

The ENERGY STAR CFL Third Party Testing and Verification Program: Original Equipment Manufacturer Performance Assessment

May 2013

Assessment Highlights

- The ENERGY STAR Compact Fluorescent Lamp (CFL) Third Party Testing and Verification Program (“CFL Testing Program”) was established to verify, on an ongoing basis, whether ENERGY STAR CFLs sold after initial qualification meet ENERGY STAR requirements. From May 1, 2009 through March 31, 2013, 334 models were tested through the program. The results of this testing reflect significant performance variability across original equipment manufacturers (OEMs) of these products.
- The 334 tested products included in this assessment were manufactured by 30 different OEMs; 17 of these OEMs had five or more products tested. OEMs with five or more products tested account for 93% of total tested products. Among these OEMs, passing rates ranged from 15% to 90%.
- Products manufactured by the 17 OEMs with five or more products tested represent a large number of products labeled under different brand names. The 312 tested products manufactured by these OEMs were linked to 1,620 privately labeled products on the ENERGY STAR qualified products list.
- While CFL technology has improved significantly over time, testing data collected through the CFL Testing Program suggest that quality control remains an issue. ENERGY STAR CFLs pass initial testing and qualification requirements to earn the ENERGY STAR label; however, over the past four years, the overall passing rate upon verification has been 55%.
- OEM pass rates as high as 90% indicate that effective quality control for CFLs is achievable.
- Private labelers of CFLs can play an important role in addressing quality control issues by inquiring about their OEM’s testing record and plans for improving it, as needed.
- EPA is taking targeted actions to help drive improved quality control in the production of ENERGY STAR CFLs. They include individual notices to OEMs providing a recap of their testing performance in the CFL Testing Program, greater oversight of products associated with OEMs with high failure rates and heightened quality assurance requirements for labelers using products from those sources, and increased verification testing of products from OEMs with low compliance rates or that have been significantly undertested to date.

Program Overview

The ENERGY STAR Compact Fluorescent Lamp (CFL) Third Party Testing and Verification Program (“CFL Testing Program”) was established to verify, on an ongoing basis, whether ENERGY STAR CFLs sold after initial qualification meet ENERGY STAR requirements.¹ The program enables EPA to identify and disqualify products that fail to meet ENERGY STAR requirements. The program tested 20% of all ENERGY STAR qualified CFL products each year from 2009 through 2013. Testing is conducted by an independent third-party laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Half of the products tested are selected through a nomination process, and half are chosen randomly from the qualified products list.² EPA, participating ENERGY STAR partners, and stakeholders, such as utilities, may nominate products for testing; EPA reviews and approves the final list of nominations each year. Once the final list is compiled, partners with products selected for testing are informed and the laboratory initiates procurement and testing.

Products tested under the CFL Testing Program undergo the same 11 tests performed for purposes of ENERGY STAR product qualification (see Figure 1), except that products are tested through 40% of their rated lifetimes (for qualification, products are tested for the entire rated lifetime).

Figure 1: Tests Required for ENERGY STAR Qualification and Verification

Light Output	Lifetime Performance	Lamp Operation
Luminous Efficacy	Rapid Cycle Stress Test	Power Factor
Color Rendering Index (CRI)	Interim Life Test	Run-up Time
Correlated Color Temperature (CCT)		Starting Time
1000-Hour Lumen Maintenance		
Lumen Maintenance at 40% of Rated Life		
Initial Elevated Light Output Ratio*		

*Performed on indoor covered reflector products only

Performance is assessed at three stages of testing: 100 hours, 1000 hours, and 40% of rated life. Testing failure can occur at any of these three stages.

If a product fails testing, EPA notifies the tested partner, the OEM, and any other affected private labelers that EPA intends to disqualify the product from the ENERGY STAR program. Affected parties have the opportunity

¹ The CFL Testing Program is currently testing the final round of selected products, and is expected to complete testing on all products by 2014, at which time CFL testing will transition to Agency-recognized certification bodies (CBs).

² <http://www.energystar.gov/products>

to dispute the pending disqualification, in which case EPA conducts a technical review of all information the partner submits before making a final determination on the product's status.

For any CFL that warrants disqualification from the ENERGY STAR Program, EPA requires a corporate certification detailing product control measures undertaken to manage the sale, distribution, and marketing of the disqualified model, such that ENERGY STAR is no longer associated with the product. Products that are disqualified appear on the [Lighting Products Disqualified from the ENERGY STAR Program](#) list on the [ENERGY STAR Program Integrity](#) webpage.

The CFL Market

Early CFL technology had several identifiable performance issues that impeded its adoption in the U.S. residential market. Through the 1980s and 1990s, consumers expressed dissatisfaction with the performance and reliability of CFLs in comparison to incandescent bulbs and were reluctant to introduce the new technology into their homes. Some of the most common issues observed were poor color quality, low light output, delayed starting time and illumination, and early lamp failure.

ENERGY STAR performance requirements for CFLs are designed to address technological issues that can be reasonably controlled and to encourage the production of high-quality, efficient CFLs. These requirements have played a role in fostering innovation and improving the design of and components in CFL bulbs. For example, consumer complaints about early lamp failure and start time delays led to the adoption of new testing requirements, including increased Efficacy (light output), Run-Up Time (time it takes lamps to reach 80% of their full brightness), and Correlated Color Temperature (light color) requirements, which are now consistently met by products going through the ENERGY STAR certification process.

While CFL technology has clearly improved, the performance of CFLs remains susceptible to quality control issues. A number of factors may explain why a product that qualifies initially subsequently fails upon verification. First, there can be a difference in the quality control processes that are used in mass production compared with those applied to the units submitted to the test laboratory for initial qualification. Second, cost considerations may lead manufacturers to substitute cheaper electrical components, which can adversely affect CFL performance. Circumstances such as the rare earth mineral shortage from 2009 to 2011 may drive manufacturers to purchase lower-quality phosphor for their products in order to meet demand, which can negatively affect light appearance. Third, there is the possibility that OEMs are not consistently getting the product components they specify from their suppliers.

To be effectively addressed, quality control issues must be considered within the context of the CFL market structure. In the United States, CFLs are sold under a variety of brand names. These branded products, or private labels, are manufactured by OEM who then sell their products to the brand owners. In some cases, an OEM will sell the product under its own brand name, as well as selling it to other labelers. Other times, a brand owner and an OEM will enter into an exclusive relationship whereby the brand owner will label only

products produced by that OEM. Most commonly, an OEM sells the same model to multiple labelers; each labeler sells the model under its own brand name.

Test Results

From May 1, 2009 through March 31, 2013, the CFL Testing Program tested 334 models that had previously been shown to pass initial testing and qualification requirements to earn the ENERGY STAR label. These models included a variety of CFL product types, including bare spiral, bare specialty, and covered CFLs. Over the 46-month period, 147 products failed one or more tests, while 185 products, or 55%, passed all tests (see Table 1). In all but one instance, these products passed the applicable ENERGY STAR efficacy requirement. Additional detail on the nature of the performance-related failures can be found in the summary reports for each round, located at www.energystar.gov/index.cfm?c=partners.pt_es_integrity.



Bare Spiral or Bare Specialty CFLs



Covered CFLs

Table 1: Summary Performance Results of All CFL Products Tested May 2009 – March 2013**

Year	Products Tested	Passed All Tests	Failures	Passing Rate
2010	61	39	22	64%
2011	129	71	58	55%
2012	111	67	43	60%
2013	33	8	25	24%
Cumulative	334	185	148	55%

** The markedly reduced passing rate for 2013 testing is likely a result of recent changes to the testing program. For 2013 testing, EPA removed the product testing cap that limited a partner's total testing exposure to 3 products per testing

cycle and had somewhat distorted testing exposure among manufacturers. Once the cap was removed, EPA, utilities, and other parties were better able to nominate without constraints products of interest, including those with potential performance concerns, as well as products from sources with limited verification data.

Table 2: Performance Results by Product Type ***

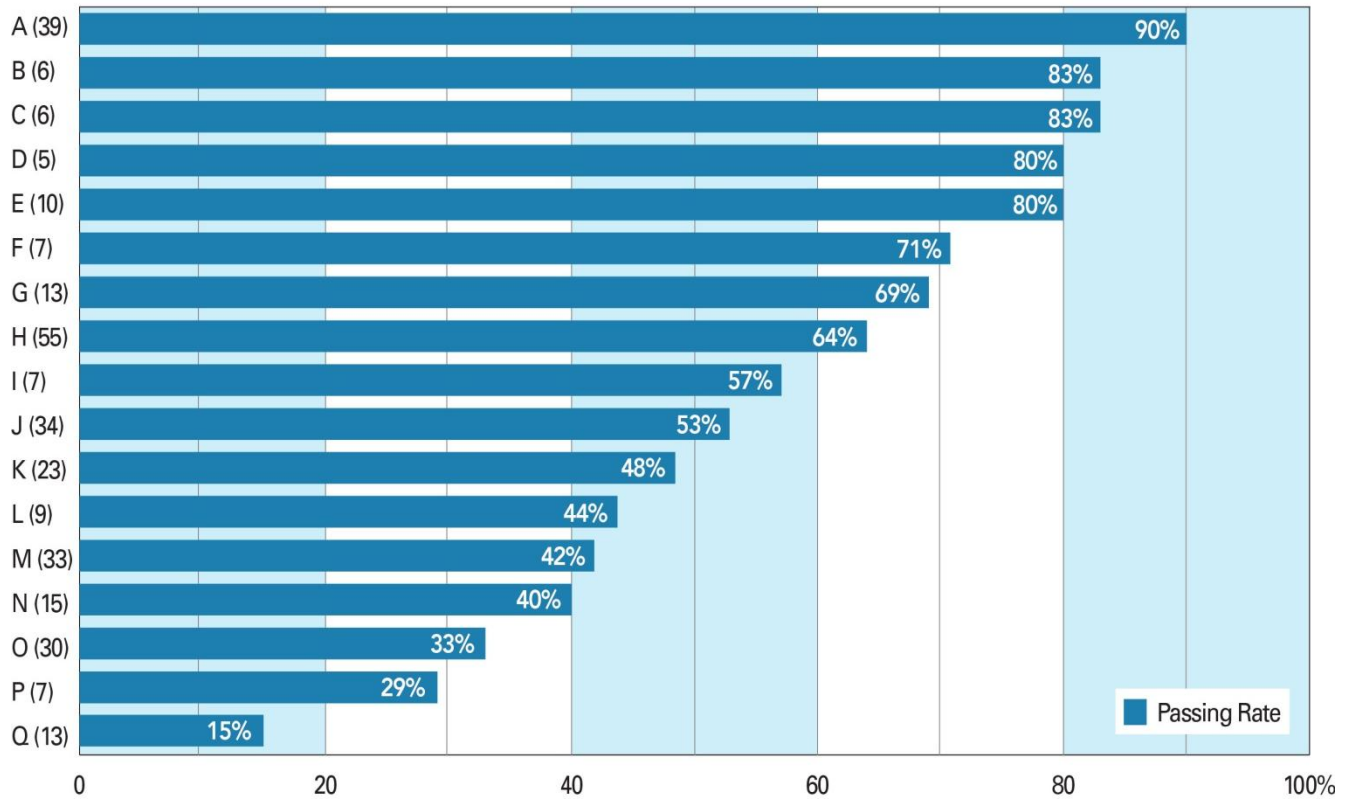
Year	All CFLs	Bare Spiral		Bare Specialty		Covered	
		# Tested	# Passed	# Tested	# Passed	# Tested	# Passed
2010	61	44	31	6	4	11	4
2011	129	73	49	12	8	44	14
2012	111	70	57	4	3	37	7
2013	33	16	5	3	1	14	2
Cumulative	334	203	142	25	16	106	27

*** Tables 1 and 2 do not include marginal failures (a tested unit with one less sample passing a test than required, subsequently re-tested to determine the final qualification status), and therefore are not reflected by the sum of “Passed All Tests” and “Failed” categories.

OEM Performance

The 334 products tested were manufactured by 30 original equipment manufacturers OEMs; 17 of these OEMs had five or more products tested and account for 93% of total tested products. Performance among these OEMs varied, with passing rates ranging from 15% to 90% (see Figure 2 on the following page).

Figure 2: Passing Rates of Original Equipment Manufacturers with ≥ 5 Products Tested



Note: OEM names have been masked for confidentiality. The number of products tested for each OEM is indicated in parentheses.

The number of affected private labelers, or organizations selling products labeled under different brand names using the same OEM model, reflects the impact of a particular OEM's tested products on the qualified products list and is not necessarily indicative of market impact. If a product fails testing, the OEM model and all affected privately labeled models are subject to disqualification. Table 3 shows the number of affected private labelers for OEMs with five or more products tested. Tested products manufactured by these OEMs were linked to 1,620 privately labeled products on the ENERGY STAR qualified products list.

Table 3: Performance of Original Equipment Manufacturers with ≥ 5 Products Tested

OEM Partner	# of Tested Products	# of Affected Private Labelers	# of Products Passed	Passing Rate
A	39	376	35	90%
B	6	11	5	83%
C	6	27	5	83%
D	5	0	4	80%
E	10	79	8	80%
F	7	11	5	71%
G	13	52	9	69%
H	55	461	35	64%
I	7	30	4	57%
J	34	463	18	53%
K	23	89	11	48%
L	9	58	4	44%
M	33	253	14	42%
N	15	105	6	40%
O	30	70	10	33%
P	7	9	2	29%
Q	13	30	2	15%

Improving Quality Control

Significant post-qualification performance variability among CFL OEMs indicates that quality control may be a manufacturer-specific issue. Covered bulbs, in particular, had a lower pass rate (25%) than other CFL products (see Table 2). The testing data summarized in this report demonstrate that consistent production of high-performing products is achievable (for example, OEM A with a pass rate of 90% on 39 tested products), but that a number of OEMs consistently produce products that fail to perform. To remedy this situation, it is

critical that CFL labelers exercise the leverage they have over their suppliers to drive better quality control. EPA is enhancing its compliance efforts to facilitate the necessary improvements.

Compliance Rate Monitoring and Communication

In April 2013, EPA issued each CFL OEM a letter providing an individualized recap of its testing performance in the CFL Testing Program, including the overall pass rate for those tested models. These letters serve to ensure that every CFL OEM that supplies products associated with the ENERGY STAR label is aware of its overall performance against program requirements, and to provide a somewhat standardized basis of comparison for interested parties. EPA encourages utilities, private labelers, and others to seek and consider this type of data to inform market decisions. OEMs will be provided with updated compliance information at the completion of the CFL program testing to reflect overall compliance rates based on testing of approximately 420 products total.

Heightened Quality Assurance Oversight

Going forward, labelers of ENERGY STAR certified CFLs that fail verification testing will be subject to heightened control measures if the OEM of the failed model is among those with poor performance records (i.e., with a failure rate greater than 45%). Specifically, EPA will require labelers of such a failed product to identify all models associated with that OEM. This will allow for enhanced oversight of products from sources with demonstrated quality assurance vulnerabilities and provide greater awareness of the potential scope of a failed product's impact in the marketplace. These labelers will then be required, as part of corrective measures, to establish and submit additional quality control assurances covering all models from that source. These additional assurances are expected to better ensure for labelers that the entire portfolio of products supplied by that OEM will perform as certified.

Increased Source-Based Testing

In selecting CFL products for future verification testing, models from sources with failure rates of greater than 45% (based on 5 or more product tests) will be given greater consideration for testing nominations. In particular, these products will be considered for testing as part of the transition from the CFL Testing Program to ENERGY STAR verification testing conducted by Agency-recognized CBs. In addition, to obtain more information about sources with limited historical testing, EPA will seek additional testing on products from OEMs that have had few products tested in the CFL Testing Program. These testing focuses will provide greater oversight of those OEMs with a demonstrated history of below-average performance and allow EPA to better assess the quality of products from sources with limited verification exposure.

Product Control Measures

EPA will continue its ongoing efforts to minimize the impact of failing CFLs on consumers. For CFLs that warrant disqualification from ENERGY STAR, EPA requires a corporate certification detailing measures undertaken to manage units of the disqualified model in the marketplace. Manufacturers are provided a standard format for submitting product control measures, which they must submit to EPA for approval within 20 days from the time of notification. In all instances of product disqualification, the manufacturer is required

to immediately cease unit labeling and shipment; remove ENERGY STAR references from related marketing materials, spec sheets, and websites; cover or remove labels on units within the manufacturer's control; and notify downstream labelers of this model and retailers and distributors who have purchased the model of the product's status.

Conclusion

The review of four years of testing data from the CFL Testing Program indicates a wide variability of product performance among OEMs and associated products previously certified to meet ENERGY STAR. The wide performance disparity suggests that inadequate quality control may be a primary cause of product failures. The compliance actions outlined here are expected to improve quality control in the production of ENERGY STAR CFLs. Private labelers, retailers, and utilities are encouraged to use this information to make informed market decisions. EPA will continue to examine annual compliance rate data and consider the effectiveness of these, as well as other potential compliance policies, as warranted. More information on CFL verification testing can be found at www.energystar.gov/integrity.