



NEVADA SURE BET PROGRAM

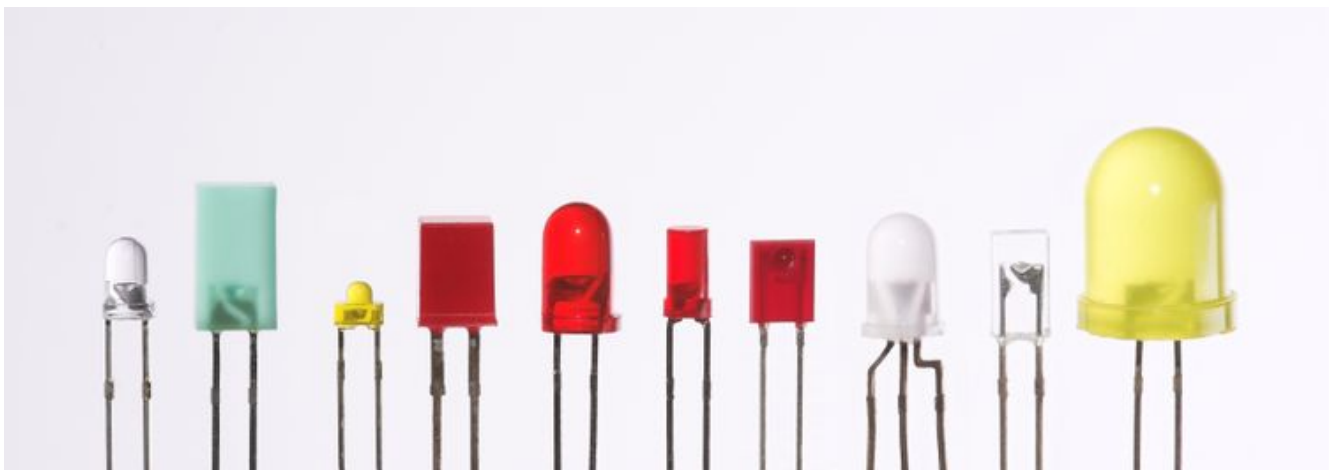
Sierra Pacific Power Company and Nevada Power Company

LED – The future of lighting technology?

Have you noticed the bright, new eye-grabbing marquee signs and billboards that are now popping up along the road? How about the traffic signals and auto tail lights that are made up of clusters of small lamps grouped together? If not, take a look the next time you drive around town.

These are all examples of **LED lighting**. LED is a relatively newly commercialized source of highly efficient solid-state lighting. Although the technology has been around for many years, until recently LEDs were only used in electronic devices due to color and cost limitations. LED lighting is now exploding onto the market place with applications that meet almost any lighting need.

There are many reasons LED is becoming so popular: it is durable, reliable and it has a very long life, especially compared to the incandescent or halogen lamps that it often replaces. But one of the best reasons to consider LED lighting is that it is more efficient. It uses less power and therefore costs less to operate and it puts out less heat than traditional light sources.



Technology

LED stands for Light-Emitting Diode. The LED is a semi-conductor material that gives off light when electrical current is passed through it. Different color LEDs result from the use of different semi-conductor materials. Although the light output of a given LED can vary somewhat depending on its size, voltage and color, higher light output is often achieved by the use of multiple lamps in a fixture. LED lamps are typically accompanied by a diffuser or lens to distribute the light from the pinhead-sized LED source. Current LED lamps put out about 40-60 lumens per watt. This makes them more efficient than incandescent, quartz, halogen, and most neon and low-wattage fluorescent lamps but still less efficient than higher wattage fluorescent lamps, or HID sources like metal halide or high pressure sodium. In lab tests, researchers have produced LEDs with light output ranging from 130-150 lumens per watt, technology that could make LED the most efficient lighting source available of any size. Rapid advances in the availability of very high efficiency LED lighting are expected in the next few years.

Economics

Currently, the single shortcoming of many LED lamp types is likely the initial cost. Lamps, and particularly higher-intensity lamps that are made up of a number of LED modules, can cost several times more than the cost of the incandescent or other types of lamps they replace. However, LED lamps will also last several times longer than incandescent lamps. Thus, when reduced replacement costs as well as the energy savings are considered, the payback period is often quite attractive.

Common Applications

Some of the most common and cost-effective applications and examples of their use are described below:

EXIT SIGNS – LED exit signs use about 3 watts as compared to 10-15 watts for fluorescent or 20-30 watts for an older incandescent sign. The LED sign uses about one-tenth the electricity of the incandescent sign. An incandescent sign costs more than \$26 to operate per year versus \$2.68 for the LED sign. At a cost of \$20 to \$50 the LED signs often payback in one to three years.

TRAFFIC SIGNALS – The incandescent lamp in a typical traffic signal is 130-150 watts. An LED traffic signal uses about 30 watts. Although the savings of a given lamp depend on the cycle time, Clark County installed nearly 9,000 lamps in 2005-2006 and

saved about 400 peak kW and 3.6 million kWh, for an average of 45 watts and 400 kWh (about \$40) per lamp per year. The signals cost \$50-90 per lamp. Municipalities find that these LEDs often pay for themselves in reduced electric costs and reduced replacement costs within a year.

MARQUEE SIGNS – In Nevada, we are all familiar with the spectacular marquee signs in front of gaming establishments. In recent years, numerous signs have been upgraded to LED signs, cutting the wattage by 70-90 percent and saving tens of thousands of dollars per year in lower energy bills and reduced lamp replacement costs.



“ROPE” and NEON LIGHTING REPLACEMENT – Architectural features or decorative lighting often use neon-tube lighting, incandescent lamps or “rope” lights consisting of a chain of tiny incandescent lamps. These older systems can draw up to 35 watts per foot. Linear LED modules are now available with power requirements at 10-15 watts per foot.

SPOT and FLOOD LIGHTS - A common light fixture in retail establishments and public areas is the MR11 or MR16 mini-spot. These range in wattage from 25-50 watts and are popular because they impart “sparkle”. LED versions of these lamps are now available that produce equivalent light output and quality. These have been installed at the Clark County Natural History Museum.

Detailed information on available products for given applications and their costs can be accessed through a web search on “LED Lighting”. More detailed technical information and research reports on specific applications can be accessed at www.LRC.RPI.edu.