lumen maintenance test.</p> <p>One stakeholder expressed concern with the 6000-hour test duration and noted that since LED chip manufacturers do not provide a guarantee of color maintenance, lamp manufacturers must start the color maintenance testing at the same time as the lumen maintenance testing, risking additional testing cost if the lamps fail the elevated temperature life testing.</p>		<p>The Agency has maintained the color maintenance requirement from previous drafts and the current LED lamp specification in Draft 3.</p>
Color Rendering	R₉	<p>The proposed requirement of $R_9 > 0$ for all lamps in Draft 2 was carried forward from the Integral LED Lamps V1.4 specification, and was intended to address a specific color rendering deficiency common to phosphor based products. The Agency also requested detailed responses regarding potential cost increases to the consumer as a result of this requirement for CFLs.</p> <p>Some stakeholders reiterated that the requirement has the potential to increase costs significantly for CFLs and have negative effects on efficacy, lumen output, and color consistency due to the reformulation costs and additional phosphors that would be required to consistently meet the requirement but no estimates or data was presented.</p> <p>One stakeholder suggested that lamp color quality can be improved when the R_9 value is negative, and requested a change in the requirement to allow a negative R_9 value if an additional check of the lamp's chromatic saturation (chroma) value, a metric used in the Color Quality Scale (CQS), confirmed the value is greater than the chroma value for the Blackbody reference source.</p> <p>Other stakeholders were supportive of the requirement to improve color quality. These comments for improvements in CRI included suggesting a high performance tier for high CRI and R_9 to help eliminate a consumer dis-satisfier of "color."</p>	<p>Although requested, no efficacy or cost information was submitted to the Agency for consideration.</p> <p>EPA reviewed the negative R_9 proposal and its dependency on measured chromatic saturation (chroma), a color quality metric factored into the Color Quality Scale (CQS) method for characterizing color quality. EPA will continue to monitor the progress of CQS, as well as the development and publication of other color quality metrics to determine if at a later date, the method(s) warrant inclusion into the specification.</p> <p>In light of limited comments provided by stakeholders, coupled with the color quality benefit to consumers regardless of technology, the Agency carried forward the proposed requirement for all lamps to have a positive R_9 in Draft 3.</p>

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	High CRI with lower Efficacy	Some stakeholders requested special consideration, i.e., lower efficacy allowance, for products with high CRI values, noting that some methods for producing high CRI products are derived at the sacrifice of efficiency, and that some end users are reluctant to use directional LED lamps when the color rendering is not the same as or very close to the 100 CRI of halogen.	EPA carefully considered this proposal and conducted research on the matter. EPA's research included several meetings with stakeholders and analysis of currently certified ENERGY STAR lamps and DOE Lighting Facts data and determined that a 95-100% of lamps with CRI of 90 or greater are able to meet the proposed efficacy requirements in Draft 2. Additionally, any decrease in efficacy levels for low power directional lamps would be lowering the bar below the original levels set in 2009 for the rapidly advancing technology. Efficacy levels were adjusted from wattage bins of under 10 Watts and 10W and greater to a break at 20W to allow for a greater number of existing products to meet the new levels and also raising efficacy for high wattage lamps for extra energy savings.
Commercial Grade	<p>In support of commercial applications and incentive programs requiring products with longer rated life values, Draft 2 proposed new provisions for commercial grade lamp labeling. Commercial grade lamps would need to satisfy requirements for a minimum rated life claim of 35,000 hours, and also have increased requirements for power factor and warranty.</p> <p>One stakeholder commented that defining a new class of lamps would limit competing technologies in the marketplace, while a number of stakeholders commented that the commercial grade classification was unnecessary and suggested it should be eliminated. They commented that the requirement, which is optional for most lamps and a prerequisite for low voltage MR-16 lamps, appears biased in holding only these lamps to a higher standard. They also indicated that the commercial grade requirement would result in product SKU proliferation, multiple product packaging changes and consumer confusion.</p> <p>Other stakeholders wholeheartedly supported the commercial grade designation proposed in Draft 2 and reiterated that commercial accounts have different needs, including more rigorous requirements for their lighting systems. They commented that the commercial designation would simplify product selection for buyers and account managers fulfilling the requirements of utility rebate programs.</p>		<p>In response to concerns that its implementation would create potential complications in the marketplace with existing "commercial" lighting products, as well as potentially confuse consumers, EPA removed the language associated with the commercial grade requirements proposed in Draft 2. Although the commercial tier designation was introduced to allow large purchasers or efficiency program implementers to distinguish between the performance and longevity of ENERGY STAR lamps, the Agency believes that a better solution is to rely on the new filtering capabilities of the certified product list. The advanced features will allow users to screen for specific performance attributes that meet individual project or programmatic needs such as lifetime, CRI and power factor - all elements that were originally included in EPA's proposed "commercial" tier.</p> <p>As a result of the removal of the commercial tier, low voltage MR-16 lamps, which were added to the scope of the specification in Draft 2, will not be required to meet more stringent requirements such as 35,000 hour rated life.</p>

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Dimming	<p>In Draft 2, EPA signaled that a set of performance requirements for dimming range, flicker, audible noise and compatibility were in development for inclusion in the specification.</p> <p>While acknowledging the magnitude and complexity of the issue, the efficiency community expressed strong support of the development of dimming requirements, including methods of measurement, noting that poor dimming performance is a consumer dis-satisfier which hinders adoption of energy efficient lighting technology and programs have been hesitant to grant rebates for dimmable LED lamps because of this problem.</p> <p>A number of stakeholders commented that they are not in support of dimming requirements in the specification until international and regional dimming standards are published.</p>	<p>Draft 3 introduced some basic dimming requirements for dimming range, flicker and noise along with draft test methods. Dimming requirements and test methods are still in development and round robin testing is being conducted in support of the requirements and test method.</p> <p>To inform the final test methods and requirements to support certification of ENERGY STAR dimmable lamps, such as sample size and passing criteria, round robin testing is underway and developments will be shared with stakeholders outside of this specification at the lamps specification development page at www.energystar.gov/lamps. Additional guidance is in development for evaluating flicker on products employing pulse width modulation.</p>
Effective Date	<p>One stakeholder proposed that a Version 1.0 effective date be chosen that will provide manufacturers 24 months to comply with the new requirements consistent with UL safety standards.</p>	<p>When revising ENERGY STAR specifications, EPA generally provides partners with a nine month transition period to update product literature and marketing materials for affected models. EPA also takes into consideration product development cycles and new testing requirements, as applicable to each product category. EPA intends to continue discussions with stakeholders regarding an effective date that allows for a smooth transition between specifications while more immediately rewarding more efficient, higher quality designs.</p>
Efficacy	<p>The efficacy values in Draft 2 remained unchanged from Draft 1 which contained limited increases in efficacy due to the already strict performance requirements contained in the Compact Fluorescent Lamps V4.3 and Integral LED Lamps V1.4 specifications.</p> <p>A few stakeholders suggested that the directional lamp category should have higher efficacy levels based on the growing efficiency of lamps in this category. Other stakeholders commented that the focus on total lumens for directional lamps does not account for the location or area of the lumens, and suggested that candela per watt (Cd/W), perhaps paired with lamp beam angle, is a more meaningful metric for efficacy of directional lamps.</p> <p>Some stakeholders commented that dimmable lamps and lamps with CRI greater than 90 should have relaxed efficacy requirements based on consumer preference of dimmability and color quality.</p>	<p>In response to stakeholder feedback and after further analysis, the Agency more closely aligned wattage bins with the DOE CFR and adjusted the efficacy by wattage for directional and decorative lamps to ensure that a wide range of products are available to consumers at various price points.</p>

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<p>Elevated Temperature Test</p>	<p>In Draft 2 the Agency aligned the test method and allowed both LED lamps and CFLs to be tested on the same switching cycle: three hours ON and 20 minutes OFF. Also in Draft 2, the Elevated Temperature Life test method was revised to align with the elevated temperature from the existing CFL specification and included an Option C hot room with a 55°C ambient temperature.</p> <p>A number of stakeholders commented that the 11% increase in test time due to cycling LED lamps impacts a manufacturer's time to market.</p> <p>Several stakeholders were concerned with the increase from 45°C to 55°C, and recommended 45°C, citing potential occupational hazards associated with test technicians entering a 55°C environment.</p> <p>Another stakeholder asserted that requiring the Elevated Temperature Life test results in double testing (one test at 25°C and one at the elevated temperature), increased testing burden and potential test lab capacity issues for medium based CFLs covered by federal regulations.</p> <p>A few stakeholders commented that LED lamps have been designed for testing at 45°C, and an increase in test temperature will necessitate redesigns to find solutions to meet higher temperature testing, such as new circuit board materials and significantly de-rating of electrical components, which will result in product costs going up significantly.</p> <p>Some stakeholders expressed concern that CFLs with rated power $\geq 10W$ must be tested in an elevated environment. Stakeholders remarked that the elevated temperature test will increase certification costs and the cost of the lamp; and that ENERGY STAR partners are not responsible for misapplication of lamps.</p>	<p>Due to on-going industry efforts to establish new cycling recommendations for solid-state lighting products, EPA reverted to the non-cycling option from the Integrated LED Lamps specification in anticipation of new industry guidance signaled in drafts of upcoming IES laboratory manuals and technical memorandums.</p> <p>Based on stakeholder feedback citing occupational risks associated with working in a high temperature ambient, the elevated temperature for the Option C test environment has been reduced from 55°C to 45°C.</p> <p>In addition, Draft 3 was updated to more clearly align with federal standards for compact fluorescent lamps and clarify where data can be shared and where testing for the ENERGY STAR specification may differ.</p> <p>The Agency has maintained elevated temperature life testing for omnidirectional lamps 10W or greater. This decision was made because, despite requirements that manufacturers indicate on their packaging where lamps should not be used, that effort is not being widely practiced. As a result, consumers will use lamps in areas that could result in high heat, leading to premature failure if the lamps were exempt from the high heat test.</p>
<p>In situ temperature test</p>	<p>In Draft 2, the Agency proposed that the <i>in situ</i> temperature test report required for the early interim qualification requirement be submitted by an OSHA NRTL laboratory.</p> <p>To ease the cost burden and streamline the testing process, stakeholders requested that EPA-recognized laboratories which are not OSHA Nationally Recognized Testing Laboratories (NRTLs), but are accredited to conduct <i>in situ</i> temperature measurement be permitted to submit test reports in support of the <i>in situ</i> temperature measurement requirement.</p>	<p>After considering stakeholder feedback and consulting with the National Institute of Standards' National Voluntary Laboratory Accreditation Program (NVLAP), EPA has made an allowance for both OSHA NRTL laboratories and EPA-recognized laboratories, which are not OSHA NRTLs, but are accredited to conduct <i>in situ</i> temperature measurement to submit test reports in support of the <i>in situ</i> temperature measurement requirement.</p>

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Labeling & Packaging	Packaging	<p>In Draft 2, EPA revised the lamp packaging requirements and deferred to FTC labeling with a few exceptions so as to avoid duplication of FTC Lighting Facts label and ANSI/UL safety requirements. There were a few product packaging requirements that provide important information consumers need to select a lamp that meets their needs which remained.</p> <p>Icons for non-standard LED lamps were proposed in Draft 2 in order to provide consumers with an illustration of the light distribution expected from non-standard lamps.</p> <p>A few stakeholders requested that lamp packaging include the model number or the retail number, but not both, citing current industry practice. Some stakeholders supported the inclusion of the non-standard lamp icon proposed in Draft 2 and suggested the same logo should be used for both ANSI and non-standard shaped lamps, so as not to imply non-standard lamps meet an ANSI lamp standard light distribution.</p>	<p>Due to stakeholder concerns and confusion surrounding the non-standard SSL category introduced in Draft 2, and after the results of an analysis of the current use of the non-standard SSL certification pathway revealed it is not being used as intended, the Agency excluded these products from the scope in Draft 3. As a result, the non-standard light output icons were also removed from the specification.</p> <p>To aid consumers with product compatibility, the Agency decided to add packaging requirements for lamps that are dimmable on a limited set of controls and for low voltage MR lamps consistent with the packaging requirements for low voltage MR lamps in the existing LED lamp specification 1.4.</p>
	Lamp Labeling	<p>The Agency revised the lamp labeling requirements in Draft 2 to avoid duplication of information required by the safety listing and FTC but maintained requirements for essential information useful to the consumer after the packaging has been disposed of.</p> <p>Many stakeholders commented that in some cases the lamp itself has very little room to include additional information beyond what is already required by law and safety certifications.</p> <p>Another stakeholder remarked that in some cases, the lamp will be marked with two different models numbers, one for UL and one ENERGY STAR, and suggested that the model number should not be required on the lamp label and only appear on the packaging as is specified in the current CFL and Integral LED Lamp specifications.</p>	<p>For Draft 3 EPA used the smallest eligible lamp type low voltage MR16 to assess the space available on the lamp for information. And in response to stakeholder's suggestions and concerns about limited lamp surface area for printing, EPA indicated in Draft 3 that watts or CCT included in a model or retail number that use "W" or "K" after the appropriate number can be used to satisfy lamp labeling requirements for wattage and color temperature. In addition, the Agency added the option of beam angle in lieu of light output for PAR and MR lamps since beam angle is generally the information consumers need to select replacements for these products.</p>

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Lamp Toxics Reductions	<p>In Drafts 1 and 2, EPA included limits on mercury content in lamps based on the lamp's wattage and also outlined maximum concentration values of other toxic substances, such as lead, by weight percentage.</p> <p>A few stakeholders commented that testing for toxics is extremely expensive, increases the costs of lamps, and suggested that the toxic requirements be removed from the specification. Some stakeholders remarked that the proposed requirement as written implies that the requirements and exemptions in the EU RoHS directive apply and requested that EPA confirm whether or not the exemptions in the EU RoHS directive are applicable. Another stakeholder expressed concern about the expired or expiring exemptions in the EU RoHS directive, citing the expired exemption for lead in amalgam CFLs will require lead-free amalgams, which will increase the lamp costs for amalgam CFLs significantly or likely cause amalgam lamps to become ineligible for ENERGY STAR certification.</p>	<p>The Agency maintained the limits on mercury and other toxic substances in Draft 3, and continued to reference the EU RoHS directive only for obtaining and maintaining the required technical documentation that demonstrates conformity with the specification requirements. EPA will continue to review relevant sources on toxic substances, gather feasibility data on manufacturers' ability to produce specific lamp types with limited toxic materials to determine if exemptions are necessary, and will refine the toxics reduction requirements as appropriate in the next draft of the Lamps specification.</p>
Lifetime	<p>In Draft 2, the Agency reverted minimum lifetime requirements for LED lamps to the 15,000 and 25,000 hour minimum life requirements in the existing specification for LED lamps. The proposed increase for CFL minimum life requirements, from 8,000 hours to 10,000 hours, remains unchanged from Draft 1.</p> <p>Stakeholders were generally supportive of the revised rated life requirements CFLs and LED lamps. However, one stakeholder commented that requiring long lifetimes for lamps compromises lamp designs and slows the adoption of better-performing lamps as the market becomes saturated with long life lamps. Another stakeholder expressed concern that it will be difficult for covered CFL products to meet the requirement of 10,000 hours.</p>	<p>Draft 3 maintained the minimum lifetime requirements for lamps proposed in Draft 2. The Agency will continue to explore and evaluate if longer lifetimes are necessary for residential lighting, and if longer lifetimes would prevent a more efficient lamp from replacing a currently installed, qualified lamp in the future.</p>
Lumen Maintenance	<p>Stakeholders suggested changes to lumen maintenance "passing test" language, including building in a tolerance for 1 CFL lamp failure, since 1 LED lamp is allowed to fail.</p>	<p>This comment was carefully considered and wording for passing language was revised in Draft 3, removing the requirement that no samples could have less than 70% of lumen maintenance at 40% of rated life, and indicating that no more than three samples achieving less than 75% of lumen maintenance at 40% of rated life are allowed. EPA brought the lumen maintenance check at 1,000 hours from the existing CFL specification and removed the 6,000 hour check, since the 1,000 hour check is required for federal standards and is a good early indicator of performance confirmed by EPA's verification testing of CFLs.</p>

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Luminous Intensity Distribution	<p>To address efforts to match beam quality and performance of ENERGY STAR lamps with the incandescent lamps being replaced, in Draft 2 EPA introduced luminous intensity distribution requirements for PAR and MR lamps, specifying candela values at various points within the beam.</p> <p>Several stakeholders expressed concerned that the luminous intensity distribution requirements introduced in Draft 2 for PAR and MR lamps do not adequately address the quality and smoothness of the beam when shown against a surface, and only add complexity and cost to the testing process.</p> <p>Stakeholders also commented that Draft 2 was written in a way to force incandescent performance on non-incandescent products, whose physical performance cannot fully replicate incandescent performance, specifically CFL reflector and PAR lamps, which have larger beam angles than their incandescent counterparts.</p>	<p>Upon further analysis and in response to stakeholder concerns that the requirements may not achieve the goal of providing consumers with a consistent and quality beam performance, and may unnecessarily penalize products that meet consumer needs but are not identical to traditional lighting, EPA removed the luminous intensity distribution requirement in Draft 3, and will consider luminous intensity distribution requirements for future revisions.</p>
Operating Frequency	<p>In Draft 2, the proposed operating frequency requirements for CFL lamps aligned with the existing requirements in the Compact Fluorescent Lamp specification. The Agency opted to leave the operating frequency requirements for LED lamps to be determined.</p> <p>Some stakeholders supported keeping the existing limit of ≥ 40 kHz for CFLs declaring that all screw-based CFLs have been designed to meet the requirement. One stakeholder commented that manufacturers should be allowed to set the operating frequency for their products, and strongly recommended that the Agency remove operating frequency parameters for electronics from the specification since it is not directly related to energy efficiency.</p> <p>Other stakeholders suggested the removal of the operating frequency requirement from the specification.</p>	<p>Light source flicker and associated discomfort is a consumer dissatisfier that can hinder adoption of energy efficient lighting technologies, therefore EPA has carried over the operating frequency requirement from existing ENERGY STAR CFL and LED lamp specifications in Draft 3, including (≥ 120 Hz) and supplemental testing guidance from ENERGY STAR Integral LED Lamps V1.4. EPA acknowledges that there is not an established method of measurement at this time, so manufacturers will simply be required to report the operating frequency value to their Certification Body as they have been. EPA will continue to work with the IEEE PAT 1789 working group, IES, and the Alliance for Solid-state Illumination Systems and Technologies (ASSIST) to identify appropriate methods of measurement to ensure that qualified lamps do not produce perceptible flicker, stroboscopic effects, or adverse health effects.</p>

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Power Factor	<p>To ensure a balance between cost and performance and to harmonize with the Luminaires specification, in Draft 2 EPA adjusted the minimum power factor to 0.5 for residential CFLs, and to 0.7 for residential LED Lamps, and 0.9 for all commercial products where high power factor is in higher demand.</p> <p>One stakeholder requested that the ≥ 0.9 requirement for commercial grade lamps be removed, while another stakeholder supported the ≥ 0.9 power factor requirement and recommended raising the requirement to ≥ 0.75 for all other lamps regardless of technology as a way to drive improvements in energy efficiency. Another stakeholder commented that the power factor requirement should be set at 0.7 for both CFLs and LED lamps to accomplish technology neutrality in the specification.</p> <p>Other stakeholders commented that low voltage MR-16 lamps should be exempted from the requirement while suggesting the power factor requirement for low voltage MR-16 lamps has little benefit in the market since the transformer has the greatest impact on the electrical grid.</p>	<p>EPA's intent in addressing power factor in this specification is to ensure that ENERGY STAR qualified lamps help to support utility partner efforts to improve power factor. In Draft 3 EPA removed the higher power factor value of 0.9 due to the elimination of the commercial tier option from the specification.</p>
Rapid Cycle Stress Test	<p>In Draft 2, EPA proposed to cap rapid cycle stress testing at a maximum of 15,000 cycles. This cap reduces test time for lamps with rated life >15,000 hours, including commercial grade lamps which are typically switched less frequently, while maintaining increased stringency for residential applications where consumer satisfaction is a key concern.</p> <p>A few stakeholders commented that although the number of cycles has been capped at 15,000, the requirement of one cycle per hour of rated life, i.e. more than 4000 - 6000 cycles, will eliminate CFLs, especially instant start types, from the ENERGY STAR program.</p>	<p>In Draft 3 EPA has maintained the proposed cycling with a cap for the maximum cycling to 15,000 cycles so as to thoroughly stress lamps but not unnecessarily prolong testing. Also, in response to comments describing the technological trade-off of limited cycling capability for instant start lamps, and the high desirability of this feature for consumers the Agency allowed these lamps to be cycled once per two hours of rated life.</p>

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Run Up Time	<p>In Draft 1, the proposed run-up time requirements included multi-tiered run-up times and a tightened run-up time for covered CFL lamps. The Agency elected to maintain the levels in Draft 2 in the interest of addressing common consumer complaints that compact fluorescent lamps are not bright enough, and that they take too long to reach full light output.</p> <p>Some stakeholders commented that the run-up time requirement is too stringent for some CFLs, remarking the requirement is more stringent than the current and future European run-up time requirements. Stakeholders also expressed concern with the financial costs associated with increases to the proposed requirements. Some stakeholders suggested the requirement should be revised to indicate 80% stabilized light level since the human eye is designed to detect visible light over 12 orders of magnitude.</p> <p>While citing run-up time as a big consumer perception issue with CFLs which creates difficulty in engaging consumers with efficient lighting products, a few stakeholders supported or recommended tightening the proposed run-up time levels.</p>		<p>An analysis of currently qualified CFLs found that 91% of non-covered lamps can achieve 80% stabilized light output in ≤60 seconds and 80% of covered lamps can achieve 80% stabilized light output in ≤120 seconds. Based on the analysis and the concerns noted, in Draft 3, EPA has returned to the 80% stabilized light output requirement in CFL V4.3 for both covered and non-covered CFLs. In addition, for covered CFLs, EPA has increased the time allowed to reach 80% stabilized light output from ≤90 seconds in Draft 2 to ≤120 seconds. EPA has also removed the intermediate measurement points due to lack of data on product capability. EPA believes these levels will lead to continued improvement in lamp run-up time, while not placing an undue cost and technical burden upon manufacturers.</p>
Scope	Low-Voltage MR16 Lamps	<p>Recognizing the energy savings potential for MR16 lamps used in commercial applications, lack of energy efficient alternatives, and acknowledging a higher confidence in proper installation and energy savings in commercial applications, EPA included this product type within the scope of the specification for Draft 2 for commercial use. The commercial grade requirements for these lamps included higher power factor, longer rated life of 35,000 hours, and longer warranty requirements.</p> <p>Several stakeholders commented that categorizing the low-voltage MR-16 lamp as a commercial product, and requiring it to satisfy requirements for a minimum 35,000 hour rated life claim, is unwarranted. They argued that significant energy savings can be achieved when replacing the existing Halogen lamps with low-voltage MR16 lamps rated 25,000 hours.</p>	<p>The commercial performance tier was eliminated in Draft 3 in response to concerns that its implementation would create potential complications in the marketplace with existing “commercial” lighting products, as well as potentially confuse consumers. As a result, low-voltage MR16 lamps are no longer required to be rated 35,000.</p>

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	<p>Non-Standard Lamps</p>	<p>In Draft 2, the Agency more clearly defined non-standard lamps, and proposed additional requirements for non-standard lamps to help consumers understand these products, including revising the non-standard SSL light output icons.</p> <p>Stakeholders submitted comments both in support of and against the inclusion of non-standard lamp provisions, but most stakeholders from both the manufacturing and efficiency communities were not in support of EPA including non-standard lamps. One stakeholder rejected the use of the light output icons, remarking that they are confusing and erroneously indicate that the lamp produces darkness.</p> <p>Some stakeholders, commented that the specification should serve as a tool to move the market toward the adoption of ANSI standard designs and expressing a desire to eliminate loopholes for less rigorous product testing, recommended that the non-standard SSL lamp category be removed from the specification.</p>	<p>Due to stakeholder concerns and confusion surrounding the non-standard SSL lamp category introduced in Draft 2, the Agency has excluded non-standard SSL products from the specification scope in Draft 3.</p>
	<p>Semidirectional Lamps</p>	<p>In an effort to provide a clear certification path for multiple lamp types, semidirectional lamps were added to the specification scope in Draft 2. The semidirectional category was intended to include non-standard lamps which are neither omnidirectional nor directional per the requirements in the specification.</p> <p>Several stakeholders had questions regarding the semidirectional lamp category, requested the inclusion of a definition in the specification and expressed concern that the lamp category may create a loophole for marginally performing lamps to become ENERGY STAR certified.</p>	<p>Due to stakeholder concerns and confusion surrounding the non-standard SSL and semi-directional category introduced in Draft 2, the Agency has excluded these products from the specification scope in Draft 3.</p>
<p>Technology Neutrality</p>	<p>Some stakeholders commented that Draft 2 did not achieve technology neutrality because the specification includes testing and performance requirement differences that purportedly allow unfair advantages to some technologies. Requirements outlined by stakeholders included:</p> <ul style="list-style-type: none"> • Power Factor • Rated Life • Lumen Maintenance • Run-up Time • Color Angular Uniformity 		<p>To the extent the ENERGY STAR label designates highly efficient models within a product category, the Agency's emphasis is on technology neutral efficiency requirements. The Agency strives to set appropriate performance levels in a technologically neutral way to the greatest extent possible to ensure consumers have a consistent experience with an ENERGY STAR certified product. Ensuring that product performance is not traded off against gains in efficiency does require in some cases establishing testing and performance requirements that are tailored for a given technology.</p>

Topic	Comment	EPA Response
Significant Digits and Rounding	<p>In Draft 1 and Draft 2, EPA proposed significant digits and rounding guidance which aligned with general ENERGY STAR program guidance on this topic.</p> <p>Stakeholders recommended aligning the significant digit and rounding guidance in the specification with the method outlined in the Code of Federal Regulations (CFR) so that manufacturers could submit the same test data for both ENERGY STAR and DOE compliance.</p>	<p>In response to stakeholder suggestions and in order to better align with DOE requirements, EPA has updated the significant digits and rounding guidance to align with rounding practices in 10 CFR 430.23 in Draft 3.</p>
Test Method: Start Time	<p>With Draft 2 EPA introduced a draft of the Start Time test method, in Annex D, which was the result of an industry collaboration of experts in the area of CFL lamp technology and measurement.</p> <p>Some stakeholders requested additional clarification of the 98% threshold of the initial plateau and inquired if a tolerance value could be used with the initial plateau value. Stakeholders also suggested that the definition should be simplified to 95% or 90% of initial plateau, that the initial plateau may not be readily identifiable, and that it may not be present for some technologies or lamp circuits.</p>	<p>Annex D of the specification defines start time as the time between application of power to the device and the point where the light output reaches 98% of its initial plateau. The Agency included two examples using oscilloscopic plots to demonstrate the initial plateau of the light output when plotted over time. The 98% initial plateau threshold was selected after analyzing the performance of lamps and noting that the light output waveform's inflection occurred consistently at 98% of the plateau or steady-state. EPA did not receive data to support the requests to include of a tolerance or to simply the initial plateau percentage, and requests supporting data for any alternate proposals.</p>