LED Streetlights Save Energy, but Could Have Some Serious Side Effects

BY ZOE LOFTUS-FARREN – MARCH 10, 2014

Exposure to blue-rich LED lights can disrupt natural circadian rhythms in humans and wildlife

This post has been updated to include information about San Francisco's choice of yellow-rich LEDs.

Streetlights don't make a lot of headlines. They are a constant in our cityscapes, rarely drawing the attention of passing pedestrians and motorists.

*Photo by flickr user meltedplastic*LED street lights on a Houston, TX residential street. LEDs definitely bring some benefits, the
biggest of which is energy savings.

That is, until recently. During the past few years, cities from Baltimore, to San Antonio, to Los Angeles have begun replacing traditional streetlights (typically high pressure sodium bulbs) with newer light-emitting diode bulbs (LEDs). Last year, Oakland, CA joined the ranks of the LED converts with its Streetlight Conversion Project, switching out 30,000 of the city's 38,000 regular bulbs for LED substitutes. Later this year two other California Bay Area cities, Berkeley and San Francisco, will follow in Oakland's footsteps with LED conversion projects of their own, converting 8,000 and 18,500 streetlights respectively.

The hype around LEDs stems from two primary benefits. First, LEDs are brighter than traditional lights, and many cities feel that the increased brightness improves public safety. Second, LEDs are more energy efficient than earlier generation bulbs, bringing both financial and environmental benefits to converting cities.

Public safety was a big motivator behind the Oakland conversion project, and it may seem intuitive that brighter lights improve safety. However, some studies suggest that though brighter streets make people *feel* safer, they have no impact on actual crime levels.

In terms of the environment, LEDs definitely bring some benefits, the biggest of which is energy savings. The Oakland Streetlight Conversion Project will save the city nearly $20,000 per year in energy costs, and will reduce city greenhouse gas emissions by approximately 40 percent (or 80,000 pounds) per year. "The overall goal of this whole project was to have better light in our city streets," says Kristine Shaff, a public information officer with the City of Oakland. "And the energy savings are tremendous."

Similarly, Berkeley and San Francisco estimate that new LED streetlights will consume 50 percent less energy than existing streetlights.

LEDs are available in a variety of color temperatures, typically ranging from "warm" yellow-rich lights, to "cooler" blue-white lights. LEDs in the blue-white range are generally 10 to 15 percent more energy efficient than warmer LEDS, leading many cities to opt for the blue-rich bulbs. (The yellow-rich LEDs still provide significant energy savings compared to other common streetlight bulbs).

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Unfortunately, exposure to blue-rich light at night can lead to decreased melatonin secretion in humans. Melatonin is a hormone secreted at night by the pineal gland that helps balance the reproductive, thyroid, and adrenal hormones and regulates the body's circadian rhythm of sleeping and waking. Lower Melatonin levels have been tenuously linked to increased risk of cancer.

Exposure to blue-rich light also disrupts natural sleeping and eating patterns in wildlife. "In an area that has a lot of blue-rich white light, you would stay alert, you would stay as if it was day," says Bob Parks, executive director of the International Dark-Sky Association, a nonprofit that works to raise awareness about the hazards of light pollution. "Now, people can certainly close their blinds and block-out that rich blue-white light. The problem is that every other species on the planet can't do that, so you have an impact on everything else. And not just animals — we are talking plants, trees, right down to one-cell organisms. Every living creature has this circadian disruption issue."

Luckily for Bay Area residents, Oakland, Berkeley, and San Francisco have all chosen to install LEDs on the yellow side of the spectrum. The yellow-rich LEDs are still brighter than the streetlights they are replacing, but are less likely to disrupt either people or wildlife than blue-rich LEDs. "Most of the cities that have been doing a really good job [using yellow-rich LEDs] are in California," says Parks.

In addition to energy savings, LED streetlights also help reduce waste. LEDs have a significantly longer lifespan than traditional sodium and fluorescent bulbs, lasting for 50,000 to 100,000 hours, or two to five times longer than traditional streetlights. This longer life span means fewer bulbs in landfills. Because LEDs contain no toxic materials, they are also recyclable. Additionally, LEDs are compatible with adaptive controls, which, when installed in streetlights, allow cities to dim and even switch-off streetlights when there is little pedestrian or vehicle traffic.

If we can overlook their bright, sometimes glaring appearance, and encourage cities to use yellow-rich LEDs rather than their blue-rich cousins, it seems that LED streetlights are a good thing. And because LED technology is progressing rapidly, LEDs of the future are likely to help cities save even more in energy costs and greenhouse gas emissions.

Zoe Loftus-Farren
Zoe Loftus-Farren is managing editor of *Earth Island Journal*. In addition to her work with the *Journal*, her writing has appeared in Civil Eats, Alternet, Salon.com, and Truthout, among other outlets. She also holds a law degree from Berkeley Law, where she studied environmental law and policy.

Comments

It still seems that there is are significant misunderstandings about the difference between charactistics that are due to LED lighting and those that are due to poor lighting design.

As to glare and light trespassing, LED lenses are far more versatile and directional than a traditional street light and do not require shielding if designed properly. The reason that shields are used with traditional lights is that there is no other way to control light distribution from a bulb.

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In NZ there are very strict requirements around maximum limits for light passing into people's properties and the level of acceptable glare. LED streetlight lenses are designed accordingly to comply. Similar restrictions apply around glare.

As with most things in life, if you don't set a strict standard you will end up with a cheaper product that won't work as well. If you are having these problems it sounds like the spec that your council is tendering out is too loose or they don't have proper lighting designers engaged.

By Mark Respinger on Thu, December 14, 2017 at 2:22 *pm*

Spanky McGhee, you might want to re-read the post, especially your use of the term 'moronic.' The article explains that the new LED lights don't just stay in the 'streets' or on the 'sidewalk' but ventures into windows and yards and lighting up houses, etc. So, the argument is that wildlife IS affected, just as WE are affected. I am one who believes that a little light is fine, but to believe that an extraordinary amount is better, is ludicrous. Just because it saves energy and money in the cities does not mean we should just 'live' with it. There is such a thing as light pollution and I definitely notice the change. Perhaps you should take a walk a night and look for yourself.

By CeeCee on Wed, December 13, 2017 at 7:10 *pm*

New LED lights have recently replaced the warm yellow older street lights in our neighborhood, and our neighborhood looks like a strip-mall. The lighting went from lighting up the street to lighting up our homes. I walk across my living room and see my shadow on the wall. Its like walking across a Broadway Stage. The new fixtures have 2 bulbs. The City has removed one of the bulbs, which took the light from our windows, but still lights up our yards. Seeing the stars is now impossible. We sit out front in my yard and have a bright light shining in our eyes.
For safety reasons, yes, light up the sidewalks at night, but the City has no duty to light up our homes. I am glad to see that there have been rampant complaints around the country about the brightness of the lights. Many cities are switching to a lower wattage bulb, and to the warmer yellow-toned LED light from the standard blue-toned light. I am asking our City to do the same.

By Lid on Tue, November 29, 2016 at 9:05 *pm*

Will 40000K LEDs affect my Acer as much as 24hour/day compact fluorecents which inflicted "High Light Stress" leading to "Programmed Cell Death" leaving no leaves the next year BUT new epicormic growth round base allowing photosynthesis to restart & small branches erupting two feet up trunk. I am a Biologist and knew there was a reason for the damage to my beautiful tree. It took a lot of research but I found the problem, the light!
Wendy Goodwin BSc.,CBiol.,MRSB

By Wendy Goodwin on Mon, October 03, 2016 at 2:38 *am*

It sounds like it is still worth it for cities to make the switch to LED lights. It is not that hard to stay on the yellow side of the light spectrum, and I agree that lighter streets are normally safer streets. The more I can see the less likely I am going to get into an accident. That is why I have switched over to LED lights for my car as well. The added life span of the bulbs is just a bonus.

By James Bergman on Mon, May 02, 2016 at 9:58 *am*

Actually white light LEDs rich in blue increase light pollution. The short wavelength of blue scatters more in our atmosphere, above cities. Its is called the Rayleigh Effect. Also Mei scattering is more so with blue rich LEDs. The notion that LEDs are dark sky friendly is therefore a half truth if the CCT is above 3000K. The fixture designs are also a big problem, flat panel and decorative offer poor stray light control. The emitting light source should be shielded and not visible to achieve effective reductions in glare and light trespass. The 99% of the LED fixtures are not properly shielded.

By Shawn Nielsen on Tue, December 22, 2015 at 1:05 *pm*

I seem to see this same complaint levelled against LED lighting all over the internet. It is essentially a question of what correlated colour temperature (see http://www.depond.co.nz/#!UNDERSTANDING-COLOUR-TEMPERATURE-IN-LED-LIGHTING/wa3wl/563a5ff20cf23796cd8d139f) should lights be run at. Higher colour temperatures

improve driver visibility, are safer and use less energy for the same illumination, but lower colour temperatures are easier to sleep next to.

By Mark Respinger on Mon, December 14, 2015 at 1:40 *pm*

The article fails to mention the much lower BUG (backlighting, uplighting, and glare) rating that LEDs offer compared to HPS, metal halide, and mercury vapour. LEDs produce much less light pollution in the forms of urban sky glow and light trespass. So not only do LEDs produce the same amount of light with much less energy, they also ensure it is directed where it is needed - on the road surface, instead of up into the sky or into residents' bedrooms.

The detrimental health effects of light trespass into sleeping quarters are well documented. Using LEDs to reduce or eliminate that light trespass will have health benefits that far outweigh any detrimental effect of bluer light (which will likely not be an issue anyway, given the number of municipalities opting for lower colour temperature LEDs).

By Alex on Fri, December 04, 2015 at 7:51 *am*

Do we know of a tint or polymer that might filter the
blue and white light at night ,but still have sun light come in the day time?

By John on Thu, March 26, 2015 at 11:26 *pm*

When they switched the street lights in New York City from blue to the warm more pleasant yellowish the crime rate went down drastically after dark.

By Randy Yost on Thu, June 26, 2014 at 3:19 *pm*

Spanky, if you're trolling then fair play, you wound me up for a second. If not, you're at best simple. A lot of wildlife isn't easy to spot but does live in lit areas.

To the author, thank you for a great article, I am going to cite it when discussing street lighting plans in my area with my local council.

Thanks!

By Spangly Migoo on Fri, May 02, 2014 at 10:35 *am*

Incredibly ridiculous story.
The lights are on the Street- hence the term "streetlight".
If the animals find it too bright- they walk away to where it's dark.
I have yet to see a deer, raccoon or turtle hang out on streets & sidewalks for an extended periods of time.
Moronic.

By Spanky Mcghee on Mon, April 28, 2014 at 2:18 *pm*

You might find the lights installed in Hawaii on the Big Island interesting. These roadway luminaires are required to be friendly to the astronomy community on Mauna Kea. The roadway lights have on average 1% of less blue light calculated as the total output of light in mw from 400 - 500 nm/ 400 - 700 nm. The new lights being installed this year are typically >80 lumens /W. These same lights are also eco friendly for the sea turtles.

By Bob Adams on Wed, March 19, 2014 at 8:59 *am*

Very interesting

By David Straker on Wed, March 19, 2014 at 7:38 *am*

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