

EPA NEMA Road Mapping

March 27th Webinar

Balancing cost and consumer
satisfaction

Luminaires Verification Testing

- [Directive #2012-01, April 20, 2012, ENERGY STAR Luminaires Verification Testing Guidance: Test Requirements, Sample Sizes and Determining Testing Failures \(60KB\)](#)
- [Directive #2013-01, September 30, 2013, ENERGY STAR Luminaires That Do Not Ship with Lamps Verification Testing Guidance for Certification Bodies – Test Requirements \(227KB\)](#)

Directive No 2013-01 Luminaires that Do Not Ship with Lamps



THIRD PARTY CERTIFICATION IMPLEMENTATION

ENERGY STAR® PRODUCTS

SUBJECT: ENERGY STAR Luminaires That Do Not Ship with Lamps
Verification Testing Guidance for Certification Bodies – Test Requirements

DIRECTIVE NO. 2013-01

Date: 9/30/2013

Verification testing for ENERGY STAR certified luminaires should be limited to the following core performance requirements as applicable to the specific model.

- Zonal Lumen Density (for directional luminaires)
- Maximum Measured Ballast or Driver Case Temperature
- Off-State Power Consumption (only luminaires employing an integral method of switching)
- Power Factor

To ensure these luminaires continue to meet the ENERGY STAR specification, verification testing must be conducted for these performance requirements in the same manner as testing was conducted during certification. Such luminaires would be tested with lamps that are of the same type indicated on the luminaires' packaging (per "Product Labeling & Packaging Requirements" in the Luminaires specification) and that are compliant with ANSI/ANSI C78.81-2010 data sheets (for T8) or IEC 60081 data sheets (for T5).

Luminaire program VT guidance



THIRD PARTY CERTIFICATION IMPLEMENTATION

ENERGY STAR® PRODUCTS

SUBJECT: ENERGY STAR Luminaires Verification Testing Guidance for Certification Bodies – Test Requirements, Sample Sizes and Determining Testing Failures

DIRECTIVE NO. 2012-01

Date: 4/20/2012

Performance Criteria

Verification testing for ENERGY STAR certified luminaires is limited to the following core performance requirements as applicable to the specific model.

- Luminous Efficacy and Output
- Zonal Lumen Density (Directional Luminaires Only)
- Lumen Maintenance¹
- Correlated Color Temperature
- Color Rendering
- Color Angular Uniformity
- Color Maintenance¹ (Directional Solid State Indoor Luminaires Only)
- Source Start Time
- Source Run-Up Time
- Maximum Measured Ballast or Driver Case Temperature
- Off-State Power Consumption (Only Luminaires Employing an Integral Method of Switching)²
- Power Factor

CFL 4.3 Verification Testing Review Process

3. **Testing Review Process:** Based on the results and incorporation of measurement tolerances, EPA will categorize the tested products into three groups:
- Qualification verification
 - Marginal failure
 - Disqualification of the product

Qualification verification is defined when a product meets or exceeds all of the ENERGY STAR qualification testing requirements of the Third Party Testing and Verification Program.

Marginal failure is defined as having one sample exceed the allowable failure rate for one test. An example of a marginal failure is a result of 4 out of 6 samples passing the rapid cycle stress test or if the interim lifetime testing results in failure of 2 samples (out of the 10 samples). The reason behind the establishment of a marginal failure is that if a product meets or exceeds all of the other testing requirements, especially the efficacy and 1,000-hour lumen maintenance tests and fails the rapid cycle stress test, it then causes a conflict on the quality of the product. To provide a reasonable and fair alternative, EPA will follow the process below to gather additional data to help resolve the performance issues.

CFL 4.3 Marginal Failure Process

Marginal Failure Process:

1. After testing has been completed through 40% of rated lifetime, products will be reviewed to identify a marginal failure. If a product is deemed a marginal failure, EPA will immediately contact the PARTNER and inform them.
2. At this time, EPA will institute an immediate retest for the test that was failed to verify the initial results. EPA will instruct the Third Party Testing Program Administrator to coordinate with the participating testing laboratory(ies) to procure the samples and ship them to one of the approved third party testing laboratories. The manufacturer of the product is responsible for all retesting costs (as stated in Section H).
3. In addition, the PARTNER can request to receive the failed lamp(s) so they can perform an autopsy analysis on the product.
4. During this retesting process, the product in question will retain its ENERGY STAR qualification status to avoid confusion or unnecessary administration costs to prematurely remove product from the retail channels.
5. If the retest results in the product meeting the originally failed test requirement, it will remain ENERGY STAR qualified.
6. If the product fails the requirement retest, then EPA will institute the disqualification process (see below).

Disqualification is defined when a product fails one or more of the ENERGY STAR qualification testing or Third Party Testing requirements.

Stakeholder survey results

35 respondents

2. Please indicate your professional area of interest regarding these programs

Value	Count	Percent %
Industry / Manufacturer	16	45.7%
Energy Advocacy / Environmental	2	5.7%
Utility / Utility Consultant	10	28.6%
Government / Regulatory	2	5.7%
Other	6	17.1%

Statistics	
Total Responses	35

3. Please indicate which ENERGY STAR program(s) you are interested in

Value	Count	Percent %
ENERGY STAR Lamps	31	88.6%
ENERGY STAR Luminaires	26	74.3%

Statistics	
Total Responses	35

Stakeholder Survey Results; Lamps

	Not Important	Somewhat Important	Important	Very Important	Extremely Important	Responses
Luminous Efficacy	0.0% 0	9.4% 3	28.1% 9	28.1% 9	34.4% 11	32
Light Output	3.2% 1	9.7% 3	29.0% 9	35.5% 11	22.6% 7	31
Elevated Temperature Light Output Ratio	13.8% 4	31.0% 9	34.5% 10	20.7% 6	0.0% 0	29
Center Beam Intensity	10.0% 3	33.3% 10	33.3% 10	23.3% 7	0.0% 0	30
Luminous Intensity Distribution	7.4% 2	18.5% 5	37.0% 10	33.3% 9	3.7% 1	27
Correlated Color Temperature (CCT)	9.7% 3	9.7% 3	45.2% 14	22.6% 7	12.9% 4	31
Color Rendering	6.5% 2	22.6% 7	22.6% 7	41.9% 13	6.5% 2	31
Color Maintenance	6.5% 2	16.1% 5	25.8% 8	45.2% 14	6.5% 2	31
Color Angular Uniformity	17.2% 5	24.1% 7	34.5% 10	20.7% 6	3.4% 1	29
Lumen Maintenance	0.0% 0	9.7% 3	35.5% 11	51.6% 16	3.2% 1	31
Rated Life	3.2% 1	3.2% 1	38.7% 12	51.6% 16	3.2% 1	31
Rapid Cycle Stress Test	0.0% 0	31.0% 9	34.5% 10	31.0% 9	3.4% 1	29
Electrical Safety	16.7% 5	6.7% 2	40.0% 12	6.7% 2	30.0% 9	30
Power Factor	10.3% 3	24.1% 7	51.7% 15	13.8% 4	0.0% 0	29
Frequency	17.9% 5	35.7% 10	39.3% 11	7.1% 2	0.0% 0	28
Start Time	16.1% 5	16.1% 5	32.3% 10	32.3% 10	3.2% 1	31
Run-Up Time	17.2% 5	17.2% 5	37.9% 11	27.6% 8	0.0% 0	29
Transient Protection	17.9% 5	32.1% 9	39.3% 11	10.7% 3	0.0% 0	28
Maximum Light Output	13.8% 4	27.6% 8	31.0% 9	20.7% 6	6.9% 2	29
Minimum Light Output	3.3% 1	16.7% 5	56.7% 17	13.3% 4	10.0% 3	30
Flicker	3.2% 1	19.4% 6	35.5% 11	29.0% 9	12.9% 4	31
Audible Noise	19.4% 6	19.4% 6	32.3% 10	10.1% 5	12.9% 4	31
Lamp Toxics Reduction	26.7% 8	23.3% 7	23.3% 7	23.3% 7	3.3% 1	30
Dimensional Requirements	17.9% 5	28.6% 8	28.6% 8	17.9% 5	7.1% 2	28
Lamp Labeling	6.7% 2	16.7% 5	40.0% 12	26.7% 8	10.0% 3	30
Lamp Packaging	10.0% 3	36.7% 11	26.7% 8	16.7% 5	10.0% 3	30
Warranty	6.9% 2	24.1% 7	34.5% 10	20.7% 6	13.8% 4	29

Stakeholder Survey Results: Luminaires

	Not Important	Somewhat Important	Important	Very Important	Extremely Important	Responses
Luminous Efficacy	0.0% 0	12.0% 3	20.0% 5	40.0% 10	28.0% 7	25
Minimum Output Levels	3.8% 1	23.1% 6	30.8% 8	34.6% 9	7.7% 2	26
Zonal Lumen Density Requirements	16.7% 4	20.8% 5	41.7% 10	20.8% 5	0.0% 0	24
Light Source Life Requirements	8.0% 2	20.0% 5	36.0% 9	32.0% 8	4.0% 1	25
Lumen Maintenance Requirements	8.0% 2	24.0% 6	32.0% 8	32.0% 8	4.0% 1	25
Correlated Color Temperature (CCT) Requirements	7.7% 2	23.1% 6	26.9% 7	34.6% 9	7.7% 2	26
Color Rendering Requirements	7.4% 2	29.6% 8	29.6% 8	29.6% 8	3.7% 1	27
Color Angular Uniformity Requirements	28.0% 7	8.0% 2	32.0% 8	28.0% 7	4.0% 1	25
Color Maintenance Requirements	11.5% 3	26.9% 7	26.9% 7	26.9% 7	7.7% 2	26
Light Source Shipment Requirements	28.0% 7	28.0% 7	40.0% 10	4.0% 1	0.0% 0	25
Source Run-Up Time Requirements	8.0% 2	32.0% 8	48.0% 12	12.0% 3	0.0% 0	25
Light Source Replaceability Requirements	18.5% 5	14.8% 4	40.7% 11	25.9% 7	0.0% 0	27
Dimming Requirements	0.0% 0	19.2% 5	30.8% 8	42.3% 11	7.7% 2	26
Power Factor Requirements	12.0% 3	24.0% 6	48.0% 12	16.0% 4	0.0% 0	25
Transient Protection Requirements	26.1% 6	26.1% 6	26.1% 6	21.7% 5	0.0% 0	23
Lamp Current Crest Factor Requirements	31.8% 7	31.8% 7	27.3% 6	4.5% 1	4.5% 1	22
Off-State Power Consumption Requirements	8.3% 2	29.2% 7	20.8% 5	41.7% 10	0.0% 0	24
Operating Frequency Requirements	21.7% 5	30.4% 7	30.4% 7	13.0% 3	4.3% 1	23
Ballast/Driver Replaceability Requirements	20.0% 5	20.0% 5	28.0% 7	28.0% 7	4.0% 1	25
Noise Requirements	16.0% 4	24.0% 6	36.0% 9	16.0% 4	8.0% 2	25
Thermal Performance Requirements	13.0% 3	17.4% 4	26.1% 6	39.1% 9	4.3% 1	23
Minimum Operating Temperature Requirements	18.2% 4	18.2% 4	45.5% 10	18.2% 4	0.0% 0	22
Safety Requirements	20.0% 5	8.0% 2	32.0% 8	12.0% 3	28.0% 7	25
Product Labeling	8.0% 2	20.0% 5	44.0% 11	20.0% 5	8.0% 2	25
Product Packaging Requirements	12.5% 3	41.7% 10	20.8% 5	16.7% 4	8.3% 2	24
Lighting Toxics Reduction Requirements	33.3% 8	29.2% 7	20.8% 5	12.5% 3	4.2% 1	24
Warranty Requirements	8.3% 2	29.2% 7	29.2% 7	16.7% 4	16.7% 4	24

Stakeholder Survey Comments

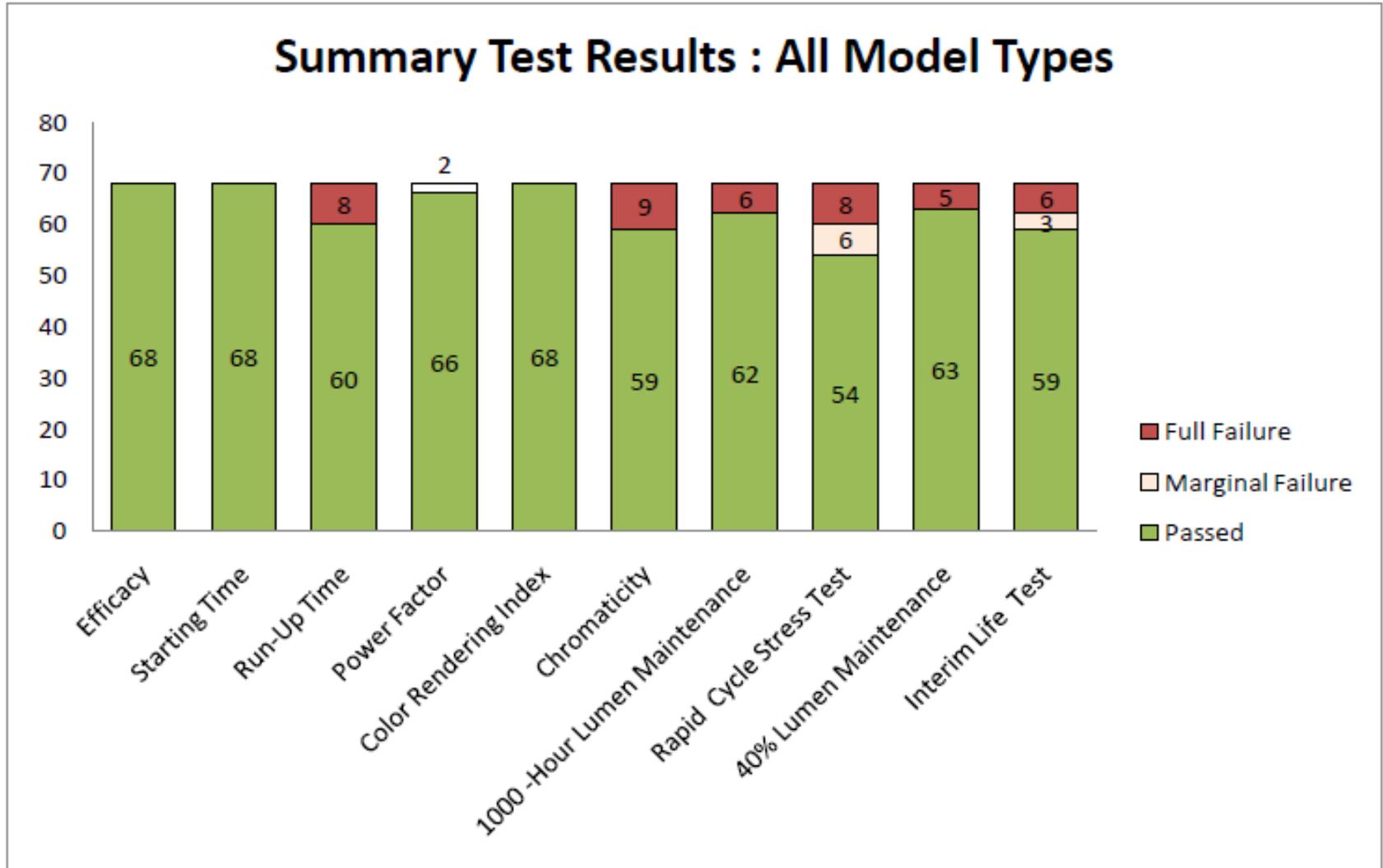
6. Other Comments

Count	Response
1	Missing Categories : How do buildings upgrade indoor pin-CFL surface mount fixtures? Lamps don't work and luminaires are not always necessary. Many of these fixtures are 24/7.
1	Note - when highlighted as not important or somewhat important, it is meant from what should be the scope of Energy Star. Energy Star should be about power consumption in on and off state, as a function of light output. Lamp or fixture light quality and longevity aspects, do not have to be part of the specification.
1	We must address how consumers find controls that are compatible with ES lamps and Luminaires that are dimmable.
1	While Efficacy is #1 importance for Lamps, many of the other parameters are crucial to ensure a high-quality product is available, especially as new LED manufacturers are entering the market without a proven track record of quality products.
1	Cost modelling to understand what it takes to get a lamp or luminaire qualified...this would help limit expansion of specification and possible spec. reduction

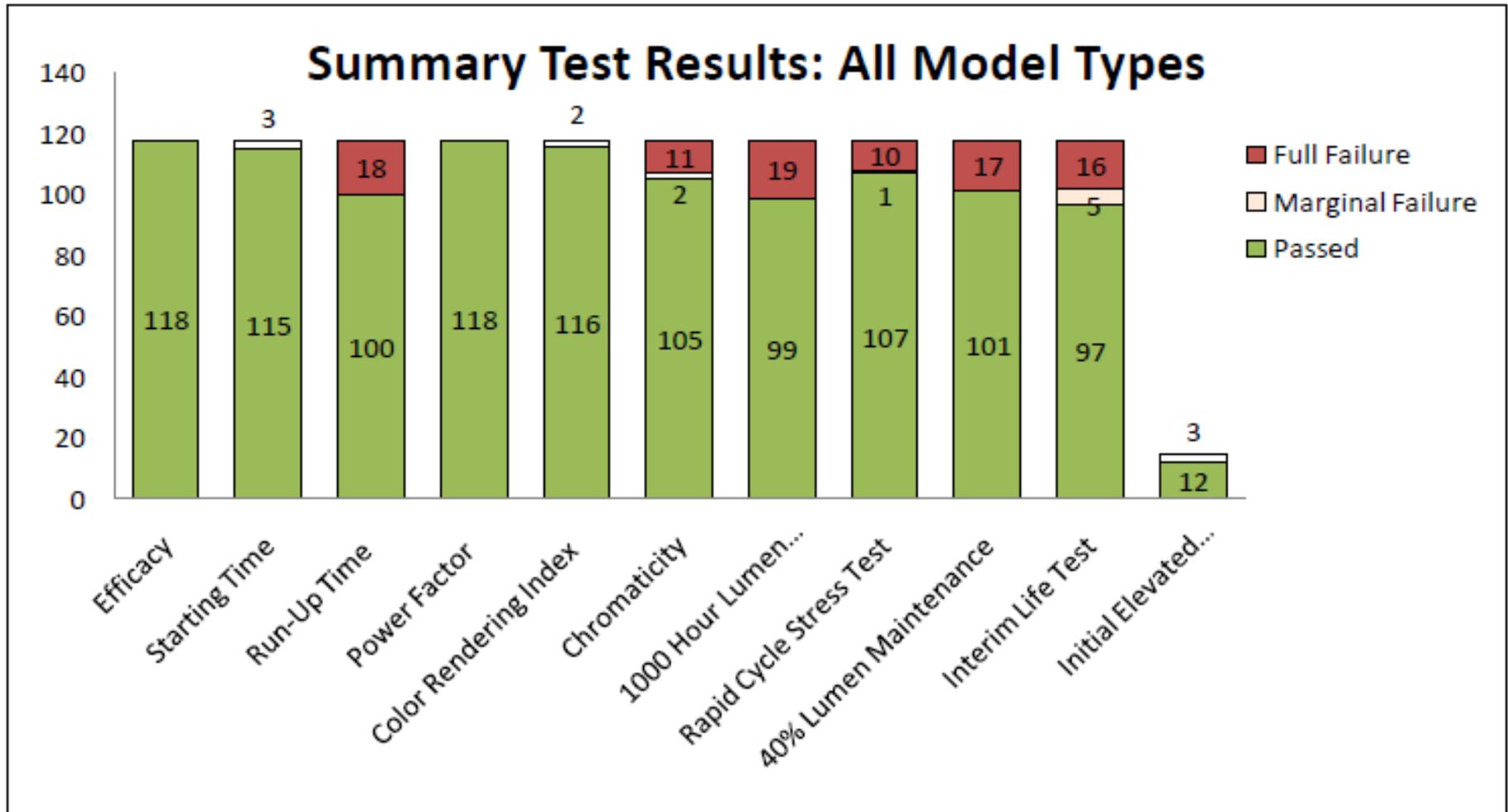
CFL VT Results: Batch 1

	Passing Criteria	Results		Failures				Passing	
		Mean	Median	Full		Marginal		Total	Percentage
				Number	Percentage	Number	Percentage		
Rapid Cycle Stress Test	5/6 survive to half of rated life	5.44	6	4	6%	7	10%	57	84%
Interim Life	9/10 survive to 40% of rated life	9.21	10	5	8%	6	9%	55	83%
40% Life Lumen Maintenance	> 80%	85%	86%	7	11%			59	89%
1,000 Hour Lumen Maintenance	> 90%	93%	94%	7	10%			61	90%
Chromaticity	All coordinates inside ellipse	9.47	10	3	4%	3	4%	62	91%
Run-Up Time	< 60 or <180 seconds	47.8	32.5	4	6%			64	94%
Starting Time	< 1000 milliseconds	360	270	3	4%			65	96%
Power Factor	> 0.5	0.59	0.56	3	4%			65	96%
Efficacy	Varies by type	65.3	67.82	1	1%			67	99%
Color Rendering Index	> 80	82.7	82.4	0	0%			68	100%
Total				21	31%	8	12%	39	57%

CFL VT Results: Batch 2



CFL VT Results: Batch 3



Discussion

- Can a reduced set of tests provide some assurance of a reasonably good product, without performing all the costly and lengthy tests that are done for up front certification?
- Considerations
 - SSL product forecasts of <12 month product lifecycle
 - Reduced cost in any stage of testing helps contribute to improved adoption & satisfaction
 - Verification testing for ENERGY STAR LED lamps just began so little is known on post certification performance, while much is known for CFLs due to 3 years of verification testing
 - 17 LED lamp failures have occurred between 3,000-6,000 hour in up front testing

Suggestions for reduced VT for Lamps

ENERGY STAR TEST/CRITERIA	NEMA proposal	Notes
Rapid Cycle test (All lamps)	Yes	
Start up time (All lamps)	No	
Run up time (CFL only)	Yes	
Power Factor (All lamps)	No	
CCT (All lamps)	No	
CRI (All lamps)	Yes	
Efficacy (LM/watt) (All lamps)	Yes	
Lumen Maintenance 1,000hrs (CFL only)	Yes	
Lumen Maintenance/Interim life 3k hrs/40% (All)	No	
Luminous Intensity Distribution (omni & deco LED)	No	
Minimum Light Output (All lamps)	Yes	
Color Angular uniformity (Directional)	No	
Minimum Center Beam Intensity (Directional)	No	
Elevated Temp Light Output Ratio (Directional)	?	

Goal: focus on what is most crucial to consumer satisfaction to reduce cost and time of verification testing

Can a reduced set of tests provide some assurance of a reasonably good product, without performing the same lengthy testing as is done for certification?

Notes:

- Lumen maintenance/life testing has already been truncated for verification testing of lamps.
- As previously announced, EPA will be monitoring dimming outside of the formal verification testing process until further notice.