SSL Postings

DOE offers a number of tools to help buyers make solid-state lighting product purchase decisions. As with any new technology, they face a learning curve with SSL, and part of that curve has to do with equivalency. Ever since Edison's day, we've thought about light sources primarily in terms of their wattage: a 60W bulb emits more light than a 40W bulb, and so on. That's served us well until recently, because generally speaking, with incandescent bulbs, the higher the wattage, the more light produced. But with SSL and other high-efficiency lighting technologies, wattage isn't a reliable indication of light output. That's because wattage refers to the energy consumed, and the idea behind such technologies is to generate the maximum amount of light with the minimum amount of energy. So it's the amount of lumens produced (i.e., the visible light output) that counts, not the wattage; and all of us – not just consumers, but also lighting designers, product specifiers, building managers, and buyers – are learning to think in those terms.

Some SSL manufacturers are including equivalency claims with the packaging of their products. These purport to give the incandescent wattage that's equivalent in light output to that produced by the LED product in question – e.g., "this LED lamp is equivalent to a 60W incandescent bulb." However, DOE's CALiPER testing has demonstrated that such claims are often overstated, with products marketed as replacements for particular lamps (e.g., 50W MR16) often providing light output comparable to much lower-wattage versions (e.g., 20W MR16).

To address this issue, DOE recently published a Fact Sheet,

"Establishing LED Equivalency." It summarizes a number of key performance characteristics to consider when comparing LED products and evaluating their equivalency to conventional lighting technologies. The most obvious one is light output. That is, will the product in question produce the same amount of lumens as the one it claims to replace? But light output isn't the only consideration. There's also the question of light distribution. Just because something looks like an incandescent bulb doesn't mean it will necessarily behave like one and give off light in all directions. Equivalent products should emit similar amounts of light in any given direction – i.e., their luminous intensity distribution should be comparable.

Color quality and appearance, which are typically characterized by correlated color temperature and color rendering index, also come into play. Not only should an equivalent LED product emit light that appears the same color as the conventional light source, but any given object should look the same under the light sources that are being compared.

The shape and size of the bulb also should be considered. No matter how bright and efficient, a replacement lamp is of little value if it doesn't fit into the socket it was purchased for. And it also has to be electrically compatible with the existing system – the transformer, dimmer, and connected load – or it won't perform as intended. Manufacturers should provide compatibility charts for their products.

How long the product will last is another concern. Lifetime is especially tricky to compare, because of the different rating methods used for LEDs and other light sources. Longer lifetimes should be accompanied by longer warranty periods, and the product should continue to perform for the duration of the rated life. And finally, there's the question of cost, and whether the LED product is worth the extra money. In determining this, it's important to consider lifetime costs and not just initial cost, because energy and maintenance savings can often tip the balance in favor of SSL.

These characteristics aren't the only ones to consider when determining equivalency. Depending on the application, there may be others – such as sensitivity to heat in enclosed spaces, dimming capability and behavior, flicker, and power factor. It's also important to remember that no two products are identical in every respect, and that tradeoffs are often necessary, due to inherent differences in technologies.

DOE's Lighting Facts website offers a number of useful tools to facilitate accurate LED lighting product comparisons. One is the Lighting Facts products list, which includes photometric data for registered products (to date, more than 3,700 of them). Another is the Commercial and Residential Product Performance Scales, which facilitate benchmark comparisons between LED lighting products and their traditional counterparts.

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