SSL Postings

To counterbalance the growing and often undifferentiated enthusiasm for solid-state lighting, the caution has frequently been sounded – by us and others – that at this stage of the game SSL is far from being a "slam-dunk" for many applications; its use should be dictated by the specific needs of each setting. It should also be noted, however, that SSL has progressed to the point where, increasingly often, the reverse is equally true – that is, in head-to-head comparisons, the incumbent lighting technology is no longer a slam-dunk either. This means not only that solid-state lighting has reached the stage where it deserves serious and careful consideration, but that even in the absence of an impressive payback from energy savings, its use may still be justified for other reasons.

This point is well-illustrated by a report published last week on a U.S. Department of Energy (DOE) GATEWAY demonstration conducted at the Bonneville Power Administration (BPA) headquarters in Portland, OR. GATEWAY demonstrations showcase high-performance LED products for general illumination in a variety of commercial and residential applications. DOE's role is strictly as a facilitator and evaluator, and it's usually the host site that selects the type of LED lighting to be used, sometimes with DOE's input and sometimes not. The BPA project, an example of the latter, involved a retrofit of 32 track lights used to illuminate artwork in the building's lobby. For the demonstration, 12W LED PAR38 lamps replaced 15W and 23W reflectorized CFLs that had been installed in 2001 to save energy over the original 90W halogen PAR38 reflector lamps.

Although both CFLs emitted more light than their LED replacements, the fact is that CFLs are not effective directional light sources; the narrower light distribution of the LED product concentrated the lumens on the artwork better, minimizing the amount that was spread on the surrounding wall. What's more, although the color temperature was comparable for all three lamps (about 2700K), color quality was decidedly better with the LED lamps, whose CRI was 93 compared with 82 for the CFLs. The LED lamps also emitted more light in the long-wavelength red region of the visible spectrum (i.e., between 650-700 nm) than the CFLs, resulting in better rendering of red tones in the architectural finishes and artwork. There was one minor caveat, though: the LED lamps were slightly too narrow for the setting in terms of their beam angle although their distribution was far better in this regard than the CFLs they replaced.

Because of the low electrical rates and the high cost of the LED lamps, their simple payback story was less than compelling. There was no payback at all for the LEDs when compared with the 15W CFLs, and the 9-year payback compared with the 23W CFLs was due in large part to expected maintenance savings resulting from longer LED lamp life (50,000 vs. 8,000 hours for the CFLs). If electrical rates more typical of the country were used, that payback would shrink, but only to the 7- to 8-year range.

But LED lamps in this case were replacing CFLs, so financial payback based on energy savings was not a main driver for the demonstration. The big take-away from this project was that the performance of the LED lamps was so much better than the CFLs, whose soft, wide pools of light were felt to diminish the drama and visibility of the art on display. The LED lamps raised the visibility of the lobby's historical photos and posters and improved their appearance, while still saving energy over the incumbent CFLs. In short, BPA wasn't looking for a quick energy payback, but instead for better light quality and control – and the LED lamps provided that.

However, it's important to note several things. One is that even though the payback for the LED lamps wasn't compelling, they still saved energy – by 20 percent compared with the 15W CFLs and by 48 percent compared with the 23W CFLs. While not significant monetarily because of the low electrical rates, that's still important – and speaks directly to the core goal of DOE's solid-state lighting program. Another note is that the CFLs replaced the original halogen lamps back in 2001 to save energy, despite falling short in terms of light quality and distribution. The success of the present demonstration shows that, going forward, such tradeoffs won't have to be made since there's now a viable alternative.

The BPA demonstration offers another example of how SSL is starting to find use in high-end lighting applications and how its other advantages – such as long life, optical control, and esthetics – can be as important to end users as its more-publicized energy efficiency. The project adds to the growing library of useful information the GATEWAY program is assembling on a wide range of real-world SSL applications – from bridges, to parking lots, to walkways, to museums, to hotels, to private residences, to grocery-store freezer cases. Nearly 20 GATEWAY demonstrations are currently in the works, in addition to the completed projects whose reports can be found online or will be published soon. Collectively, these reports form a valuable resource for buyers, specifiers, building managers, and others who are considering the use of solid-state lighting – a resource that will continue to build on itself by leading to further investigations into more nuanced areas of a technology that has only just begun to fulfill its potential.

As always, if you have questions or comments, you can reach us at postings@lightingfacts.com.