



NRDC Responses to CEC Invitation to Participate – Small Diameter Directional Lamps (SDDL) Category

Lighting Docket -Number 12-AAER-2B

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Natural Resources Defense Council (NRDC)

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On behalf of the Natural Resources Defense Council (NRDC) and our more than 250,000 California members and electronic activists, we respectfully submit responses to the California Energy Commission's (CEC's) Invitation to Participate (ITP) for Small Diameter Directional (SDDL) Lamps.

Introduction – Small diameter (less than or equal to 2 ½ inches) reflector lamps that go into recessed cans or track lighting are becoming increasingly popular, especially in new construction and remodeled spaces, both in the residential and commercial sectors. It's not uncommon for a home remodel to include 25 to 50 small diameter recessed cans. The lamps that go into those sockets include MR16, MR11, PAR16, and PAR11 lamps, which stand for multi-faceted and parabolic aluminized reflector lamps, respectively. The number designation following MR and PAR refer to the lamp's diameter in eighths of an inch. Thus a MR-16 is a 2 inch diameter lamp.

These lamps represent a rapidly growing category and source of energy use. Due to historical regulatory categories, only reflector lamps greater than 2 ½ inches are covered by federal minimum efficiency standards. As such there is a gaping regulatory hole which a CEC standard would fill to ensure the lamps that go into these smaller diameter openings are also energy efficient. As discussed below, SDDL lamps offering energy savings of 30 to 80% compared to conventional halogen SDDL lamps exist.

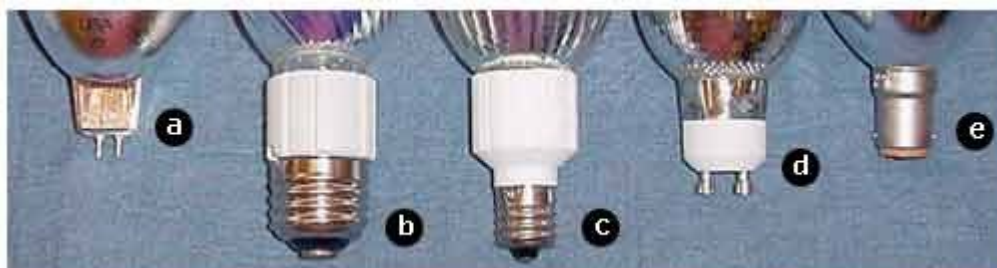
NRDC has reviewed the submission made by the California Investor Owned Utilities (IOUs) and is in agreement with their data and analysis. Rather than repeat much of their content, NRDC provides below supplemental answers to selected topics listed in the Commission's Invitation to Participate (ITP). The heading numbers below reflect the numbers contained in the Commission's data request.

All Lighting Categories

1. Category definition and scope – Reflector lamps with a diameter of $\leq 2 \frac{1}{2}$ inches would be covered by the CEC minimum efficiency standard as larger diameter incandescent based reflector lamps (IRLs) are already covered by federal standards. The standard would apply to all lamp technologies including incandescents, halogen, LED and other technologies that might enter the market at a later date.

The standard would cover lamps that produce between X and Y lumens of light. It would also cover lamps of all lamp bases. See the figure below excerpted from a guide by the Lighting Research Center at Rensselaer Polytechnic Institute - <http://www.lrc.rpi.edu/programs/nlpip/lightingAnswers/mr16/whatAreMR16.asp>

Different MR16 lamp base types



- (a) 2-pin
- (b) medium screwbase with integral transformer
- (c) intermediate screwbase with integral transformer
- (d) turn and lock
- (e) bayonet

As this figure shows, some SDDL lamps screw into the base while others connect via a pin. Also some of the lamps operate with line voltage and have a built in transformer, while others operate at lower voltages, such as 12 or 24V and rely on a transformer built into the fixture. We recommend CEC include both line and low voltage lamps in its regulation.

4. Sources of Test Data

Data on lamp light output and efficiency are available from online manufacturer catalogues. In addition, DOE has a sortable database for all LED based lamps, including small diameter reflector lamps that can be accessed at the Lighting Facts website: <http://www.lightingfacts.com/content/products>. In addition DOE's testing program Caliper tested halogen and LED based MR-16 lamps in 2008 (http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/mr16_benchmark_11-

[08.pdf](#)). Note LED MR lamp light output has since increased dramatically as has lamp efficacy.

In brief small diameter reflector lamps today fall into three categories, ranging from least to most efficient: Halogen, Halogen Infrared (HIR) and LED. The most common halogens, the incumbent lamp, come in 20, 35 and 50W offerings. The HIR offerings use approximately 30 to 40% less energy than the equivalent halogen MR16 lamp. LEDs use approximately 50 to 80% less power than conventional halogens. In addition, HIR lamps are rated to last 2 to 3 times longer than conventional halogens, and LEDs are commonly rated to last 25,000 to 35,000 hours, or roughly 10 times longer than conventional halogens.

From Philips online marketing materials, their HIR lamps provide up to 43% in energy savings compared to a standard halogen MR16 lamp.

http://www.lighting.philips.com/pwc_li/us_en/connect/tools_literature/downloads/p-5758.pdf

Cree recently announced new LED based MR-16 lamps that offer energy savings of 80% <http://www.cree.com/news-and-events/cree-news/press-releases/2013/january/lm16-intro> :

The Cree LM16 50-watt halogen equivalent delivers 620 lumens (consuming only 9 W) and the 35-watt halogen equivalent delivers 425 lumens (consuming only 7 W). The new lamps are designed to provide a minimum of 25,000 operating hours, reducing the need to replace lamps. The 50-watt equivalent is dimmable to five percent on a broad range of dimmers and transformers. The new Cree LM16 LED Lamp is available in three beam angles, including 17° spot, 25° flood and 40° wide flood.

These two examples are meant to be illustrative and products that offer roughly equivalent performance are available from other manufacturers as well.

We also understand that the California Lighting Technology Center (CLTC) has recently completed laboratory testing of a cross section of SDDL lamps purchased at retail and the data will soon be publicly available.

5. Energy Use Metrics

The potential CEC standard would be a single standard that would apply to all technology types. It would most likely be a continuous equation that sets minimum efficiency requirements as a function of light output. Due to the physics involved brighter lamps would be required to have higher efficacy levels.

CEC should also investigate whether separate requirements would be necessary for line and low voltage lamps.