ENERGY STAR® Testing

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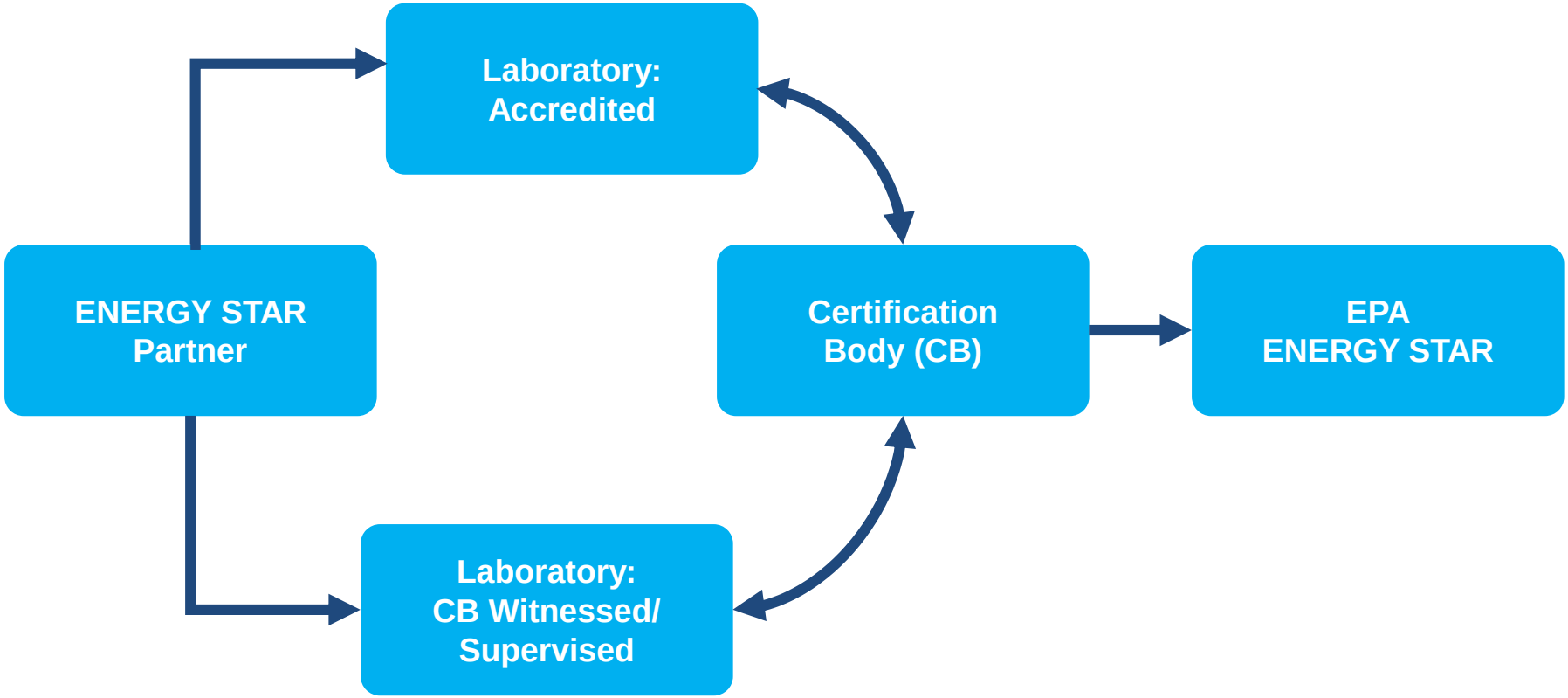
ICF International

ENERGY STAR 3PC Testing



ENERGY STAR® Testing

Laboratories are Recognized by Category

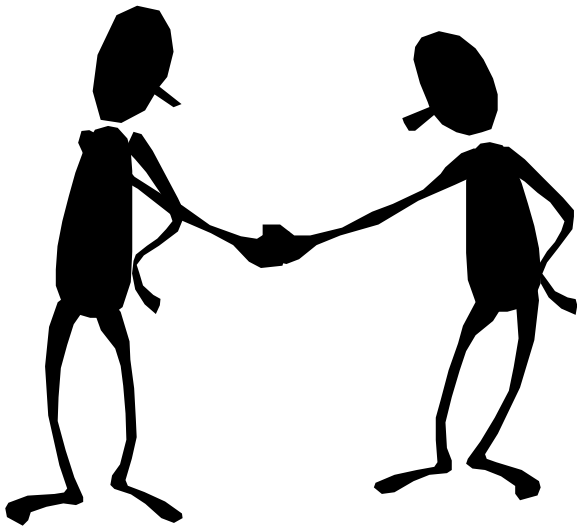
- **LED Packages/Modules/Arrays**
  - IES LM-80-08
- **Luminaires**
  - Recognition by source technology and luminaire type
- **Lamps**
  - Recognition by lamp type and technology
- **Integral LED Lamps V1.4 and Compact Fluorescent Lamps V4.3**
  - Nope, too late, those specifications are no longer applicable.

ENERGY STAR® Testing

- So you want to be an EPA-recognized Laboratory…2 options:
  - Be accredited to ISO:17025 or NIST-150 and to the appropriate test methods
  - Participate in a CB's Witnessed or Supervised Manufacturer Test Laboratory (WMTL/SMTL) program

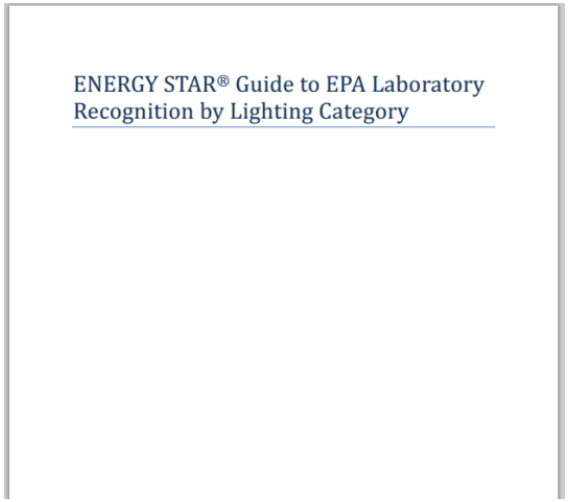
WMTL and SMTL Data Portability

- Test data from a witnessed or supervised lab (WMTL or SMTL) is NOT portable between certifying bodies
  - But, a manufacturer laboratory can participate in multiple CBs' WMTL or SMTL programs



Test Methods Referenced for ENERGY STAR Lamps V1.1

- Industry Standard Test Methods:
  - IES LM-65-10
  - IES LM-66-11
  - IES LM-79-08
  - ANSI C62.41.2-2002


ENERGY STAR® Guide to EPA Laboratory Recognition by Lighting Category

- ENERGY STAR Test Methods and Recommended Practices
  New!
  - Elevated Temperature Life Test (ETLT)New!
  - Ambient Temperature Life Test (ATLT)New!
  - Elevated Temperature Light Output Ratio (ETLOR)New!
  - Start Time TestNew!

  Recommended Practices for Dimmable lamps: *do not* require accreditation

Test Methods Referenced for ENERGY STAR Luminaires V1.2

- IES LM-9-09
- IES LM-10-13
- IES LM-31-13
- IES LM-40-10
- IES LM-41-13
- IES LM-46-04
- IES LM-47-12
- IES LM-51-13
- IES LM-65-10
- IES LM-66-11
- IES LM-79-08
- IES LM-82-12
- IES LM-58-13
- ANSI C62.41.2-2002
- ANSI C82.2-2002
- ANSI C82.6-2005
- ANSI C82.77-2002

ENERGY STAR® Guide to EPA Laboratory Recognition by Lighting Category

Table 9: Required Methods of Measurement for Non-directional SSL Lumina

Requirement Category	Methods of Measurement and Referen		
Efficacy, Output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES	LM-79-08	Electrical State Ligh non-direc
Power Factor	ANSI	C82.77-2002	Harmonic Requirem
CRI	CIE	Pub. No. 13.3-1995	Method o Rendering
CCT	CIE	Pub. No. 15:2004	Colorimet
Efficacy, Light Output, Lumen Maintenance, CCT , CRI, Color Maintenance, Light Source Life	IES	LM-82-12	Character LED Lamp Propertie

The following are notable reference documents but are not req accreditation.

Table 10: Reference Documents for Non-Directional SSL Luminaires and Sub

Reference Category	*Reference Document*[12]		
Light Source Life, Lumen Maintenance	*IES*	*TM-21-11*[13]	*Projecting Light Sour*

Elevated Temperature Life Testing for Lamps

- Required for a range of lamps
  - Omnidirectional CFL and LED lamps ≥ 10W
  - Directional lamps
- Exemptions:
  - Decorative lamps
  - Lamps not rated for enclosed or recessed fixtures

Elevated Temperature Life Testing for Lamps

1. **Option A: Recessed can fixture**
   - Available for all lamps requiring Elevated Temperature Life Testing (ETLT) but base up only
2. **Options B & C: Hot room or chamber**
   - Allow for multiple orientations & temperatures
   - 45°C ± 5°C
     - Omnidirectional lamps ≥ 10W
     - Directional lamps ≤ 20W
   - 55°C ± 5°C
     - Directional lamps > 20W

Ambient Temperature Life Testing for Lamps

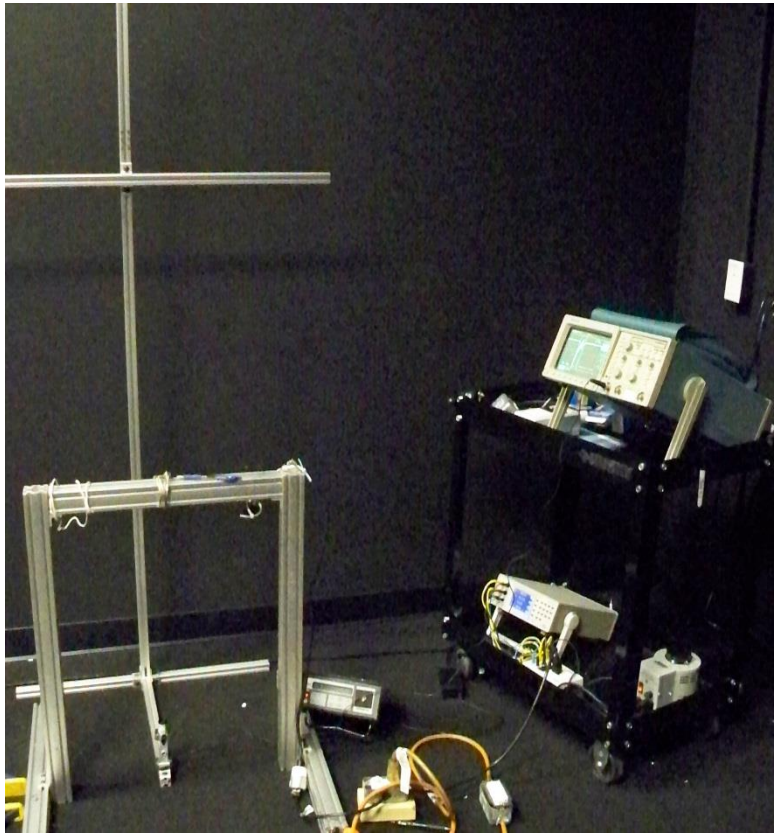
- 25°C testing lumen maintenance/life testing
  - unchanged previously certified products: no retesting anticipated but Certification Body needs to review test conditions

Elevated Temperature Light Output Ratio for Lamps

- Comparison of the light output at ambient temperature vs. elevated temperature
- Required for Directional lamps
  - New for LED lamps
  - Exempt: Lamps labeled “not intended for use in recessed fixtures”

Start Time Test for Lamps

- **NEW** test method
- **ALL LAMPS** must be evaluated using new test method before being certified to Lamps V1.0
- Start Time Test results may impact Rapid Cycle Stress Testing needed for CFLs
  - A Start Time of >100ms requires more cycles



Run Up Time Test for Lamps

- **NEW** test method
  - **ALL CFL LAMPS** must be evaluated before being certified to Lamps V1.0
- Requirements simplified & stricter
  - Bare CFLs $\leq$ 60 sec
  - Covered CFLs $\leq$ 120 sec (down 60 seconds)

Dimming Testing for Lamps

- No accreditation or third party lab is required
- Flexibility in methods: absolute and relative both methods okay
  - Light Output on a Dimmer
  - Light Source Flicker
  - Noise
- Dimming Data Collection Sheet (www.energystar.gov/lamps)
  - Dimming capability will appear on energystar.gov
  - Send data sheets to lighting@energystar.gov
  - Share feedback of methods

Test Methods for Luminaires V1.2

- Test methods for Luminaires vary depending on:
  - The category of recognition
    - Directional or Non-Directional
  - The light source technology
    - SSL
    - Fluorescent
    - HID
    - Halogen
  - Check the lab guide

Dimming Recommended Practices

- Found in the document "ENERGY STAR Lamps V1.0 Final Test Methods and Recommended Practices"
- All dimming test methods are considered Recommended Practices
  - Testing is not required to occur at an accredited laboratory
  - Testing is reported to EPA via a Dimming Data Collection Sheet
  - Results are being gathered for further refinement and simplification of testing

Dimming Recommended Practices

- Allow for relative or absolute measurements
  - Absolute = Integrating Sphere
  - Relative = Other
- Stabilization options
  - Standard stabilization on each lamp and each test
  - Can reference previous stabilization times to minimize labor

Dimming: Maximum Light Output

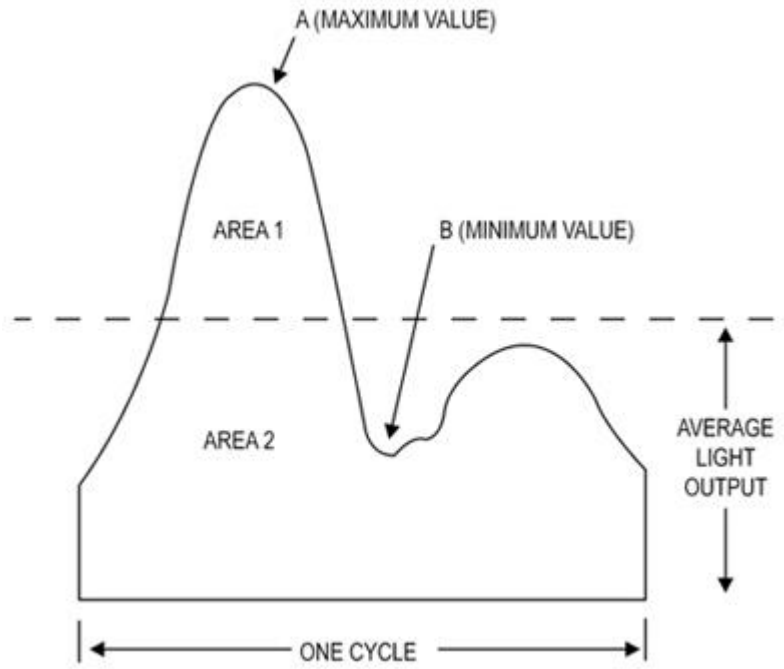
- Lamp light output on the maximum control setting of a dimmer/control must be:
  - No less than 20% below the light output of the lamp without a dimmer
- 80% of tested lamp/dimmer combinations must meet the requirement
- Example:
  - If a lamp produces 1000 lumens without a dimmer, it must produce greater than 800 lumens at the maximum control setting when on a dimmer

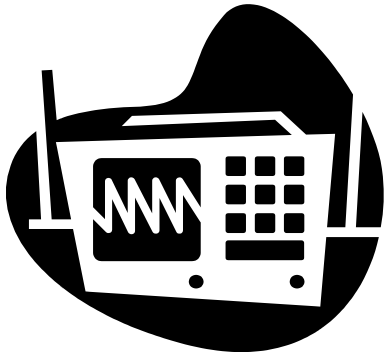
Dimming: Minimum Light Output

- Lamp light output on a dimmer/control shall be no more than 20% of the maximum light output of the lamp on each tested dimmer/control
  - If no specific level claimed, must test at 20%
  - If a manufacturer claims a lower level, test at the claimed level
  - E.g. if a lamp claims to dim down to 5%, test at 5% of the maximum light output on a dimmer.
- 80% of tested lamp/dimmer combinations must meet the requirement.
- Example:
  - If a lamp produces 1000 lumens without a dimmer, produces 900 lumens on a dimmer at the maximum control setting, and claims dimming down to 5%, it must meet reach down to 45 lumens, and meet flicker and noise

Dimming: Flicker

- Can be measured simultaneously with light output
- Requires a Digital Storage Oscilloscope





Dimming: Audible Noise

- Lamp shall not emit noise above 24dBA at 1 meter.
  - Does not require an anechoic chamber
  - Tested at six points about the lamp
    - Can be tested stationary with 6 microphones
    - Can be rotated using 1 microphone
  - Testing is sound of one lamp only
    - Dimmer and any additional lamps on circuit external to measurement area
- 80% of tested lamp/dimmer combinations must meet the requirement.