San Francisco Light's Up Our Lives

by George Wooding

Say goodbye to the yellow glow of San Francisco's yellow street lights.

The San Francisco Public Utilities Commission (SFPUC) is replacing approximately 18,500 city-owned street light fixtures with bright, Light-Emitting Diodes (LEDs). Starting in April, 2017 the SFPUC has already replaced 13,000 of the high-pressure sodium (HPS) "cobra head"-style fixtures with LEDs, and is in the process of converting the remaining 5,500 fixtures. SFPUC crews expect to complete the changeover by early 2018.

LEDs produce light by passing a one-way electric current through semiconductor material. As the electricity is transferred through the semiconductor diode from one electrical terminal to another, it releases energy in the form of light.

The HPS conventional incandescent and fluorescent lamps work by heating a filament or gas to a temperature that produces light. While LEDs, like other lamps, release heat as well as light, they are considered far more efficient because they produce more light per watt of energy consumed.

The PUC promised that LEDs "will improve lighting conditions throughout the city and will last about four times longer than existing lights while using half as much electricity."

They also promised that the switch over would be fast and efficient. It takes about 30 minutes removing the old HPC lamp head from a lighting fixture and attaching a new LED light. The switch from HPS to LED lighting costs approximately $135 per light.

The street light changeover is happening rapidly in District 7. If your street has clear bright lighting, your street has already been converted to LED lights. Almost all of D7 will be using the new LED lights within the next six months.

The decision to change most of the HPS street lights owned by the SFPUC to LEDs was made for a variety of reasons: LEDs use 50% less energy; cost less to maintain; and will improve lighting for pedestrians, bicyclists, and drivers.

The SFPUC estimates that the new fixtures are good for 100,000 hours of illumination, or roughly 20 years of glow time. HPS lamps need to be replaced every four to five years.

No Environmental Impact Review was ever done on the LED lights. The SFPUCs Bureau of Environmental Management completed internal review called "*The Guide to San Francisco Street Lights*" on January 10, 2012 examining environmental impacts of the LED Street Light Conversion Program, and concluded that the program is categorically exempt from environmental review. On June 2, 2010 the Major Environmental Analysis Division of the San Francisco Planning Department concurred that the proposed program is exempt because it entails "replacement or reconstruction of existing utility systems and/or facilities involving negligible or no expansion of capacity" (California Environmental Quality Act, section 15302, class 2).

The lack of an EIR based on "replacement or reconstruction of existing utility systems and/or facilities," is unbelievably shoddy work by the SFPUC and the Planning Department. Both agencies are saying that the existing light poles are OK, but they are not considering the impact of the LED lights on flora, fauna, or people. That's like approving the fuse of a bomb, but not examining the bomb.

The 2016 American Medical Association's (AMA) report from its *Council On Science and Public Health, human and environmental effects on LED lighting* states: "Despite the energy efficiency benefits, some LED lights are harmful when used as street lighting." AMA Board Member Maya A. Babu, M.D., M.B.A. noted, "The new AMA guidance encourages proper attention to optimal design and engineering features when converting to LED lighting that minimize detrimental health and environmental effects."

High-intensity LED lighting designs emit a large amount of blue light that appears white to the naked eye and creates worse nighttime glare than conventional lighting. Discomfort and disability from intense, blue-rich LED lighting can decrease visual acuity and safety, resulting in concerns and creating a road hazard.

In addition to its impact on drivers, blue-rich LED street lights operate at a wavelength that most adversely suppresses melatonin during night. It is estimated that white LED lamps have five times greater impact on circadian sleep rhythms than conventional street lamps. Recent large surveys found that brighter residential nighttime lighting is associated with reduced sleep times, dissatisfaction with sleep quality, excessive sleepiness, impaired daytime functioning, and obesity.

The detrimental effects of high-intensity LED lighting are not limited to humans. Excessive outdoor lighting disrupts many species who need a dark environment. For instance, poorly-designed LED lighting disorients some bird, insect, turtle, and fish species, and U.S. national parks have adopted optimal lighting designs and practices that minimize the effects of light pollution on the environment.

Recognizing the detrimental effects of poorly-designed, high-intensity LED lighting, the AMA encourages communities to minimize and control blue-rich environmental lighting by using the lowest emission of blue light possible in order to reduce glare. The AMA recommends an intensity threshold for optimal LED lighting that minimizes blue-rich light. The AMA also recommends all LED lighting should be properly shielded to minimize glare and detrimental human health and environmental effects, and consideration should be given to utilize the ability of LED lighting to be dimmed for off-peak time periods.

Even before the AMA warning, some researchers raised health concerns. Some noted that exposure to the blue-rich LED outdoor lights might decrease people's secretion of the hormone melatonin. Secreted at night, melatonin helps balance the reproductive, thyroid, and adrenal hormones, and regulates the body's circadian rhythm of sleeping and waking.

Large cities such as New York, Seattle, and Phoenix all had problems as early adopters of the LED lights, Once LED lighting was approved by the Environmental Protection Agency (EPA), the EPA pushed the lighting onto large municipalities across the country.

The real LED problem was that the lights that were initially approved at a 4000K and 5000K level were too bright. [**Note:** Kelvin is a temperature scale on an absolute scale, not a relative scale, and is used, in part, to measure the range of color temperatures. It is expressed with a "K", but *without* a degree sign used with Celcius and Farhenheight.] The three primary types of color temperature for light bulbs are: Soft White (2700–3000K), Bright White/Cool White (3500–4100K), and Daylight (5000–6500K). The higher the Kelvin, the whiter the color temperature.

Wisely, in 2014 the AMA iss*ued LED guidelines to limit blue-light emission by outdoor lighting by lowering the acceptable color temperature for approved lighting products to 3000K or below. More recently-engineered LED lighting is now available at 3000K or lower. At 3000K, the human eye still perceives the light as "white," but it is slightly warmer in tone, and has about 21% of its emission in the blue-appearing part of the spectrum. This emission is still very blue for the nighttime environment, but is a significant improvement over the 4000K lighting because it reduces discomfort and disability glare. Because of different coatings, the energy efficiency of 3000K lighting is only 3% less than 4000K, but the light is more pleasing to humans and has less of an impact on wildlife.

San Francisco has learned from the mistakes of other cities. The SFPUC will match existing lighting levels on City streets to prevent over-illumination. The SFPUC is doing one-to-one replacement with existing fixtures to maintain the existing lighting levels. The SFPUC states, "During our outreach, residents expressed a preference for lights with a warmer color temperature. That's why this project will feature LEDs with a Color Coordination Temperature (CCT) of 3000K. These LEDs will feature a warmer white light than the LEDs installed by most of the other cities and counties across the U.S., which feature a CCT range of 4,000–6,000K. In this regard, San Francisco is approaching its LED streetlight conversion differently than other cities in the country. In fact, for the past few years, San Francisco has only purchased LEDs with a CCT of 3,000K.

The new LED streetlights cannot be controlled remotely.

The yellow cobra head lights will soon be gone and technology inexorably marches on. It appears that once the City develops a central LED monitoring system, San Francisco will be at the forefront of safe efficient street lighting. Let us

hope that the 3000K level is as safe as San Francisco, the AMA, and the EPA all believe over the long term. Enjoy the new lighting!

George S. Wooding, President, Coalition For San Francisco Neighborhoods. Feedback: wooding@westsideobserver.com.