



# Innovator in blue

## ADAPTS LEDs FOR CONSUMERS

*As the government phases out incandescent bulbs, John Edmond is betting mercury concerns will steer people toward HB LEDs.*

**GOODBYE, INCANDESCENT LIGHT BULBS;** hello, CFLs (compact fluorescent lamps). The US Congress last December sent that message by passing an energy bill that phases out traditional incandescent bulbs starting in 2012 and making CFLs the only currently available lighting option for most homes and businesses. The more consumers get to know about CFLs, however, the less they like them. CFLs have wildly varying lifetimes, their light output is in a limited spectrum, and they contain small but measurable amounts of mercury. Seeing the perfect opportunity to insert HB (high-brightness) LEDs into the massive home-, office-, and industrial-lighting market, LED manufacturers are racing to reduce the price of semiconductor lighting and increase both light output and efficiency.

John Edmond, chief technology officer of LED-lighting manufacturer Cree ([www.cree.com](http://www.cree.com)) and one of the pioneers in HB LEDs, sees the challenge confronting the HB-LED industry: “Lumens per watt per dollar summarizes the challenge on a macroscale,” he says. As chief technology officer of Cree, though, he directs development on a microscale and must figure out the best approach to increasing light output, measured in lumens, while consuming less power, measured in watts, and reducing the cost of the end product to compete with incandescent and fluorescent technologies.

Edmond has worked to create and refine blue LEDs—the engines behind HB LEDs—for his entire career. He started Cree with five other founders while fresh out of the doctoral program at North Carolina State University, and, other than a stint as a paper boy, it’s been his only job.

White light comprises a continual spectrum between infrared and ultraviolet light. Combining a blue LED with a yellow phosphor yields a cool-white light. Consumers usually prefer a warm-white light, however, and LED manufacturers until recently added red phosphors to get

the warm light popular in home lighting.

Red phosphors are inefficient light sources, however, because they decrease the overall lumens per watt of HB LEDs, resulting in a light efficiency of only about 70 lm/W. Cree is betting that a more efficient approach is to add a red LED to the blue-LED/yellow-phosphor combination because red LEDs are more efficient than red phosphor. This technique can increase the HB LED’s efficiency to 100 lm/W.



Edmond also sees room for improvement in HB-LED-packaging designs, which can contribute light losses of 5 to 10%.

Edmond is pragmatic about consumer acceptance of LED lighting: “Consumers don’t care whether their lighting technology is LED, CFL, or incandescent. Their No. 1 concern is about cost, and [the second concern is] whether it’s environ-

mentally friendly,” he says. “CFLs are catching on after they’ve been around for a long time—first because the cost came down and second because people are becoming more conscious about the fossil fuels being used [due to the inefficiency of] incandescents.” Edmond sees the trace amounts of mercury in CFLs as a real deal-breaker for consumers. “People are not going to want mercury in their home. If you break a CFL right now, there’s really no good way to clean it up; you’ve just put mercury vapor into your home. The question becomes: What will the consumer pay to not have mercury in their lights at half the power consumption of a CFL and a lifetime of 25 years?”

Edmond points out that Cree’s LLF (LED-lighting-fixtures) division, which developed the intellectual property behind the LED/red-phosphor replacement, currently sells the technology in a down, or recessed, light for about \$100—too expensive for the consumer market in which CFLs sell for less than \$2. Edmond hedges on what the exact price of HB-LED lights

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will be in five years but says \$10 might be a realistic price. How good is his crystal ball? “I’ll probably be murdered by our marketing people,” he says. But he sees \$10 as the approximate price that volume production can push LED pricing to—and where it has to go for HB LEDs to become major players in the consumer-lighting market.

—Margery Conner