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*Comment Received From: Mark Baker
Submitted On: 7/15/2022
Docket Number: 22-BSTD-01*

LEDs Are Not Energy Efficient

The definition of energy efficiency is providing the same quality of service using less energy. There are two parts to this definition: a quality part and an energy part. For lighting, the CEC has ignored the quality part of the definition and used only the energy part of the definition which is the luminous efficacy measured in lumens/watt. The CEC falsely claims that LEDs are energy efficient by ignoring the spatial, spectral, and temporal properties of light. In particular, the CEC has failed to acknowledge that LEDs are a flat-surface emitter that products non-uniform luminance and that this non-uniform luminance is toxic for humans and all biological systems.

The Soft Lights Foundation has notified the CEC of this issue for the past 2 code cycles, and yet our message has been ignored. Now, however, others have confirmed what we have been saying. Cree Lighting is the first large lighting company to admit that LEDs emit non-uniform luminance and that the entire industry has no metrics for measuring non-uniform luminance light. Cree also admits that LED light is dangerous.

In 1968, Congress directed the US Food and Drug Administration to regulate electromagnetic radiation from electronic devices, including visible light. While the FDA developed regulations for lasers, it has failed to develop regulations for LEDs. Thus, no LED product has been approved for use by the FDA and there are no FDA safety regulations for LED products. The CEC's insistence on pushing unapproved, unregulated LED products that are toxic, dangerous, and discriminatory is not legally justified and is endangering the lives of the public and the health of our entire ecosystem.

Attached is the Soft Lights Foundation submission to the US Department of Energy detailing how Congress was misled about the quality of light from LEDs, the documented cases of harm to people from LED light, and describing how LEDs are not energy efficient. The Soft Lights Foundation Citizen Petition to the FDA to regulate LED products is docket number 2022-P-1151. The New York State Public Service Commission investigation of LED streetlights triggering epileptic seizures is case 21-02623.

While the CEC may have been able to claim ignorance for previous rule making cycles, this claim is no longer possible for the 2025 cycle. If the CEC is still claiming that LEDs are energy efficient, or that LED products are FDA approved, or that LED light is safe, or that LEDs emit uniform luminance in the 2025 energy codes, the CEC will be knowingly committing fraud. Therefore, the CEC must acknowledge that LEDs are a low-quality light which cannot be compared to incandescent for energy efficiency purposes, that LEDs are not energy efficient compared to incandescent, that the FDA

has not yet approved LED products, that LED light is a major health hazard, and that LED light discriminates against those who are LED light-disabled.

Additional submitted attachment is included below.

1
2 SOFT LIGHTS FOUNDATION,

3 Petitioner,

4 vs.

5 US DEPARTMENT OF ENERGY

6 Respondent

APPEAL OF FINAL RULES FOR
GENERAL SERVICE LAMPS EERE-2021-
BT-STD-0005 AND EERE-2021-BT-STD-
0012

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9 **I. Introduction**

10 On May 9, 2022, the US Department of Energy Office of Energy Efficiency and
11 Renewable Energy published two final rules. 1) Final Rule Docket: EERE-2021-BT-STD-0005
12 - Energy Conservation Program: Energy Conservation Standards for General Service Lamps¹
13 and Final Rule Docket: EERE-2021-BT-STD-0012 - Energy Conservation Program: Definitions
14 for General Service Lamps²

15 The fundamental purpose of a General Service Lamp is to provide safe, uniform
16 illumination. Rule -0005 sets a 45 lumen per watt minimum luminous efficacy standard for
17 GSLs without requiring uniform illumination. Rule -0012 classifies LED lamps as a GSL, even
18 though LEDs do not provide uniform illumination and are unsafe. Because of the failure of these

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22 ¹ <https://www.federalregister.gov/documents/2022/05/09/2022-09477/energy-conservation-program-energy-conservation-standards-for-general-service-lamps>

23 ² <https://www.federalregister.gov/documents/2022/05/09/2022-09480/energy-conservation-program-definitions-for-general-service-lamps>

1 two rules to ensure uniform illumination and the protection of the public health and welfare,
2 neither of these two rules can be adopted.

3 4 **II. The Law**

5 **A. Radiation Control for Health and Safety Act of 1968**

6 In 1968, Congress passed the Radiation Control of Health and Safety Act which directed
7 the Food and Drug Administration to regulate electronic products and the electromagnetic
8 radiation emitted by those products, including visible light. The FDA issued Title 21, Part I,
9 Subchapter J, Part 1040 in the Code of Federal Regulations which is titled Performance
10 Standards for Light-Emitting Products. The FDA has issued 21 CFR Part 1040.10 Laser
11 products., Part 1040.20 Sunlamp products and ultraviolet lamps intended for use in sunlamp
12 products., and Part 1040.30 High-intensity mercury vapor discharge lamps.

13 In 2018, the FDA posted the statement on the FDA’s website, “LEDs (Light Emitting
14 Diodes) are different from laser diodes and are not subject to the Federal laser product
15 performance standard.”³ This statement does not clarify whether LEDs have never been
16 regulated by the FDA, or if the FDA had been previously regulating LEDs under Part 1040.10
17 but has now stopped regulating LEDs within Part 1040.10. In either case, this lack of regulation
18 of LEDs violates Congress’ mandate in the 1968 Radiation Control of Health and Safety Act to
19 regulate electromagnetic radiation.

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23 ³ <https://www.fda.gov/radiation-emitting-products/home-business-and-entertainment-products/laser-products-and-instruments>

1 LEDs were invented in the 1960s, so FDA regulation of Light Emitting Diodes should
2 have occurred long ago. As we can see, however, Part 1040 Performance Standards for Light-
3 Emitting Products is missing Subpart 1040.40 Light Emitting Diode products. Despite their
4 toxicity and potential for harm, LED products are currently unapproved and unregulated. The
5 FDA has not stated that LED light is safe.

6
7 **B. The Public Health and Welfare**

8 The Energy Policy and Conservation Act of 1975, the Energy Policy Act of 1992, the
9 Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007 (each
10 described in more detail below) have all been codified into the federal statutes for energy
11 efficiency which are found in Title 42 of the United States Code titled The Public Health and
12 Welfare.⁴ It is critical to recognize that energy efficiency statutes must meet the goal of Title 42
13 which is protect the public health and welfare. An energy efficiency statute that fails to consider
14 the impacts on human health or which harms public health must be rejected as illegitimate.

15 Chapter 77 of Title 42 is titled Energy Conservation. The first section in Chapter 77 is
16 Section 6201 which is titled Congressional Statement of Purpose which states “*The purposes of*
17 *this chapter are— (5) to provide for improved energy efficiency of motor vehicles, major*
18 *appliances, and certain other consumer products;*” Congress’ explicit statement of purpose is to
19 improve energy efficiency and at the same time protect the public health and welfare under Title
20 42. If the statute fails to meet Congress’ purpose, then the statute must be vacated. LED light is

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23 ⁴ <https://www.govinfo.gov/content/pkg/USCODE-2011-title42/pdf/USCODE-2011-title42.pdf>

1 not an energy efficient light (explained in great detail below) because it does not provide uniform
2 illumination and harms the public health. Any statute or rule that attempts to allow LED lamps
3 to replace incandescent lamps fails to meet Congress' energy efficiency requirements.

4 Title 42, Chapter 77, Subchapter III is titled Improving Energy Efficiency. Energy
5 efficiency means providing the same quality of service using less energy. If the statute or rule is
6 designed for using less energy but fails to ensure the same quality of service, then the statute or
7 rule must be rejected as invalid.

8 9 **C. The Energy Policy and Conservation Act of 1975**

10 Congress passed the Energy Policy and Conservation Act in 1975.⁵ This act included
11 sections on energy efficiency but did not include energy efficiency standards for lightbulbs. The
12 EPCA stated the following definition: "*The term 'energy efficiency' means that ratio of the*
13 *useful output of services from a consumer product to the energy use of such product, determined*
14 *in accordance with test procedures under section 323.*" In simpler language, energy efficiency
15 means providing the same quality of service (useful output) using less energy (energy use). The
16 EPCA was codified in statute in United States Code Title 42 The Public Health and Welfare.

17 18 **D. Energy Policy Act of 1992**

19 Congress passed the Energy Policy Act in 1992 which added energy efficiency standards
20 for lighting.⁶ Title I is titled Energy Efficiency. Subtitle C is titled Appliance and Equipment

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23 ⁵ <https://www.govtrack.us/congress/bills/94/s622/text>

⁶ <https://www.govinfo.gov/content/pkg/STATUTE-106/pdf/STATUTE-106-Pg2776.pdf>

1 Energy Efficiency Standards. Section 123 is titled Energy Conservation Requirements for
2 Certain Lamps and Plumbing Products.

3 The Energy Policy Act of 1992 amended US Code Section 6291 to contain definitions for
4 (30)(A) Fluorescent Lamp, (30)(B) General Service Fluorescent Lamp, (30)(C) Incandescent
5 Lamp, (30)(D) General Service Incandescent Lamp, (30)(F) Incandescent Reflector Lamp. Note
6 that the term General Service Lamp had yet to be defined.

7 Item (30)(E) states “*The terms ‘fluorescent lamp’ and ‘incandescent lamp’ do not include*
8 *any lamp excluded by the Secretary, by rule, as a result of a determination that standards for*
9 *such lamp would not result in significant energy savings because such lamp is designed for*
10 *special applications or has special characteristics not available in reasonably substitutable lamp*
11 *types.*” As we look forward into additional updates to US Code Title 42 Section 6291, we must
12 keep in mind that Congress is not intending for newer technologies to replace previous
13 technologies if the quality of the light is reduced. There can be no “energy savings” if the
14 service provided is changed or if the quality of the light is reduced.

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16 **E. Energy Policy Act of 2005**

17 Congress passed the Energy Policy Act of 2005 in 2005 and for the first time in the
18 history of the Energy Policy and Conservation Act timeline introduced the Light Emitting
19 Diode.⁷ Title IX is titled Research and Development. Section 912 is titled Next Generation
20 Lighting Initiative. Item (c) is titled Objectives and states, “*The objectives of the Initiative shall*

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⁷ https://www1.eere.energy.gov/femp/pdfs/epact_2005.pdf

1 *be to develop advanced solid-state organic and inorganic lighting technologies based on white*
2 *light emitting diodes that, compared to incandescent and fluorescent lighting technologies, are*
3 *longer lasting, are more energy-efficient and cost-competitive, and have less environmental*
4 *impact.”*

5 We must look very, very closely at this section. This section is Title IX Research and
6 Development. Congress is not mandating anything other than investigation. Congress is not
7 mandating solid state lighting but is hopeful that LED lighting can be a more energy efficient
8 version of incandescent and fluorescent lighting. Congress is not stating that LED lighting is
9 more energy efficient than incandescent lighting but is directing public and private parties to
10 develop solid state lighting that is longer lasting, more energy-efficient and cost-competitive, and
11 have less environmental impact. Failure to develop such a technology is entirely possible, but
12 Congress is authorizing the investigation with the hope that success is possible.

13 In the following years from 2005 to 2022, the industry has certainly invested money and
14 time into developing solid state lighting using Light Emitting Diodes, but what they didn't do is
15 develop a solid-state device that is more energy-efficient than incandescent. The reason is
16 because LEDs do not provide uniform illumination. The flat surface of an LED chip produces a
17 dangerous beam of non-uniform energy that interferes with the human nervous system and is
18 toxic to human health. Since LEDs do not provide the same uniform illumination service as
19 incandescent, LEDs are not energy-efficient compared to incandescent and LEDs harm the
20 public health and welfare. **Thus, LED lamps do not meet Congress' directive to develop**
21 **solid-state lighting that is more energy efficient than incandescent or fluorescent.**

22
23 **F. Energy Independence and Security Act of 2007**

1 Congress passed the Energy Independence and Security Act in 2007.⁸ Title III is titled
2 Energy Savings Through Improved Standards for Appliance and Lighting. Subtitle B is titled
3 Lighting Energy Efficiency. Section 321 is titled Efficient Light Bulbs. Section 6291 Item
4 (30)(BB) is titled General Service Lamp. This is the first appearance of the definition of General
5 Service Lamp and states, “The term ‘general service lamp’ includes -- (I) General Service
6 Incandescent Lamps; (II) Compact Fluorescent Lamps; (III) General Service Light Emitting
7 Diode (LED or OLED) Lamps; and (IV) any other lamps that the Secretary determines are used
8 to satisfy lighting applications traditionally served by general service incandescent lamps.

9 It is in this Energy Independence and Security Act of 2007 that Congress made the error
10 of including something called a “General Service Light Emitting Diode” without defining what
11 such a device is, and then including this device in the classification of GSL. As we have seen
12 earlier, LEDs do not provide uniform illumination, are not more energy-efficient than
13 incandescent, and cause harm to human health and welfare.

14 The cause of this error was that Congress was misinformed about the technical nature of
15 LEDs. Even today, there is a lack of understanding within DOE, and all other federal agencies,
16 and the LED lighting industry that LEDs emit non-uniform luminance. While certain individuals
17 in the LED lighting industry and many more individuals in the LED display industry certainly
18 understand that LEDs emit non-uniform luminance, this knowledge is not widely dispersed, and
19 certainly did not make it to the members of Congress. Congress is therefore under the false
20 impression that LEDs emit uniform luminance just like incandescent.

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23 ⁸ <https://www.govinfo.gov/content/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf>

1 Congress' directive in 2005 to research the idea of using solid-state lighting as an energy-
2 efficiency replacement for incandescent lighting rapidly morphed into full-scale adoption of
3 LEDs without any effort to study to the health effects of such light, by focusing only on
4 luminous efficacy, and by ignoring the light quality properties. By 2007, members of Congress
5 had been led to believe that LED light was an equivalent light to incandescent, and thus
6 Congress included General Service LED in the classification of GSL even though it was invalid
7 to do so.

8 Item (a)(6) is titled Standards for General Service Lamps. Within this section are
9 directives to the Secretary to determine if more stringent standards for luminous efficacy for
10 GSLs are needed. The problem here is that Congress was misinformed about the nature of solid-
11 state lighting and did not understand that their 2005 directive to investigate the possibility of
12 using solid-state LED lighting as an energy-efficient replacement for incandescent was not
13 successful. Members of Congress were given the impression by DOE and the industry that LED
14 lighting provided uniform illumination, when it does not.

15 From 2007 to 2022, DOE has been attempting to determine if more stringent luminous
16 efficacy standards should be applied to GSLs. DOE was unsuccessful in making this
17 determination, most likely because LEDs cannot be classified as GSLs. In item (a)(6), Congress
18 specified a backstop luminous efficacy requirement of 45 lumens/watt if DOE failed to
19 determine if more stringent luminous efficacy standards should be applied to GSLs. However,
20 this 45 lumen/watt requirement was based on Congress' flawed understanding of how LEDs emit
21 light and the invalid assignment of LEDs to the GSL classification.

1 The Massachusetts Institute of Technology has developed an incandescent technology
2 called “light recycling” that may be able to achieve a luminous efficacy of 45 lumens per watt.⁹
3 However, this technology is not yet mature has not been given the resources by DOE in the same
4 way that DOE supported LED development. Therefore, Congress’ 45 lumen/watt backstop
5 cannot be applied simply because no technology exists that meet Congress’ criteria of a GSL that
6 provides the same quality of service as an incandescent with 45 lumen/watt luminous efficacy.
7 DOE therefore is not obligated to implement the 45 lumen/watt backstop rule, and, in fact,
8 cannot implement this backstop rule. **An LED is not a GSL and does not meet Congress’**
9 **energy-efficiency and public health and welfare requirements.**

10
11 **G. Executive Order 13990**

12 On January 20, 2021, President Biden issued Executive Order (“E.O.”) 13990, Protecting
13 Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. 86 FR
14 7037 (Jan. 25, 2021). In the opening paragraph, President Biden stated, “**Section 1.** Policy. *Our*
15 *Nation has an abiding commitment to empower our workers and communities; promote and*
16 *protect our public health and the environment; and conserve our national treasures and*
17 *monuments, places that secure our national memory. Where the Federal Government has failed*
18 *to meet that commitment in the past, it must advance environmental justice. In carrying out this*
19 *charge, the Federal Government must be guided by the best science and be protected by*
20 *processes that ensure the integrity of Federal decision-making. It is, therefore, the policy of my*

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23 ⁹ <https://jdj.mit.edu/~ilic/recycling-light>

1 *Administration to listen to the science; to improve public health and protect our environment; to*
2 *ensure access to clean air and water; to limit exposure to dangerous chemicals and pesticides;*
3 *to hold polluters accountable, including those who disproportionately harm communities of*
4 *color and low-income communities; to reduce greenhouse gas emissions; to bolster resilience to*
5 *the impacts of climate change; to restore and expand our national treasures and monuments;*
6 *and to prioritize both environmental justice and the creation of the well-paying union jobs*
7 *necessary to deliver on these goals.”*

8 The DOE Final Rules for General Service Lamps, -0005 and -0012, do not meet the
9 President’s or Congress’ goals of using the best science and protecting public health. LED lamps
10 are undeniably dangerous to public health and welfare, and therefore, these two final rules are in
11 direct opposition to Executive Order 13990 and cannot be adopted.

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13 **H. Rule EERE-2021-BT-STD-0005**

14 In the Summary section of EERE-2021-BT-STD-0005, the DOE writes, *“In this final*
15 *rule, the U.S. Department of Energy (“DOE”) is codifying in the Code of Federal Regulations*
16 *the 45 lumens per watt (“lm/W”) backstop requirement for general service lamps (“GSLs”) that*
17 *Congress prescribed in the Energy Policy and Conservation Act, as amended. DOE has*
18 *determined this backstop requirement applies because DOE failed to complete a rulemaking*
19 *regarding GSLs in accordance with certain statutory criteria. This final rule represents a*
20 *departure from DOE’s previous determination published in 2019 that the backstop requirement*
21 *was not triggered.”*

1 As noted earlier in this document, the reason why DOE has flip-flopped on its
2 understanding of whether the 45 lumen/watt backstop requirement was triggered or not is
3 because of Congress' error in assigning the so-called General Service Light Emitting Diode to
4 the classification of General Service Lamp. Both DOE and Congress are under the mistaken
5 belief that LEDs provide uniform illumination and are an energy-efficient replacement for the
6 incandescent light bulb. Since LEDs are not energy-efficient compared to incandescent, and
7 since LEDs are a danger to public health and welfare, the 45 lumen/watt backstop cannot be
8 applied because the statute itself is based on a false premise and is thus invalid.

9
10 **I. Rule EERE-2021-BT-STD-0012**

11 In the Summary section of EERE-2021-BT-STD-0012, the DOE writes, "*On January 19,*
12 *2017, the U.S. Department of Energy ("DOE") published two final rules adopting revised*
13 *definitions of general service lamp ("GSL") and general service incandescent lamp ("GSIL"),*
14 *and other supplemental definitions, to go into effect January 1, 2020. ("January 2017 Final*
15 *Rules"). Prior to that effective date, on September 5, 2019, DOE withdrew the revised definitions*
16 *of GSL, GSIL, and the other supplemental definitions. Upon further review and consideration, on*
17 *August 19, 2021, DOE published a notice of proposed rulemaking ("NOPR") proposing to*
18 *amend the definitions of GSL, GSIL and the other supplemental definitions as previously set*
19 *forth in the January 2017 Final Rules. DOE responds to comments received on the NOPR in this*
20 *final rule and adopts the definitions of GSL and GSIL and the associated supplemental*
21 *definitions set forth in the January 2017 Final Rules as proposed in the NOPR."*

1 Again, and as noted earlier in this document, the reason why DOE has flip-flopped on its
2 understanding of what can be classified as a General Service Lamp is because of the error in
3 belief that an LED lamp provides uniform illumination and is safe for public health and welfare.

4 In EERE-2021-BT-STD-0012, the DOE falsely claims that LED light has the same
5 characteristics as incandescent light, falsely claims that DOE is unaware of any negative health
6 effects from LED light, and claims that the Americans with Disabilities Act is irrelevant. The
7 reason why these DOE claims are false is explained in great detail below.

8 DOE does not classify a laser lamp as a GSL. Similarly, DOE cannot classify an LED
9 lamp as a GSL. Classifying a Light Emitting Diode as a General Service Lamp is unsupported
10 by the physics and the health effects of LED light.

11

12 **J. Regulation of LEDs**

13 While the Food and Drug Administration regulates laser light, the FDA has failed in its
14 duty to regulate LED light. While LED chip makers have created chips that exceed 100,000,000
15 nits of peak luminance, human comfort level is approximately 300 nits. Maximum human
16 tolerance is about 50,000 nits. The radiance/luminance of LED chips far exceeds any level that
17 could be considered safe for humans, and yet there are no regulations to prohibit lamp
18 manufacturers from making unsafe products. The federal agencies that are not regulating LEDs
19 include the FDA, NHTSA, EPA, FMCSA, CPSC, CDC, FHWA, FCC, FAA, and DOE.

20 It is negligent for DOE to classify an unregulated, dangerous device such as an LED lamp
21 as a General Service Lamp whose purpose is to provide safe, uniform illumination.

1 **III. The Physics**

2 **K. Definition of Energy Efficiency**

3 There is not a single universal definition of “energy efficiency”, but all definitions
4 include the same basic premise. **Energy efficiency is providing the same quality of service**
5 **using less energy.**

6
7 [United States Department of Energy](#) – “Simply put, energy efficiency means using
8 less energy to get the same job done.”¹⁰

9 [West Virginia Department of Environmental Protection](#) – “Energy efficiency means
10 using less energy to accomplish the same task.”¹¹

11 [Environmental and Energy Study Institute](#) – USA – “Energy efficiency simply means
12 using less energy to perform the same task.”¹²

13 [United Kingdom Department of Energy and Climate Change](#) – “On a technical level,
14 energy efficiency is the relationship between the energy consumed and the output
15 produced by that energy, often called ‘energy services’, for example the number of
16 miles travelled for a gallon of fuel. Increasing energy efficiency means using either
17 less energy to provide the same level of energy services, or using same level of
18 energy to provide a higher level of energy services.”¹³

19 [Law Insider](#) – Energy Efficiency means a decrease in customer consumption of
20 electricity or natural gas achieved through measures or programs that target
21 customer behavior, equipment, devices, or materials without reducing the quality of
22 energy services.¹⁴

23 ¹⁰ https://www.energystar.gov/about/about_energy_efficiency

¹¹ <https://dep.wv.gov/daq/EnergyEfficiency/Pages/default.aspx>

¹² <https://www.eesi.org/topics/energy-efficiency/description>

¹³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/65598/6918-energy-efficiency-strategy-statistical-summary.pdf

¹⁴ <https://www.lawinsider.com/dictionary/energy-efficiency>

1 The claim of energy efficiency relies on a comparison to a baseline energy system. The
2 following two examples demonstrate energy systems that improve energy efficiency by
3 providing the same quality of service but using less energy.

4 **Example 1:** A motor vehicle with an Internal Combustion Engine travels 15 miles on one
5 gallon of gas. Engineers redesign the combustion chamber with a hemispherical top, resulting in
6 less wasted energy and an increase to 20 miles of travel on one gallon of gas. The same job is
7 performed, but using less energy, so the new technology is energy efficient.

8 **Example 2:** The water in a hot tub is heated by burning wood in an open fire underneath
9 the hot tub and it takes 3 chords of wood to heat the water to 105 degrees Fahrenheit. The system
10 is redesigned to enclose the fire and direct more of the heat to the bottom of the hot tub so that it
11 only takes 2 chords of wood to heat the water to 105 degrees and yet still heat the water
12 uniformly. The same job is performed, but using less energy, so the new system is more energy
13 efficient than the old system.

14 If the new technology performs a different job or a lower quality of service, then a claim
15 of energy efficiency cannot be made. The following three examples demonstrate systems that
16 reduce energy usage, but which are not energy efficient because the quality of the service is
17 reduced.

18 **Example 3:** A water purification machine uses 100 watt-hours of energy to produce 75
19 gallons of water that is 99.9% free of bacteria. A new technology machine uses 50 watt-hours of
20 energy to produce 75 gallons of water, but the water produced is only 30% free of bacteria. The
21 new technology did not perform the same job, so the new technology is not more energy efficient
22 than the previous technology.

1 **Example 4:** An elevator uses 1,000 joules to carry 5 passengers to the 4th floor and open
2 the door to let the passengers out. A new elevator design uses 600 joules to carry 5 passengers to
3 the 4th floor, but the new design does not allow the doors to open, and the passengers remain
4 stuck inside. The new technology is not more energy efficient than the previous technology
5 because it doesn't have the same functionality.

6 **Example 5:** A light bulb uses 60 watts to illuminate a room with 700 lumens of uniform
7 light. A new technology uses 10 watts to provide 700 lumens of light, but the light is not
8 uniform, making it difficult to see and making people sick. Thus, the new technology is not
9 more energy efficient than the previous technology because it does not provide the same service
10 and results in less quality illumination than the previous technology.

11 The baseline service in the case of General Service Lamps is that provided by the
12 incandescent light bulb. An incandescent has the following light qualities: a) uniform
13 illumination, b) a spectral power distribution with a smooth transition from low blue to high red
14 and high infrared, and c) low analog flicker. A new technology such as LED that does not
15 provide those same characteristics cannot be considered to be energy efficient because it isn't
16 getting the same job done or providing the same service.

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18 **L. Light Quality**

19 The incandescent light bulb provides the baseline quality metrics for electric lamps. The
20 incandescent light bulb provides the following:

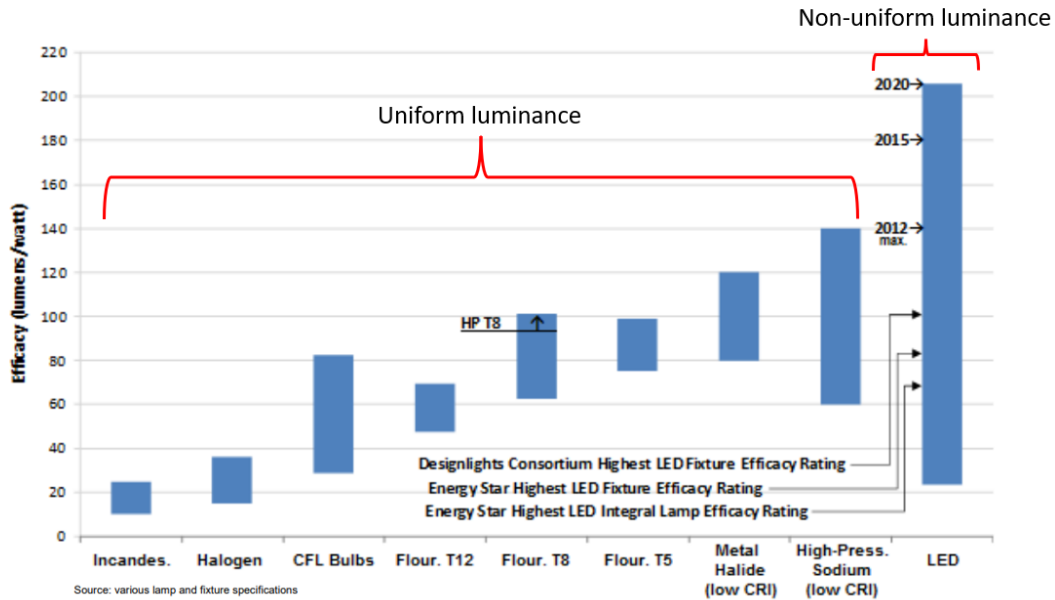
- 21 a) Uniform illumination.
- 22 b) Smooth, continuous increase from low blue to high red spectral power
23 distribution.

1 c) Analog sine wave flicker characteristics.

2 To set energy efficiency standards, DOE must include light quality metrics paired with
3 luminous efficacy requirements. A new technology would need to provide uniform illumination,
4 a smooth, continuous spectral distribution from low blue to high red, and analog flicker
5 characteristics, with a luminous efficacy greater than the luminous efficacy of an incandescent
6 light bulb to be able to claim greater energy efficiency.

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8 **M. Luminous Efficacy**

9 Figure 1 shows a comparison of the luminous efficacy of various lamp types. Each lamp
10 type has different characteristics compared to incandescent. All the lamp types emit uniform
11 luminance, except LED which emits non-uniform luminance. Even though LED has the highest
12 potential luminous efficacy, LED cannot be used or classified as a GSL because LED does not
13 provide the service of uniform illumination. Luminous efficacy alone does not equate to energy
14 efficiency and LEDs are not energy efficient compared to incandescent.



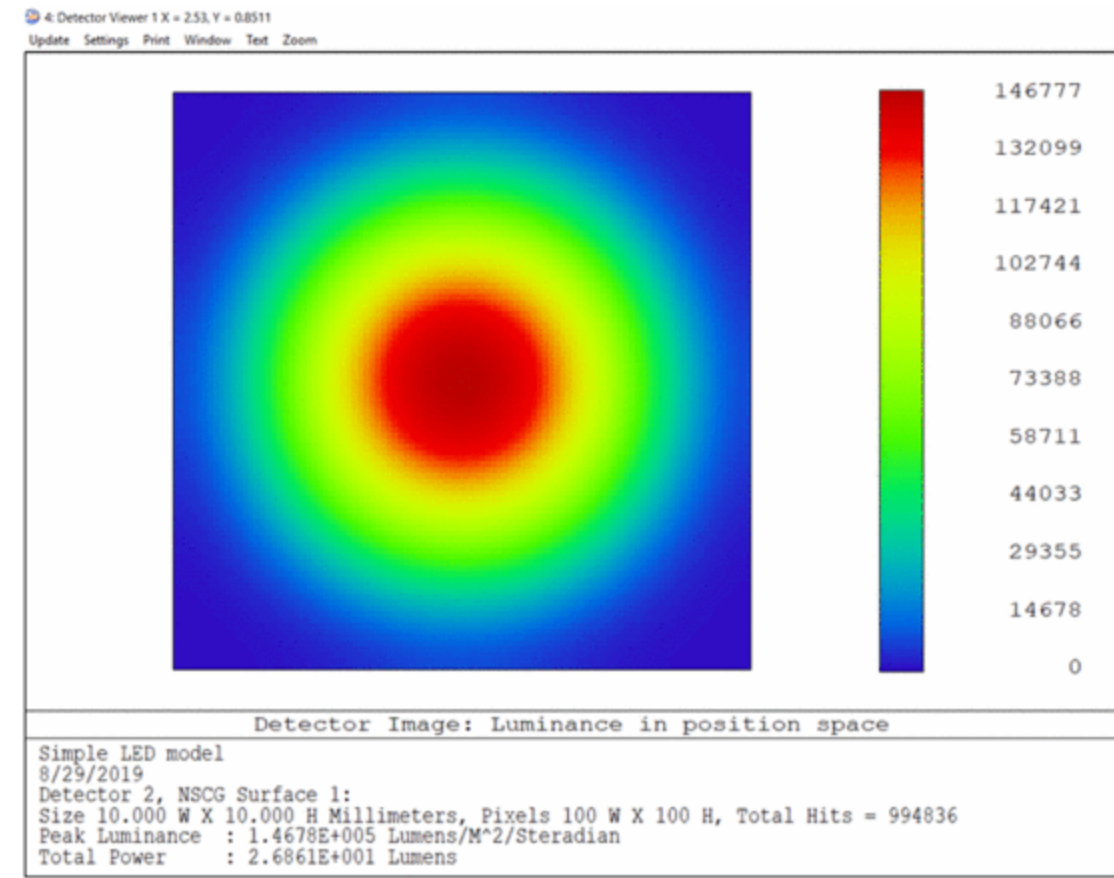
Source: Centerpoint Energy - <https://www.centerpointenergy.com/en-us/Documents/Commercial-Industrial-Docs/Lighting-Guide.pdf>

Figure 1 - Luminous Efficacy Comparison

N. Spatial Uniformity

Figure 2 shows the flat surface of a solid-state LED light source.¹⁵ The false colors indicate the changing luminance, with the peak luminance, in red, being in the center of the LED chip. An LED chip is called a *surface source* and brightness is measured with luminance in nits (candela per square meter). The human nervous system is not biologically adapted to receiving this type of non-uniform energy. Therefore, the non-uniformity of surface source light creates a spatially low-quality light.

¹⁵ <https://ieeexplore.ieee.org/document/8879542>



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Figure 2 - Non-uniform Luminance

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On the other hand, Figure 3 shows the uniformity at a given distance of a **point source** such as incandescent. The brightness of a point source is measured with luminous intensity in candela. This uniform energy is biologically compatible with the human nervous system and thus a point source creates a spatially high-quality light.



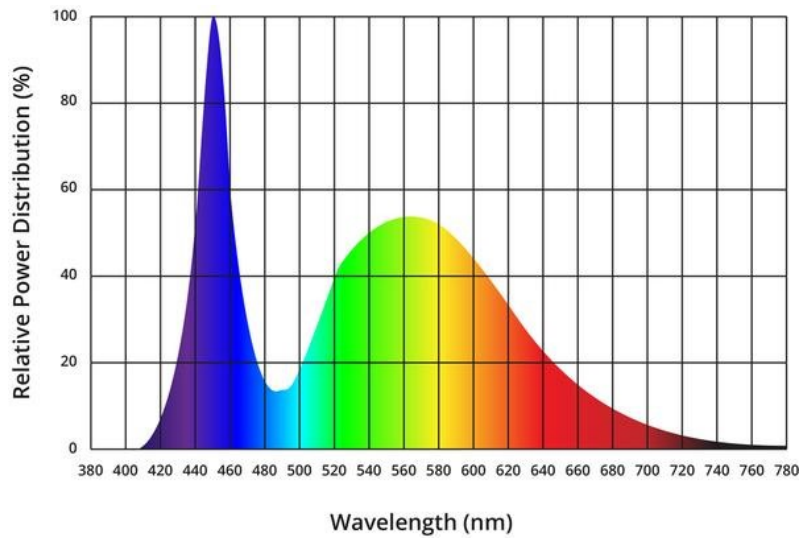
Figure 3 - Uniform Luminance

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8 This difference in spatial distribution between the uniform luminance from a point source
9 incandescent and the non-uniform luminance from a surface source LED is in direct contrast to
10 DOE's statement in EERE-2021-BT-STD-0012 that "*DOE has confirmed that all lamp types*
11 *included in the GSL definition have the same characteristics in the non-incandescent versions as*
12 *offered in the incandescent versions.*" DOE has incorrectly placed LED lamps into the category
13 of General Service Lamps by falsely claiming that LED light has the same characteristics as
14 incandescent light. DOE is wrong to state that incandescent light and LED light have the same
15 characteristics.

16 As a comparison example, consider a laser light source. DOE is not claiming that laser
17 light and incandescent light have the same characteristics. DOE would not attempt to claim that
18 a laser light source is more energy efficient than an incandescent light source because the light
19 output has different characteristics between the two types of emitters. In the same way, DOE
20 cannot claim that an LED light source is more energy efficient than an incandescent light source
21 since the light output has different spatial properties between the two source types.

1 **O. Spectral Power Distribution**

2 Figure 4 shows the spectral power distribution of a 5500K LED lamp. Notice the sharp
3 spike of blue wavelength at 450nm which is the same wavelength that is toxic for humans and
4 damaging to the eye. In addition, notice the trough at 490nm-cyan and lack of red and infrared
5 light. This distribution of energies in the visible spectrum is low quality because of the toxicity of
6 blue wavelength light, the piecewise spectral distribution, and lack of red wavelength.



15 *Figure 4 - LED Spectral Power Distribution - 5500K*

16 On the other hand, Figure 5 shows the spectral power distribution for an incandescent
17 lamp. This is a high-quality light because of the lack of blue wavelength light, the strictly
18 increasing spectral distribution, and the large amount of red wavelength.

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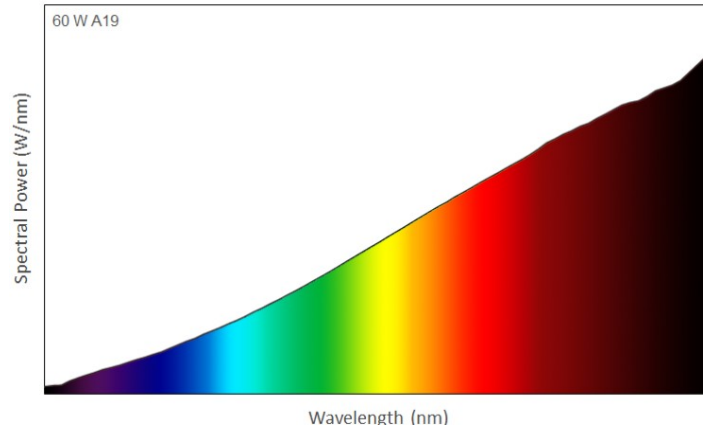


Figure 5 - Incandescent Spectral Power Distribution¹⁶

We refer again to DOE’s statement in EERE-2021-BT-STD-0012 that “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.” As shown in the two images above, LED light and incandescent light do not have the same characteristics and LED light, by virtue of the excessive amount of toxic blue wavelength light, is a low-quality light.

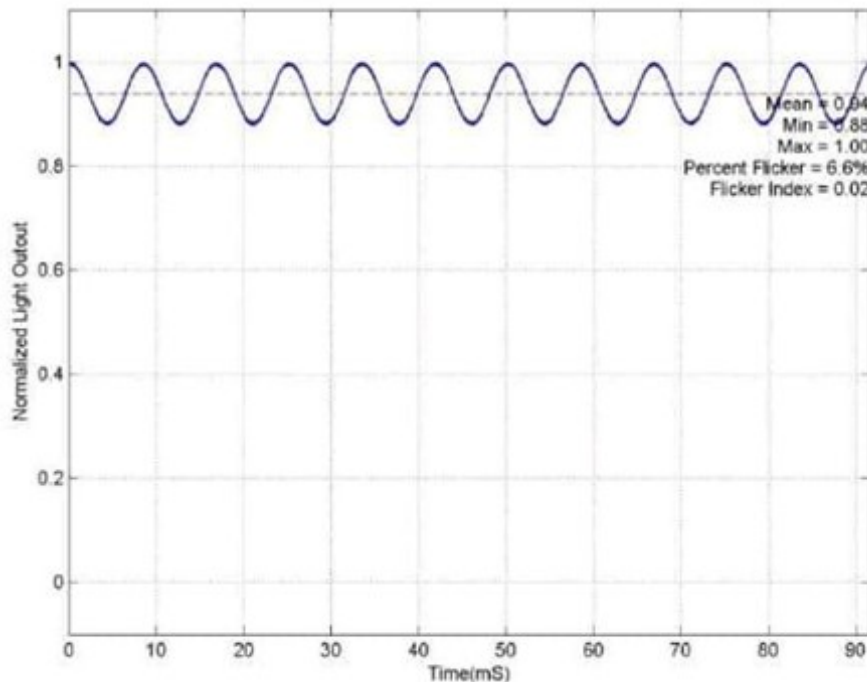
It should be noted that the reason that the manufacturers use blue wavelength light in LEDs is because this is how they increase luminous efficacy and reduce costs. The industry claims that LEDs are energy efficient are false because LEDs don’t provide the same high-quality spectral distribution as incandescent. If the manufacturers were to make LEDs with the same quality of spectral power distribution as incandescent, the luminous efficacy would be no better than incandescent.

¹⁶ https://www.energy.gov/sites/prod/files/2016/11/f34/royer_spectral-power-dist_denver2016.pdf
 APPEAL OF FINAL RULES FOR GENERAL SERVICE LAMPS EERE-2021-BT-STD-0005 AND EERE-2021-BT-STD-0012 - 21

1 **P. Flicker**

2 The article 1789-2015 - IEEE Recommended Practices for Modulating Current in High-
3 Brightness LEDs for Mitigating Health Risks to Viewers shows the difference between the
4 analog sine wave flicker from an incandescent, and the digital square wave flicker of an LED.¹⁷
5 As noted by IEEE, “*Presently, there are no standards on safe modulating frequencies for high-*
6 *brightness LEDs.*” This lack of safety standards for LEDs makes LEDs very dangerous because
7 chip makers and lamp manufacturers have no restrictions on the flicker emitted by the LED.

8 Figure 6 shows the flicker characteristics of an incandescent. The sine wave is
9 continuous and smooth and the light output changes by 6.6% as the alternating current cycles.



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Figure 6 - Incandescent Flicker – 6.6%

¹⁷ <https://ieeexplore.ieee.org/document/7118618>

1 On the other hand, Figure 7 shows the essentially discontinuous function of the square
2 wave flicker of an LED. The light output drops from 100% to 0% and then back to 100% as the
3 alternating current cycles. The discontinuous function and the extreme change between states
4 produces flicker that is incompatible with the human nervous system.

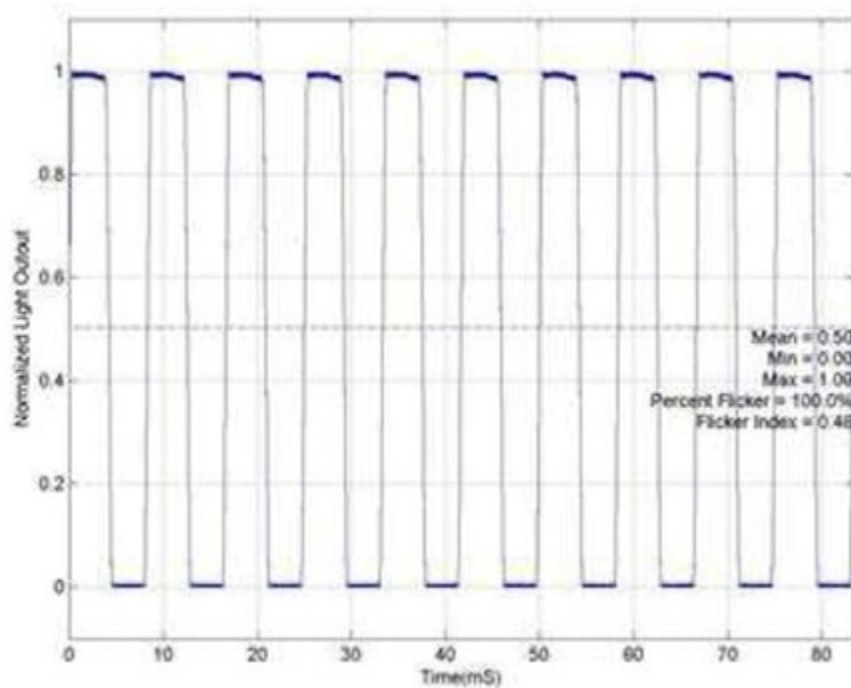


Figure 7 - Solid State Flicker - 100%

17 The square wave flicker is neurologically dangerous for many people and this makes
18 LED light a low-quality light. For some people, this flicker is not consciously noticeable, but for
19 others the flicker is consciously noticeable. However, even if the square wave flicker is not
20 consciously noticeable, it is still having a negative effect on human health and is to be avoided.
21 Since square wave flicker is lower in quality than analog sine wave flicker, the LED light is a

1 lower quality light than incandescent, and DOE cannot claim that LEDs have the same
2 characteristics as incandescent and cannot claim that LEDs are energy efficient.

3
4 **Q. Characteristics of Incandescent and Non-Incandescent General Service Lamps**

5 In EERE-2021-BT-STD-0012 Energy Conservation Program: Definitions for General
6 Service Lamps, the DOE states, “*Hence, in this final rule, incandescent lamps that are included*
7 *as GSLs have or can have more efficient, non-incandescent replacements with the same form*
8 *factor and light output. DOE has confirmed that all lamp types included in the GSL definition*
9 *have the same characteristics in the non-incandescent versions as offered in the incandescent*
10 *versions.*”

11 To be “more efficient”, the non-incandescent replacement must provide the same light
12 quality as incandescent. A non-incandescent cannot simply achieve a higher luminous efficacy
13 than incandescent by having different or lower light quality metrics and be considered “more
14 efficient”. The DOE incorrectly concludes that all non-incandescent lamp types, including
15 LEDs, included in the GSL have the same characteristics as incandescent. LEDs have non-
16 uniform luminance compared to the uniform luminance of incandescent. Most LEDs have a
17 large peak of blue wavelength light compared to almost no blue for an incandescent. LEDs have
18 square wave flicker compared to sine wave flicker for an incandescent. The so-called General
19 Service Light Emitting Diode Lamp cannot be classified as a General Service Lamp because it
20 has different light output characteristics than an incandescent.

21 In EERE-2021-BT-STD-0012, DOE states, “*General service lamps include, but are not*
22 *limited to, general service incandescent lamps, compact fluorescent lamps, general service light-*
23

1 *emitting diode lamps, and general service organic light emitting diode lamps.*” This
2 classification appears to be wholly arbitrary, as incandescent lamps and LED lamps provide
3 entirely different services. DOE further states that, “*General service lamps do not include:*
4 *General service fluorescent lamps; High intensity discharge lamps.*” DOE also does not include
5 laser lamps in the definition of GSL. DOE has incorrectly used only the screw base type and the
6 lumen output criteria to classify a lamp as GSL. This cannot be done because the definition of
7 energy efficiency requires a comparison of the light quality and the service provided and because
8 the purpose of a GSL is to provide uniform illumination. If fluorescent lamps, high intensity
9 discharge lamps, and laser lamps are all excluded from the classification of GSL, then so too
10 must LED lamps be excluded from classification of GSL.

11 Placing any type of light source into a medium screw base with a luminous flux between
12 310 and 2600 lumens does not automatically qualify that light source as a General Service Lamp.
13 Using the incandescent as a baseline, to qualify for GSL classification the light output of the
14 lamp GSL must produce uniform illumination, low-blue to high-red spectral distribution, and
15 analog flicker characteristics. These requirements automatically exclude laser light and LED
16 light from the GSL classification. **All GSLs must provide the same service and same quality**
17 **of service, but incandescent and LED provide different services, and therefore an LED**
18 **lamp cannot be classified as a GSL.** DOE’s decision to include LEDs in the category of GSL
19 is arbitrary and not legally justifiable.

21 IV. Public Health and Welfare

22 R. Harm to Human Health

1 In 2005, when Congress directed DOE to study the feasibility of using solid-state lighting
2 to create a lamp that was more energy-efficient than an incandescent, DOE failed to study the
3 impacts of the non-uniform luminance, blue wavelength light, and square wave flicker from
4 LEDs on the public health and welfare. This is a major oversight, and this failure has led to
5 serious negative health effects, loss of ability to work, exclusion from society, and an entirely
6 new class of disabled persons who are LED light-disabled. Again, we must remember that US
7 Code Title 42 is titled The Public Health and Welfare and that Congress' goals are for DOE to
8 develop energy-efficient lighting that does not harm public health or welfare. DOE's analysis of
9 the health effects of LED light fails to meet Congress' directive for developing a solid-state
10 energy efficient light that does not harm public health and welfare.

11 In EERE-2021-BT-STD-0005, DOE states, "*Though the public comments do not include*
12 *quantitative evidence of specific lighting technology characteristics relevant to health, DOE has*
13 *considered these public comments. DOE researched studies and other publications to ascertain*
14 *any known impacts of LED lamps on human health and has not found any evidence concluding*
15 *that LED lighting used for general lighting applications directly results in adverse health*
16 *effects.*" and then lists the following three references as supposed proof that LEDs do not result
17 in adverse health effects.

- 18 1) European Commission, "Scientific Committee on Health, Environmental and
19 Emerging Risks (SCHEER) Report," June 2018. Available at [https://ec.europa.eu/
20 health/system/files/2019-02/scheer_o_011_0.pdf](https://ec.europa.eu/health/system/files/2019-02/scheer_o_011_0.pdf);
- 21 2) Cleveland Clinic, "Are LED Lights Damaging Your Retina?" August 9, 2019.
22 Available at <https://health.clevelandclinic.org/are-led-lights-damaging-your-retina/>;

1 3) Light Europe, “Frequently Asked Questions on alleged LED health related issues,”
2 December 2016. Available at [https://www.lightingeurope.org/images/publications/
3 general/FAQ_on_alleged_LED_related_health_issues_-_December_2016.pdf](https://www.lightingeurope.org/images/publications/general/FAQ_on_alleged_LED_related_health_issues_-_December_2016.pdf).

4
5 The listing of just these three links, only one of which is a study, is inexcusably
6 negligent. Immediately obvious is the omission of the American Medical Association report of
7 2016 showing that blue wavelength light is dangerous.¹⁸ Also missing are the studies of how
8 LED light impacts those who are most sensitive to the non-uniform luminance of LED light such
9 as those with epilepsy, autism, and migraines.

10 The SCHEER report referenced by the DOE is a severely flawed document that cannot be
11 relied on. Yet, the SCHEER report is full of warnings of the dangers of LED light. The
12 language used in the report attempts to water down the risk, but many dangers of LED light are
13 listed. Here are some quotes from the SCHEER report.

- 14 1. Page 2 – *“Since the use of LED technology is still evolving, the Committee considers*
15 *that it is important to closely monitor the risk of adverse health effects from long-term*
16 *LED use by the general population.”* – The SCHEER report was published in 2018.
17 Since that time, even more research has come out showing that LED light is
18 dangerous and toxic. DOE has failed to “closely monitor” the adverse health effects
19 of LED light.

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23 ¹⁸ [Human and Environmental Effects of Light Emitting Diode \(LED\) Community Lighting](#)
APPEAL OF FINAL RULES FOR GENERAL SERVICE LAMPS EERE-2021-BT-STD-0005 AND EERE-2021-
BT-STD-0012 - 27

- 1 2. Page 22 – “*point source light (light emitted from an LED chip)*” – This is incorrect.
2 LED light is a surface source (Lambertian), not a point source.
- 3 3. Page 8 – “*The SCHEER is concerned about the high-luminance exterior sources used*
4 *on some vehicles.*” – High luminance LED light with excessive amounts of blue
5 wavelength light is dangerous, and yet these LED lights are being used as vehicle
6 headlights, floodlights, streetlights, and indoor lights.
- 7 4. Page 8 – “*People who suffer from photosensitive conditions have been considered.*” –
8 This “have been considered” phrase is the same meaningless phrased used by DOE.
9 What does it mean to “have considered” something? Where are the details? How
10 was it considered? What were the positives and negatives? Where is the discussion
11 of those who have suffered seizures, migraines, panic attacks, blurred vision, loss of
12 balance, skin rashes, and nausea from LED light? The “have been considered” phrase
13 is simply a way to ignore the truth about the negative effects of LED light.
- 14 5. Page 12 – “*The optical radiation incident on a target tissue is expressed in terms of*
15 *irradiance (W/m²) or illuminance (lm/m² or lux).*” – The SCHEER report is
16 misunderstanding that LEDs are a surface source light and that the proper metrics are
17 radiance (W/m²-steradian) and luminance (nits or candela/m² or lumen/m²-steradian)
- 18 6. Seizures – Even though LED light is known to trigger epileptic seizures, there is no
19 discussion of this in the SCHEER report.

20 Examining all the flaws of the SCHEER report would be an exhaustive exercise that
21 deserves its own paper.

22 The link to the Cleveland Clinic is not a study, just a simple article and certainly not
23 worthy of reference. Similarly, the link to Light Europe (“The Voice of the Lighting Industry”)

1 is not worthy of consideration. DOE’s failure to provide serious, detailed analysis of the
2 hundreds of reports of harm caused by LED light is wholly inadequate and does not meet
3 Congress’ directives to ensure that LED lighting technology does not harm public health and
4 welfare. DOE must diligently review and provide detailed analysis of the LED research studies.

5 The overwhelming and inescapable conclusion of hundreds of studies, many of which are
6 linked to below, is that LED light is toxic, hazardous, unsafe, and is not fit for the purpose of
7 general illumination.

8

9 **S. Health Research**

10 DOEs only comment on the research that LED light harms human health is the following,
11 “DOE has considered these public comments.” This singular comment about the health effects
12 constitutes negligence by DOE officials. The scope of how LED light impacts human health and
13 ecosystem system health is so vast that the statement “DOE has considered these public
14 comments” constitutes a dereliction of duty.

15 Below is a list of some of the research studies on the effects of artificial light and LED
16 light that DOE has ignored.

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

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

20 **December, 2021** – [Is Street Lighting Damaging Our Health?](#) – Cree Lighting is the first
21 company in the industry to admit that the industry has been measuring LED light incorrectly.

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

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

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

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

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

10 **February, 2021** – [Insights into blue light accelerated tooth whitening](#) – At a radiance of
11 190 mW/cm², LEDs will bleach teeth.

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

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

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

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

22 **May 24, 2020** – [20% to 30% Have Heightened Sensitivity](#) – This article articulates how the
23 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.

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

3 **December, 2018** – [Exposure to excessive blue LED light damages retinal pigment epithelium and photoreceptors of pigmented mice.](#)
4

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

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

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

9 **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.
10

11 **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
12 breast cancer.

13 **June 29, 2017** – [Effects of white light-emitting diode \(LED\) exposure on retinal pigment epithelium in vivo](#)
14

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

16 **February, 2017** – [Blue Light Paradox](#) – Blue wavelength controls circadian rhythms, but also damages the eye.
17

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

20 **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.*
21
22

1 **June 14, 2016** – [Human and Environmental Effects of Light Emitting Diode \(LED\) Community Lighting](#) – The American Medical Association reports that blue wavelength
2 light from LEDs is toxic.

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

5 **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
6 damage.

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

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

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

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

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

15 **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.
16

17 DOE must address these studies with in-depth analysis prior to adopting any rule that
18 would allow the use of LED lamps.

19
20 **T. Personal Stories of Harm**

21 The DOE has failed to conduct studies of the effects of LED light on human health but
22 has allowed LEDs to proliferate across the US without regulatory oversight. Thus, we have all
23

1 become unwitting participants in a real-time experiment. We can use the responses generated by
2 the public as evidence that LED light is harmful.

3 Ms. MarieAnn Cherry testified to the New York State Public Service Commission that
4 LED light triggers life-threatening epileptic seizures. Ms. Cherry opened her testimony with the
5 following statement, *“I have epilepsy and migralepsy. I cannot neurologically tolerate any LED*
6 *exposure, and I am thrown instantly into violent seizures from the briefest strike of LED light.”*¹⁹

7 Ms. Elaine Dennehy testified to the Irish Parliament that LEDs have excluded her from
8 society. Ms. Dennehy opened her testimony with the following statement, *“I thank the*
9 *committee very much for this opportunity. I also hope that this can help, in many ways, the*
10 *others who are suffering around the world from light emitting diode, LED, sensitivity and*
11 *artificial light sensitivity. I have been made ill from LEDs since 2007. It is more than a*
12 *sensitivity; it is a disability. I am disabled by my environment, like so many others, and excluded*
13 *from society. This is also an accessibility issue.”*²⁰

14 Below is a list of confirmed stories of personal injury from LED light.

- 15 1. [Testimony to NYSPSC](#)
- 16 2. [NY Times Opinion](#)
- 17 3. [Personal letter from a person with epilepsy](#)
- 18 4. [Personal letter from a person with epilepsy](#)
- 19 5. [Testimony to Irish Joint Committee on Disability Matters](#)
- 20 6. [Personal letter from a person with migraines](#)

21 _____
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23 ¹⁹ <https://www.softlights.org/wp-content/uploads/2022/05/To-the-Hon-Letter-to-NYSPSC.pdf>

²⁰ https://www.oireachtas.ie/en/debates/debate/joint_committee_on_disability_matters/2022-02-03/2/

- 1 7. [Personal letter from a person with migraines](#)
- 2 8. [Personal letter from a person with autism](#)
- 3 9. [Personal letter from a person with autism](#)
- 4 10. [Personal story in the New York Times](#)
- 5 11. [Personal story of eye damage](#)
- 6 12. [Personal story of neurological trauma](#)
- 7 13. [Personal story from a person with lupus](#)
- 8 14. [Personal story from a person who gets headaches](#)
- 9 15. [Personal story from a person with nystagmus](#)
- 10 16. [Personal story from a teacher](#)
- 11 17. [Personal story from a person with lupus](#)
- 12 18. [Light sensitivity causing social isolation](#)
- 13 19. [Personal story from a person with electromagnetic sensitivity](#)

14
15 The following are the results of an informal survey conducted in New York.²¹

- 16 1. *“I have not found a medication that stops seizures that are triggered by the (LED)*
- 17 *lights.”*
- 18 2. *“I have epilepsy as well and know the damage the lights can cause.”*

21 <http://www.softlights.org/wp-content/uploads/2022/01/Quotes-from-adversely-affected-individuals.pdf>

- 1 3. *“Daily I am bombarded with seizure triggers (strobes on bicycles, dog collars, police*
2 *and fire engines, and LEDs in stores, restaurants, and even in doctors' offices...which*
3 *I find unforgivable!) ...They also make my muscles twitch and I feel nauseous.*
- 4 4. *“When exposed to LED light sources I experience nausea, vertigo, anomia and*
5 *sometimes migraine-like, pounding headaches combined with a feeling of reality*
6 *loss...certain street lights or LED panels induce very fierce symptoms after only a*
7 *short exposure.”.*
- 8 5. *“Currently I am not employed or doing any volunteer work because of lighting in*
9 *buildings...and other road lighting. I hate going out in public because of light*
10 *sensitivity.”*
- 11 6. *“I had no previous health conditions, optical sensitivity, or problems with*
12 *headaches...Bright blueish LEDs also make me feel agitated and nauseous. I'm*
13 *perfectly well if I stay away from these lights, but that means staying away from my*
14 *children's school, the health center and hospital, most churches and meeting houses,*
15 *libraries...much of life as I knew it. The times the symptoms last depend on the length*
16 *of exposure to the lighting, but for ages afterwards I feel incredibly drained and down*
17 *and 'wrong' all over.”*
- 18 7. *“This situation has recently gotten a lot worse with the introduction of LED street*
19 *lighting...which causes the worst pain yet.”*
- 20 8. *“... no longer able to cycle, walk or drive wherever LED streetlights are installed as*
21 *they instantaneously trigger bad headaches...which quickly develop into disabling*
22 *migraines, including dizziness, not being able to think straight, some loss of*
23

1 *coordination, and a general inability to function... symptoms lasting more than a*
2 *day.”*

3 9. *“I have seizures when I glimpse an LED light...Anyone else experiencing the*
4 *same???”*

5 10. *“I cannot be around any LEDs...incandescent works perfectly well, but the lighting*
6 *industry is desperate to phase them out...It's getting to be where many of us are*
7 *prisoners in our own homes.”*

8 11. *“The LED streetlights I have encountered have been pure and utter hell for me. Being*
9 *around them, I just feel burning right on my eyes...the pain is almost unbearable.”*

10 12. *“Blue light is recognized by photo-dermatologists to be much more penetrating and*
11 *therefore much more aggravating for people with light sensitive skin conditions. The*
12 *high blue content of the proposed street lighting...I would become totally*
13 *housebound...”*

14 13. *“I was bathed in a very bright LED street light from a new housing estate...I felt ...a*
15 *severe headache, the pain lasted for a month and was accompanied by general light*
16 *sensitivity to all bright light.”*

17 14. *“It is well-known that light can affect the brain in negative ways. Sometimes I think:*
18 *how has this happened? How is this the kind of environment we want to live in?”*

19 15. *“...the impact is far worse from LED lights...(I wear) special tinted glasses to try and*
20 *mitigate the effects, but they only help to a limited degree. I'm concerned about when*
21 *the relaxing orange street light outside my bedroom window will be changed to LED,*
22 *because others have been converted in our road already. If the one outside my*
23 *window gets changed to LED, that would be a disaster for me.”*

- 1 16. *“I have special glasses I wear when going out that seem to help with bright lights.*
2 *With the LEDs it can be tricky. If I notice any place I went to has LED lights, then I*
3 *make it (a point to) remember. It helps me avoid them (LEDs).*
- 4 17. *“All new street lights including LEDs make me feel disoriented, lose my balance and*
5 *be unable to sense my feet... I have to hold onto another person to stop myself falling.*
6 *After being exposed, I suffer a migraine.”*
- 7 18. *“Most LED street lights make me feel awful and unable to function well, with*
8 *migraines, dizziness, pain, extreme discomfort, being on edge, and a substantial*
9 *feeling of general malaise. NonLED street lights are totally fine for me!”*
- 10 19. *“Street lights in my area were changed over four years ago from sodium... effect on*
11 *me so devastating (that I have) barely left the house or even opened my front door in*
12 *the evening since they were installed. I can also be affected during the day as many*
13 *LEDs are actually on permanently...”*
- 14 20. *“I was already unable to work due to LED lighting in the offices but losing the*
15 *freedom to be outside or even look outside at dawn or after dusk is a further*
16 *disability, I am having inflicted upon me. The winter months are a particularly*
17 *difficult time as I have to draw the blinds and curtains in the middle of the day to*
18 *avoid feeling ill.”*
- 19 21. *“a devastating change...excluded from work and leisure outside the house...(no)*
20 *classes or meetings, even just walking through the town is impossible (since LED*
21 *street lighting arrived)...very upsetting, but better than living in constant pain...”*
- 22
- 23

1 22. *“The parking garage (now) has LED lighting. The second (I am in the garage) I get a*
2 *lightheaded feeling and nausea...I cannot use LED light bulbs without feeling quite*
3 *ill. My time in public stores, these days, has to be very short.”*

4 23. *“I’ve never had migraines...but recently I was in Walmart, and it felt like the lights*
5 *were flashing, it seemed exceedingly bright...I am experiencing the same thing now at*
6 *work. They’ve changed the lighting to LEDs in our warehouse and now this is*
7 *happening.”*

8 The informal study above was conducted in New York, but those quotes likely represent
9 the population as a whole. Here are some statistics of classes of people in the USA whose health
10 may be harmed by LED light.

11 3,400,000 people with epilepsy.

12 5,400,000 adults with autism.

13 35,000,000 people with migraines.

14 73,000,000 children.

15 There are hundreds of documented stories of harm to human health caused by LED light
16 and likely millions of undocumented stories. Some of these stories are documented by the Soft
17 Lights Foundation²² and other stories documented by LightAware Charity.²³ Ongoing reports of
18 harm are posted daily on numerous social media groups such as Ban Blinding LEDs.

19
20
21
22
23 ²² <http://www.softlights.org/stories/>

²³ <https://lightaware.org/about/individual-stories/>

1 Based on these reports of the personal adverse effects of LED light, it is likely that
2 millions of Americans are being harmed by LED light. All of these reports contradict DOE's
3 assertion that LED light does not cause harm. These reports of harm from LED light must be
4 taken seriously by DOE and cannot be ignored.

5
6 **U. Americans with Disabilities Act**

7 The ADA is a federal law originally adopted in 1990, and then further strengthened in
8 2008. The ADA prohibits discrimination. LEDs have created a new class of disabled citizens
9 who are LED light-disabled. If LEDs remain classified as GSLs and incandescent light bulbs are
10 eliminated from the market, then businesses and government agencies will be placed into the
11 impossible position of having to provide light that discriminates due to unavailability of non-
12 discriminatory incandescent lighting.

13 For example, let's say that a small town has one US Post Office that was previously using
14 incandescent light bulbs that are safe for LED light-disabled people. If an incandescent light
15 bulb burns out and needs replacement, but incandescent light bulbs are no longer available, then
16 the USPO will have three choices: 1) Replace the incandescent with an LED lamp that produces
17 low-quality light that causes epileptic seizures, migraines, and panic attacks, thus preventing
18 those who are LED light-disabled from accessing the USPO, or 2) Use candles or oil lamps, or 3)
19 Leave the USPO dark. This is a dilemma that the DOE must not force the Post Office into.

20 DOE has not collaborated with the US Access Board during this process. DOE must
21 begin the conversation with the US Access Board to ensure that guidelines are developed to
22 protect LED light-disabled people from discrimination.

1 **V. RELIEF**

2 In this appeal, we have proved all the following:

- 3
- 4 1. In the same way that laser lamps are not classified as a GSL, LED lamps cannot be
5 classified as a GSL because LED lamps do not provide the fundamental service of
6 safe, uniform illumination and are a danger to public health.
 - 7 2. Congress' 45 lumen/watt luminous efficacy backstop requirement was made on the
8 false premise that an LED lamp can be classified as a GSL, and therefore the 45
9 lumen/watt requirement cannot be adopted.
 - 10 3. Energy efficiency requires both light quality and luminous efficacy requirements.
 - 11 4. Setting luminous efficacy requirements without corresponding light quality metrics
12 results in lower quality light that can harm human health and a failure to achieve
13 energy-efficiency.
 - 14 5. The FDA has not approved any LED products.

15 Therefore, DOE must do the following:

- 16
- 17 1. Remove LEDs from the GSL classification.
 - 18 2. Rescind the 45 lumen per watt luminous efficacy requirement for GSLs.
 - 19 3. Explain to members of Congress that LEDs are not energy efficient, and that LEDs
20 do not meet Congress' Title 42 public health and welfare requirements.
 - 21 4. Develop energy efficiency rules for General Service Lamps that pair light quality
22 requirements with luminous efficacy requirements and which are technologically
23 achievable.

- 1 5. Seriously and carefully consider the large volume of research studies,
2 epidemiological data, and personal stories showing that LED light is toxic, dangerous,
3 and discriminatory.
- 4 6. Authorize and direct additional studies to further understand the neurological effects
5 of non-uniform luminance surface source LED light.
- 6 7. Wait for the Food and Drug Administration to regulate LEDs before adopting any
7 Rules that promote LED products.
- 8 8. Collaborate with the US Access Board to develop guidelines to ensure that DOE rules
9 do not create discriminatory barriers.

11 Dated: July 10, 2022

12 Respectfully Submitted,

13 **SOFT LIGHTS FOUNDATION**

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