



illuminating the *challenges*

Solid-State Lighting Portfolio Planning Workshop Summary

In November 2003, the U.S. Department of Energy held a two-day workshop with more than 160 solid-state lighting experts to refine its R&D portfolio. This pivotal technology promises to fundamentally alter lighting in the future, saving a significant amount of energy and enhancing the quality of our building environments.



**U.S. Department of Energy
Energy Efficiency
and Renewable Energy**

Realizing the Promise of Solid-State Lighting

Solid-state lighting (SSL) technologies promise to change the way lighting systems—and buildings—are designed and used, while significantly lowering energy use and costs. Breakthroughs in light emitting diode (LED) and organic light emitting diode (OLED) technologies are catalyzing advances in solid-state lighting. SSL sources are already replacing conventional technologies in niche applications such as traffic lights, exit signs, and airplane taxiway edge-lights. Further technology advances will drive the development of white-light sources that will ultimately replace incandescent and fluorescent lamps in general illumination applications.

Major research challenges must be addressed before the full promise of SSL can be realized. In partnership with industry, research and academic organizations, and national laboratories, DOE is accelerating the development of SSL technology. Through a series of ongoing, interactive workshops, DOE and its SSL partners are refining an extensive research plan to ensure that DOE's portfolio is focused on appropriate R&D topics that will improve efficiency and move SSL into the market.

DOE support of SSL R&D is essential. While the projected energy savings are significant, white-light sources represent a high-risk investment that industry is unlikely to fund in the near term. If our nation is to maintain its leadership position in SSL technology development, the U.S. must keep up with other countries' aggressive funding levels. The results from DOE's collaborative, cost-shared projects will ultimately deliver substantial energy savings and position U.S. companies as global leaders in new products, systems, and service markets.

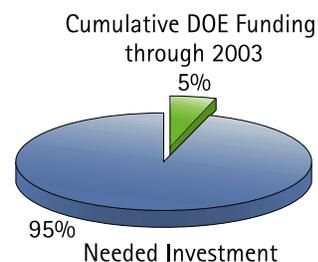
Potential Returns from SSL Technology Investments

Solid-state lighting R&D investments can help secure our nation's energy future and technology leadership. A recent study indicates that if SSL achieves projected price and performance targets anticipated under an accelerated investment scenario, 3.5 quadrillion BTUs of primary energy could be saved by 2025. The potential returns are compelling:

- ▶ By 2025, SSL would displace light sources such as incandescent and fluorescent lamps, decreasing national energy consumption for lighting by 29 percent.
- ▶ Cumulative electricity savings from 2005-2025 would save consumers more than \$125 billion on electric bills.
- ▶ More than forty 1000 MW power plants would be deferred, contributing to a cleaner environment and a more reliable electrical transmission and distribution system.
- ▶ The SSL market revenues in 2025 are projected to be as much as \$10 billion per year nationally.

Shaping Research Priorities

DOE held a Solid-State Lighting Workshop on November 13-14, 2003, to refine and prioritize its SSL R&D activities. More than 160 participants—including scientists and business leaders from industry, universities, research institutions, trade associations, and national laboratories—gathered in Washington, D.C., to participate in this interactive forum.



Current Research Investment

Advances in physics, chemistry, materials science, and engineering, as well as manufacturing and lighting distribution, are essential to achieve the breakthroughs in price and performance needed to accelerate SSL technology into the market. Current DOE R&D investments represent only a small fraction of the needed investment.



Technology Development Targets

To develop full spectrum, energy-efficient, white-light SSL sources for general illumination, DOE invests in research activities that target improvements in six key areas: quantum efficiency, longevity, stability and control, packaging, infrastructure, and cost reduction. Technology advances in these key areas will result in cost-competitive SSL sources that provide better quality light and save energy.

Hosted by DOE's Office of Energy Efficiency and Renewable Energy, this workshop represented the first annual meeting of the Department's newly established program to accelerate SSL technology. Representatives from DOE's Office of Science, the National Science Foundation, the National Institute of Standards and Technology, and the Defense Advanced Research Projects Agency outlined their research programs in SSL and related materials and device technologies. Industry representatives and select associations described their efforts to foster SSL technology development and meet some of the key challenges ahead. Successful commercialization of SSL technology will require coordinated efforts that leverage the strengths and capabilities of industry, research and academic organizations, national laboratories, and government.

DOE announced its aggressive goal for SSL R&D: by 2015, develop advanced SSL technologies that, compared to conventional lighting technologies, are much more energy efficient, longer lasting, and cost competitive by targeting a product system efficiency of 50 percent with lighting that accurately reproduces sunlight spectrum.

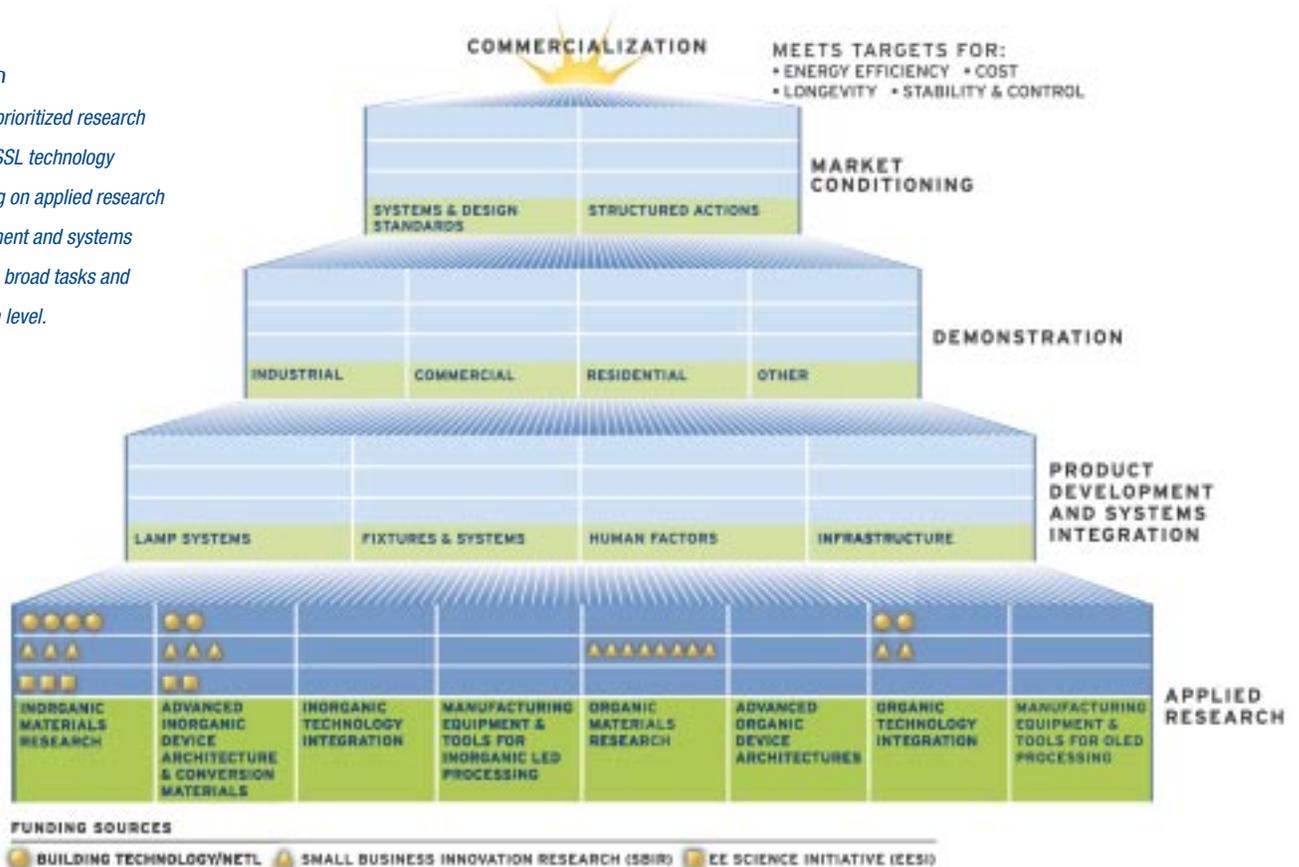
In the November workshop, participants reviewed more than 40 proposed R&D tasks and sub-tasks related to applied research, and product development and systems integration challenges. After clarifying the language and modifying the subtasks, participants then ranked them as low-, medium-, or high-priority.

Workshop participants voted to focus in the near-term on materials research and device architecture for both LEDs and OLEDs. Product development and systems integration were also identified as a priority for LEDs. Workshop results are available in the SSL Workshop Report at www.netl.doe.gov/ssl.

The output from the workshop will form the basis for future DOE solicitations. The tasks ranked "high-priority" provide DOE with a substantial list of specific technology topics for its solicitations. However only a small subset of these recommended research areas can be included in the upcoming solicitations due to funding constraints. Current SSL projects are concentrated in the applied research area, but DOE envisions an evolution of priorities and projects over time, as research overcomes the technical challenges.

SSL Research Plan

DOE and its partners prioritized research activities to advance SSL technology development, focusing on applied research and product development and systems integration, as well as broad tasks and sub-tasks within each level.



To obtain a copy of the Solid-State Lighting Workshop Report, or to learn more about DOE's SSL R&D portfolio and funding opportunities, visit www.netl.doe.gov/ssl.



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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
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www.eere.energy.gov/buildings

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Bringing you a prosperous future
where energy is clean, abundant,
reliable, and affordable