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**BY EMAIL**

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**Re: Definitions for General Service Lamps**

The United States Department of Energy has two dockets, EERE-2021-BT-STD-0005 and EERE-2021-BT-STD-0012, which are both titled Energy Conservation Program: Definitions for General Service Lamps.<sup>12</sup> These two documents contain fundamentally false statements that must be addressed.

EERE-2021-BT-STD-0005, Page 78: *“DOE researched studies and other publications to ascertain any known impacts of LED lamps on human health and has not found any evidence concluding that LED lighting used for general lighting applications directly results in adverse health effects.”*. This statement is either willful fraud or gross negligence.

EERE-2021-BT-STD-0012, Page 31: *“DOE has confirmed that all lamp types included in the GSL definition have the same characteristics in the non-incandescent versions as offered in the incandescent versions”*. This statement is untrue.

EERE-2021-BT-STD-0012, Page 34: *“Additionally, DOE notes that the ADA does not apply to DOE for purposes of this rule, as the ADA applies only to private employers and not Federal agencies.”* This statement is untrue.

**EERE-2021-BT-STD-0005, Page 78**

The DOE states that they were unable to find any research studies or publications that LED lighting results in adverse health effects. As there are hundreds of research studies and publications proving that LED lighting causes not only adverse health effects, but causes life-threatening reactions, the research by DOE must be considered grossly negligent, if not outright fraudulent.

There are three major categories of quality metrics for light: spatial, spectral, and temporal. The quality differences in these three categories between point source light, such as from incandescent, and surface source light, such as from LED, are dramatically different.

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<sup>1</sup> <https://www.energy.gov/sites/default/files/2022-04/gsl-definitions-fr.pdf>

<sup>2</sup> <https://www.energy.gov/sites/default/files/2022-04/gsl-backstop-fr.pdf>

**Spatial:** While a point source such as incandescent emits spatially uniform energy, a surface source such as LED emits a directed beam of non-uniform energy. Thus, LED light is lower in quality than incandescent light.

**Spectral:** The mechanism that LEDs use to increase luminous efficacy is by increasing the amount of toxic blue wavelength light. The higher the blue, the greater the luminous efficacy, but the lower the quality of the light.

**Temporal:** Many LED luminaires exhibit digital flicker. This digital flicker property is lower quality than the analog flicker of incandescent light.

The lower quality of light from LEDs has resulted in major adverse health effects, including documented cases of epileptic seizures, migraines, anxiety, panic attacks, lupus flares, mood disorders, sleep disorders, increases in cancer risk, and many other negative health effects.

Below is a list of some of the research studies showing the adverse health effects of LED light that the US DOE is unaware of.

**March 14, 2022** – [Light Exposure During Sleep Impairs Cardiometabolic Function](#) – Blue light is bad. Any light is bad. Tiny amounts of light at night is bad.

**March 10, 2022** – [Outdoor Light at Night and Autism Spectrum Disorder](#) – Artificial Light at Night significantly increases the risk of developing autism.

**2021** – [Is Street Lighting Damaging Our Health?](#) – Cree Lighting states that the industry has been using the wrong metrics to measure LEDs.

**November, 2021** – [One Third of Us are At Risk](#) – Compiled links to medical research on the effects of LEDs.

**May 13, 2021** – [Should We Re-think Regulations and Standards for Lighting at Workplaces? A Practice Review on Existing Lighting Recommendations](#) – Quote: the quality of light should not be reduced for lower energy consumption.

**April, 2021** – [What is Photobiological Safety Standard?](#) – Discussion of IEC 62471 and concern about eye damage from LEDs and the classification groups Risk Group 0, 1, 2 and 3.

**March, 2021** – [Do no harm: the beginning of the age of healthy hospital lighting](#) – Reduction of blue wavelength light improves sleep.

**February 8, 2021** – [Associations between Artificial Light and Risk for Thyroid Cancer](#) – Artificial light increases thyroid cancer risk by 55%.

**February 2021** – [Insights into blue light accelerated tooth whitening](#) – At a radiance of 190 mW/cm<sup>2</sup>, LEDs will bleach teeth.

**January 27, 2021** – [Moonstruck sleep: Synchronization of human sleep with the moon cycle under field conditions](#) – Sleep timing is synchronized under the moon cycle. Artificial light disrupts this cycle.

**January 7, 2021** – [Light Pollution, Sleep Deprivation, and Infant Health at Birth](#) – This study confirms that light pollution can lead to premature births.

**November 5, 2020** – [Evening home lighting adversely impacts the circadian system and sleep](#) – This article makes the case that the economic benefits of energy efficient LED lighting are outweighed by the substantial disease burden they produce.

**July 14, 2020** – [Comparison of ophthalmic toxicity of light-emitting diode and organic light-emitting diode light sources](#) – LEDs are toxic to the eye, OLEDs less so.

**May 24, 2020** – [20% to 30% Have Heightened Sensitivity](#) – This article articulates how the 20% to 30% of the population who are sensitive receptors have been so far snubbed by the the psychology profession.

**February 29, 2020** – [LED Street Lights – Major Health Concerns](#) This presentation by Dr. Wojcik summarizes the research about the dangers of blue wavelength light.

**February 27, 2020** – [Blue Light Suppresses Melatonin in Dairy Calves](#) This study shows that melatonin is suppressed by blue wavelength light, thus affecting eating, drinking, etc.

**February 2020** – [Light-induced Retinal Ganglion Cell Damage and the Relevant Mechanisms](#) – Retinal Ganglion Cells in the eye are damaged by excessive visible radiation.

**October 17, 2019** – [Daily blue-light exposure shortens lifespan and causes brain neurodegeneration in Drosophila.](#) – LED blue wavelength light causes serious injury to flies.

**December 2018** – [Exposure to excessive blue LED light damages retinal pigment epithelium and photoreceptors of pigmented mice.](#)

**October 2, 2018** – [Melatonin: An Anti-Tumor Agent](#) This study shows that light at night increases risk of breast and prostate cancer.

**June 25, 2018** – [Current Understanding of Photophobia, Visual Networks, and Headaches](#) – How light triggers pain.

**June 5, 2018** – [SCHEER Final Opinion on Light Emitting Diodes](#) – An overly positive opinion of LEDs, choosing to ignore the downsides and missing studies.

**February, 2018** – [Including an index measuring the weighted content of blue light in lamp labelling](#) – A proposal for G-Index in place of Correlated Color Temperature.

**August 8, 2017** – [Harvard University – Outdoor Light at Night and Breast Cancer Incidence in the Nurses’ Health Study II](#) This study shows the link between artificial light at night and breast cancer.

**June 29, 2017** – [Effects of white light-emitting diode \(LED\) exposure on retinal pigment epithelium \*in vivo\*](#)

**February 18, 2017** – [Light-emitting-diode induced retinal damage and its wavelength dependency \*in vivo\*](#)

**February 2017** – [Blue Light Paradox](#) – Blue wavelength controls circadian rhythms, but also damages the eye.

**January 31, 2017** – [National Institutes of Health – Timing of Light Exposure Affects Mood and Brain Circuits](#) This scientific research article covers how circadian rhythms are being disrupted by artificial light at night.

**October, 2016** – [Blue Light: What are the Risks to Our Eyes?](#) – International Review of Ophthalmic Optics – Quote: *We cannot seriously deny the potential ocular risks from overexposure to blue light. It is important not to forget that it is the cumulative effect over time that is dangerous and must be fought.*

**April, 2016** – [Exposure of Fluid Milk to LED Light](#) – LED light has a strong negative impact on the taste of milk.

**January 24, 2016** – [NIH – Effects of Blue Light on the Circadian System and Eye Physiology](#) This scientific research paper concludes that blue light causes photoreceptor damage.

**April 8, 2015** – [Retinal damage induced by commercial light emitting diodes \(LEDs\).](#)

**March 2014** – [White light-emitting diodes \(LEDs\) at domestic lighting levels and retinal injury in a rat model.](#)

**January 2013** – [Health Effects of Large LED Screens on Local Residents](#) – Luminance above 10,000 nits is dangerous and this article mentions the need to further study the impacts of LEDs on those with epilepsy.

**November 8, 2012** – [Ensuring Safety in LED Lighting](#) – Significant coverage of the dangers of LED radiation. Blue light hazard, excessive luminance, macular degeneration, sleep disruption, and LEDs classified as lasers for use in toys.

**December 2010** – [Light Pollution: Light at Night and Breast Cancer Risk Worldwide](#) This study shows that cancer risk increased by as high as 50% for countries with high Artificial Light at Night.

**November 22, 1996** – [Effect of bright light exposure on muscle sympathetic nerve activity in human](#) – 5000 lux light triggers nerve activity, even after the light is shut off.

The use of surface source LED light has triggered major changes in people’s lives such as creating conditions where people can no longer access their place of employment and excluding people from society. These people have now become light disabled solely due to the use of LED light.

Below are documented stories of harm from LED light that the US DOE is unaware of.

### *Epilepsy*

**January 31, 2022** – [Epilepsy and LEDs](#) – New York Times Opinion

**April 27, 2021** – [I’m Trapped in a State of Shock](#)

**April 16, 2021** – [We Are Desperate to be Heard](#)

### *Migraines*

**February 3, 2022** – [Presentation to Irish Joint Committee on Disability Matters](#)

**January 4, 2021** – [I Have Not Been Able to Go for an Evening Walk](#)

**April 29, 2019** – [I Get a Headache from the Bright Light](#)

### *Autism*

**September 3, 2021** – [An Encounter with an Emergency Vehicle](#)

**April 7, 2019** – [The Police Chased Me through the Park](#)

### *Lupus*

**April 29, 2019** – [I Developed a Sunburn-rash to my Face](#)

### *General*

**February 9, 2022** – [New York’s Ubiquitous Glowing Screens Are Making My Life Unlivable](#)

**May 27, 2021** – [My Right Eye Never Recovered](#)

**June 6, 2021** – [I Immediately Felt Very Uncomfortable and Was In Pain](#)

**2021** – [Quotes from affected Individuals](#) – This is a set of quotes from real persons, describing their suffering from LED electromagnetic radiation.

**2019** – [Stories Collected by LightAware](#) – These stories describe the impacts of LED light on people's lives.

DOE's failure to locate this research and these stories and address the health effects of LED light in detail is unacceptable and invalidates the conclusions drawn by the DOE that LED light does not cause harm. There are likely millions of Americans who cannot neurologically process LED light safely. DOE has also failed to provide references to research showing that LED light is safe. LED light is toxic and unfit for use in a General Service Lamp.

## EERE-2021-BT-STD-0012, Page 31

The DOE claims that incandescents and LEDs have the same characteristics. This is untrue. There are two categories of light: point source and surface source.

**Point Source:** The light from a point source is spatially uniform. An incandescent light bulb is an example of a point source. Brightness is measured with luminous intensity in candela. Point source light is generally considered safe and high quality.

**Surface Source:** The light from a surface source is a directed beam of non-uniform energy. An LED is an example of a surface source. Brightness is measured with luminance in nits (candela per square meter). Surface source light is a low-quality, industrial grade light that is unsafe for cellular organisms, including humans.

Given that incandescent light and LED light fall into two entirely different categories, it is simply not possible for the DOE to claim that incandescent lamps and LED lamps have the same characteristics. The human nervous system is not evolutionarily designed to tolerate the non-uniform electromagnetic radiation emitted by LEDs, resulting in debilitating sensory overload.

In addition to the different spatial characteristics between incandescent and LED, there are also different spectral characteristics. The method by which LEDs emit white light is via use of a blue or violet light-emitting diode. This high energy light is then sent through a yellow chemical phosphor to produce a so-called white light. However, the fundamental energy component of the light is still high energy blue. Figure 1 shows an example of the spectral power distribution of a 5500 Kelvin LED.

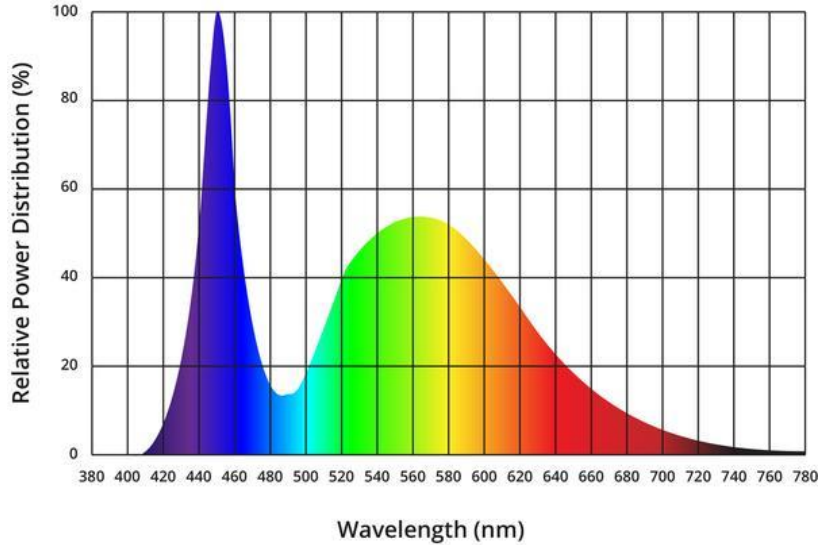


Figure 1 - SPD of 5500 Kelvin LED

Blue wavelength light also happens to be toxic for humans, as noted in the many research studies provide above. The engineers who develop LEDs use the blue wavelength light because it has the highest luminous efficacy. However, the tradeoff is increased toxicity for humans and a reduced quality of light. LED lamps are sold to consumers with a label that specifies the Correlated Color Temperature in the section labeled Light Appearance. A 6500K LED example is shown in Figure 2.

<b>Lighting Facts</b> Per Bulb	
<b>Brightness</b>	<b>2600 lumens</b>
<b>Estimated Yearly Energy Cost</b>	<b>\$2.17</b>
Based on 3 hrs/day, 11¢/KWh Cost depends on rates and use	
<b>Life</b>	<b>45.7 years</b>
Based on 3 hrs/day	
<b>Light Appearance</b>	
Warm <span style="display: inline-block; width: 100px; border-bottom: 1px solid black; margin: 0 10px;"></span> Cool <div style="text-align: center;">▲</div> <b>6500 K</b>	
<b>Energy Used</b>	<b>18 watts</b>

Figure 2 - Lighting Facts Label

It is this Light Appearance section that encapsulates the amount of blue wavelength light toxin that the LED lamp emits. The Cool white has a higher luminous efficacy, but greater toxicity. It is not possible for the DOE to claim that incandescents and LEDs have the same characteristics when the very mechanism by which LEDs might have higher luminous efficacy than incandescents is by increasing the amount of blue wavelength light that causes injury to humans.

LEDs are a digital device, requiring electronics to convert the incoming alternating current into direct current. This conversion creates flicker. Because an LED turns on and off almost instantly, this flicker can interfere with human nerve functioning. Incandescents, on the other hand, show very little change during the 60 Hertz A/C switching because the tungsten filament does not lose its heat energy immediately. The DOE cannot possibly claim that LEDs have the same characteristics as incandescents since LEDs exhibit digital flicker and incandescents do not.

LEDs are a Direct Current device, whereas an incandescent light bulb is an Alternating Current device. Whereas an incandescent lamp can be plugged into a wall socket directly, an LED lamp requires electronics to convert the alternating current to direct current, which reduces quality and produces harmful radio frequency electromagnetic radiation. It is not possible for the DOE to claim that LEDs have the same characteristics as incandescents.

## [EERE-2021-BT-STD-0012, Page 34](#)

The DOE states that the Americans with Disabilities Act applies only to private employers and not Federal agencies. This is a false statement. The ADA as has 3 Titles. Title I covers employment, which includes employment at federal agencies. Title II covers state and local government. The Courts have held that this includes federal agencies. Title III covers private businesses.

The federal US Department of Energy may not create a rule that discriminates against a class of people. The DOE rule for General Service Lamps that mandates a minimum luminous efficacy of 45 lumens per watt without pairing this value with light quality metrics will cause businesses to manufacture and sell low-quality LED lamps whose use will discriminate against those who are LED light disabled and there will be no alternative product with a light quality comparable to the light quality of an incandescent. This discrimination is prohibited by the ADA and the DOE cannot mandate such discrimination. The federal Americans with Disabilities Acts has precedence over the DOE General Service Lamp rule, thus invalidating the DOE rule.

The federal US Access Board develops the guidelines that give government agencies and businesses guidance for architectural designs. The US Access Board has so far failed to create guidelines for surface source LED light, and we see no indication that the US DOE made any effort to work with the US Access Board to develop such guidelines. However, the absence of ADA guidelines does not justify the use of discriminatory LED light.

The DOE's position that the ADA does not apply to federal agencies is incorrect and the DOE must ensure that its rules do not mandate discrimination. Given that the use of LED light causes discrimination, the DOE's rule that effectively prohibits the sale of incandescent light bulbs is discriminatory.



## Energy Efficiency

Docket EERE-2021-BT-STD-0012 uses the word “efficiency” 21 times and the word “efficient” 8 times. The name of the DOE agency overseeing this effort is named Office of Energy Efficiency and Renewable Energy, Department of Energy. The final rule states, “EPCA, as amended,<sup>1</sup> authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment.” It would be reasonable, then, to believe that mandating a luminous efficacy of 45 lumens per watt for General Service Lamps is because of the DOE’s desire for GSLs to be energy efficient.

Yet, the DOE goes out of its way to act as if this rule is unrelated to energy efficiency. DOE states, “Further, this final rule defines only the scope of GSLs and does not set energy efficiency standards for GSLs.”

The definition of **energy efficiency is providing the same quality of service using less energy**. Setting a luminous efficacy minimum of 45 lumens per watt does not accomplish any energy efficiency goals because the luminous efficacy requirement has become disconnected from the quality-of-service part of the energy efficiency definition. Manufacturers will be free to sell low-quality LED lighting products without concern for the health or disability rights of the user.

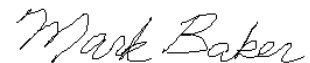
LEDs are not energy efficient. Setting a luminous efficacy of 45 lumens per watt for General Service Lamps accomplishes nothing more than forcing the public to live with low-quality, discriminatory lighting products.

## Summary

- 1) The research showing that LED light causes severe negative health effects is undeniable.
- 2) LED light has vastly different characteristics than incandescent light.
- 3) A rule that effectively eliminates incandescent lights is discriminatory.
- 4) LEDs are not energy efficient.

For these reasons, the DOE must retract its Final Rule for dockets EERE-2021-BT-STD-0005 and EERE-2021-BT-STD-0012.

Sincerely,



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President

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