

New Kid in Town

LEDs revolutionize the market for recessed lighting and control

by [Susan Bloom](#)
Published: April 2012

As an estimated 5-million-piece market valued at nearly \$1 billion in U.S. sales, recessed lighting has been a familiar go-to configuration within millions of professional and residential lighting applications for decades. Once dominated by incandescent lighting, however, the recessed market has changed; light-emitting diodes (LEDs) now deliver a new level of energy efficiency, long life, low maintenance costs, and light and color quality to the recessed lighting market, proving this once-standard setup is anything but.



The Cree CR6 LED downlight is designed for the residential market.

Recessed lighting 101

"Recessed lighting has traditionally been used for a number of lighting techniques, including general illumination to light the entire room or space, wall-washing to open up a room and make the space feel larger by providing light on the wall from floor to ceiling, accent lighting to showcase objects or highlight artwork, and task lighting to highlight countertops or desks," said Cheryl Fabian, portfolio product manager for Cooper Lighting, Peachtree City, Ga. "Recessed lighting provides a clean look by not infringing on the space."

Bonnie Littman, president of New Windsor, N.Y.-based USAI Lighting, agreed that recessed downlighting offers a sophisticated, versatile way to brightly illuminate a room while opening up a space to make it feel larger.

"If used properly," Littman said, "recessed downlighting offers a streamlined and energy-efficient way to illuminate a space to achieve greater visual interest and uniform lighting."

In terms of the configuration itself, "recessed lighting fixtures consist of a housing, which is used to physically secure the fixture in the ceiling, as well as a reflector or trim, which is the visible portion of the fixture responsible for controlling the light distribution," said Chris Hogan, vice president of brand management for Hubbell Lighting's Prescolite brand, Greenville, S.C. "From a lighting design perspective, recessed lighting provides an aesthetically unobtrusive way of providing most any desired lighting effect."

According to Kyle Rogers, product marketing manager for Durham, N.C.-based LED manufacturer Cree Inc., incandescent and halogen light dominated recessed lighting in the past, "but over the last 15–20 years, there's been increasing pressure to make lighting more energy-efficient to help meet ever-tightening energy codes and reduce energy consumption and cost."

While a range of other popular technologies have been used in downlighting applications—e.g., compact fluorescent lamps (CFLs) and high-intensity discharge (HID) sources such as ceramic metal halide—each has its share of drawbacks.

"For instance," Rogers said, "in addition to containing some level of mercury, being slow to start up, and experiencing some deficiencies and inconsistencies in color quality, CFLs and others have been notoriously difficult to control with dimmers, occupancy detectors and other energy management solutions." These factors have limited the viability of these sources in recessed lighting applications.



Cooper Halo downlight in Bidwell Mansion Visitor Center, Chico, Calif.

Naomi Miller, senior lighting engineer with the Pacific Northwest National Laboratory (PNNL) in Richland, Wash., concurred that prior lighting technologies had their pros and cons in the recessed lighting arena.

"Halogen is easily dimmed and remains a beloved color through the dimming range," she said. "As a point source, it also offers terrific optical control and is generally inexpensive to purchase. But it's a relatively short-life lamp (2,000–6,000 hours) and isn't very efficient at producing lumens per watt."

At the same time, she said, "metal halide is fairly long-lasting (6,000–20,000 hours), can pack a lot of lumens in a small space, can offer excellent color quality, and delivers high lumens per watt when new. Unfortunately, it dims very poorly, delivers poor color at the low end of its dimming range, has a time delay in restriking after being switched off, and its color and lumen output can degrade fairly rapidly over time."

LEDs to the rescue

"With their directional, compact and intense properties, LEDs are a perfect light source through which to create efficient downlighting products," said Mark Lombardo, vice president and general manager of Zenaro Lighting, Boynton Beach, Fla. "LED downlights can be created in very small to very large diameters, from low to high intensity, and with an unlimited potential for optical beam spreads," he said.

"LEDs definitely offer the benefits of long life; higher lumen per watt efficacy than halogen, most CFL and some metal halide lamps; and better potential dimming than CFL or metal halide. LEDs also have no restrike issues and exhibit fairly consistent color over the dimming range," Miller said.

Ian Austin, marketing manager for the Lighting Science Group (LSG), Satellite Beach, Fla., said LEDs are perfect for recessed applications.

"Their long lifespans help minimize maintenance costs, while their higher efficiency (as much as 80 percent or more) means decreased overhead costs to illuminate a property. Also, the lower ambient temperatures at which LEDs operate result in less load on HVAC systems, which drives additional savings."

Their ease of installation is a plus, as well.

"Existing recessed downlights can be easily retrofitted with LED modules by simply screwing an adapter into the socket and, with the absence of breakable components inherent in solid-state technology, can last up to or in excess of 50,000 hours," Fabian said.

Their energy-efficient nature also speaks for itself.

"When comparing incandescent to LED, for example," she said, "the 65W BR30 provides 620 lumens while a comparable 15W LED source provides 600 lumens, delivering up to 75 percent energy savings, and when compared to a 42W CFL recessed downlight, a higher lumen 25W LED can result in more than 40 percent energy savings with equal lumen output."

On top of the "punch and sparkle" and level of efficiency LEDs deliver, recessed lighting systems can be combined with lighting control solutions to maximize energy-saving potential.

"In general, the average savings of 25–30 percent with more efficient lighting fixtures can be increased to as much as 75–80 percent during peak power usage, depending on the control solution deployed—from daylight harvesting systems to networked lighting to sensors and wireless controls systems—and the application at hand," USAI's Littman said.



Installed LED recessed lighting from Lighting Science Group

LEDs and the LED recessed lighting market faces booming projections, with some industry estimates predicting that 80 percent of the global indoor and outdoor lighting market will be converted to LEDs by 2020.

"The recessed lighting market is a good 3–5 years ahead of many other market segments, so we're continuing to see tremendous growth opportunities for recessed LED lighting now," Cree's Rogers said. "Just imagine being able to tell a business owner that they can install a light source that they won't have to touch again for 10 years or more and that, throughout that entire time, they'll be cutting their power consumption in half or better. That's a pretty powerful message."

A word of caution

According to Hubbell's Hogan, recessed LED sources may not be ideal for some applications.

"High-ceiling-height applications are currently the biggest challenge for LED-based recessed lighting because the output required can't be easily generated from a recessed fixture and still meet necessary thermal restrictions," he said.

"Contractors also need to be aware of the control systems used with LED lighting," LSG's Austin said. "Because LEDs are fully

Maximizing your participation

The experts offered the following tips to help contractors better understand and maximize their participation in the growing market for LED recessed lighting and control:



Prescolite's LF4SQLED LED recessed downlight is part of the company's Squares family of products.

- **Buyer beware:** "These days, LED lighting can be used in almost any recessed lighting application, and there are many high-quality, high-performing products, which are fully compatible with dimmers and controls from the start, making installation and operation simple. But there are a lot of LED products in the market, and all LED lights are not created equal," Cree's Rogers said. He recommends checking the product's packaging or cut sheet to ensure it is dimmable or compatible with controls, and take note of which kinds of dimmers and controls it is designed to work with. Also, evaluate measures such as CRI, CCT, efficacy and lifetime to ensure your customer is getting the best quality light.

- **Quality and compatibility:** PNNL's Miller advised contractors to "be cautious of glare control from recessed LED downlights, appropriateness of the color of the LED light, and dimming compatibility. Don't just buy the cheapest products, as they may deteriorate in color or light output very quickly. Also, always check for compatibility between LED downlights and any dimming devices."

- **Sell the benefits:** "Based on energy savings, a simple payback analysis can typically sell most customers on using LED recessed downlighting," Cooper Lighting's Fabian said. "When compared to incandescent, the payback time can be less than one year, and when compared to compact fluorescent, the payback period could be less than two years, depending on the hours of use and utility rates, but LED technology provides additional benefits such as long life and ease of dimming."

- **Research, review and sample:** According to Zenaro Lighting's Lombardo, "information on LED products is available on many company websites and a careful review of the information provided, including photometric data, is recommended. While many good products are available from reputable manufacturers, there are just as many offered by less well-considered producers. When in doubt, ask to review a sample, and take the time to assess the product in a mock-up situation to get comfortable with its quality and light delivery."

- **Verify products:** "When specifying a solution, contractors should seek a reputable manufacturer that stands behind their products with a strong warranty for extended service, has a long history in a range of lighting functions, and provides users with third-party verifications [such as the DOE's Lighting Facts] to ensure product quality," USAI's Littman said. Fabian noted that Energy Star guidelines also can help users to assess product quality and reliability.

- **Tap industry resources:** Many LED lamp and fixture manufacturers offer lighting centers or online courses where contractors can seek education in LED technology, such as Hubbell's on-site Lighting Solution Center or LSG's website, "where contractors will find educational tools, calculators, lamp specifications, and information on dimmer compatibility," said LSG's Austin. "In addition," said Hubbell's Hogan, "industry organizations, such as ASHRAE, NALMCO, and IES, all offer a wealth of in-person and online education and resources related to LED lighting solutions."



Zenaro Lighting's Soho recessed ceiling luminaire

Along with other industry experts, Cree's Rogers is bullish on the promise that LEDs hold for recessed lighting and other lighting categories.

"Because LED is a digital technology, the possibilities are endless," he said. "We're bearing witness to one of the greatest innovations of our time."

BLOOM is a 20-year veteran of the lighting and electrical products industry. Reach her at susan.bloom.chester@gmail.com.

How would you rate this article (1=Poor, 5=Great)?

