# SOLID STATE LIGHTING PROJECT

## About the Project

The Science and Technology Council has identified a need for an unbiase
lighting (SSL) technologies, which includes LED emitters, for motion pi
have been identified regarding its ability to supplement and integrate wi
such as tungsten, fluorescent, HMI, and Xenon that are currently used i
pictures. The primary purpose of this investigation is to provide the indu
evaluate the impact of using SSL, as well as to provide a framework for th
emitting technologies as they are developed. The Council's efforts have l
motion picture industry with accurate and previously unpublished radior
measurements (e.g., spectral power distribution, radiant flux, luminous f
light sources currently in use.

## How Long has the Academy Been Concerned with Lighting?

Since the Academy's inception. The first technical report ever published
invention – incandescent lighting. "Academy Reports - No. 1 - Incandesc
written one year after the founding of the Academy. This 80-page report
incandescent lighting in motion pictures. It is a rigorous study encompas
including the contemporary economic advantages over alternatives such



## Project Objectives

### The Solid State Lighting Project deliverables include:

- Radiometric and photometric measurements of emitter technolog
- Comparisons between solid state emitters' radiometric and photo radiometric and photometric measurements typical of existing ligl
- Comparisons of solid state light sources and existing light sources for the evolving lighting technologies' integration with existing ligl technologies
- Develop a reporting framework for consistent comparisons betwe

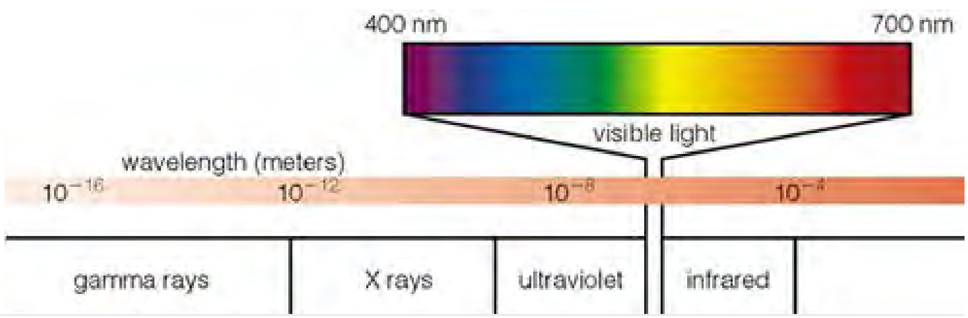
### Parameters assessed:

Many of the parameters provided by the manufacturers for solid state lig
independently verified. The fixtures will be measured to provide the foll
picture industry:

- The technology currently in use (e.g., high power LEDs, tricolor L
  technology)
- Intended use (e.g., flood, fill, spot)
- Light output (radiant flux, luminous flux)
- Power consumed (watts)
- Available electronic adjustments (e.g., color temperature)
- Spectral power distribution

### Solid State Lighting Assessment Technical Information

Visible light is a form of electromagnetic energy, part of a spectrum that
ultraviolet and infrared. Visible radiation is commonly called "light", and
wavelength, which is expressed in nanometers. One nanometer is one bil
ten-billionths of an inch. The relationship of light to other forms of ener
eye can only see a part of this energy spectrum – a very narrow band of w
780 nm. The hue we see as blue lies below 480 nm, green between appro
between 560 and 590 nm, orange between 590 and 630 nm, and red appe



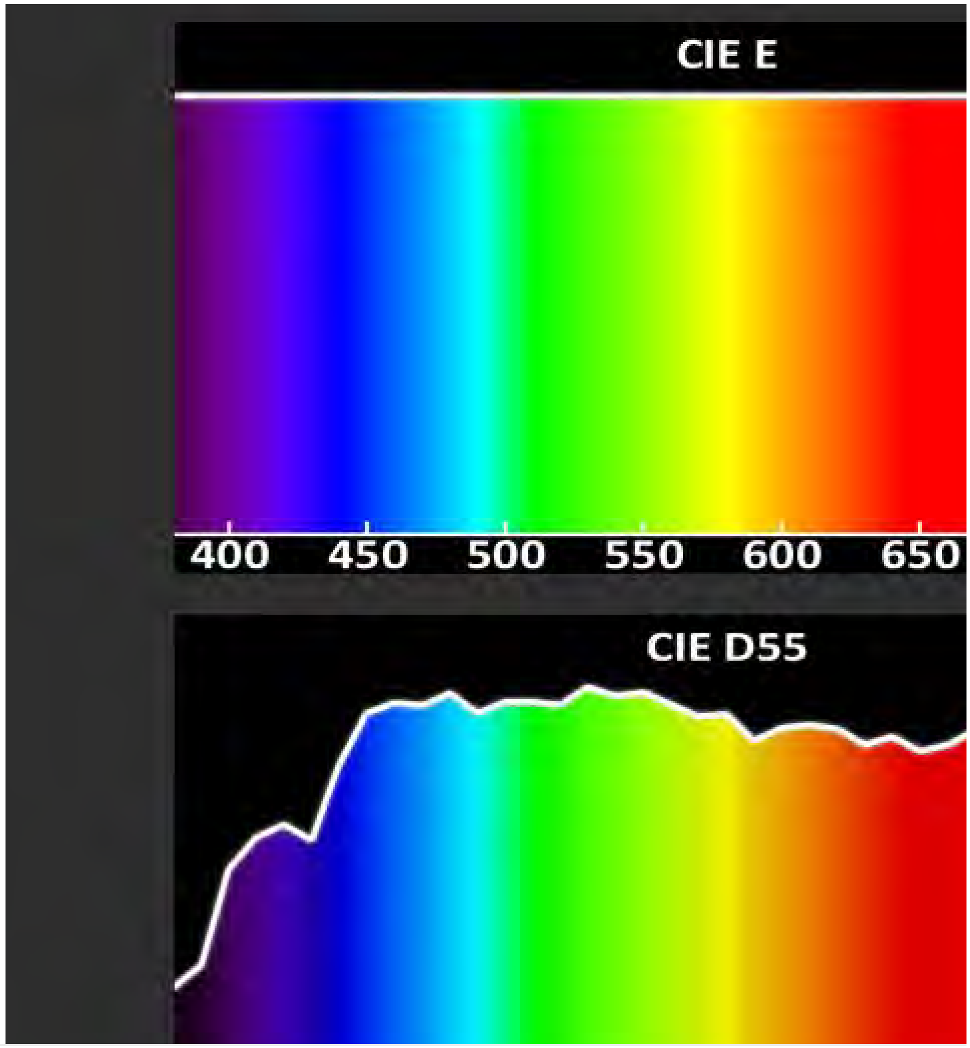



Sources of light such as the sun, florescent lamps, tungsten-filament ligh
composed of a combination of visible wavelengths. A curve showing the
wavelengths emitted by a light source is known as its "spectral power dis
physical objects are directly affected by the spectral power distribution c
And more importantly for motion picture production, the hues seen by f
picture cameras are also directly affected by the illuminant's spectral pov
different ways than the human eye.

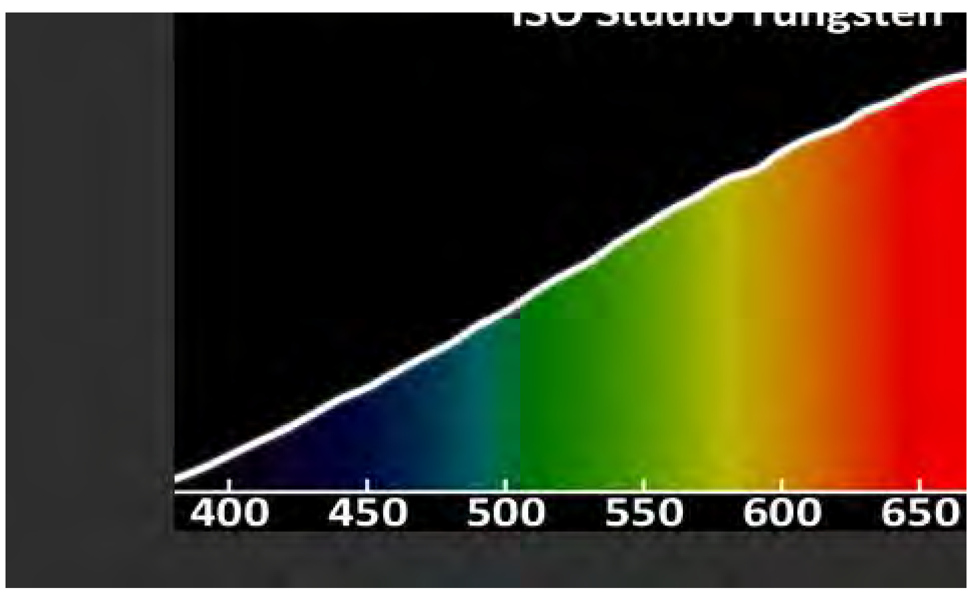
### Standard Illuminant Curves

The curves shown below are the spectral power distributions for three c
basis for comparison with actual lighting instruments. They are standard
International Commission on Illumination (CIE) or the International St
first curve – labeled "CIE E" – represents a theoretical source that has e
second curve – labeled "CIE D55" – represents mid-morning or mid-afte

color temperature of approximately 5500 degrees Kelvin. The third curv
represents the light emitted by tungsten filament light bulbs.



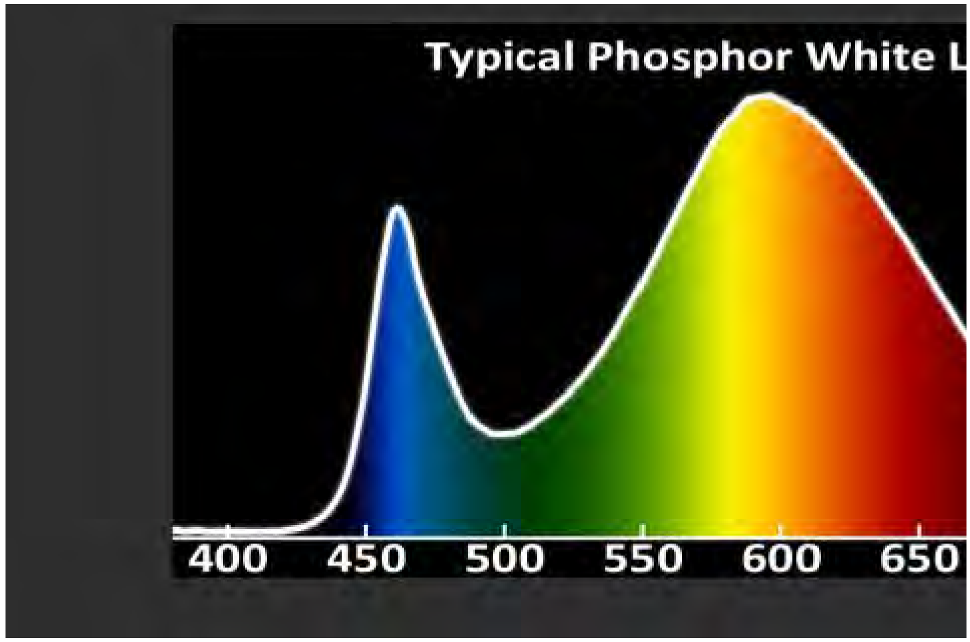


## Sample of Typical Lighting Instruments

The following curves represent typical LED lighting instruments curren
instrument curves are very different than the references curves, and ther
illuminated by them are noticeably different relative to the reference cur

The lighting instrument represented below is constructed from what ap
LED, but in fact it emits a narrow band of blue light that excites a broad
from the yellow phosphor is combined with the blue emission, the result




A similar approach to producing visible white light is the "blended phosp
phosphors with the blue emitter to create a curve that is more like Studi

Another type of instrument uses multiple LEDs that each emit light at d

A variation of the multi-emitter technique uses additional LEDs that em

## The Visible Effect of Sample Lighting Instruments



gray shades. The charts below are called "split Macbeth charts" because ‹
effects of two light sources – studio tungsten in the top half of the patch,
the bottom half. Each chart below corresponds to the light sources descı
distributions above. Although your computer display is not likely to be a
wide variations in color patch hue caused by different illuminant spectra
readily apparent.



Presented by the Academy's Science and Technology Council
Hosted by Science and Technology Council member Daryn Okada

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