

July 23, 2015

## Far Beyond the Bulb: New Frontiers of SSL Energy Savings

Suppose you could wave the proverbial magic wand and convert all U.S. lighting to today's most efficacious SSL products overnight. How great would the energy savings be? That's the scenario at the heart of the newly published [Adoption of Light-Emitting Diodes in Common Lighting Applications](#), which is the fifth such study released by DOE since 2003 and provides an update to the 2013 analysis.

While the scenario may be fictional, the report reveals a wealth of practical insights into promising pathways for SSL technology R&D. Most notably, it puts the spotlight on two commercial and industrial applications — linear and low-bay/high-bay — that hold, far and away, the greatest potential for future energy savings from SSL.

The report investigates the current adoption and resulting energy savings of LEDs in 10 common white-light applications, including A-type, decorative, directional, small directional (MR16), linear fixtures, low-bay/high-bay, parking lot, parking garage, area/roadway, and building exterior. It estimates the energy saved due to current levels of LED penetration as of 2014, as well as the potential energy savings if each of these applications switched completely, "overnight," to the best available LEDs.

Here are few highlights on where SSL lighting stands today:

- **While adoption growth rates have been very impressive in the last two years, SSL market shares remain modest.** From 2012 to 2014, LED installations increased in all applications, more than quadrupling to 215 million units overall. Market penetration climbed to 3% overall, versus less than 1% in 2012.
- **Small directional LEDs remain the market share leader.** This category saw continued growth, with market share more than doubling from 10% in 2012 to 22% in 2014, the highest of any LED product. Growth rates are expected to slow in the coming years.
- **Outdoor LED applications enjoyed a 10% share of the 2014 market.** In contrast, LEDs earned only a 2.8% share across indoor applications. In

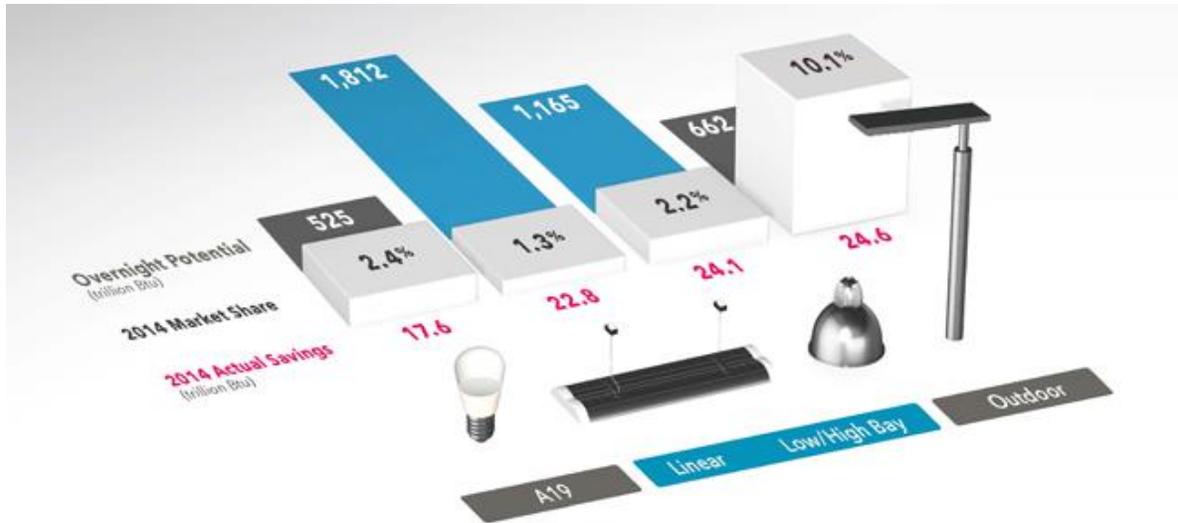
terms of units, however, indoor lighting represents a significantly larger market than outdoor lighting.

- **LED cumulative installations were predominantly in indoor (88%) versus outdoor (8%) and other (4%) applications.** Total installations were led by A-type lamps (36% of units installed) and directional lamps and luminaires (31% of units installed).
- **LEDs made inroads in important commercial and industrial lighting markets.** Thanks to recent performance gains, LED products have begun to compete successfully against lower-priced incumbents, attaining a 1.3% share in linear fixtures and a 2.2% share in low-bay/high-bay applications.

All told, LED installations saved 143 trillion British thermal units (tBtu) of source energy in 2014, equivalent to about \$1.4 billion in annual savings. Impressive, yes — but remember that magic wand? In an ideal scenario, the report calculates an overnight potential for all LED products of 4,896 tBtu. So we are only about 3% of the way to what today's LED products could be saving, leaving aside the much greater efficacy projected for tomorrow's products.

Which niches offer the most promising savings, moving forward? Linear and low-bay/high-bay products, by far. Drilling down on that 4,896 tBtu of overnight potential, those two categories alone account for 2,978 tBtu, more than 60% of the total.

Already, despite their relatively low market share to date, low-bay/high-bay and linear fixtures rank second and third in 2014 energy savings (after directional applications), accounting for 17% and 16% respectively. Energy impacts in these applications are disproportionately high relative to market share, because of the large number of installations and extended operating hours. In contrast to A-type lamps, which are typically used in residences and average less than two hours per day of operation, low-bay/high-bay fixtures, which are used in the commercial and industrial sectors, operate for an average of about 12 hours per day.



Realizing the greatest possible energy savings from LED products will require ongoing technology R&D. Linear LEDs, for example, face tough competition from modern fluorescent lamp and ballast systems in terms of efficacy as well as initial and lifecycle costs. While the best linear LED products now on the market are more than 50% more efficacious than the best linear fluorescents (about 150 lm/W versus about 90/lm/W), many believe these products must climb closer to the 200 lm/W efficacy level to gain market momentum. For low-bay/high-bay products, the main competitive challenge will be to boost lumen outputs, building on recent gains. Progress is also needed in integrating linear and low-bay/high-bay fixtures with lighting control systems, which will enable further energy savings.

Again, these are the challenges on the immediate horizon, if we're going to optimize the energy-saving potential of current technologies. As for tomorrow's technologies, further advances in LED and OLED technologies not only will boost efficacy to new levels, but will also result in entirely new lighting solutions that don't yet have a category —making their overnight potential impossible to calculate.

For more details on the new report, visit the [DOE website](#).

As always, if you have questions or comments, you can reach us at [postings@akoyaonline.com](mailto:postings@akoyaonline.com).