



Solid State Lighting and ENERGY STAR®

Solid State Lighting (SSL) products are currently addressed under two ENERGY STAR performance specifications:

SSL V1.0 focuses on directional lighting and applies to seven lighting fixture applications. It introduces a new testing approach to the residential market that measures the efficiency of the light fixture as a whole. Despite the different testing approach, the efficiency requirements were established to be comparable to those of the existing ENERGY STAR residential light fixture program. Products within these seven lighting applications may qualify for the ENERGY STAR as of September 30th, 2008.

RLF V4.2 applies to non-directional, general illumination residential light fixtures. It maintains the technology neutral requirements of the ENERGY STAR residential light fixture program that have been in place since 1997. This specification creates a level playing field across the general illumination lighting technologies and was recently extended to SSL fixtures based on industry requests to allow SSL fixtures to qualify once a testing procedure had been finalized that allowed these fixtures to be measured in a comparable manner to other fixtures and technologies covered under the specification.

More About Efficiency Testing

- ❑ SSL V1.0 requires the measurement of fixture efficiency using a whole fixture approach (IESNA LM-79). This approach offers the advantage of explicitly addressing optical losses and crediting SSL technology with its more directional nature. Some have expressed concerns that a strong focus on whole fixture efficiency will lead to functional, yet unattractive fixtures from the standpoint of the consumer, as there is significant motivation to meet the specification at the lowest cost which could reasonably mean limiting materials and glass treatment that could interfere with the flow of light from the light source.
- ❑ RLF V4.2 continues to focus on the efficiency of the light source. Similar to the requirements for fluorescent lighting applications, the efficiency of SSL-based fixtures is measured using an LED light engine approach (ASSIST Recommends Vol. 4). This is consistent with current testing approaches in the residential lighting market. Further, this light engine approach explicitly addresses the number one issue limiting LED life: heat. It accounts for both light output losses and color shift resulting from heat.

More About Quality

The quality of the fixtures that earn the ENERGY STAR is important. Key consumer-oriented quality issues that have been addressed in the ENERGY STAR Residential Light Fixture Program include product life, color temperature and light output equivalency to familiar technology. These issues have been identified, researched and incorporated into requirements of the ENERGY STAR Program over its eleven year history.

- ❑ Minimum Light Output: SSL V1.0 dictates light output requirements specific to each of seven applications. RLF V4.2 requires that SSL fixture packaging indicate an incandescent light output equivalency for any fixture with output less than that of a standard 60 watt incandescent bulb.
- ❑ LED Life: SSL V1.0 references IESNA LM-80, a lumen maintenance (life) testing document not yet finalized which may or may not feature an accelerated testing method. RLF V4.2

incorporates elevated temperature testing of the LEDs, extrapolating life to L₇₀ using a functional fit curve based on data collected during the first 6,000 hours of operation.

- ❑ Color Temperature: SSL V1.0 dictates color temperature limits specific to each of the seven applications. RLF V4.2 requires labeling with respect to color temperature, allowing EPA to monitor values for acceptable ranges.

Based on EPA's experience with the nearly 13,000 fixtures currently qualified under the ENERGY STAR residential light fixture program, RLF V4.2 addresses these issues in a manner that strikes an appropriate balance between ensuring product quality and placing additional burdens on SSL technology, relative to the burden on other technologies, prior to actual quality issues arising. However, EPA is committed to thoroughly reviewing each SSL fixture submittal and taking additional steps if quality issues are apparent.

Two Complementary Approaches

A broad range of SSL lighting products are eligible for the ENERGY STAR based on two complementary approaches. Using these requirements for ENERGY STAR in the coming months, paired with careful monitoring of the products that qualify, will allow interested parties to assess a number of questions important to refining the program in the future while also providing sufficient safeguards to protect the ENERGY STAR brand. These questions include:

- ❑ Is the consumer satisfied with the SSL fixtures they are buying?
- ❑ Are manufacturers finding sufficient flexibility to offer energy-efficient decorative light fixtures that consumers also find attractive?
- ❑ Are additional quality requirements necessary for SSL fixtures beyond those for fluorescent or other fixtures to ensure quality residential general illumination fixtures?
- ❑ Are the fixtures providing the expected savings?
- ❑ What is the value of accounting for light loss in the residential lighting market place and for what types of fixtures?

Next Steps

EPA envisions a number of steps over the coming months:

- ❑ First, EPA is seeking comment on the technical amendment to the ENERGY STAR Residential Light Fixture specification which extended ENERGY STAR eligibility to SSL residential general illumination fixtures. EPA sought to offer a technology neutral approach that did not place additional burdens on SSL fixture relative to fixtures employing other technologies. EPA looks forward to comments.
- ❑ Second, EPA will be closely monitoring the SSL fixtures qualified under the ENERGY STAR Program. In particular, EPA will watch for potential tradeoffs between color temperature and efficiency and for uniformity of light distribution. If such issues arise, EPA will address them through a modification process which would include stakeholder comment.
- ❑ Third, after an appropriate period of time (dependent largely on the rate of SSL fixture qualifications) EPA will engage stakeholders as to the issues and successes in the market place, as well as refinements for consideration.

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