



National Electrical Manufacturers Association

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June 24, 2021

Online via: <https://www.regulations.gov/>

Ms. Stephanie Johnson
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Office, EE-5B
1000 Independence Avenue SW
Washington, DC 20585-0121

NEMA Comments on General Service Lamps Request For Information

Docket Number: EERE-2021-BT-STD-0005

Dear Ms. Johnson:

As the leading trade association representing electrical and medical imaging manufacturers, the National Electrical Manufacturers Association (NEMA) submits these comments to the DOE Request for Information (RFI) regarding General Service Lamps (GSL). These comments are submitted on behalf of NEMA Light Source Product Section Member companies.

NEMA represents some 325 electrical equipment and medical imaging manufacturers that make safe, reliable, and efficient products and systems. Our combined industries account for 370,000 American jobs in more than 6,100 facilities covering every state. Our industry produces \$124 billion shipments of electrical equipment and medical imaging technologies per year with \$42 billion exports.

We count on your careful consideration of these comments. If you have any questions on these comments, please contact Alex Boesenberg of NEMA at alex.boesenberg@nema.org.

Sincerely,

A handwritten signature in dark ink that reads "Philip A. Squair". The signature is written in a cursive, flowing style.

Philip Squair
Vice President, Government Affairs

NEMA Comments on General Service Lamps Request For Information

Issues on Which DOE Seeks Comment:

- 1) DOE requests information on the availability of lamps defined as GSLs that have a minimum efficacy of 45 lm/W. To the extent available, DOE requests information for all lumen outputs, voltages, and base types included in the GSL definition.
NEMA Comment: Lamps defined as GSLs that have an efficiency of 45 Lumens per watt or greater include essentially all LED and CFL lamps.

Alternatively, all Incandescent and Halogen lamps that have a medium screw base, operate between 110 and 130 volts, and that produce between 310 and 2600 lumens cannot achieve an efficiency of 45 lumens per watt. Past industry attempts to successfully design and market Halogen lamps capable of achieving 45 lm/W failed. No more development work is being done in this area due to the highly successful development and rapid sales growth of LED technology. DOE reached the conclusion in its 2019 Final Determination¹ that it was not economically feasible to increase efficiency Standards for Halogen or incandescent lamps to 45 lm/W. This conclusion holds true. A 45 lm/W Standard would eliminate incandescent and halogen GSLs from the market.

Regarding the DOE request about lamps being sold in this defined product area, NEMA can confirm that sales of incandescent, halogen and CFL lamps continue to decline². Apart from a brief, forecasted spike, Incandescent and Halogen lamps sales have been in decline since the EISA law was originally passed in 2007. CFL lamp sales have been declining since 2015. The only product category that is increasing in sales is LED lamps.

- 2) DOE requests information of the availability of lamps excluded from the definition of GSL that have a minimum efficacy of 45 lm/W. To the extent available, DOE requests information for all lumen outputs, voltages, and base types of such lamps.
NEMA Comment: Lamps excluded from the definition of GSL lamps that have an efficiency of 45 lm/W or greater include essentially all LED lamps designed to replace standard white light sources in this excluded product area. From the excluded lamp list this includes reflector lamps, rough service lamps, shatter-resistant lamps, 3-way lamps, vibration service lamps, larger T lamps greater than 1" in diameter, and most decorative lamp shapes with medium screw bases. Intermediate and candelabra base lamps are already regulated with maximum wattage limits and by statute were specifically not assigned efficiency Standards, therefore a 45 lm/W efficacy Standard would not be appropriate. All Incandescent and Halogen lamps that are excluded from the definition of GSL cannot achieve an efficiency of 45 lumens per watt.

Regarding the request for more information about excluded lamps being sold in this defined product area, industry can confirm that sales of excluded incandescent and halogen lamps continued to decline since the EISA law passed in 2007 except for rough service and vibration service lamps. Due to lamp sales that exceeded forecast (though still declining) rough and vibration service lamp types were regulated according to statute in 2018 with a backstop Standard³. DOE can refer to its latest collection of shipment data for unit sales of the 5-lamp types (i.e. rough service, vibration service, 3-

¹ <https://www.federalregister.gov/documents/2019/12/27/2019-27515/energy-conservation-program-energy-conservation-standards-for-general-service-incandescent-lamps>

² <https://www.nema.org/analytics/lamp-indices>

³ https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=16

way, high-lumen, and shatter-resistant lamps) to quantify the decline in sales. Decorative CFL and Reflector CFL lamp sales have been declining since 2015 and are nearly gone from the market. The EISA 2007 regulatory provision to address potential loophole sales from the 5 exempt lamp types is working.

The only product category that has seen increasing sales is LED lamps.

- 3) To the extent that any lamp type within the definition of GSL or any lamp type excluded from the definition of GSL already performs at a minimum efficacy of 45 lm/W, DOE requests information on the percent of the market of that lamp type represented by the 45 lm/W lamps.

NEMA Comment:

A-Line Lamps

Please see the NEMA A-line index illustrating the conversion from Halogen and CFL to LED A-lamps⁴. LED A-line lamps now represent almost 75% of all A-line lamps sales and due to much longer LED lamp life with each replacement they gain a larger, lasting proportion of installed lamps.

The amount of CO₂ emissions associated with the electricity produced to operate GSL A-line lamps has declined by 89% from 2007 to 2020 due to the rapid conversion to LED technology⁵. Industry estimates that the maximum amount of CO₂ emissions reduction associated with this A-line lamp category, should the entire category switch to LED or CFL lamps is approximately 96% since 2007. Given the current rate of conversion to LED, the category will achieve a reduction of 92% with no regulation by 2025. Most of the energy savings and CO₂ emission reductions associated with phase out of incandescent and halogen GSL A-line products has already been achieved in the GSL A-line product class.

Excluded Lamps

Excluded incandescent and halogen lamps remain incapable of achieving 45 lm/W. However, while there has also been a significant conversion to LED for many excluded lamps including the Reflector, Decorative and 3-way lamp categories, the excluded lamp category is less than half the size of the General Service Lamp category. Furthermore, not all excluded lamps can be switched to LED technology given the technical limitations of LED lamps and application requirements. The amount of CO₂ emissions associated with the electricity produced to operate nonregulated GSL lamps has declined by 82% from 2007 to 2020 due to the rapid conversion to LED technology. Given the current rate of conversion to LED, the category will achieve a reduction of 88% with no regulation by 2025. Most of the energy savings and CO₂ emission reductions have already been achieved in the excluded product classes because incandescent and halogen technology is being voluntarily replaced with LED by consumers where applications permit.

⁴ <https://www.nema.org/analytics/lamp-indices>

⁵ All percent CO₂ savings in these comments are estimated using NEMA sales data and EPA tools, <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>

- 4) If a lamp type within the definition of GSL or a lamp type excluded from the definition of GSL does not currently have units with an efficacy of at least 45 lm/W, DOE requests information on whether it is possible to create lamps in that category that perform at such a level and how long it would take for those products to be sold at retail locations.

NEMA Comment: From the current excluded product list, there are several LED lamp types that cannot be made with over 45 lm/W, or cannot be made at all for the application.

- Appliance Lamps have multiple applications, and while some are amenable to an LED replacement only halogen and incandescent technology is designed to operate in high temperature appliances such as ovens. LED lamps are wholly incompatible for very high temperature applications. (Claims that new appliances are being sold with LED light sources omit the fact that these products are built with LED, and protecting it, in mind. LED lamps are not appropriate retrofit light sources for very high heat applications.)
- Black Light Lamps (and any other UV lamp) that cannot be tested for efficacy and are not general service lighting.
- Bug Lamps, Colored Lamps, and some multi-color lamps are not tested for white light and are not general service lighting.
- Infrared lamps, Plant Light Lamps, and Showcase lamps (T8 and smaller) are also not appropriate for general service lighting applications and are specifically designed for very niche purposes for which they are purchased.
- Marine Lamps, Marine Signal Service Lamps, Mine Service Lamps, R20 Short lamps, Sign Service lamps and Traffic Signal replacement lamps. LED versions may not meet required military, transportation, or other specifications.
- Specialty lamps have no acceptable LED replacement lamps due to:
 - Very low sales volumes for which LED replacement lamp development is not economically justified
 - Form factors for LEDs must be much larger in size to produce the same amount of light (due to the electronic components)
 - Inability to match lumen output. This is especially true for high-output applications with a very small form factor. A typical pin-based halogen lamp can provide 600-1200 lumens, while LED replacement options either have very low lumens for their size or are physically larger for the same lumen output as before. Thus, the LED options for these products are not always direct replacements for applications requiring high lumen output or tight physical fit. Due to limitations of LED lamp technology, this is not expected to change.

Categories which may no longer need an exemption because the product is no longer made include left-hand thread lamps and M-14 lamps.

The remaining two exempted lamps are G-40 lamps and Silver-Bowl lamps. These are used in very few applications and are exempted because their size or light distribution makes them difficult to use anywhere else.

Other Lamp Options for Traditional GSIL Applications:

Besides these excluded lamp types, industry recognizes that DOE is also evaluating any other lamps that are used to satisfy lighting applications traditionally served by general service incandescent lamps (GSILs).

To determine potential lamp type options today, the focus must be on homes, because there is little to no use of incandescent technology in commercial applications anymore due to maintenance and energy cost issues. The specialty incandescent or halogen lamps still being used in the commercial sector are being used because there is no acceptable LED substitute for their application.

The traditional application of a general service incandescent lamp used in the home has a medium screw-base, operates at 120 volts, and has a lumen output between 310 and 2600 lumens, which is why a traditional GSIL was defined as such in EISA. The only other bases typically found in a home and used for general illumination are candelabra base or intermediate screw base. There is also very limited use of pin-based lamps in some homes. The only other voltage found in a home for lighting is 12 volts, which requires using a fixture with a transformer and is also less common.

Incandescent or Halogen Lamps using any other base or any operating at any other voltage are considered specialty lamps. They have very low sales volumes and use, in total, very little energy. In many cases, there is no LED substitute. LED versions have not been developed and may never be developed because it is not economical due to sales volumes being too low and declining. As these halogen or incandescent specialty types cease to be made, users must generally change fixtures or devices. Most importantly, these lamp types cannot satisfy lighting applications traditionally served by general service incandescent lamps. These odd base-type, or odd-voltage lamps, should continue to be exempt from regulation while their market declines to zero naturally.

In general, the biggest limitation to LED technology use is thermal issues, operating in hot environments, or in hot fixture or device applications. The second biggest issue is the size/lumen output trade-off, since higher light output requires a bigger LED lamp shape. The biggest advantage of small quartz halogen lamps is the ability to generate a significant amount of light from a very small source and to operate at very high temperatures, something LED technology cannot do. Based on the professional experience of NEMA, LED lamps with a small diameter or in shapes such as MR16 or MR11 will have a thermal limit on their light output capability for the foreseeable future.

- 5) Given normal stock levels, how long does it take for a store to sell through its inventory of lamps (i.e. from when the lamp arrives at the store to when the store sells it to a customer)?

NEMA Comment: Consideration of timing should not be limited to the retail shelf-to-consumer-sale range of events. Purchasing and business decisions, roadmaps, supply chain coordination and manufacturing all take place months prior to the product appearing on a retailer's shelf.

The total time between the retailer's initial factory order and when a consumer can purchase product can be up to 6 months or longer. The purchase cycle begins when a purchase order is placed with the lamp factory, in response to retailer demand. For lower to medium volume products, retailers typically place regular stocking orders on the manufacturer's US distribution center based on a one to two-week lead time for cartons

and pallets. However, a longer lead time (60 to 75 days) is needed for larger, full container orders to deliver directly to a retailer's distribution center.

Once received, the goods remain in a retailer's distribution center between two and four weeks until the goods are shipped to individual store locations based on individual item/store demand.

The upstream timing includes an average of three months from the start of the process of procuring raw materials until the release of component shipment to the factory, although the time will vary depending on the source of the materials. This timeframe includes paperwork, placing binding orders, shipping components from remote sources, clearing customs (for international components), and transportation to the manufacturing plant. After components arrive in the factory, production will take two or three months and once released from production it may take 5–14 more days to route the final product from the distribution center to a shipping location, which is often international. From there, it can take 2-4 weeks or more to arrive at the manufacturer distribution center and then 1-2 weeks to get to the retail customer distribution center.

Other factors, such as retailer-specific contracts and "safety stock", may also affect how retailers stock lamps. For example, contract terms with certain retailers mandate certain inventory levels. Such contracts specify that manufacturers provide multiple months of inventory, particularly for new items. In addition, manufacturers often carry 2–3 months of component inventory in "safety stock" to meet all customer demands. In total, it takes between 5 and 12 months, including transit, for a lamp to move from the manufacturing source through a major retailer's distribution centers to the store.

Regional and National retail chains typically review product assortments once per year on a fixed schedule which varies by individual retailer. Due to the complicated logistics and labor involved in resetting a physical product assortment across regional and national chains this process can take 18 to 24 months to finalize and implement, to include normal sell through of product on the shelf.

DOE should interview medium and small lighting retailers, many of whom are small businesses, who will face additional challenges complying with a sales ban that is not long enough to allow for already purchased goods to sell through. DOE should consider the negative financial impact mid-sized and smaller retailers may face and ensure the final rule provides sufficient time to avoid stranded assets in retail stores of all sizes.

- 6) What steps would manufacturers/retailers need to take to avoid stranded inventory for lamps that do not have an efficacy of at least 45 lm/ W? How long would each step take (i.e., how early must a manufacturer/retailer know that a lamp cannot be sold to avoid stranded inventory)?

NEMA Comment: In our experience, most retailers have on average three months of inventory between their store and distribution centers to prevent having empty shelf space. Once goods are finally at the retail site, lower to medium demand products and specialty seasonal demand products (e.g. colored lights) may sit on a store shelf between 30 and 90 days, while retailers prefer to maintain at least two weeks of inventory for high demand products. Specialty lamps, which are low volume products, spend significantly longer time on store shelves and would entail greater exposure to risk from a sales prohibition order such as that contemplated by the "backstop." Empty

shelves present significant problems in that customers are frustrated by a lack of product choices and retailers lose sales opportunities as a result.

In addition, filling the open bays takes time and there may be added reset costs. Identifying and sourcing new products for an open retail bay can take 6–12 months, including identifying and qualifying the source, setting up the new vendor, product testing time, price negotiation, purchase orders, transit from the source, and initiating new data setup in store registers. In addition, lamp sales are seasonal and affected by scheduled events, which requires manufacturers to prepare several months earlier to have adequate inventory to meet demand. Typically, big box retailers schedule line reviews for lamps using fast changing technologies, such as LED lamps; these line reviews may take 4–6 months followed by a shelf reset which takes place 8–10 months after the start of the cycle. Product resets normally happen in the Spring or Fall months.

To minimize disruption and provide certainty throughout the supply chain, NEMA recommends a two-step approach for manufacturers and retailers if DOE decides to enact a 45 lm/W minimum requirement.

- 1) Manufacture-by date of certain lamp types in effect one year after final rule publication in the Federal Register**
- 2) Sell-by date of same lamp types effective one year following manufacture-by date**

A phased 2-step approach will be significantly less disruptive to manufacturers and retailers and will be far easier to manage than a blanket 45 lm/W sales ban.

EISA allows a phase-in approach of additional regulations. While the 2007 statute accomplished this over a three-year period by limiting sales of different wattages each year, the two-phase approach we suggest is sufficient to provide certainty in the marketplace, allow for advanced planning to avoid stranded inventory and empty shelf space, and result in reduced disruption throughout the supply chain.

- 7) If manufacturers/retailers end up with stranded inventory, what will they do with it (e.g., will it be destroyed or exported)? What are the costs associated with handling the stranded inventory?

NEMA Comment: Each manufacturer or Retailer will individually decide what to do with stranded inventory. If a 45 lm/W minimum efficiency sales ban (i.e. backstop) were to be implemented, it is imperative that DOE provide enough time for manufacturers and retailers to plan an orderly exit from regulated product lines. Failure to provide adequate transition time would cause each manufacturer and each retailer to incur significant unexpected costs to dispose of stranded inventory. Furthermore, it would also waste material, manufacturing, and transportation resources while providing very little additional energy savings or CO₂ emissions reductions.

The life of incandescent and halogen lamps is very short. Unlike many other energy-using products regulated by DOE that have a 10 to 20-year life span, halogen and incandescent lamps typically fail within 1 to 2 years and will need to be replaced with an LED source if incandescent lamps are no longer available. This means the lost energy-savings risk of providing adequate time to manufacturers and retailers is very small, while the potential economic damage risk to both large companies and small family-

owned retailers alike is large. DOE should err on the side of caution by offering more than enough time to sell off inventory than too little.

Unlike State laws, National laws make it very difficult to find alternative markets to sell newly restricted products. There are very few other countries that use 120-volt lamps where there are no existing energy regulations. While manufacturers or retailers can attempt to find other markets for these products, it is likely that most stranded inventory will need to be disposed of in landfills.

The costs associated with disposal will be the cost of each individual light bulb, plus the cost of the labor to pull the light bulbs off the store shelves or out of inventory, plus the landfill cost to dispose of the unused goods.

If selling in another market, lamps are often sold at break-even or at a loss to exporters just to clear inventory, especially in view of repacking and reshipping costs. It is likely that markets will only be found for high sales volume lamp types which would not include the myriad niche products discussed in our preceding remarks.