Overview of Fitted Target Efficacy (FTE) for Outdoor Pole-Mounted Area and Roadway Luminaires
US Department of Energy, ENERGY STAR for SSL Luminaires
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DOE developed a new metric, Fitted Target Efficacy (FTE), to quantify outdoor pole-mounted luminaire performance for ENERGY STAR qualification purposes. Other existing project-independent metrics do not adequately measure the efficacy with which outdoor pole-mounted luminaires will deliver light to intended target areas.

Two key assumptions underlie the FTE metric. First, relatively rectangular distribution patterns cover most areas more efficiently (with less unnecessary overlap) than rounded distributions (see **Figure 1** below). Second, a luminaire's approximate area of coverage can be defined as the area illuminated to IES-recommended uniformity ratios.

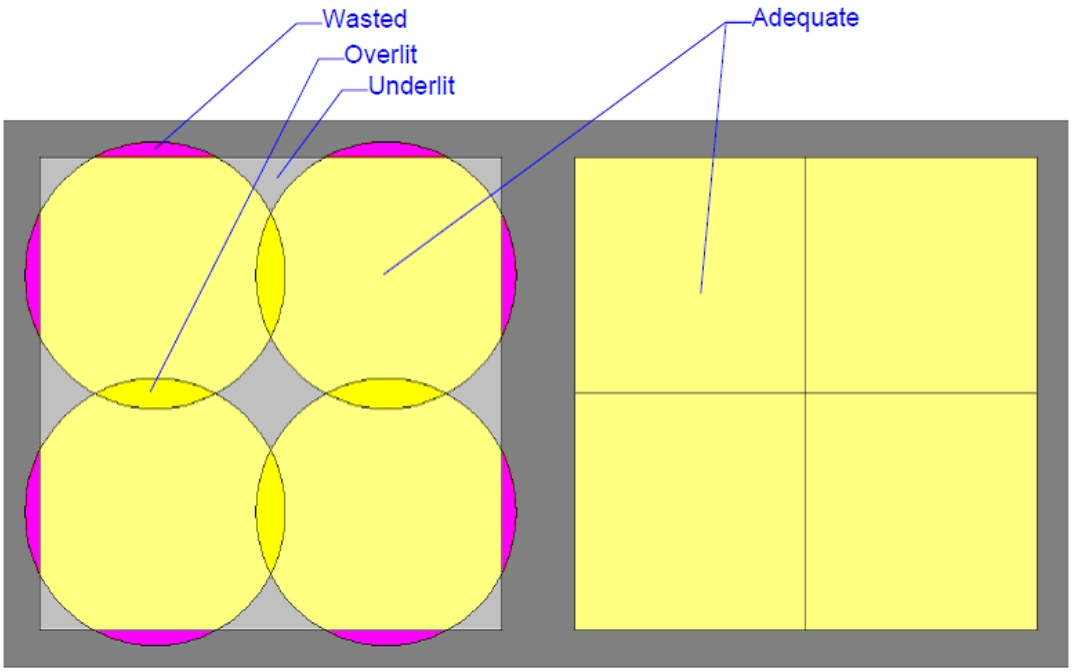

Figure 1. Simplified comparison of circular and rectangular (square) distributions of equal area

In the FTE approach, the target (or task) is defined as the rectangle enclosing the uniform "pool" of light produced by the unique intensity distribution of each luminaire. This uniformly covered portion of the target is itself defined as the area meeting IES-recommended uniformity ratios.

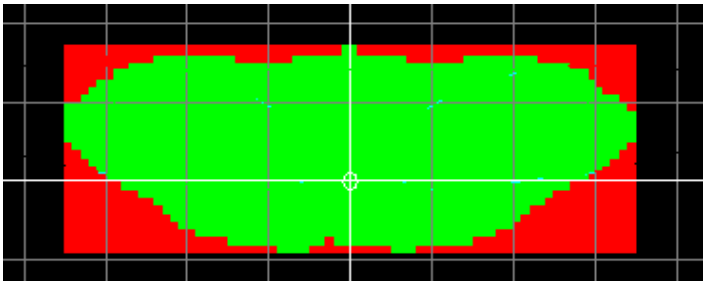

Figure 2. Uniform Pool within Rectangular Target

In **Figure 2** above, a luminaire represented by a white circle is surrounded by the uniform pool of light (green area). Luminous flux landing outside the uniform pool (red and black areas) is discarded. Flux landing inside the uniform pool is summed and then scaled down by the percent of the rectangular target area covered by the uniform pool (green area divided by the sum of green and red areas), thus discounting a portion of non-rectangular distributions that tends to result in wasted or obtrusive light. *For example, note that a tell-tale trait of uncontrolled backlight is non-rectangularity.* FTE is then calculated as the remaining flux (lumens) divided by luminaire input power (watts). The equation can be summarized as:

$$\text{FTE} = \frac{\text{(flux in uniform pool) (percentage of rectangular target covered by uniform pool)}}{\text{(luminaire input power)}}$$

The result is a measure of efficacy that has been tailored (or fitted) to the distribution, independent of any specific project. By using uniformity and rectangularity of distribution as the criteria for useful luminous flux, the same method of calculation can be applied to luminaires of all IES types (Types I through V), and no project-specific geometries or criteria are required.

DOE evaluated hundreds of HID luminaire photometric files to establish ENERGY STAR minimum FTE requirements. Minimum FTEs for SSL luminaires in each category were established to achieve at least 20% energy savings compared to top performing incumbent HID products.