

Energy Savings Estimates of Light-Emitting Diodes in Niche Lighting Applications

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This DOE report presents analysis findings for twelve different markets where light-emitting diodes (LEDs), a type of solid-state lighting (SSL), are competing or are poised to compete with traditional light sources (e.g., incandescent and fluorescent). The twelve markets don't include every application where LEDs are making progress in the marketplace, but were selected to reflect emerging trends and potential for LED growth. Estimates of the energy saved due to current levels of LED market penetration, as well as estimates of potential energy savings if these markets switched completely to top-performing LEDs "overnight," are given. In addition, non-energy saving benefits of LEDs in each market are discussed.

The markets analyzed in this report are classified into three groups: general illumination applications, outdoor lighting, and consumer electronic displays. For general illumination applications, four markets were analyzed: PAR, BR, and R-shaped; MR16; 2-foot by 2-foot troffer fixtures; and general service A-type. For outdoor lighting, four markets were analyzed: roadway, parking, area and flood, and residential. DOE also analyzed four applications for consumer electronic displays: televisions, laptops, monitors, and mobile handsets.

- Annual energy savings from solid-state lighting in 2010 from the twelve markets analyzed was approximately 3.9 terawatt-hours, equivalent to the electricity needed to power more than a quarter-million average U.S. households. Forty-one percent of this savings was due to the use of LEDs for parking lot and garage lighting.
- Annual energy savings from solid-state lighting in the twelve markets analyzed could approach 263 terawatt-hours if all twelve markets switched to LEDs "overnight." Energy savings of this size would be the same as taking more than 21 million households off the grid. This estimate is based on 2010 performance levels and would be 399 terawatt-hours—the energy required to power nearly 32 million households—if LED replacements within each market improve according to DOE's predictions for 2020.
- In the outdoor applications alone, LEDs saved a total of 2.2 terawatt-hours of electricity in 2010, and it was estimated that the annual savings would be 131 terawatt-hours (based on 2010 performance levels) if all lighting within this sector was replaced with LEDs.
- Additional benefits of LEDs include long operating life, durability, directionality, compact size, ease of control and dimmability, cold temperature resilience, and high-quality light.

Solid-state lighting offers a new and revolutionary lighting technology with the potential to save energy and improve quality, performance, and service. DOE has developed a comprehensive strategy to accelerate the development and market introduction of solid-state lighting for general illumination. To learn more, visit www.ssl.energy.gov.