



## **CALiPER Program Supports Unbiased Testing, Promotes Consumer Confidence**

Solid-state lighting (SSL) technologies are changing and improving rapidly as a growing stream of new products is introduced to market. Industry groups, standards-setting organizations, and the U.S. Department of Energy (DOE) are moving quickly to develop and implement needed standards and test procedures for SSL products. At the same time, there is a need for reliable, unbiased product performance information in the dynamic early years of a developing market.

DOE's Commercially Available LED Product Evaluation and Reporting (CALiPER) program addresses that need. CALiPER test results guide DOE planning for research and development (R&D), technology demonstration, procurement, and ENERGY STAR® initiatives; convey objective product performance information to the public; and inform the development and refinement of standards and test procedures for SSL products.

Launched in October 2006, CALiPER supports testing of a widely representative array of SSL products available for general illumination, using industry-approved test procedures. Guidelines for selecting products for testing ensure that the overall set of tests delivers insights across a range of lighting applications, product categories, and performance characteristics, a mix of manufacturers and devices, and variations in geometric configurations that may affect testing and performance. In addition, CALiPER testing measures variability across units and establishes benchmarking data with respect to other light source technologies and LED thermal management.

### **Testing Procedures and Methods**

Products selected for the CALiPER program are purchased and sent to qualified independent lighting testing laboratories. All luminaires are tested with both spectroradiometry and goniophotometry, along with temperature measurements (taken at the hottest accessible spots on the luminaire) and off-state power consumption. Standardized procedures are used for the tests, including the LM-79 standard for electrical and photometric measurement of SSL products, issued by the Illuminating Engineering Society of North America (IES) in April 2008.



### **Why CALiPER?**

- Solid-state lighting is different from traditional sources.
- Traditional standards and test procedures are not appropriate for evaluating SSL products.
- New standards and test procedures for evaluating LED-based luminaires (light source and fixture) are now available.
- CALiPER results help industry develop and implement a new way of testing.
- CALiPER results support DOE planning.
- Credible performance information is needed to avoid early buyer dissatisfaction and delay of market development.

Manufacturers of tested products are given the opportunity to comment on test results prior to report completion. Testing results, summaries, and analysis are then distributed via the DOE SSL Web site.

- **Detailed Test Reports** are distributed in the public interest for noncommercial, educational purposes only.
- **Summary Reports** provide detailed analysis of the test results for all products included in each round of testing.
- **Benchmark Reports** help users better compare LED products with conventional lighting technologies.

## Results

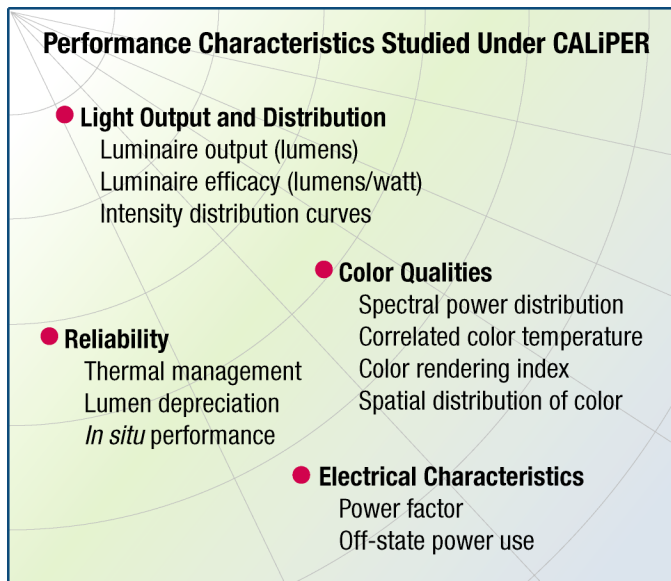
CALiPER testing to date has revealed a wide range of performance, from poor to excellent. Some SSL products tested deliver light output and efficacies that equal or exceed comparable incandescent and CFL products. Others perform poorly and do not produce enough light output for their intended application to be considered a suitable replacement for any similar product in use today.

The great divergence in applications and performance characteristics highlights the need for buyers to consider the performance of each product separately and to require clear and accurate luminaire performance information from manufacturers. While some manufacturers are publishing credible values for luminaire output and efficacy, there is often wide disparity between performance claims in marketing literature and actual tested luminaire performance. The need for reliable standards, credible testing, and accurate information—both for manufacturers and the public—is clear.

## Next Steps

Ongoing CALiPER testing shows notable improvement in each round of testing, underscoring the significant potential of SSL and the rapid pace of technology advances. Luminaire manufacturers continue to integrate improvements in component efficiencies and new LED chips, which lead to improvements in overall luminaire efficacy and color quality.

Analysis of CALiPER test results and feedback from lighting manufacturers, efficiency programs, and utilities guide DOE planning for the CALiPER program as well as GATEWAY demonstrations and SSL R&D priorities. DOE hosts periodic CALiPER Roundtables to solicit input on test results and procedures and additional testing needs for SSL. DOE has also established a guidance committee—including representatives from energy efficiency programs, utilities, the lighting design community, and key trade groups—to guide CALiPER program improvements and serve as a direct communications channel with stakeholders. To learn more about the CALiPER program and guidance committee, or to download the Roundtable report, see [www.ssl.energy.gov/about\\_caliper.html](http://www.ssl.energy.gov/about_caliper.html).




---

For more information on CALiPER, see [www.ssl.energy.gov/caliper.html](http://www.ssl.energy.gov/caliper.html) or email [calipersupport@pnl.gov](mailto:calipersupport@pnl.gov).

EERE Information Center  
1-877-EERE-INF (1-877-337-3463)  
[www.eere.energy.gov](http://www.eere.energy.gov)

June 2009

 Printed with soy ink on recycled paper