Appliance Standards Awareness Project
Natural Resources Defense Council
Alliance to Save Energy
American Council for an Energy Efficient Economy
Consumer Federation of America
Consumers Union
National Consumer Law Center
Northeast Energy Efficiency Partnerships

May 16, 2016

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
Mailstop EE-5B
1000 Independence Ave, SW
Washington, DC 20585-0121

Docket Number:	EERE-2013–BT–STD–0051
RIN:	1904-AD09

Dear Ms. Edwards:

This letter comprises the comments of the signatories in response to the Department of Energy's Notice of Proposed Rulemaking on Energy Conservation Standards for General Service Lighting published March 17, 2016.

Summary

DOE's proposed rule on general service lighting is a critical part of an historic transition from incandescent to solid state technology for light bulbs in the US. We estimate that the cumulative electricity savings from the light bulb standards enacted by Congress in 2007 will exceed 1.5 trillion kWh of electricity by 2030, or enough electricity to power every home in the US for a year. Those energy savings will translate into more than $11 billion in annual electricity bill savings for consumers, the largest savings from any one energy efficiency standard ever enacted by Congress. By 2030 the 2007 standards will have avoided 704.4 million metric tonnes of CO_2 emissions. DOE's proposed rule for general service lamps (GSLs) confirms and adds to these savings.

The lighting industry has commercialized light emitting diode (LED) technology very rapidly, introducing an array of new lamps that are dramatically more energy efficient than older technologies. These new LED lamps deliver high quality light, are very popular with consumers, and offer good value over the lifetime of the products. Prices continue to decline. This achievement is the result of impressive technical innovation at individual lighting companies and of over 20 years of successful collaboration

between the lighting industry, government and utilities with the support of the energy and environmental advocacy community.

The signatories broadly support the proposed rule while also suggesting several improvements to increase savings. In summary:

- **Standby power consumption**. DOE should modify the proposed rule to place a limit on energy consumption in standby mode for GSLs capable of operating in standby mode.
- **Exemptions**. Many of the 22 lamp types exempted from the definition of GSLs are capable of providing general lighting and should not be exempt from the definition.
- **Incandescent Reflector Lamps (IRLs)**. Like general service incandescent lamps and medium base compact fluorescent lamps, IRLs provide general lighting and should be included in the definition of GSLs and subject to the same standards.
- **Proposed Efficiency Levels**. Of the trial standard levels evaluated by DOE, TSL 4 had the lowest lifecycle costs and highest electricity savings and therefore would be the most appropriate choice for determining efficiency levels in the proposed GSL standards.
- **The 45 lpw "back stop"**. The signatories support DOE's determination that the minimum efficiency requirements in EISA have been triggered for incandescent GSLs.
- **Market Impacts**. Evidence strongly suggests there will be adequate supplies of reasonably-priced, standards-compliant GSLs to meet demand by the expected effective dates for the standards. The signatories support DOE's proposed effective dates for the standards.

Given the wide variety of lamps discussed in this rulemaking, we also urge DOE to host a webinar following publication of the final rule to assist stakeholders in understanding which lighting products are GSLs and which standards apply to them.

Standby Power Consumption

In the GSL NOPR DOE anticipates that digitally connected "smart" GSLs, which may incorporate control, communication and sensor technologies, will eventually account for a significant share of the US GSL market. Unlike conventional GSLs which do not draw power when they are turned off, smart GSLs may continue to consume electricity when not emitting visible light. To address this standby power consumption the proposed rule propose to create a separate product category for GSLs capable of operating in standby mode. This product category for smart GSLs would be subject to a less stringent efficiency standard in active mode. The signatories are concerned that this proposal creates a pathway for manufacturers to minimize costs at the expense of energy efficiency by designing GSLs which could consume more energy while operating in standby mode than in active mode. DOE should amend the proposed rule to require any GSL that consumes power when not emitting visible light to be subject to an absolute maximum standby power consumption limit.

We respectfully disagree with DOE's approach for setting efficiency standards for smart GSLs in the NOPR. We believe that DOE's approach might allow energy inefficient smart GSLs, and does not meet the legal requirements set in 42 U.S.C. § 6295(gg)(3)(A) requiring DOE to address the power use of covered products in standby and off modes. In the NOPR, DOE proposes continuous equations that set efficiency standards in active mode for both conventional and smart GSLs, but includes no direct limit on a GSL's standby power use. DOE's proposal would allow a manufacturer to produce a GSL that is an efficient light source, but which could also use an unlimited amount of power when in standby mode.

The GSL NOPR assumes a typical wattage constant of 0.5 W for standby power mode consumption for smart GSLs. The NOPR further assumes that because smart GSLs could be more effectively controlled that they would use 30% less energy than conventional GSLs[1]. To illustrate the potential impact of DOE's proposed rule, Table 1a applies these assumptions to the proposed efficiency standard equations and uses typical assumptions for residential lighting use to estimate annual energy consumption for both conventional and smart GSLs. Based on these assumptions, a smart GSL would use 12% more electricity than a conventional GSL in a typical residential application.

Table 1a: Potential Impact of Standby Losses on GSL Energy Consumption

GSL Energy Consumption	GSL NOPR	
750 lumen GSL *(60 W incand equiv)*	Conventional GSL	"Smart" GSL
rated W per GSL	8.04	8.56
standby W per GSL	0.0	0.5
Hours on per day	2.5	2.5
Hours off per day	21.5	21.5
Savings from controls	0%	30%
kWh per year consumed	**7.3**	**8.2**
Increase over conventional GSL	**NA**	**12%**

However, the proposed rule would allow GSL energy consumption in standby mode to be significantly higher than 0.5 watts. Smart GSLs are in their infancy, but that intelligence could be put to other purposes than saving energy. It is necessary to provide lighting everywhere in a building that people have access to, and it is becoming increasingly necessary to also provide a similar level of wireless broadband access. Smart GSLs can provide both lighting and mobile connectivity.

As the luminous efficacy of artificial lighting continues to increase, DOE should be careful not to adopt an energy efficiency standard approach for GSLs which allows their energy consumption for non-lighting purposes to grow unchecked. Under the proposed rule for smart GSLs a manufacturer could take advantage of the lack of a standby mode energy consumption limit to combine other energy inefficient features with an efficient LED to make a compliant, but significantly more energy consumptive, GSL.

The signatories also believe DOE's estimate that smart GSLs will realize a 30% energy savings from the integration of lighting controls is overly optimistic. Research on the effects of lighting controls on residential lighting energy consumption are sparse. What research has been done tends to consider older control switching, timing and dimming technologies that are not integrated into the lamps themselves[2].

[1] GSL technical support document page 542.
[2] Consortium for Energy Efficiency Residential Lighting Controls Market Characterization, 2013 Report.

Table 1b: Potential Impact of Standby Losses on GSL Energy Consumption

GSL Energy Consumption	Potential	Suggested
750 lumen GSL *(60 W incand equiv)*	"Smart" GSL	"Smart" GSL
rated W per GSL	8.56	8.56
standby W per GSL	1.0	0.2
Hours on per day	2.5	2.5
Hours off per day	21.5	21.5
Savings from controls	15%	15%
kWh per year consumed	**13.3**	**8.0**
Increase over conventional GSL	**81%**	**9%**

Table 1b presents an alternative, more conservative estimate of energy consumption for smart GSLs capable of operating in standby mode. The "Potential" column estimates smart GSL annual energy consumption if power consumption in standby mode were 1.0 W, and if standby mode capability only decreased active mode energy consumption by 15%. In this scenario, the annual energy consumption of the smart GSL would be 81% greater than for a conventional GSL.

The signatories suggest an alternative approach, as shown in the "Suggested" column of Table 1b. DOE should amend the proposed rule to require any GSL that consumes power when not emitting visible light to be subject to a maximum standby power consumption limit of 0.2 W, consistent with current California LED light bulb standards. In contrast to the DOE's approach, this maximum power consumption limit should be fixed for all GSLs and should not vary with lumen output. Even under the more conservative assumptions discussed above, a limit of 0.2 W on standby power mode energy consumption would prevent a smart GSL from consuming more than 9% more energy than a conventional GSL.

We understand that some stakeholders are concerned that strict limits on energy consumption in standby mode could inhibit innovation. The California Energy Commission's analysis shows that 0.2 W is adequate to enable networked lighting controls. If manufacturers develop and offer GSLs that offer additional services that are more energy consumptive, the proper way to address the energy use of those additional services is through test method modifications, and if necessary, additional product classes, to be determined in a future rulemaking. In the interim, if energy use of new functions is not appropriately handled under the current test, manufacturers have the option of using the Department's test method waiver process. In the current docket, the Department should in no case relax standby power consumption limits in order to leave room for manufacturers to include speculative features.

Exempted Lamps

The triggering of the 45 lpw backstop in EISA effectively replaces incandescent GSLs (including halogens) with LEDs and CFLs in the US market. The 22 lamp types that DOE proposes to continue exempting from the definition of GSLs, and therefore from the backstop, create loopholes in the standard that offer manufacturers and retailers opportunities to produce and sell inexpensive, very inefficient light bulbs and potentially diminish the impact of the proposed rule. While the sale of exempt lamps has been relatively low and limited to niche applications, the economic incentive to exploit these potential loopholes increases dramatically once the standards go into effect in 2020. The signatories urge DOE to

close as many of these loopholes and possible by removing the exemption from many of these 22 lamp types.

In the NOPR, DOE argues that the 22 lamps types currently exempted from the definition of GSLs in EISA should continue to be exempted under the proposed rule because —

- The only way to cover the exempted incandescent lamps as general service lamps (GSLs) is by eliminating the exemption that currently makes them not general service *incandescent* lamps (GSILs); and
- Because the Appropriations Rider ("the Rider") prohibits using funds to implement standards for GSILs, DOE is unable to establish standards for incandescent versions of any of the 22 exempt lamps.

The signatories believe that DOE has the regulatory authority, without obstruction from the Rider, to review the 22 lamp types currently exempted as GSLs and to remove the exemptions as appropriate. The signatories support the legal argument presented in EarthJustice's comments on the proposed rule to the effect that EPCA requires DOE to reconsider the status of these lamps in the current rulemaking, and that DOE is failing to meet its legal obligations by proposing to maintain the current exemptions without performing the required analysis. 42 U.S.C. § 6295(i)(6)(A)(i) plainly requires DOE to consider adopting standards for the incandescent lamps excluded from EPCA's general service lamp definition.

Of the 22 exempted lamp types, the ten lamp types shown in Table 2 are exempt regardless of technology (incandescent, CFL or LED) or base type.

Table 2. Exempted Lamps - All Technologies	
1. Appliance Lamps	6. Marine Signal Lamps
2. Black Light Lamps	7. Mine Service Lamps
3. Bug Lamps	8. Plant Light Lamps
4. Colored Lamps	9. Sign Service Lamps
5. Infrared Lamps	10. Traffic Signal Lamps

Of the currently exempted lamps shown in Table 2, the signatories agree that black light, bug, colored, infrared, and marine signal lamps as defined in the proposed rule are not capable of being used in general lighting applications as required by the proposed GSL definition. We also agree that appliance and sign service lamps are not GSLs. Mine service, plant light, and traffic signal lamps are all capable of being used in general lighting applications, and the signatories ask that DOE modify the proposed rule to cover them as GSLs.

The eight lamp types shown in Table 3 are exempt from the definition of GSLs in incandescent, medium screw base versions. Non-incandescent versions of these lamps, or incandescent versions with specific other base types would be covered by the proposed rule.

Table 3. Exempted Incandescent, Medium-base Lamps (not subject to shipment tracking)	
11. Marine Lamps	16. G shape lamps ≥ 5 inches in diameter
12. Silver Bowl Lamps	17. T shape lamps ≤ 40 W, < 10 inches long
13. Showcase Lamps	18. B, BA, CA, F, G16-1/2, G-25, G30, S or M-14 lamps, if ≤ 40 W
14. Left handed thread lamps	
15. Reflector lamps	

The signatories are concerned that many of the lamp types in Table 3 could be used to undercut the GSL standards in the proposed rule. Most if not all of the lamp types in Table 3 are capable of being used in general lighting applications. For example, marine lamps are not defined in 10 CFR 430.2 or in the proposed rule and could be any shape or rated at any wattage. Reflector lamps are particularly popular and this lamp type is discussed in its own section below.

Many lamp types in Table 3 are already available in LED versions and we believe that there are no technological barriers to all of these lamp types being available in LED versions by 1/1/2020. In cases where a lamp type in Table 3 is not currently available as an LED, we believe that it is because the market for that lamp type is currently small and has been neglected by LED manufacturers in their pursuit of higher volume, more profitable product categories.

Table 4 lists an additional four lamp types that are also exempt in incandescent, medium screw base versions and are subject by statute to shipment tracking by DOE. A DOE standards rule-making is triggered when annual shipments, as reported by the National Electrical Manufacturers Association (NEMA), exceed 200% of annual shipments forecasted by a DOE model. All four lamp types are capable of supplying general lighting applications. Non-incandescent versions of these lamps, or incandescent versions with base types covered by existing standards, are not exempt.

Table 4. Exempt Incandescent, Medium-base Lamps Subject to Market Tracking		
Lamp Type	March 30 2016 status	Backstop
Vibration Service Lamps	7.1 mil shipped, 272.5% of modeled	Max 40 W, limited to 1 lamp per package at retail
Rough Service Lamps	6.7 mil shipped, 135% of modeled	
Shatter Resistant/ Proof Lamps	0.7 mil shipped, 41.1% of modeled	
3-way Lamps	32.7 mil shipped, 67.2% of modeled	Each filament in a 3-way incandescent lamp must meet the new maximum wattage requirements for the respective lumen range, and, sold at retail in 1-lamp packaging.

The four lamp types in Table 4 are loophole risks because they are capable of supplying general lighting applications, are available in shapes and lumen output packages that allow them to replace common GSILs, and are relatively inexpensive. Data released by DOE on April 7, 2016 show that shipments of vibration service lamps declined for years, in line with DOE's modeled shipment projections, and then experienced a sudden, steep rise over the last two years. This is a strong indicator that vibration service lamps are being marketed to exploit the loophole their exemption creates in current GSIL standards. An

internet search shows vibration service A19 incandescent bulbs from 40 to 100 watts and from multiple manufacturers selling for as little as $0.40 apiece. The terms “vibration service” and “rough service” are also being used interchangeably and loophole exploitation in one may indicate loophole potential in the other.

GSLs would be subject to a backstop standard of 45 lpw under the proposed rule (see discussion below), but the four exempted, tracked lamp types in Table 4 was each given its own backstop in EISA. These backstops become effective if a DOE rulemaking is triggered by shipment data but DOE fails to execute the rulemaking by the required deadline. The backstops for vibration service, rough service and shatter resistant lamps are substantially weaker than the GSL backstop and may be insufficient to stop these lamp types from becoming loopholes if DOE failed to execute a rulemaking. We believe that the backstop for 3-way lamps requires that each filament in the lamp meet the 45 lpw GSL backstop.

The NEMA shipment data released on April 7, 2016 showed for the first time that shipments of vibration service lamps had reached a level sufficient to trigger a DOE rulemaking. We commend DOE for recognizing its obligation to immediately begin a rulemaking on vibration service lamps and we recommend that they be covered as GSLs. Shipment tracking appears to have been effective as a way to identify vibration service lamps as loopholes. However, shipments of rough service lamps are also already significantly higher than DOE’s model (see Table 4) and we expect to see further increases in the shipments of rough service lamps.

Of course, this shipment tracking approach is only effective if DOE receives comprehensive shipment data for the US market, which is dependent upon comprehensive reporting by NEMA’s manufacturer members. If the U.S. market for any of these four exempt, tracked lamp types is substantially served by lighting manufacturers that are not NEMA members, actual shipments and sales of the exempted lamp types could be significantly higher than reported.

As noted above, DOE is required to review whether these four lamp types should be included within the definition of GSLs as part of the current rulemaking in the same way that DOE is required to review the other 18 exempted lamp types. The fact that these four lamp types are subject to tracking, rulemaking, and backstops does not excuse DOE from performing this review and considering their inclusion in the GSL definition. The signatories recommend that incandescent, medium screw base, vibration service, rough service, shatter resistant, and 3-way lamps be included in the definition of GSLs and subjected to the 45 lpw backstop.

The signatories also support the comments provided the Northeast Energy Efficiency Partnerships as part of this rulemaking, particularly with regards to need for additional clarity in the definitions of exempted lamp types. We share NEEP’s concerns regarding proposed lamp type definitions which may allow exempted incandescent lamps to be easily converted by the purchaser into lamps that are capable of providing general lighting.

Incandescent Reflector Lamps

The NOPR includes within the definition of GSLs all reflector lamps that are not medium screw base incandescents. Incandescent reflector lamps (IRLs) are defined in 10 CFR 430.2 as lamps which are not colored or designed for rough or vibration service applications; which contain an inner reflective coating on the outer bulb to direct the light; have an R, PAR, ER, BR, BPAR, or similar bulb shape; have an E26

medium screw base; have a rated voltage at least partially in the range of 115 and 130 volts; have a diameter that exceeds 2.25 inches; and have a rated wattage that is 40 watts or higher.

EPCA requires DOE to evaluate IRLs (and the 22 exempted lamp types discussed above) in this rulemaking. IRLs are among the most common lamp types used to satisfy general lighting applications in residences[3]. The signatories request that DOE cover all reflector lamps, including IRLs, as general service lamps. The fact that IRLs are regulated under their own standards, like medium based compact fluorescent lamps and general service incandescent lamps were previous to the proposed rule, does not excuse them from inclusion by DOE as GSLs. The signatories support the legal analysis in support of this position submitted as part of EarthJustice's comments under this rulemaking.

Establishment of 45 lpw Efficiency Requirement for Incandescent GSLs

EPCA requires DOE to initiate a rulemaking proceeding no later than January 1, 2014, to determine whether the standards currently in effect for GSLs should be strengthened and whether "the exemptions for certain incandescent lamps should be maintained or discontinued based, in part, on exempted lamp sales collected [by DOE] from manufacturers." [42 U.S.C. § 6295(i)(6)(A)(i)].
42 U.S.C. § 6295(i)(6)(A)(v) reads:

> *"If the Secretary fails to complete a rulemaking in accordance with clauses (i) through (iv) or if the final rule does not produce savings that are greater than or equal to the savings from a minimum efficacy standard of 45 lumens per watt, effective beginning January 1, 2020, the Secretary shall prohibit the sale of any general service lamp that does not meet a minimum efficacy standard of 45 lumens per watt."*

We agree that DOE will be unable to establish a standard that avoids triggering the backstop. As a result, the minimum 45 lpw requirement for all GSILs, as well as all GSLs which are not subject to more stringent standards, must take effect.

Proposed Efficiency Levels

In the GSL NOPR DOE based its proposed standard for low lumen integrated GSLs on trial standard level 3 (TSL3). However, DOE's analysis in the GSL technical support document shows that TSL 4 would yield greater lifecycle cost savings. Table 5 compares the proposed required efficiency levels and associated rated wattages of GSLs that would be in both TSL 3 and TSL 4.

Table 5. Proposed Efficiency Requirements for "low lumen" GSLs by Brightness

Comparison of TSLs for Low lumen GSLs	310 lumens *40 W equiv*	750 lumens *60 W equiv*	1050 lumens *75 W equiv*	1500 lumens *100 W equiv*	2000 lumens *125 W equiv*
TSL3 efficiency	84.1 lpw	93.3 lpw	96.6 lpw	99.2 lpw	100.6 lpw
TSL3 wattage	3.7 W	8.0 W	10.9 W	15.1 W	19.9 W
TSL4 efficiency	91.1 lpw	100.3 lpw	103.6 lpw	106.2 lpw	107.6 lpw
TSL4 wattage	3.4 W	7.5 W	10.1 W	14.1 W	18.6 W

[3] The State of Our Sockets: A Regional Analysis of the Residential Lighting Market", NEEP, 2015. The northeast has a relatively older housing stock. Regions with new housing are expected to see even higher residential use of reflector lamps than was found in this study.

A review of 1,524 medium screw base, A-line LEDs with 310 to 2,000 initial lumen output in DOE's LED Lighting Facts database shows that 424 (28%) currently meet the TSL 4 efficiency requirements. The NOPR acknowledges the rapid evolution of LED technology, and the fact that the proposed standards would not necessarily be reflected in GSLs at retail until 2021 or later, at which point even more efficient LEDs will be available.

Market Effects of Standards Timing

In verbal and written comments submitted as part of this rulemaking, representatives of the lighting industry have stated that they are focusing future product development resources on solid state (LED and other) lighting technologies for all product categories. There seems to be broad agreement that all lighting is moving to solid-state technology, the only question being when. It is worth noting that at Lightfair 2016 with hundreds of exhibitors and tens of thousands of lighting products, only solid state lighting technologies were on display.

Industry representatives have also claimed that a projected spike in LED demand that would be created by the effective dates in the proposed rule[4] would require an investment in manufacturing capacity that industry is unwilling to make. Industry representatives went on to claim that unless the effective dates of the proposed standards are relaxed there will be shortages, scarcity pricing, and other negative outcomes. The signatories strongly disagree with this assertion given the rapid ramp-up in LED shipments that have already occurred and which we expect to continue.

The NEMA lamp index update, published February 29, 2016 states:

> *"LED A-line lamps surged 226.7 percent during 2015Q4 on a year-over-year basis….Compared to 2015Q3, LED shipments rose 18.4 percent, halogen A-lines increased 0.8 percent, and CFL shipments saw a quarter-to-quarter increase of 6.5 percent. In contrast, incandescent A-line lamp shipments decreased 16.7 percent on a quarter-over-quarter basis*."

This update also noted that by the end of 2015 LEDs were already responsible for about 20% of all A-line lamp sales. An additional four full years will elapse between the market described by this NEMA lamp index update, and the 1/1/2020 effective date for the backstop, which will probably have the most immediate impact on sales of LEDs. If LEDs only continue to gain market share at the rate we have seen so far, it is reasonable to expect them to claim an 80% market share before the standards come into effect, significantly reducing the spike in demand for low lumen products projected on slide 88.

The current popularity of LEDs in the marketplace is due to their high quality performance as general service lamps, particularly in comparison to CFLs. LEDs already offer consumers good value over the lifetime of the product, and prices are continuing to fall. The comments submitted by the California investor owned utilities under this rulemaking include a graph showing price-per-unit trends of omnidirectional LED lamps by efficacy bin. Trend lines based on LED price data from the last few years predict that by 2020 the high-efficiency, omni-directional LEDs should drop below $3.00 per unit. In fact LEDs at this price level are already available in multi-packs. Considering purchase and operating costs

[4] As shown in slide 88 of DOE's presentation at the public meeting on April 20, 2016.

and their typically long service lives, LEDs today offer consumers lighting at an historically low cost per lumen.

It is reasonable to assume that LEDs sold today are disproportionately being used to replace incandescents and some CFLs that were installed in high hours-of-use applications. Halogens in these applications are naturally replaced more frequently until ultimately replaced with longer-lived CFLs or LEDs. As an increasing percentage of high hours-of-use sockets are filled with LEDs, the demand for all GSLs should flatten because the remaining sockets will be increasing in low hours-of-use applications.

Industry capacity for LED component and lamp production is also increasing to meet international consumer demand for LED lamps and respond to lighting efficiency standards around the world. Major economies including Brazil, Canada, China, the 27 countries in the European Union, Japan, Malaysia, Mexico, Russia, Turkey and Vietnam have either already banned incandescent and halogen light bulbs or are planning to in the near future. The fact that North America has a different distribution voltage for electricity than most of the rest of the world may mean that GSLs that are in excess supply in some other part of the world cannot simply be shipped to the US to satisfy demand, but any LED factory production line can be quickly modified to produce either 240 or 120 V lamps.

During the public meeting, lighting industry representatives also expressed concern about the employment impacts of the proposed rule. The fact is, that for many years most of the light bulbs sold on the US market have been manufactured in other countries. There is still some limited halogen bulb production in the US, however any domestic employment loss from shifting away from halogens should be more than offset by increased domestic LED production. Incandescent lamps are based on fully mature technology and have long been commodities that tend to be manufactured wherever in the world has the lowest production costs. LEDs technology continues to rapidly change and manufacturing is driven by innovation. Some manufacturers, like Independence LEDs, have moved production from China to the US to increase quality and better serve American markets.[5] Although the impact on direct domestic light bulb manufacturing jobs will be small, the $11 billion dollars in annual electricity savings that the proposed rule will put into consumer pockets will stimulate economic growth and have a far greater impact on general employment.

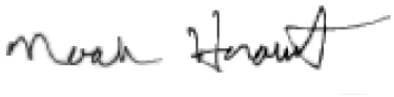
We appreciate the opportunity to provide these comments and look forward to the final rule.

Sincerely,

Christopher Granda

Chris Granda
Senior Researcher/Advocate
Appliance Standards Assistance Project (ASAP)

[5] http://www.industryweek.com/companies-executives/why-independence-led-moved-manufacturing-back-us



Noah Horowitz
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Mel Hall-Crawford
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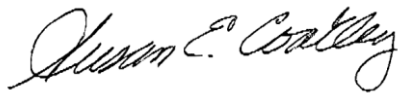
Shannon Baker-Branstetter
Policy Counsel, Energy and Environment
Consumers Union, Policy and Action from Consumer Reports

Charlie Harak
Attorney
National Consumer Law Center, on behalf of its low-income clients



Sue Coakley
Executive Director
Northeast Energy Efficiency Partnerships

Appendix A

Examples of LED versions of exempted lamp types.

Figure 1: Plant Lights

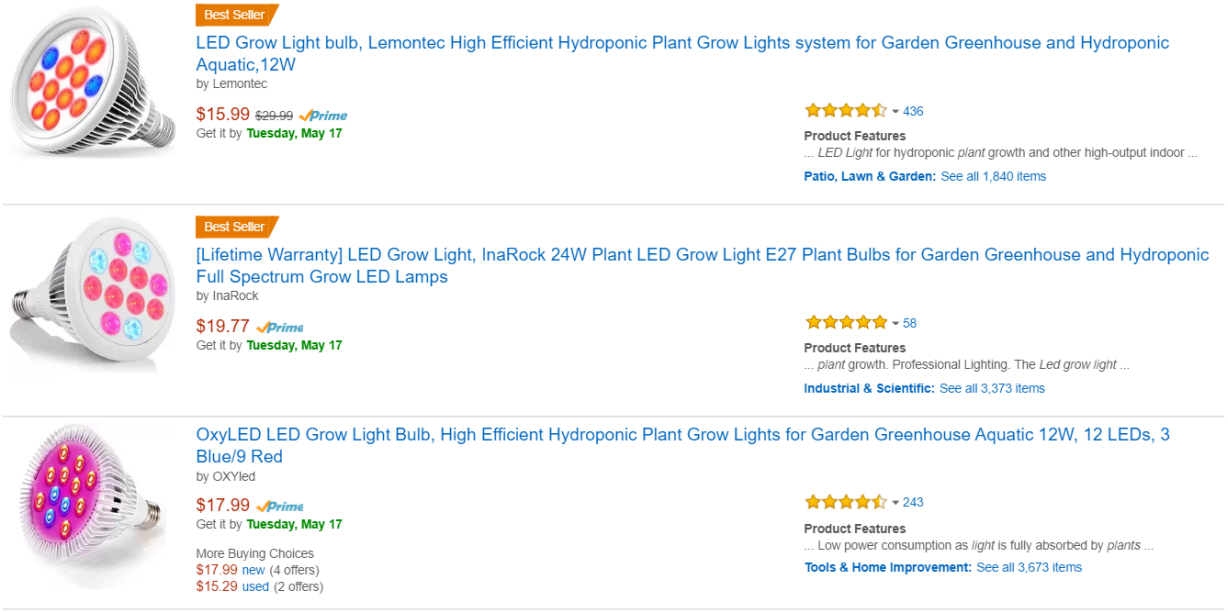


Figure 2: Traffic Signal Lamps

Colored traffic signals were actually one of the first widespread applications for LEDs. A wide array of retrofit LED lights for traffic signals have been available on the market for years.

Figure 3: Silver Bowl Lamps

Figure 4: G-shape Lamps

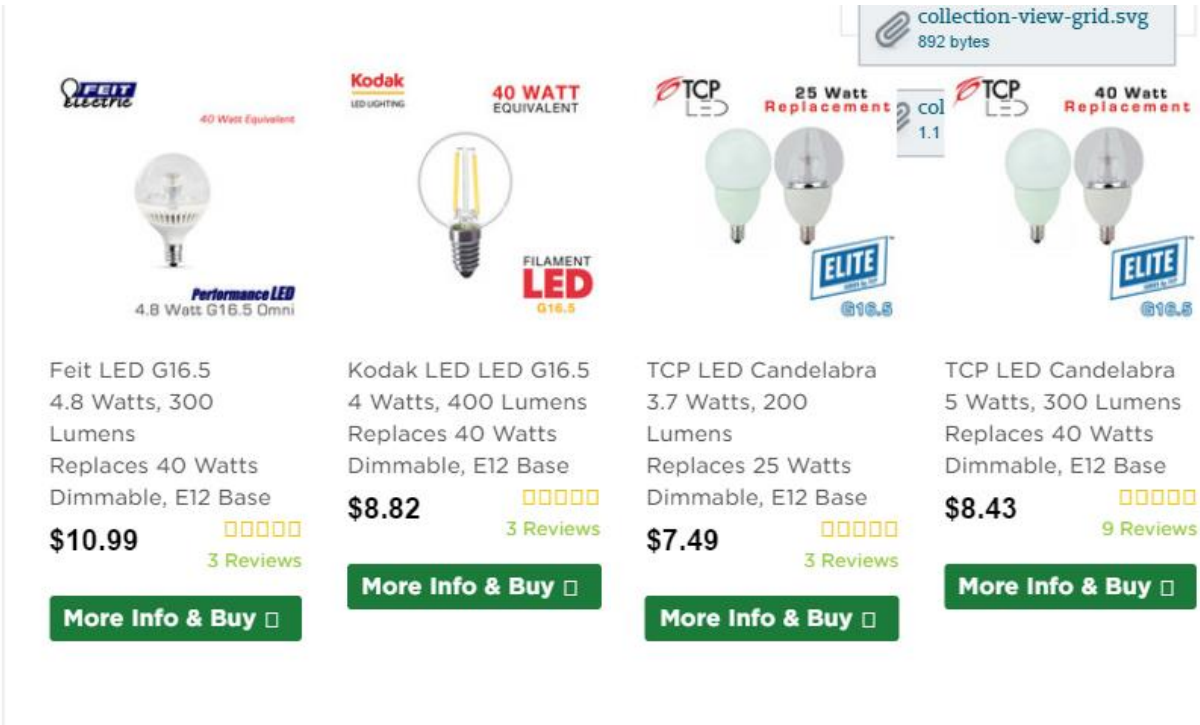


Figure 5: T Shaped Lamps

Omni Directional LED T10 Filament Tube Shape Bulb

430 lumen LED T10 lamp replaces up to a 40 watt incandescent bulb while burning only 4.5 watts with the traditional look and feel that you ask for

T10 LED Filament Lamps

Clear glass with a rich amber color filament provides a full 360 degree light output right up to the base. No more dark spots. Very smooth dimming and long life, these LED T10 lamps are UL listed for both totally enclosed fixtures and damp locations. Perfectly fine in bathrooms and so forth.

120VAC input, standard household medium base
Power consumption 4.5 watts
Dimensions: 5" L x 1.25" Dia
Lumen output: 430 with a 360 degree beam spread
CCT: 2700K Warm White
CRI 80

Figure 6: F and CA Lamps

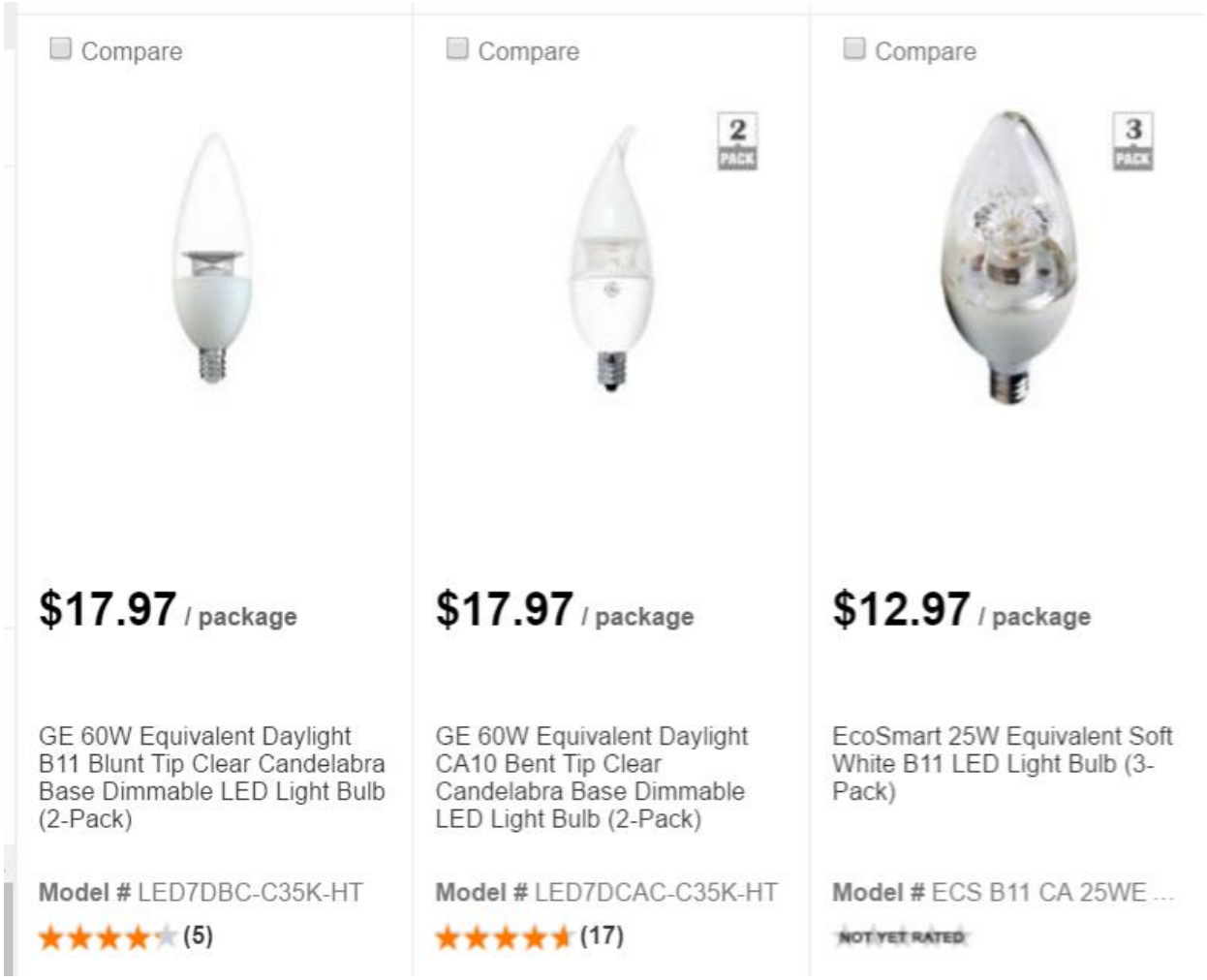
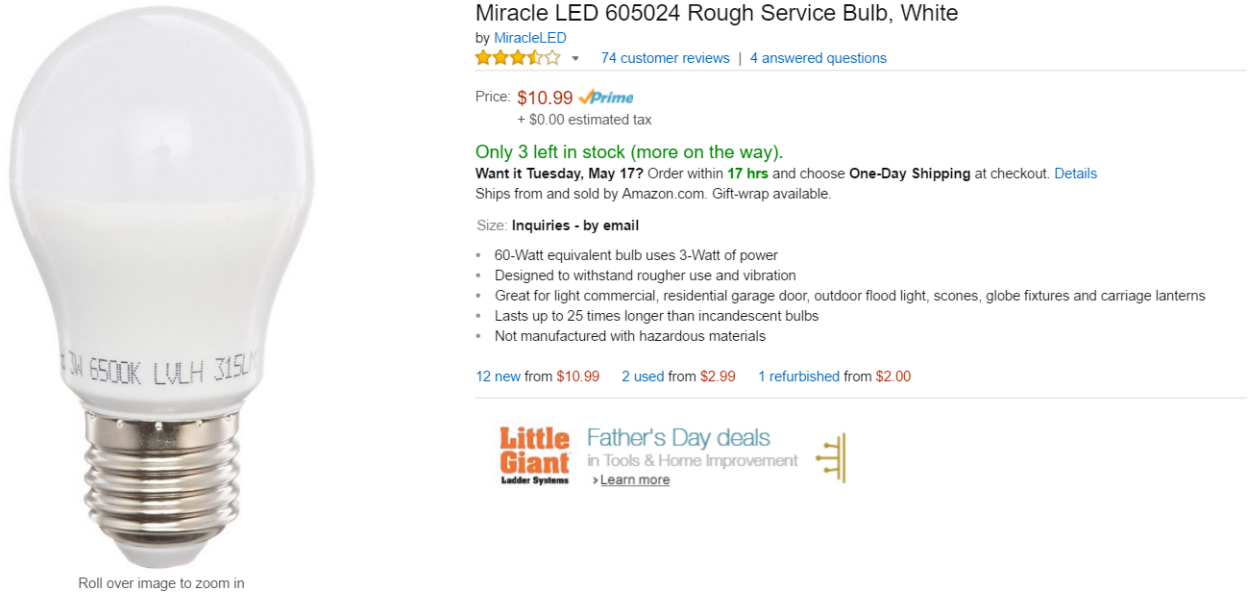


Figure 7: Vibration or Rough Service Lamp



With no internal filament, LEDs are inherently less susceptible to damage by vibration or rough service than incandescent lamps.

Figure 8: Shatter Resistant Lamp

Cree introduces shatter-proof LED lightbulbs for less than $8 a piece

Trevor Daugherty - 2 years ago @trevorjd14 NEW PRODUCT

Comments (0) Facebook Twitter Google Pinterest Reddit

(Update: Note that the popular Philips 60W equiv. 438227 10.5-watt Slim Style Dimmable A19 LED Light Bulb, Soft White are $8 shipped from Amazon. These have many of the same features as this new product from Cree)

The best part about a new technology is how it develops quickly over a short period of time, we've seen it time and time before. LED lightbulbs certainly are not exempt from this, as we've seen them go from an unattainable technology to something that consumers are rushing to put in their homes. Home Depot now has a new product from Cree in its stores that takes LED light bulbs to another level.

Starting at $7.97, the new Cree LED lightbulbs feature a shatter-proof plastic design that protects the bulb while strengthening the product for an even longer life. This new layer of protection takes away one of the final drawbacks of traditional lightbulbs (breakability) and creates a LED solution that promises a very long life in your home. Cree also has a new 4Flow design which cools the LEDs via holes at the top of the bulb which creates a convection effect to minimize heat. This new design has allowed Cree to save in the manufacturing process, which has helped lower the price.

Because the operate at lower temperatures than incandescent lamps, LED A-line lamps can use shatter=resistant plastic bulbs.

Figure 9: 3-way Lamp

Roll over image to zoom in

Cree 30/60/100W Equivalent Soft White (2700K) A21 3-Way LED Light Bulb

by Cree

223 customer reviews | 9 answered questions

Price: $24.89 Prime

+ $1.49 estimated tax

Note: Available at a lower price from other sellers, potentially withou free Prime shipping.

In Stock.

Want it Tuesday, May 17? Order within **18 hrs 31 mins** and choose **One-Day Shipping** at checkout. Details

Sold by JDP Lighting and Hardware and Fulfilled by Amazon.

Size: **1-pack**

- The Cree 3-Way LED bulb delivers three distinct levels of beautiful warm incandescent-like light for the living spaces in your home.
- 30/60/100W equivalent 3-Way uses only 3/8/18 Watts
- For use in 3-Way light fixtures (not for use with dimmers)
- Lights instantly and provides an all-around, omnidirectional light distribution - just like an incandescent bulb
- 25,000 hours of beautiful, warm, energy-efficient light - comparec to just 1,000 hours for a traditional incandescent bulb

› See more product details

10 new from $19.20

This item's packaging will indicate what is inside and cannot be hidden.