

“...no other lighting technology offers as much potential to save energy and enhance the quality of our building environments, contributing to our nation’s energy and climate change solutions.”

Energy Efficiency and Renewable Energy Section  
U.S. Department of Energy



### **The Light Emitting Diode...LED**

Basically, LEDs are tiny light bulbs, or semiconductor diodes, that fit easily into an electrical circuit. But unlike ordinary incandescent lamps, they do not have a filament that burns out or gets hot. The diodes emit light when partnered with an electrical current and are illuminated solely by the movement of electrons in the semiconductor material.

The LED is called solid state lighting or “SSL” because light is emitted from a solid object, the semiconductor diode, instead of a vacuum or gas tube (like an incandescent, fluorescent or HID lamp). The diode itself is a two-terminal crystalline and when an electrical current passes through it, the recombination of positive and negative charges results in the emission of visible light.

Less than one millimeter square, individual LEDs are clustered on a circuit board to create an array, which is then incorporated into a light fixture.

### **LED Evolution**

Back in the 1960s, LEDs were introduced as red and green indicator lights on digital clocks, handheld calculators and household appliances. By the early 1990s, researchers discovered they could fabricate a blue LED. Once the blue LED was on the map, scientists figured out that by introducing phosphors to the blue LED, they could produce a brighter, whiter light.

These phosphors, however, create heat, which is not associated with the LED itself. Solutions for heat management are critical in the design of long-lasting “white” LEDs.

Since discovering the blue LED, manufacturers have worked to produce a warmer LED light. . . because a warm white color temperature creates a familiar home-like environment. Today LED warm whites are now above 90 on the CRI (Color Rendering Index) scale; incandescent lamps have a CRI of 100, the industry standard for a perfect score.

### **Higher Color Rendering Indexes (CRI)**

Higher Color Rendering Indexes, CRI, have led to the acceptance in residential and commercial lighting applications. Higher CRIs mean true color rendition. Generally acceptable CRI values should be between 80 and 100. Color output can be controlled in 2 ways, by phosphor coating the LED chip or by color mixing of LEDs in a array of chips. Nora Lighting offers both types, our Platinum Series uses Osram® phosphor coated LEDs while our Diamond Series uses the patented Cree® coloring mixing method.

### **Longer Performance Life**

LEDs have a rated life based on the time it takes for the light output to decrease to 70% of the original output, which is typically about 50,000 hours or 17 years of normal use. A typical incandescent fixture will need to be re-lamped 10 or more times during the life of an LED fixture.

As LED chips increase in lumens and efficacy, the lighting industry is focused on producing better performing products. With higher lumen-per-watt LEDs being introduced everyday, the future for LEDs is bright.

Within the next decade LEDs are expected to be the dominant light source...a clean and green alternative for homes, cities and business.



The lighting industry has rarely seen a more compelling dynamic than the nationwide effort to go green with LEDs. Municipalities, airports and civic centers are converting entire public area lighting systems. Cost-conscious institutional and commercial facilities can not retrofit fast enough. And architects and home builders want the coveted LED (and LEED) green designations for the marketing edge.