

CALiPER

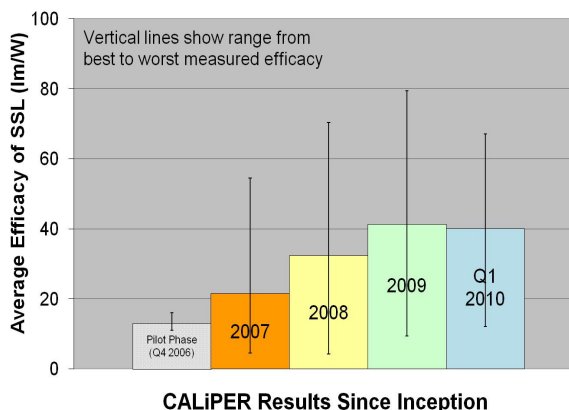
Round 10 Retailer Synopsis

Round 10 CALiPER Summary

The Department of Energy's (DOE) Commercially Available LED Product Evaluation and Reporting (CALiPER) Program has been testing general illumination solid-state lighting (SSL) products since 2006.¹ CALiPER summary reports provide analysis of photometric performance of SSL products, along with discussion of specific factors to consider for different lighting applications. Round 10 of CALiPER testing was conducted from October 2009 to February 2010.² Twenty-eight products were tested following the IESNA LM-79-08 testing method from four product types:

1. Parking Structure Luminaires
2. Outdoor Wallpack Luminaires
3. Cove Lighting Luminaires (Seven SSL cove lights and two benchmark products)
4. Replacement Lamps (Five SSL replacement lamps including MR16 and PAR lamps, an A-lamp, and a 4' linear replacement lamp)

Products tested in Round 10 exhibit a wide range of efficacy, from 12 to 67 lm/W. Where previous rounds of testing all showed increases in average efficacy, Round 10 shows slightly lower average efficacy at 40 lm/W. This drop can be attributed to the cove light products tested in Round 10. Cove lights, on average, have significantly lower efficacies than other product categories. Average efficacy of Round 10 SSL products *excluding* the cove lights gives 48 lm/W, which is an increase compared to earlier rounds (Round 8 average efficacy was 36 lm/W and Round 9 average efficacy was 46 lm/W).



This synopsis will focus on the replacement lamp and cove lighting findings as they are the most relevant to partners in the retail industry.

Replacement Lamps Summary: Four Smaller Lamps

Four small replacement lamps (MR16, PAR30L, PAR38 and A-lamp) that carry the Lighting Facts^{CM} label were tested in Round 10, and all the products met or exceeded the performance levels on their Lighting Facts labels. Three of the four lamps also met equivalency claims. Although Lighting Facts is not an independent verification of product quality, the correct use of the label may provide credibility and greater confidence in manufacturer-reported claims. It is important to note that an LM-79 tested product may still be a poor performer compared to other SSL or benchmark products. It is essential to evaluate LM-79 test results based on quality and reliability criteria.

Two of the small replacement lamps (PAR30L and the A-lamp) tested in Round 10 did not meet ANSI-defined lamp format standards for the lamp styles they are meant to replace, and therefore may not fit or look appropriate in some fixtures. Respecting form factor standards is important for market acceptance, as demonstrated by lessons learned from CFLs.

¹ Summary reports for Rounds 1-9 of DOE SSL testing are available online at <http://www.ssl.energy.gov/caliper.html>.

² The full summary of this report is available online at http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round-10_summary.pdf

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Replacement Lamps Summary: 4-Foot Linear Tubes

Previous CALiPER Rounds 5 and 9 concluded that SSL linear replacement lamps are not yet suitable as one-for-one replacements for linear fluorescent lamps. Test results of SSL linear replacement lamps (compared to the linear replacement lamps they are intended to replace) have shown that the products do not provide the same light output or efficacy levels and have narrower light distribution. Round 10 tested a 4' linear replacement lamp, using both products submitted by the manufacturer and products purchased anonymously. Although the manufacturer-submitted samples performed admirably, the anonymously purchased CALiPER samples did not achieve similar performance levels. Several attempts were made to purchase additional units for testing. In each case, the manufacturer indicated that the product was temporarily out of stock and would not be available for several months. The CALiPER results in this case raise a number of doubts about this product as well as other similar linear replacement lamps:

- The high performance of the sample submitted by the manufacturer may indicate that it was hand-picked to outperform others and is not representative of the average lamps in this product line.
- The relatively poor performance of the purchased sample as compared to the submitted sample may indicate inconsistently produced units of the product.
- The poor performance of the purchased sample may indicate design flaws or quality control issues.
- The perpetual 'out of stock' status of the product may shed doubt on the general reliability of the product and on the longer-term integrity of the product warranty.

As concluded in previous CALiPER tests, the results of Round 10 show that T8 replacement lamps are not appropriate or cost effective as replacements for linear fluorescent lamps.

Cove Lighting Luminaires Summary

Based on Round 10 testing of cove lighting, SSL products do not yet achieve the light output levels and efficacy levels of fluorescent cove lighting used for general lighting purposes. However, the SSL cove light strips do meet the light output levels of decorative cove lighting products, while providing significantly higher efficacy than xenon cove lights. A side-by-side comparison of three versions of one track system (comparing two different styles of AC LED track heads and xenon lamps), revealed that the LED versions of the product produce less light output per track head than the xenon version, but achieve two to four times the efficacy of the xenon version.

Similar to 4-foot linear tubes, this is an application where SSL technology must compete with a high-performing, low-cost incumbent technology (i.e. fluorescent T8 lamps for cove light installations designed for general lighting purposes). With steady technology progress and innovation, SSL cove lights that provide comparable light output to fluorescent coves may be developed in the coming years. But for now, based on the products tested, SSL cove lights provide insufficient light output to be one-for-one replacements for general illumination fluorescent cove lights.

Reliability and Lifetime Warning

Even though Round 10 products were not specifically tested for reliability, the range of behaviors observed and rapid rate of change of SSL technology encouraged DOE to include a warning in this report to stakeholders about being wary of all product life claims. More than half the SSL products subjected to CALiPER long-term testing will not provide 70% of initial light output at 50,000 hours and will exhibit significant color shift throughout the testing process. While some products could not pass a 1000 hour test, others demonstrated the potential for very long product life. In conclusion, retailers need to recognize that lumen depreciation and color shift are a few of many inconsistent behaviors in SSL luminaires and replacement lamps. At this time, there is no single test for SSL product reliability and lifetime that can be used to verify claims. Retailers can and should ask their vendors for a variety of sources that will help to guard against the wildest claims. These include LM-80 test data on the LED chip, 1000-hour lumen depreciation test data, product warranty, and manufacturer and product track records.