



ENERGY STAR® 101

Solid-State Lighting Luminaire Program

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ENERGY STAR Lighting Programs



Agenda

1. ENERGY STAR Lighting: Overview
2. Solid-State Lighting Luminaire Qualification
3. Integral LED Lamp Qualification
4. Third-Party Certification Requirements
5. Verification Testing Requirements: Overview
6. Q&A



ENERGY STAR Lighting Overview

- EPA Lighting Integration Plan
- Current ENERGY STAR lighting categories:
 - Residential light fixtures (RLF)
 - Compact fluorescent lamps (CFL)
 - Solid-state lighting (SSL)





- Integral LED lamps (LED lamps)





ENERGY STAR Logos

- What types of logos are there?
 - Partnership mark → 
 - Certification mark → 
 - Promotional mark → 
- Visit energystar.gov/logos for logo use guidelines.

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Step 1: Determine If Your Product Is Eligible



Eligible SSL Luminaires:

Bollards



Ceiling mounted lights with diffusers



Ceiling mounted lights with directional heads



**Cove lighting/
Shelf-mounted task lights/
Under-cabinet kitchen lights**



Outdoor decorative lights



Outdoor pathway lights



Outdoor wall-mounted porch lights



Outdoor step lights



Pendant down lights



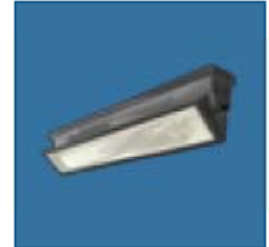
Portable desk lamps



Recessed down lights



Wall wash lights





Step 2: Review the SSL Criteria

- Documents to review:
 - ENERGY STAR Program Commitments
 - LED Luminaires Specification V.1.1
 - Manufacturer's Guide

All are available at energystar.gov/SSLPartners.



Key SSL Criteria

- Varies by product category and application:
 - Minimum light output
 - Efficacy
 - Zonal lumen density
 - CCT
- For all luminaires:
 - Life (L70): 25,000 hours residential, 35,000 hours commercial
 - CRI: 75.0 or greater
 - Power factor: 0.70 residential, 0.90 commercial
 - Operating frequency: 120 Hz



Indoor Residential Luminaires

Application	Minimum Light Output	Minimum Luminaire Efficacy (lm/W)	Allowable CCTs (Kelvin)
Under-cabinet kitchen lights	125 lm/ft	24	2700, 3000, 3500
Portable task lights	200 lumens	29	2700, 3000, 3500, 4000, 4500, 5000
Downlights	Apertures $\leq 4.5"$ 345 lumens Apertures $\geq 4.5"-8"$ 575 lumens	35	2700, 3000, 3500
Ceiling-mounted luminaires with diffusers	Apertures $< 8"$ 375 lumens Apertures $\geq 8"$ 750 lumens	30	2700, 3000, 3500
Cove lights	200 lm/ft	45	2700, 3000, 3500
Surface-mounted luminaires with directional heads	200 lm/ft	35	2700, 3000, 3500



Outdoor Residential Luminaires

Application	Minimum Light Output (lumens)	Minimum Luminaire Efficacy (lm/W)
Wall-mounted porch lights	150	24
Step lights	50	20
Path lights	100	25
Arm or pole-mounted decorative luminaires	300	35



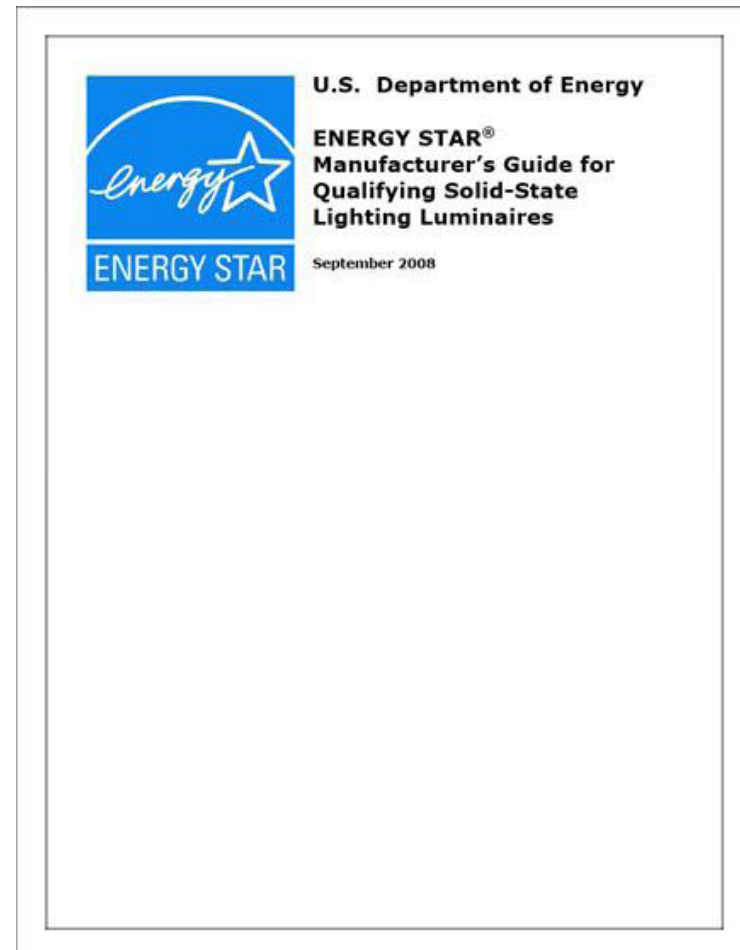
Non-Residential Luminaires

Application	Minimum Light Output	Minimum Luminaire Efficacy (lm/W)	CCT (Kelvin)
Downlights	Apertures $\leq 4.5''$ 345 lumens Apertures $\geq 4.5''$ -8" 575 lumens	35	2700, 3000, 3500, 4000, 4500, 5000
Under-cabinet shelf-mounted lights	125 lm/ft	24	2700, 3000, 3500, 4000, 4500, 5000
Portable task lights	200 lumens	29	2700, 3000, 3500, 4000, 4500, 5000
Wall wash luminaires	575 lumens	40	2700, 3000, 3500, 4000, 4500, 5000
Bollards	N/A	35	N/A

SSL Manufacturer's Guide



- The guide includes:
 - Outline of the qualification process
 - Checklist of data needs
 - Sample size
 - Approved margins of error
 - Technical interpretations





Step 3: Test Your SSL Luminaire

- 3 tests required:
 1. LM-79
 2. LM-80 (Option 1 Only)
 3. ISTMT (Option 1 Only)
- As of 9/30/2010, LM-80 and LM-79 tests are only accepted from EPA-recognized test labs for the SSL program.
- To perform the ISTMT, a lab must be:
 - Approved by OSHA as a National Recognized Test Lab (NRTL),
 - Recognized by DOE's CALiPER program, or
 - Recognized through UL's Data Acceptance Program.



Option 1 and Option 2

You choose:

- Option 1: Component performance
 - Requires 6,000 hours of LM-80 data from the LED manufacturer, but less total testing time of the luminaire
- Option2 : Luminaire performance
 - Luminaire must be tested for 6,000 hours.




Step 4: Submit Your SSL Luminaire

- Submit applications through the SSL Online Product Submittal Tool (SSLOPS)
- Once you click “submit,” your account manager will receive an automatic notice.

SSLOPS Tool Preview



**SOLID-STATE LIGHTING**
PRODUCT SUBMISSION WEB TOOL

ENERGY STAR

HomeIn Progress (4)Submitted (0)In Review (2)Returned (0)Qualified (0)? Help

Brand Name

Model Name

Model Number:

Fixture Application:

Residential

Fixture Type:

(Select)

Nominal Wattage:

Lumen Output:

Is this a private-labeled product? ☐ Yes

Enter the brand name under which this model is sold.

Enter an optional name that describes this model.

You may choose the lumen output from either the Goniophotometer Test or the Integrating Sphere Output Report.

Check the box only if you are **not** the original equipment manufacturer (OEM) of this product.

Next

SSL Product Grouping



Variations within Product Groupings	
Housing/chassis	Allowed with conditions
Heat sink/heat management	Not allowed
Finish	Allowed
Reflector/trim	Allowed
Shade/diffuser	Allowed
Mounting	Allowed
Light source	Allowed with conditions
Power supply	Allowed with conditions
CCTs	Allowed



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Step 1: Determine If Your Product Is Eligible



Eligible LED Lamps:



1) Omnidirectional lamps

A, BT, P, PS, S, T (per ANSI C79.1-2002)

2) Decorative lamps

B, BA, C, CA, DC, F, G (per ANSI C79.1-2002)

3) Directional lamps

BR, ER, K, MR16, PAR16, PAR20, PAR30S (short neck), PAR30L (long neck), PAR38, R (per ANSI C79.1-2002)

4) Non-standard lamps

Lamps without an industry standard equivalent

NOTE: LED fluorescent replacement tubes are not eligible.





Step 2: Review the LED Lamp Criteria

- Documents to review:
 - ENERGY STAR Program Commitments
 - Integral LED Lamp Specification V.1.1
 - Integral LED Lamps Technical Clarifications

All are available at energystar.gov/SSLPartners.



Key LED Lamp Criteria

- Varies by product category and application:
 - Minimum light output
 - Efficacy
 - Luminous distribution
- For all lamps:
 - Allowable CCTs: 2700K, 3000K, 3500K, and 4000K
 - Life (L70): 25,000 hours (15,000 for decorative lamps)
 - Color rendering: CRI of 80.0 or greater, $R_9 \geq 0$
 - Power factor: 0.7 or higher ($\leq 5W$ or low voltage lamps: N/A)
 - Operating frequency: 120 Hz



Omnidirectional Lamps

Criteria Item	ENERGY STAR Requirements	Reference Standard/Test Procedure
Minimum Luminous Efficacy - LED lamp power <10W - LED lamp power ≥10W	50 lm/W 55lm/W	LM-79-08
Minimum Light Output		LM-79-08
	Nominal wattage of lamp to be replaced (watts)	Minimum initial light output of LED lamp (lumens)
	25	200
	35	325
	40	450
	60	800
	75	1,100
	100	1,600
	125	2,000
	150	2,600

Directional Lamps



Criteria Item	ENERGY STAR Requirements	Reference Standard/Test Procedure	Sample Size/Specific Requirements	Laboratory Requirements
Definition	At least 80% light output within solid angle of π sr	EC No 244/2009; LM-79-08, Section 10	1 unit per model	Recognized by DOE CALiPER or accredited by NVLAP for LM-79-08
Minimum Luminous Efficacy - Lamp diameter $\leq 20/8"$ - Lamp diameter $> 20/8"$	40 lm/W 45 lm/W	LM-79-08	10 units per model - 5 BU - 5 BD 9/10 lamps must meet specification	
Color Spatial Uniformity	Variation of chromaticity within beam angle shall be within 0.0006 from weighted average point on CIE 1976 (u' , v') diagram	LM-79-08 ANSI C78.379-2006, Section 5	1 unit per model - Angular chromaticity measurements: center and edge of beam - Measurements made in at least 2 vertical planes 90° apart - Results shall be averaged from different vertical planes	Recognized by DOE CALiPER or accredited by NVLAP for LM-79-08

Decorative Lamps



Criteria Item	ENERGY STAR Requirements	Reference Standard/Test Procedure	Sample Size/Specific Requirements
Minimum Luminous Efficacy	40 lm/W	LM-79-08	10 units per model - 5BU - 5 BD 9/10 lamps must meet specification
Minimum Light Output		LM-79-08	10 units per model - 5BU - 5 BD 9/10 lamps must meet specification
	Nominal wattage of lamp to be replaced (watts)	Minimum initial light output of LED lamp (lumens)	
	10	70	
	15	90	
	25	150	
	40	300	
	60	500	

Non-Standard Lamps



Criteria Item	ENERGY STAR Requirements	Reference Standard/Test Procedure	Sample Size/Specific Requirements	Laboratory Requirements
Minimum Luminous Efficacy - LED lamp power <10W - LED lamp power ≥10W	50 lm/W 55 lm/W	LM-79-08	10 units per model - 5 BU - 5 BD 9/10 lamps must meet specification	Recognized by DOE CALiPER or accredited by NVLAP for LM-79-08
Minimum Light Output	200 lumens	LM-79-08	10 units per model - 5 BU - 5 BD 9/10 lamps must meet specification	Recognized by DOE CALiPER or accredited by NVLAP for LM-79-08



Step 3: Test Your LED Lamp

- Tests required:
 1. LM-79 and testing for 6,000 hours
 2. LM-80 & In Situ Temperature Measurement Test (ISTMT) (early initial qualification only)
- To perform the LM-80 and/or LM-79 tests, a lab must be:
 - Approved through DOE's CALiPER program until 12/31/2010
 - Recognized by EPA
- To perform the ISTMT, a lab must be:
 - Approved by OSHA as a National Recognized Test Lab (NRTL),
 - Recognized by DOE's CALiPER program, or
 - Recognized through UL's Data Acceptance Program

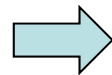


LED Lamp Testing Timeline

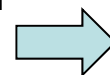
You choose:

1. Early Initial Qualification	2. Initial Qualification	3. Full Qualification (higher life claims only)
3,000 hours of testing + LM-80 and ISTMT	6,000 hours of testing	7,500 – 12,500 hours of testing depending on life claim

Must go to Step 2.



No further testing needed for minimum life claim. Otherwise, go to Step 3.



See table on page 15 of LED Lamp Criteria.



Life (L_{70}) Claims for Packaging

6000-Hour Lumen Maintenance Threshold			
	Minimum Lumen Maintenance at end of 6,000 Hours (% of initial lumens; -3% tolerance)	Maximum L_{70} Life Claim (hours)	ENERGY STAR Approval Available after 6,000-Hour Test
Minimum for Decorative	86.7	15,000	Full approval (no additional lumen maintenance testing required)
Optional for Decorative	89.9	20,000	
Minimum for Non-Standard, Omnidirectional, and Directional (Optional for Decorative)	91.8	25,000	
Optional for All Lamp Types	93.1	30,000	Initial approval pending completion of total required test period
	94.1	35,000	
	94.8	40,000	
	95.4	45,000	
	95.8	50,000	



Testing for Life Claims >25,000 Hours

Minimum Test Period (hours)	Minimum Lumen Maintenance (%)	Maximum L ₇₀ Life Claims (hours)
7,500	91.2	30,000
8,700	91.5	35,000
10,000	91.5	40,000
11,250	91.5	45,000
12,500	91.8	50,000



LED Lamp Product Grouping

- The Integral LED Lamp Program requires full testing of every product variation.

Exceptions:

- Product finish
- Beam angle
- May only share lumen maintenance test
- Must supply ISTMT and LM-79 reports for each variation



Step 4: Submit Your Product

- Download and fill out a Smart Form.
 - Form for early initial qualification are now available at energystar.gov/LEDbulbs. Click on “For Partners.”
- E-mail the following to your account manager:
 - Completed qualification form
 - LM-79 report(s)
 - For early initial qualifications: LM-80 and ISTMT reports
 - Packaging file



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New Approach to ENERGY STAR Qualification and Verification Testing



- Third-party certification of test data before
 - EPA-recognized accreditation bodies, laboratories and certification bodies
- Verification testing after qualification
 - Verify that products continue to meet the ENERGY STAR requirements regardless of changes in the production process

Comparing the Current Approach to the CB-Driven Approach

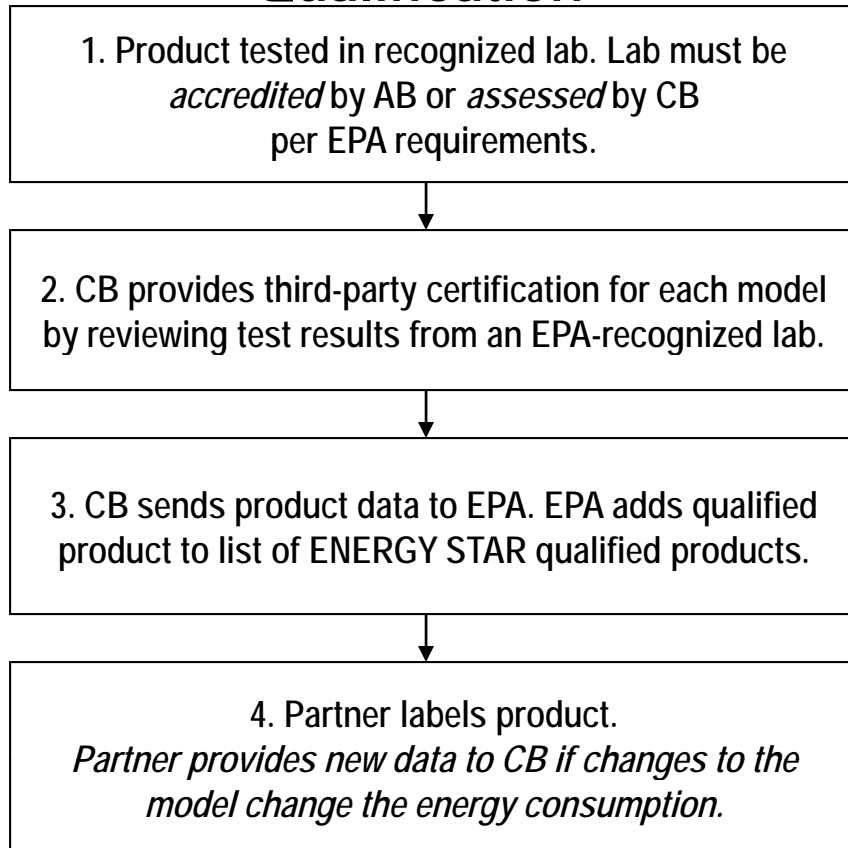


- Current approach
 - Partners submit test data to EPA to qualify their products.
 - EPA reviews test data and adds products to lists of qualified products.
 - EPA verifies the energy performance of select models.
- Certification body-driven approach (from 12/31/10)
 - CB will certify test data from products tested in EPA-recognized labs before qualification and labeling.
 - CB will conduct verification and challenge testing after qualification.
 - CB will evaluate retested products that have undergone significant post-qualification changes.

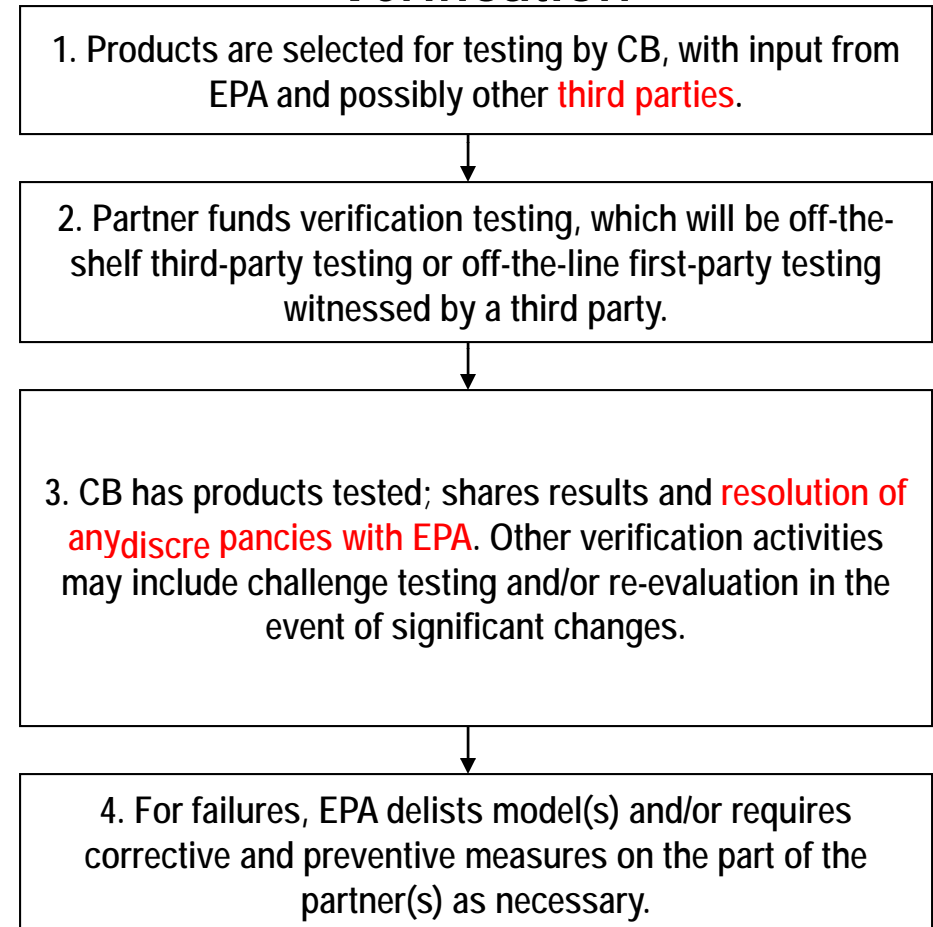
New Requirements for All ENERGY STAR Products



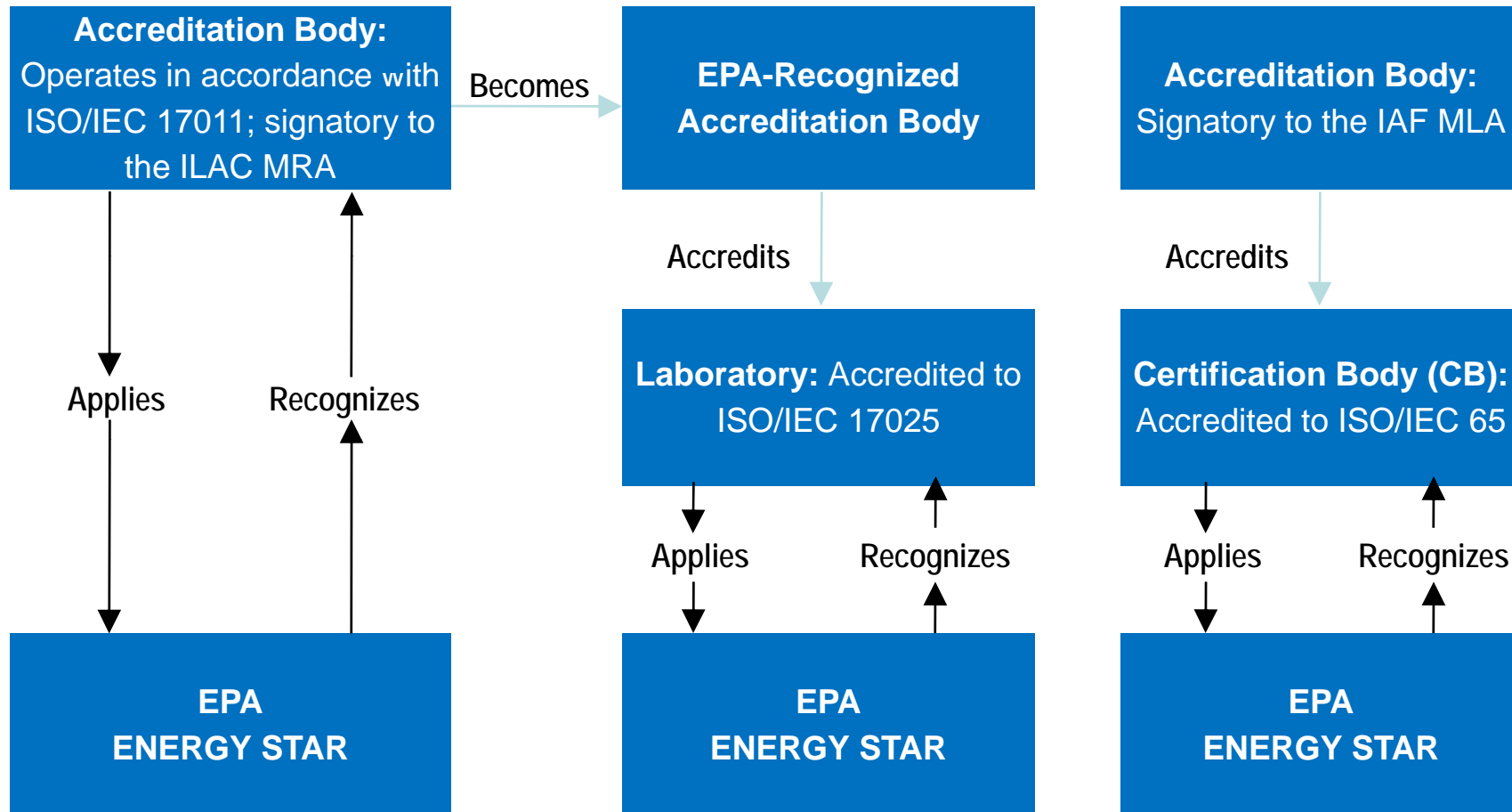
Qualification



Verification



Obtaining EPA Recognition



* Labs that participate by virtue of their being approved as WMTLs or SMTLs by an EPA-recognized CB are not covered on this chart. It is anticipated that the CB will provide EPA with a list of all such labs when it applies for EPA recognition and notify EPA whenever it adds new labs to that roster.



Certification & Accreditation

- Eamon Monahan, U.S. EPA
monahan.eamon@epa.gov, (202) 343-9589
- Website: www.energystar.gov/testingandverification
- E-mail: ENERGYSTARVerificationProgram@energystar.gov



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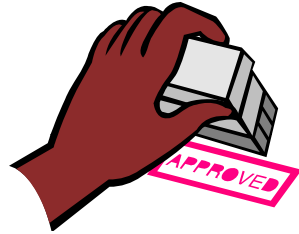
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Verification Testing

- Coming soon for SSL and integral LED lamps!
- Conducted by an EPA-recognized CB
- Manufacturer-funded
- Off-the-shelf testing
- Failure carries stiff penalties:
 - A product that fails testing is immediately disqualified.
 - Any member of a product family is eligible for testing.
 - One failure in a product family disqualifies the whole family (depending on type of failure/family relationship).

Conclusion



- Determine if your product is eligible.
- Review the criteria.
- Test your product at an EPA-recognized lab.
- Submit your application to D&R until Dec. 31. Submit to CB after Dec. 31.



Questions?

E-mail: SSL@energystar.gov

For more information, visit

<http://www.energystar.gov/SSLPartners>.

Thank you!