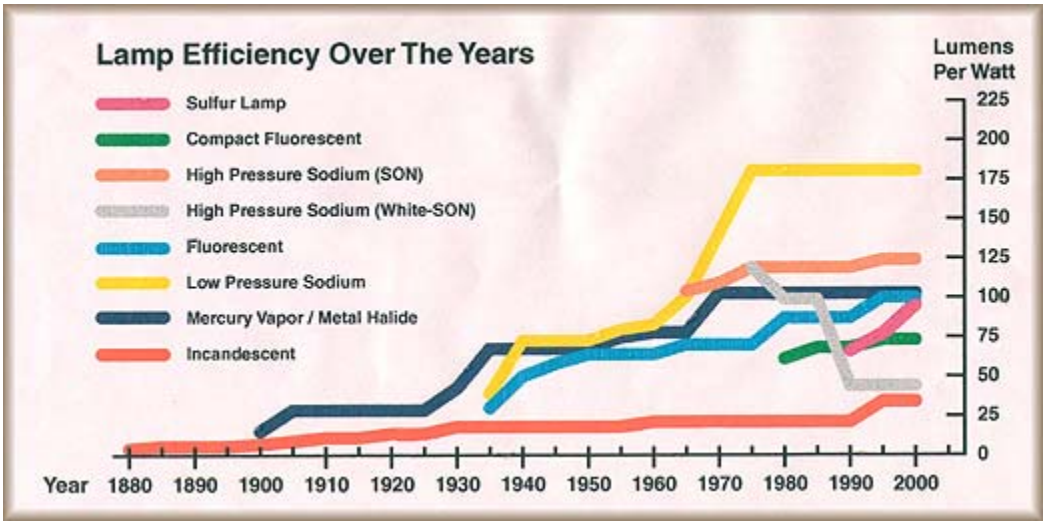
Energy Efficiency:
Light Sources in the 20th Century



The 120 years since Edison's first commercial light bulb have seen tremendous improvements in the efficacy of light sources. That bamboo-filament lamp of 1880 gave about 1.6 lumens per watt (lpw). By contrast, today's common tungsten lamps are about ten times more efficient, and many discharge lamps give over 100 lpw.

Much of the motivation for increasing efficacy stemmed from the low power of early lamps. From 1880 until the late 1910s, most common lamps gave a dim eight or sixteen candlepower (about the same amount of light as a modern 25-watt lamp). As the gas-filled tungsten lamp became more common in the 1920s, light levels began to rise in many homes. Gas lamps and candles became obsolete or were used only on special occasions.

Industrial users however, found even tungsten lamps too dim for many applications. They either had to install large numbers of fixtures or use higher power light sources like arc lamps or discharge tubes. These lamps were not easy to install or maintain and generally did not give the efficacy of the tungsten lamp, so they cost more to operate.

In the 1930s several efficient discharge lamps became available. Low pressure sodium (LPS), mercury vapor, and fluorescent lamps gave 40-50 lpw, lasted for thousands of hours, and were easy to maintain. Today, LPS lamps approach 200 lumens per watt while fluorescent tubes and metal-halide lamps both provide over 100 lpw.

Sometimes there are trade-offs. LPS, though efficient, gives a stark yellow light. High pressure sodium (HPS or, as it's known in the industry "SON") gives a somewhat better color, but at a lower efficacy. In the 1970s, an even better color HPS lamp (known in the industry as "white-SON") was developed, but the lamps' efficacy suffered still more.

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