



Lamps V2.0 Draft 2 Webinar

April 20, 2015
9 am-12 pm EST

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Today's Agenda

- Introduction
- Goals
- Specification Development Process
- Draft 2 Changes
 - Scope
 - Definitions
 - Test Criteria
 - Photometric Performance
- Lumen Maintenance
- Electrical Performance
- Controls Requirements
- Lamp Packaging
- Discussion



Welcome

- Introductions
 - In-person
- Questions/comments welcome
 - For everyone's benefit, please state name before commenting
 - Can ask questions via the webinar chat at any time



Goals of the Specification Revision

- Increase efficacy levels
- Broaden the scope and features
- Provide for use of DOE's pending LED lamp test method
- Improve harmonization between ENERGY STAR lighting specifications
- *Intended to avoid the need for partners to retest*
- *Capture improvement in LED lamps*

Specification Development Process Overview

- Draft 1
 - Draft 1 released February 13, 2015
 - Webinar held March 3, 2015
 - Comment period closed March 13, 2015
- Draft 2
 - Released April 10, 2015
 - In-person meeting and webinar April 20, 2015
 - Comment period closes May 7, 2015
 - Visit us at LightFair booth #3177
- Final Specification
 - Estimated completion June 2015
- Effective date
 - Estimated June 2016



Section 1.2: Excluded Products

- Clarified that solid state lamps intended to replace pin-based CFLs are not eligible



Section 2: Effective Date

- Anticipate finalizing in June 2015
- Lamps V2.0 effective 12 months later
- Allows partners time to redesign and retest if they choose that path





Section 3.1: Considerations for Future Revisions

- CRI as an allowable product variation
 - EPA continues to seek data to enable it to permit sharing lumen maintenance data
- Updates to Color requirements: adding lower CCT values (2200K and 2500K)
 - EPA will consider point revision (e.g. V2.1) once ANSI standards are updated
 - Demand for residential market?
 - Consistent color terminology for packaging will need to be developed

Section 4: Definitions

- Definitions have been updated for:
 - Connected lamps
 - An ENERGY STAR eligible connected lamp includes elements (hardware and software, or firmware) **or instructions** required to enable communication in response to consumer-authorized energy or performance related commands **and complies with all requirements for connected lamps in the specification.** These elements may reside inside or outside of the base lamp.





Section 4: Definitions

- Definitions have been updated for:

- Color tunable lamps:



- For the purpose of this specification, a color tunable lamp has functionality that allows the end user to alter the color appearance of the light generated by the lamp. This tuning must include white light that is capable of meeting the specification's **color** requirements, and can alter the color appearance along the black body curve, or may also extend to colors beyond the ANSI defined correlated color temperature ranges (**e.g. 2700K and 6500K**) **outside of the seven step MacAdam ellipse or the ANSI quadrangle.**



Section 4: Definitions

- Definitions have been added for:
 - Color shifting dimmable lamp:
 - A lamp that is designed to simulate the behavior of incandescent lamps where the chromaticity gradually shifts to a lower value as the lamp is dimmed. This lamp is not considered color tunable for the purposes of this specification, unless the lamp can also be tuned to different colors at full output.



Section 4: Definitions

- Definitions have been added for:
 - Standby mode:

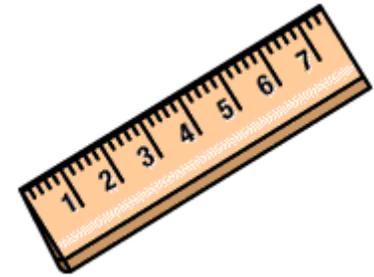


- The condition in which energy-using product is connected to a main power source; and offers one or more of the following user-oriented or protective functions; to facilitate the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer; or continuous functions, including information or status displays (including clocks) or sensor-based functions. (US DOE)



Section 4: Definitions

- Definitions have been added for:
 - Reported value:
 - The value reported for purposes of compliance with DOE and/or ENERGY STAR requirements according to the criteria in each applicable section.
 - Measured value:
 - The directly measured value from testing equipment for a given unit under test.





Section 5.1 Testing Color Tunable Lamps

- Testing:



- When testing a color tunable lamp, all tests and evaluations shall be performed at the least efficient white light setting included in this specification (Section 9.6).
- **Watts, lumens, chromaticity, and CRI** shall be tested and reported for **Default and Most Consumptive Settings** (if different from least efficient white light setting).
- In order to facilitate compliance testing, the partner shall provide detailed instructions for the control settings or control signals (as applicable) for reaching the least efficient, default, and most consumptive modes as applicable.



Section 7.1: Product Variations

- Clarified in a footnote:
 - All variations in Table 2 shall satisfy the requirements in 7.1.1-7.1.5 in addition to the additional test data required in Table 2.

The following shall be satisfied for product variations listed below:

- 7.1.1. The tested representative model and the variant(s) shall have the same rated input voltage(s).
- 7.1.2. Across a sample of up to five units of a variant, the average of *in situ* temperatures of critical components shall be no greater than 2.5°C above the same average of *in situ* temperatures in a sample of up to five units of the tested representative model. Critical components include (as applicable) the highest temperature LED package/array/module measured at TMP_{LED} , LED driver measured at TMP_C , ballast case temperature at T_C , capacitors and fuses.
- 7.1.3. For solid-state lamps, variation is not allowed where, the *in situ* temperatures measured at each unit's highest temperature or the average of up to 5 unit samples TMP_{LED} is greater than the maximum case temperature tested in the corresponding IES LM-80 report.
- 7.1.4. OSHA NRTL safety listing or certification report shall be available that includes descriptions of both the tested representative model and variant(s) demonstrating their identical construction except for the allowable variations detailed in [Table 2](#), as applicable.
- 7.1.5. Test report(s) shall be available from EPA-recognized laboratory(ies) for the tested representative model and the variant(s) demonstrating that variant performance for the following parameters varies by no more than the percent indicated while meeting this specification's requirements:
 - i. Input current and input wattage - $\pm 10\%$
 - ii. Power factor - $\pm 5\%$
 - iii. Maximum overall length, except as affected only by variations in lamp base or envelope shape - $\pm 5\%$
 - iv. Maximum overall diameter - $\pm 5\%$





Section 8: Methods of Measurement and Reference Documents

- Added new methods:
 - NEMA SSL 7A-2013
 - Anticipated update 2015
 - IEC 62301 ED.2.0 B:2011
 - Household electrical appliances - Measurement of standby power

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Photometric Performance Requirements



Section 9.1: Luminous Efficacy

	Minimum Lamp Efficacy (initial lm/W)
Omnidirectional	65
Directional	65
Decorative > 7	65
Decorative ≤ 7	55

- Omnidirectional
 - 70 LPW in Draft 1
 - 65 LPW in Draft 2.
- Decorative
 - 65 LPW in Draft 1
 - to split at 7W

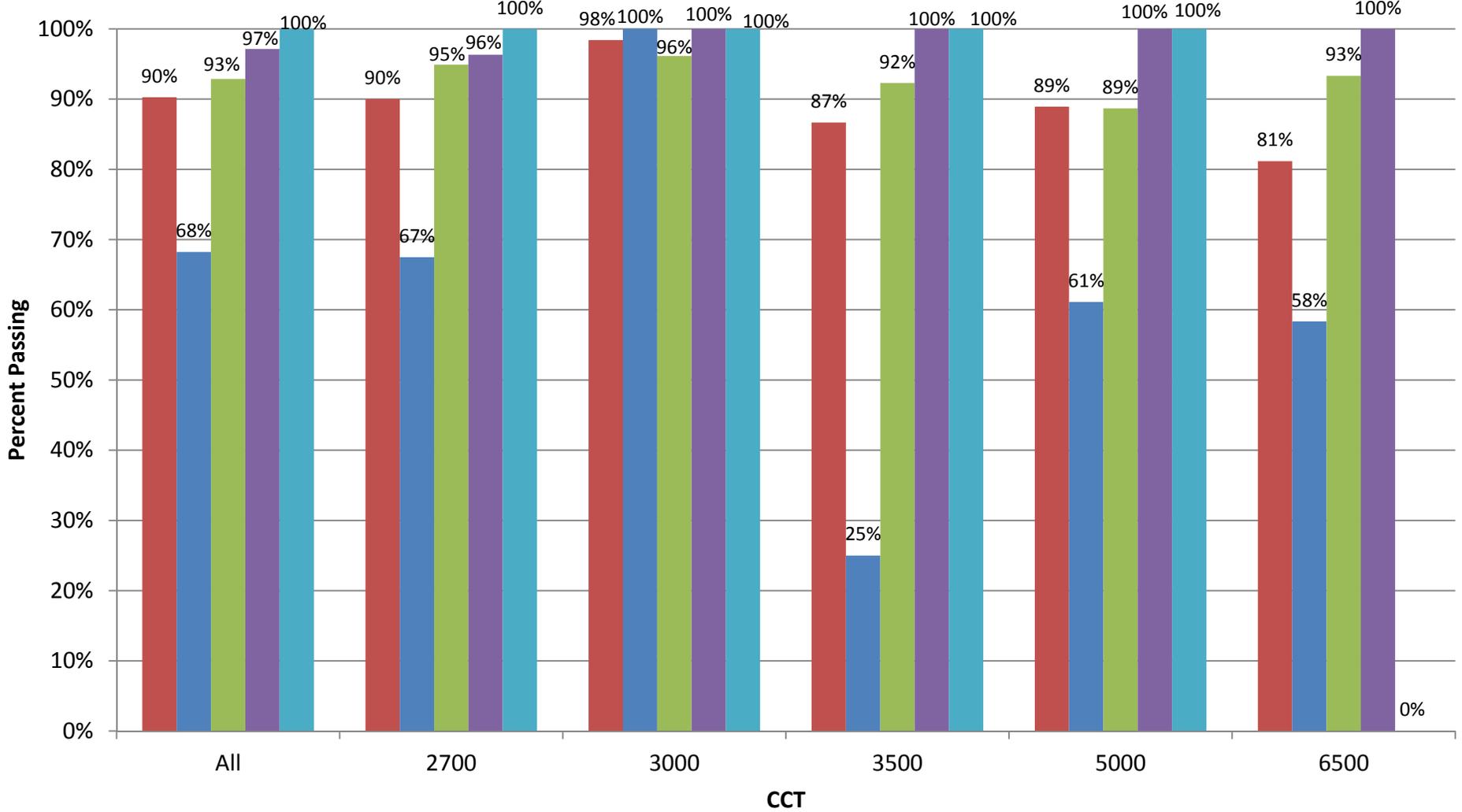
NOTE: Reporting values (no tolerance for LED lamps) remains aligned with DOE SNOPR to minimize possibility that products will no longer qualify once DOE finalizes test method



Section 9.1: Luminous Efficacy

- Analysis of currently certified products shows the following passing rates:
 - Omnidirectional
 - 78% -rated data
 - 90% -measured data
 - Directional
 - 57% -rated data
 - 80% -measured data
 - Decorative
 - 74% -rated data
 - 82% -measured data

Omnidirectional Measured Efficacy Passing Rates by Lumen Bin and CCT



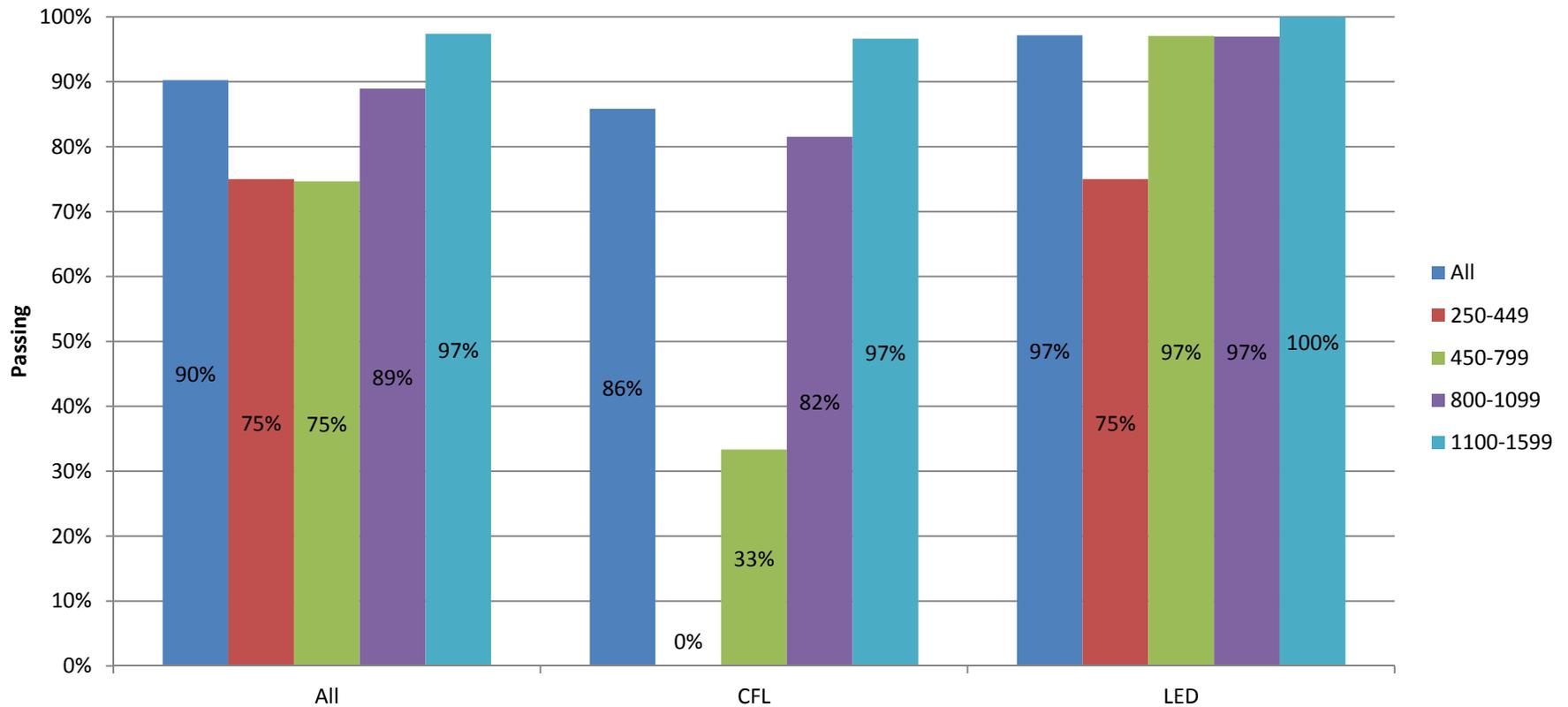
■ All ■ 450-799 ■ 800-1099 ■ 1100-1599 ■ 1600-1999

CCT	All	2700	3000	3500	4000	4500	5000	6500
All Lamps	1801	1028	249	65	77	0	225	56
450-799	159	83	35	1	9	0	22	7
800-1099	378	224	25	24	13	0	47	14
1100-1599	205	131	5	13	0	0	25	15
1600-1999	112	73	7	7	1	0	13	0





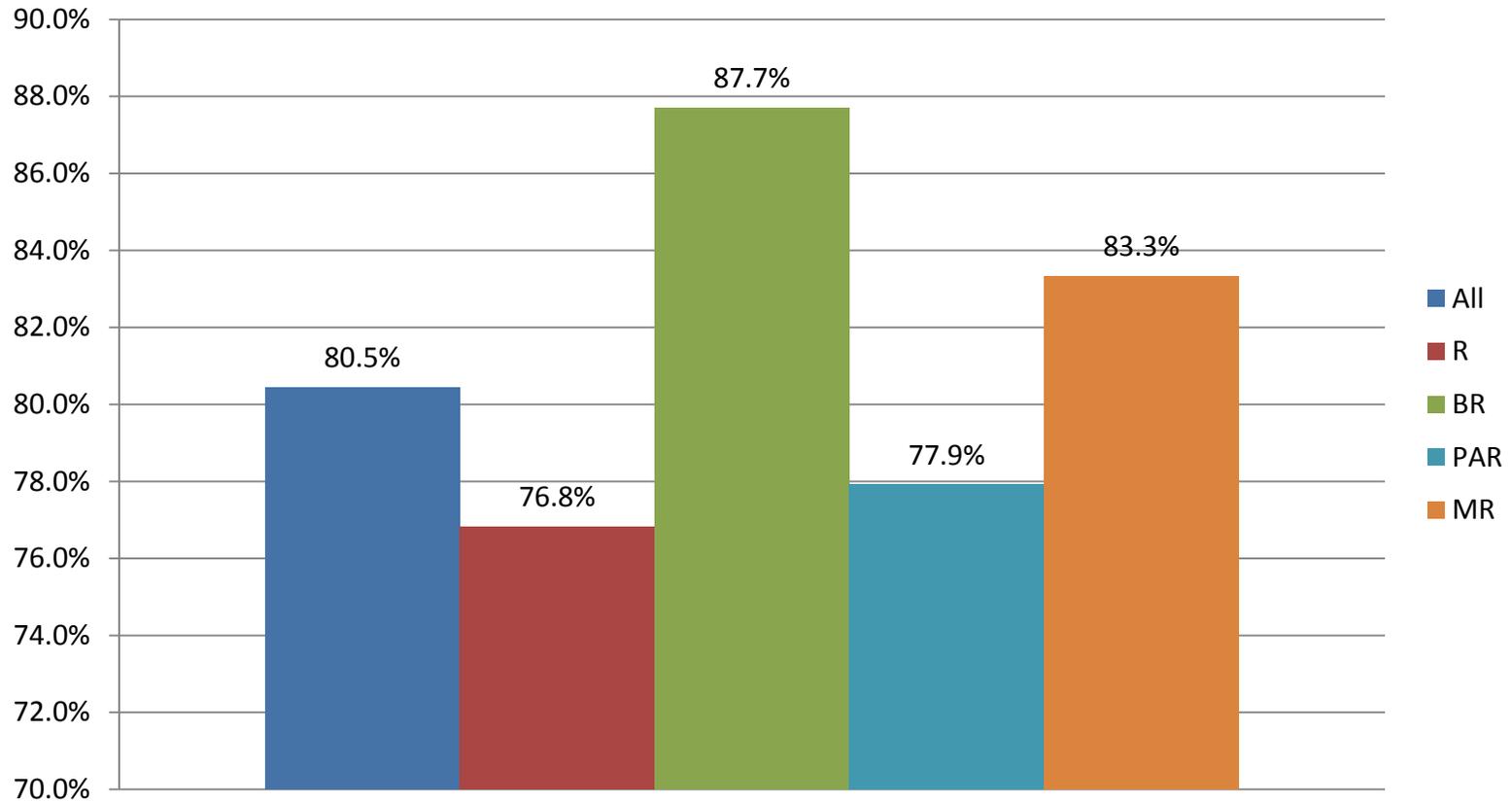
Omnidirectional Measured Efficacy Passing Rates by Technology and Lumen Bin



Lumen Bin	All	CFL	LED
Total Lamps	1797	1044	753
250-449	9	0	9
450-799	274	43	231
800-1099	732	349	383
1100-1599	262	202	60



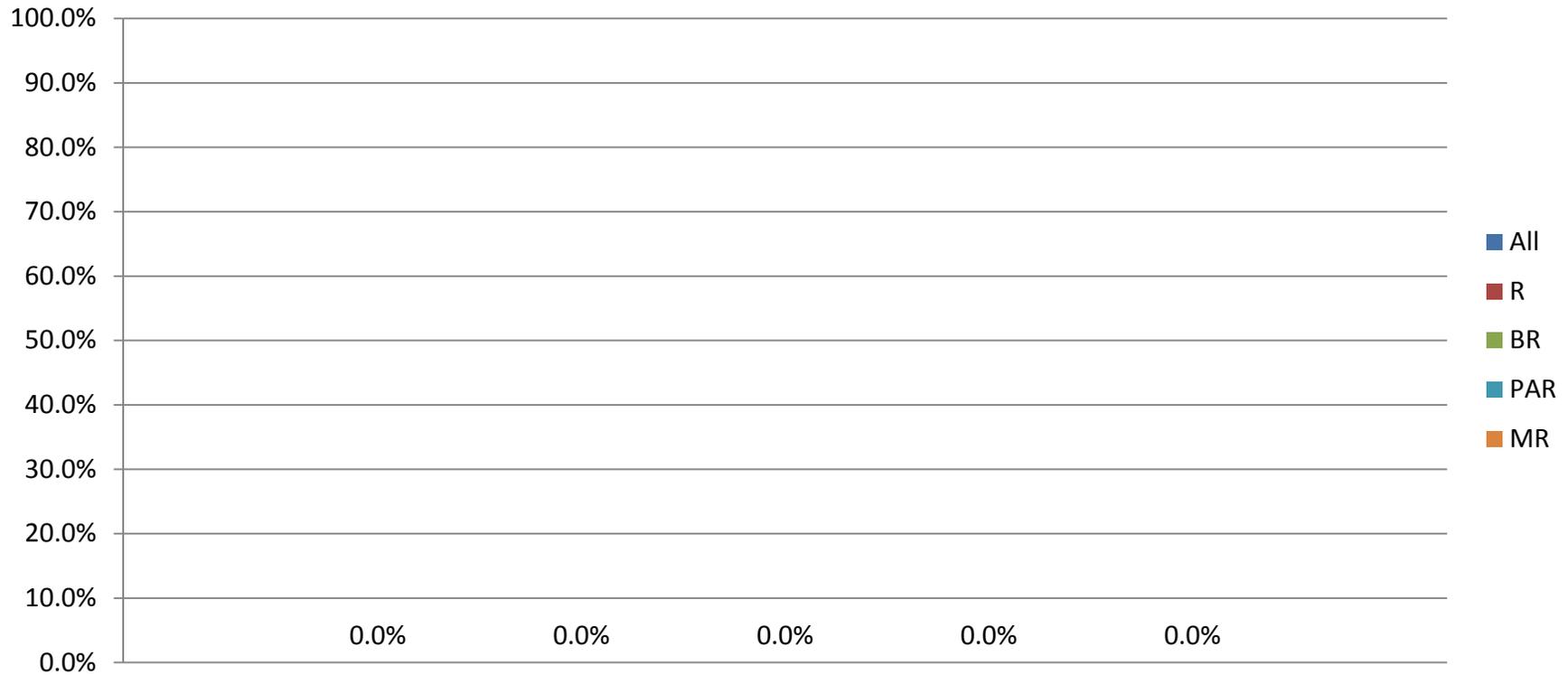
Passing Rates for Directional Lamps by Base Type



Base Type	≥65 LPW	Total Certified Products
All	2198	2732
R	136	177
BR	514	586
ER	0	0
PAR	1338	1717
MR	210	252



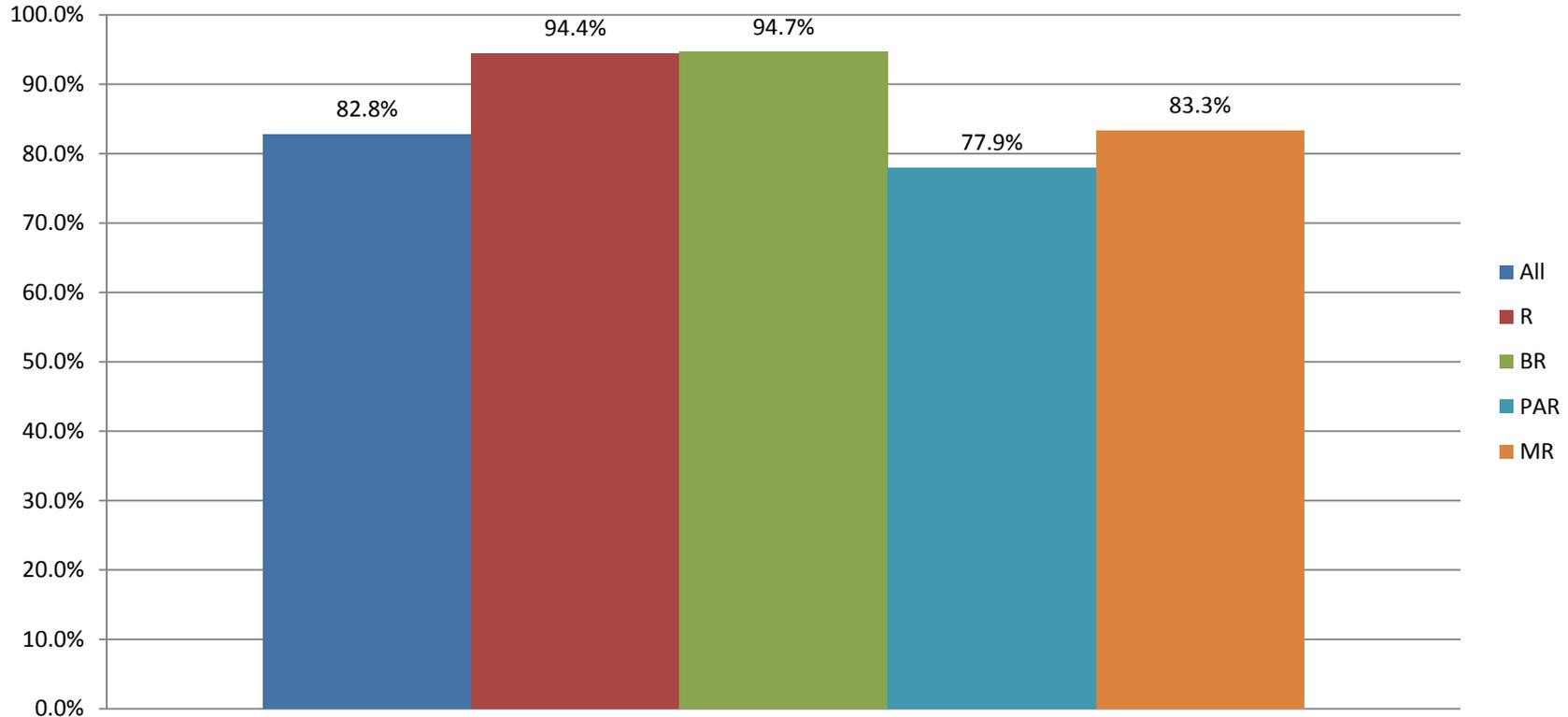
Passing Rates for Directional CFLs by Base Type



Number of Directional CFLs by Base Type		
Base Type	≥65lm/w	Total Certified Products
All	0	76
R	0	33
BR	0	43
ER	0	0
PAR	0	0
MR	0	0



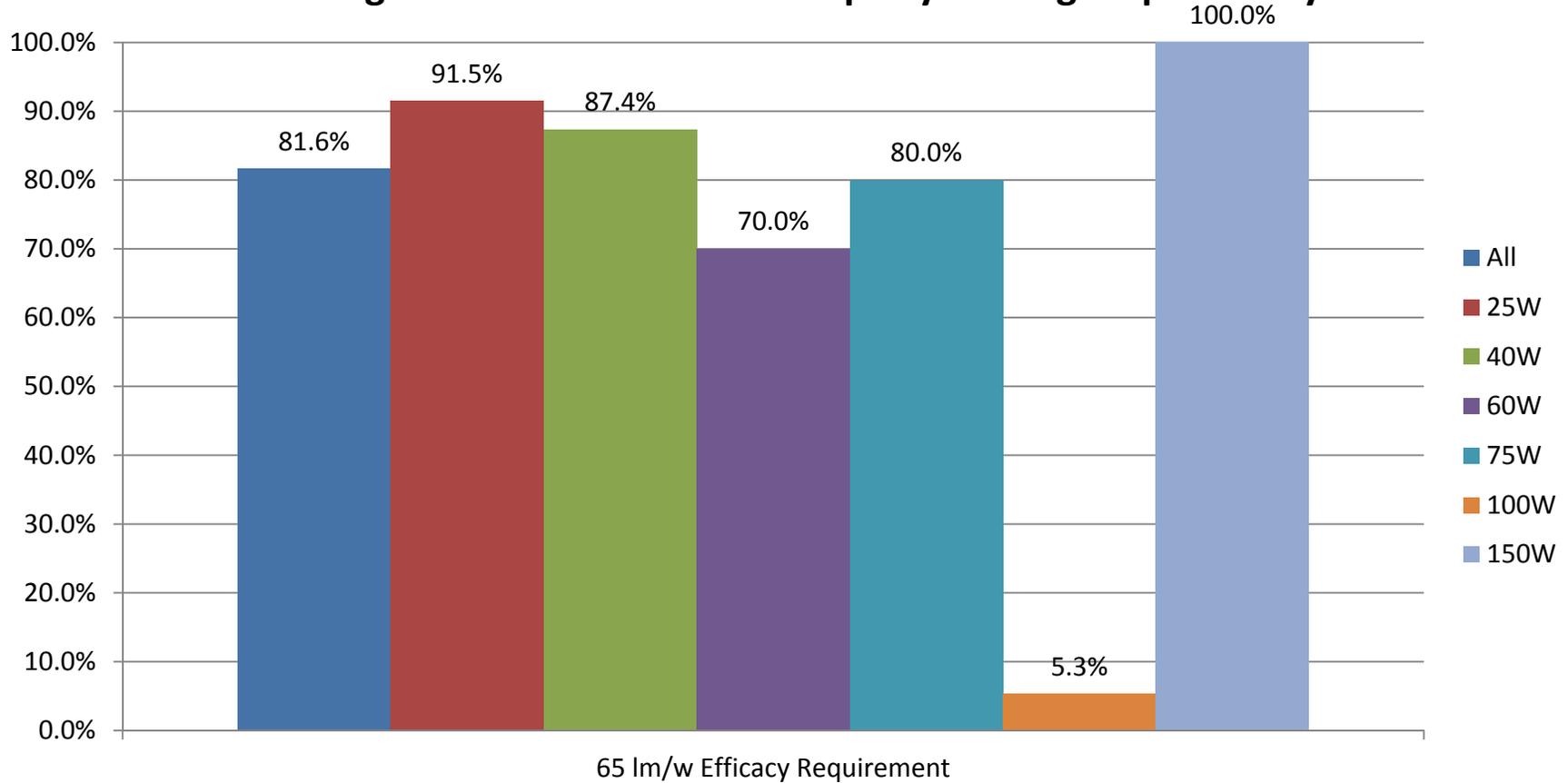
Passing Rates for Directional LEDs by Base Type



Number of Directional LEDs by Base Type		
Base Type	≥65lm/w	Total Certified Products
All	2198	2656
R	136	144
BR	514	543
ER	0	0
PAR	1338	1717
MR	210	252



Passing Rates for Decorative Lamps by Wattage Equivalency

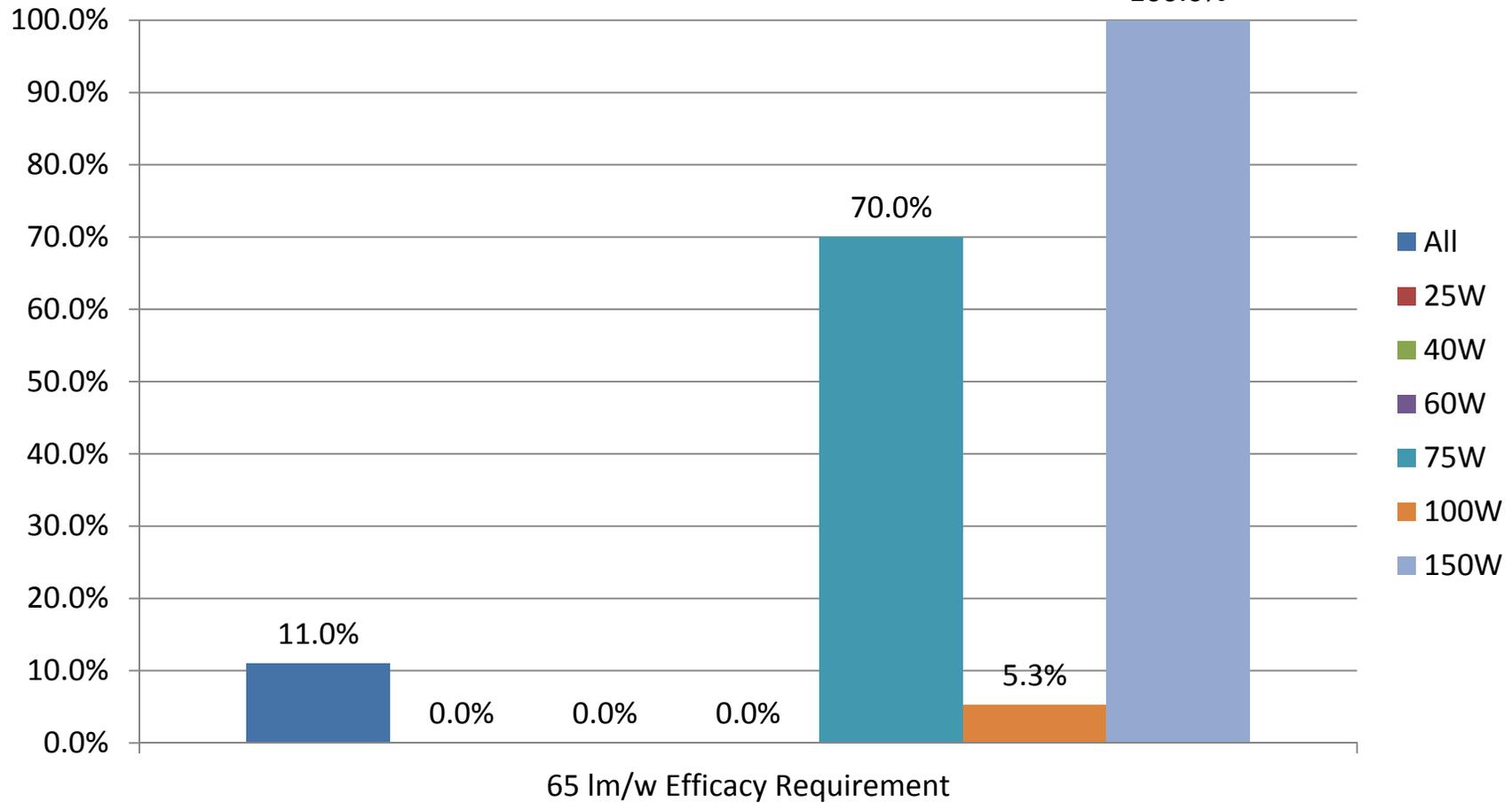


65 lm/w Efficacy Requirement

Incandescent Equivalent	All	10W	15W	25W	40W	60W	75W	100W	150W
Number Meeting Efficacy Requirement	378	0	0	86	221	56	12	1	2



Passing Rates for Decorative CFLs by Wattage Equivalency

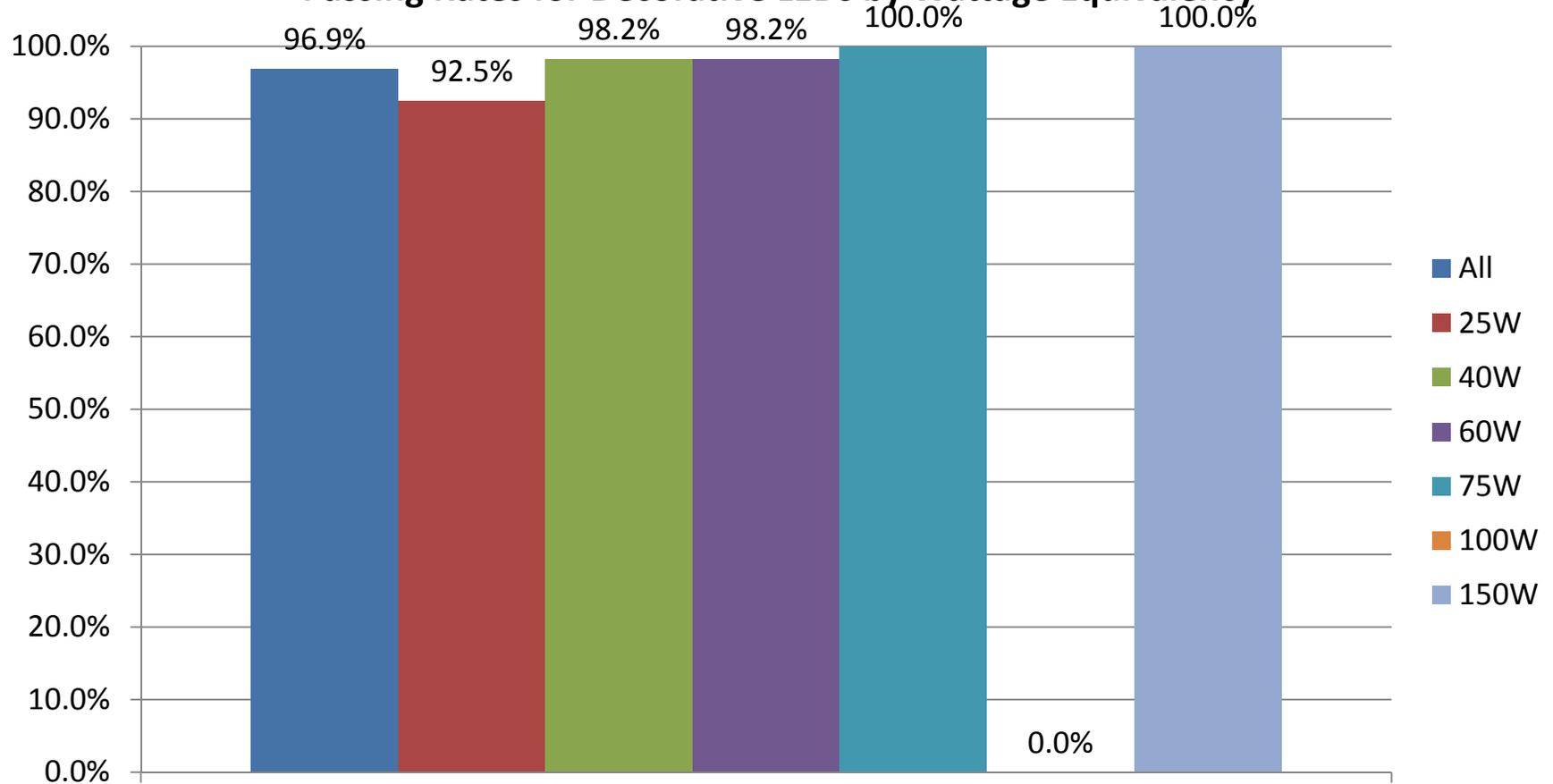


Incandescent	All	10W	15W	25W	40W	60W	75W	100W	150W
Number Meeting Efficacy Requirement	9	0	0	0	0	0	7	1	1
Total Certified Products	82	0	0	1	28	23	10	19	1





Passing Rates for Decorative LEDs by Wattage Equivalency



65 lm/w Efficacy Requirement

Incandescent	All	10W	15W	25W	40W	60W	75W	100W	150W
Number Meeting Efficacy Requirement	369	0	0	86	221	56	5	0	1
Total Certified Products	381	0	0	93	225	57	5	0	1



Section 9.2: Light Output

- Omnidirectional
 - Reinstated from CFL V4.3 3-way equivalency claims
 - EPA recognizes consumers rely on wattage equivalency claims for selecting 3-way lamps.

Rated Wattage of the Referenced Incandescent Lamp (watts)	Light Output (Lumens)
25	250-449
40	450-799
60	800-1,099
75	1,100-1,599
100	1,600-1,999
125	2,000-2,549
150	2,550-3,000
200	3,001- 3,999
300	4,000-6,000
30-70-100	1,200-1,999
50-100-150	2,150-3,000

3-way lamps shall be evaluated for equivalency claims based on tested results at the highest input setting.

NOTE: Reporting values (no tolerance for LED lamps) remains aligned with DOE SNOPR to minimize possibility that products will no longer qualify once DOE finalizes test method



Section 9.2: Light Output

- Decorative
 - Removed Covered A-line CFLs.
 - Must be certified as Omnidirectional.
 - Removed requirement that all E12 lamps be certified under the decorative category.
 - Help eliminate confusion for product variations in base type and how A and G shape with E12 bases should be evaluated.

Rated Wattage of the Referenced Incandescent Lamp (watts)	Light Output (Lumens)	
	Decorative	Globe (G) Shape
10	70-89	--
15	90-149	--
25	150-299	250-349
40	300-499	350-499
60	500-699	500-574
75	--	575-649
100	--	650-1,099
125	--	--
150	--	1,100-1,300

Section 9.3: Elevated Temperature Light Output Ratio: All Directional Lamps

- Clarified that exemption was for:
 - “omnidirectional, decorative, and lamps labeled “not for use in totally enclosed” and/or “not for use in recessed fixtures” or equivalent
- Clarified:
 - To utilize LM-82-12, the partner must designate a temperature measurement point (T_b) for attaching the thermocouple.



Section 9.7: Color Rendering: All Lamps

- Proposed to eliminate requirement of $R_9 > 0$ for CFLs.
 - Partners will still have to report value.
- $R_9 > 0$ still required for solid state products.

Fair 50–60 CRI Standard Warm White Fluorescent Standard Cool White Fluorescent	
60–70 CRI Premium High Pressure Sodium Conventional Metal Halide	
Better 70–80 CRI Thin Coat Tri-Phosphor Fluorescent	
Best 80–90 White High Pressure Sodium Warm Metal Halide Thick Coat Tri-Phosphor Fluorescent	
90–100 High CRI Fluorescents Incandescent and Tungsten-Halogen	



Section 9.8: Color Maintenance

- Rephrased requirement to:
 - “Lamp change in chromaticity coordinates from 0-hour measurement, at **each** measurement point during lamp operation, shall be within a total linear distance of 0.007 on the CIE 1976 $u'v'$ diagram.”
 - EPA intends for color maintenance to be assessed at 3,000 hours, 6,000 hours and beyond as applicable.
 - Color maintenance requirement is based on any change in color coordinates from the initial measurement in linear distance.

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Lumen Maintenance Requirements



Section 10.1: Lumen Maintenance

- Reformatted supplemental testing guidance.
- Brought back the 3% tolerance for solid state products
- Note DOE test method may not allow for tolerances.

Lamp Type/ Wattage	Methods of Measurement and/or Reference Documents	Operating Temperature
Lamps labeled "not for use in totally enclosed" and/or "not for use in recessed fixtures" on lamp and lamp packaging	IES LM-65-14; IES LM-66-14 for photometric measurements; 10 CFR Appendix W to Subpart B	Ambient temperature conditions (25°C)
Directional lamps ≤20 watts	ENERGY STAR Elevated Temperature Life Test	Option A or Option B or C at 45°C ±5°C
Directional lamps >20 watts	ENERGY STAR Elevated Temperature Life Test	Option A or Option B or C at 55°C ±5°C
All other omnidirectional and decorative lamps	ENERGY STAR Elevated Temperature Life Test	Option A or Option B or C at 45°C ±5°C
Lamps Covered by DOE	IES LM-65-14; IES LM-66-14 for photometric measurements; 10 CFR Appendix W to Subpart B	Ambient temperature conditions (25°C)



Section 10.1: Lumen Maintenance

- Clarified:
 - Ambient temperature testing restricted use language applies to either “not for use in totally enclosed fixtures” or “not for use in recessed fixtures”.
- EPA requests stakeholder feedback on:
 - Supplemental testing guidance that for color tunable lamps, the TM-21-11 projection for all LED color used shall meet the requirement.
 - Information about the availability and applicability of LM-80 data for non-white LEDs.



Section 10.2: Rated Life

- EPA maintains proposal for passing rates to align with DOE's latest proposal.
 - minimize possibility that products will no longer qualify once DOE finalizes test method.

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Electrical Requirements



Section 11.4: Start Time

- Proposed start time of 750 ms or less for non-connected lamp.
 - 99% of currently certified lamps that meet the proposed efficacy requirements have a start time of 750 ms or less.
- Proposed start time of 1 second for connected lamp.
 - Have longer start times as the more complex electronics will search for smart controls on start up of the ballast or driver.

Lamp Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Documents	Supplemental Testing Guidance
Non-Connected Lamps	Reported value of time for lamp to remain continuously illuminated shall be within 750 milliseconds of application of electrical power.	Measurement: ENERGY STAR Start Time Test	Sample Size: 3 units per model. The reported value shall be the average of measured unit values tested, rounded to the nearest millisecond.
Connected Lamps	Reported value of time for lamp to remain continuously illuminated shall be within 1 second of application of electrical power.	Measurement: ENERGY STAR Start Time Test	Sample Size: 3 units per model. The reported value shall be the average of measured unit values tested, rounded to the nearest millisecond.



Section 11.5: Run-Up Time

- Proposed run-up time of ≤ 45 seconds to achieve 80% stabilized light output.
 - 88% of CFLs that meet the proposed efficacy requirement run-up in ≤ 45 seconds.

Lamp Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Documents	Supplemental Testing Guidance
Compact Fluorescent	Reported value of time for lamp to achieve 80% stabilized light output shall be ≤ 45 seconds.	Measurement: ENERGY STAR Run-Up Time Test Reference Documents: IES LM-54-12	Sample Size: 10 units per model: 5 units tested base-up and 5 units tested base-down unless the manufacturer restricts specific use or position. If position is restricted, all units shall be tested in restricted position. Measurements shall be taken at the end of 100 hours of seasoning. The reported value shall be the average measured values of units tested, rounded to the nearest second.

Section 11.7: Standby Power

- Lamps **without integral controls** shall not draw power in the off state.
- Lamps with **integral controls, standby mode, or connected functionality** shall consume no more than 0.5W in standby mode.
- Standby power consumption requirements apply to lamps that have **wireless controllability** but may not meet all the connected criteria in this specification.



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Controls Requirements



Section 12: Controls Requirements

- 12.7 Connected Product Criteria
 - Updated definition
- 12.10 Operational Status Reporting
 - Only required to report on/off functionality.
 - Removed reporting requirements on color and luminous intensity.



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Labeling and Packaging Requirements



Section 15.1: Lamp Labeling

- Added clarification language regarding safety certifiers:
 - Application exception language such as “not for use in totally enclosed fixtures” or “not for use in recessed fixtures” or the equivalent for lamps leveraging application exemption of elevated temperature testing **as required by safety certifiers.**



Section 15.2: Lamp Packaging

- Based on stakeholder comments and discussion on April 7th call EPA has removed the proposal to use standardized descriptor terms.
- Recommended color nomenclature to be used on product packaging:
 - 2700K – Soft White
 - 3000K – Warm White
 - 3500K – Neutral White
 - 4000/4100K – Cool White
 - 5000K – Daylight
 - 6500K – Daylight





Section 15.2: Lamp Packaging

- EPA received a comment about making application exception language clearer on product packaging.
- Concerns from utilities about misapplication and early failure.
- Concerns from manufacturers about increasing packaging requirements and limited space.
- Suggestions? Solutions?



Section 15.2: Lamp Packaging

- Maximum Operating Temperature
 - EPA proposed that partners must include the maximum operating temperature on product packaging or online marketing materials.



Next Steps: Specification Development Process Overview





Discussion Time

- Questions?
- Send comments and questions after the meeting to:

lighting@energystar.gov by May 7, 2015

Please put “ENERGY STAR Lamps V2.0
Draft 2 Comments” in the subject line

