

By Nicole Graeber Hathaway

This year, California demonstrated leadership as the first state in the country to set appliance efficiency regulations for general service lamps that ensure both lighting quality and efficiency. To build on this leadership and accelerate the adoption of the high-quality, energy efficient LED lamps, in July 2018 the University of California launched a new procurement program known as the "Million LED Challenge." The program supports the UC Office of the President's (UCOP) Carbon Neutrality Initiative, which commits UC to emitting net-zero greenhouse gases from its buildings and vehicle fleet by 2025. The "Million LED Challenge" will serve as a model program for future UCOP procurement efforts.

To broaden the program's reach, and in response to California Assembly Bill 653 2015, UC collaborated with the California Community College system, the California State University system and the California Department of General Services to make the LED lamps available to facility teams, staff, students, faculty, alumni and retirees of each participating entity.

For the first phase of the program, the collaborative leveraged the California Energy Commission's *Voluntary California LED Lamp Specification* to determine appropriate LED lamps for the program for medium screw-base sockets, MR-16 and dedicated downlight applications. The program leveraged the California Energy Commission's *Voluntary California LED Lamp Specification* to determine appropriate LED lamps for the program. This specification is regularly updated based on emerging research and readily-available improvements in lighting technology. Updates are intended to keep the specification one "code cycle" ahead of California's mandatory lamp requirements, which are contained in the Appliance Efficiency Regulations. The specification serves as a tool to prepare the market for upcoming mandatory regulations.

REGULATORY LEADERSHIP

Since January of this year, newly updated California Appliance Efficiency Regulations (Title 20) mandate that all general service lamps sold in the state meet two criteria:

1. Efficacy of at least 45 lumens per watt, and
2. Minimum rated life of at least 1,000 hours

This includes general service lamps that utilize incandescent, halogen, compact fluorescent, LED and OLED light sources.

Additionally, general service LED lamps (**Figure 1**) that emit less than 2,600 lumens; have a correlated color temperature (CCT) between 2200K and 7000K; have a D_{uv} between -0.012 and 0.012 in the 1976 color space; and are equipped with an E12,

E17, E26 or GU-24 base must also meet the following requirements:

- A color point that meets the four-step industry requirements according to ANSI C78.377-2015
- Average CRI of 82 or greater, with individual color scores for R1, R2, R3, R4, R5, R6, R7 and R8 of 72 or greater
- Power factor of 0.7 or greater
- Standby power for connected lamps of 0.2 watts or less
- Rated life of 10,000 hours or more
- Light distribution:
 - Omnidirectional lamps (A-Lamps) meet ENERGY STAR Lamps v2.0 requirements
 - Decorative lamps (B, BA, C, CA, f or G) meet ENERGY STAR Lamps v1.1 requirements
- Minimum efficacy of 68 lumens per watt
- Minimum product compliance score of at least 282, where compliance is determined by the equation: Compliance Score = Efficacy + (2.3 × CRI)

These requirements do not apply to lamps that are less than 150 lumens with an E12 or E17 base, or to lamps that are less than 200 lumens with an E26 or GU-24 base.

VOLUNTARY LED LAMP SPEC

In addition to the mandatory requirements set forth in Title 20, the

California Energy Commission also publishes recommended lamp performance criteria in the *Voluntary California Quality LED Lamp Specification*. These criteria represent the Energy Commission's minimum threshold to be considered "California quality." These are the criteria met by LED lamps offered through the "Million LED Challenge."

The voluntary specification is currently on its third iteration and is aligned with upcoming, or "Tier 2," mandatory Title 20 requirements that go into effect on July 1, 2019. This makes the specification one code cycle ahead of mandatory requirements. The specification, and programs that utilize it, serve to prepare the market for the upcoming mandatory regulations.

In addition to the Tier 2 Title 20 requirements, the specification adds in minimum requirements for dimming, lamp labeling and packaging. Lamps that claim to be dimmable must dim to 10% light output or less. Additionally, the lamps must have reduced flicker operation (30% or less) and not produce noise greater than 24 decibels while set to 100% and 20% light output.

The specification does not require the inclusion of any particular label or mark; however, lamps must meet the dimming criteria and detailed incandescent-equivalency criteria before making any performance claims in marketing materials, retail packaging



Figure 1. Examples of general service LED lamps.

or on the lamp itself.

To verify performance and lamp markings, manufacturers are asked to register their qualified products with the California Energy Commission through their Modernized Appliance Efficiency Database System. Screening criteria for programs like the "Million LED Challenge" require the database entry be verified before the product is qualified for program inclusion.

CONSUMER EDUCATION

Even in this high-quality, energy efficient regulatory environment, it can still be difficult for consumers to know which lamp to purchase as stores are filled with products that vary in terms of color, controllability and longevity. There are product labeling standards that explain select lighting terminol-

ogy, but use of these labels is not universal, making the lighting aisle hard for consumers to navigate.

To address this gap for the UC community and its partners, the "Million LED Challenge" collaborative 1) leveraged its partnership with the California Lighting Technology Center to develop and share educational materials, 2) utilized its bulk purchasing capabilities to negotiate affordable prices and 3) used the product selection criteria published in *Voluntary California Quality LED Lamp Specification, Version 3.0* to select lamps for the program. This ensures that lamps in the program are affordable, meet quality and efficiency goals, and consumers are educated on which product to purchase for the various spaces in their homes. As a result, the lamps available in the program cost about 46% less than online competitors.

After a public request for proposal was launched in fall 2017, the collaborative selected the team of Consolidated Electrical Distributors Inc., and LEDVANCE, maker of SYLVANIA general lighting in the U.S., to provide lighting products for the first phase of the program. Lamp types available under the first phase of the community buy program include omnidirectional lamps, directional lamps and downlights (**Figure 2**).

Since July, lamps are available to purchase via the program's website (www.millionLEDchallenge.com). The



website has a simple user interface to streamline the lamp selection and purchasing process. Additionally, the website includes educational materials on lighting metrics, a brief history of the California regulations and how to choose the right light for an application.

This research-based program is poised to deliver significant energy savings and reduced greenhouse gas emissions. By replacing one million 60-W incandescent bulbs that are used an estimated three hours a day with equivalent LED products, the program will help save 55.8 GWh per year, or 85%. This also decreases CO₂ emissions by 41,461 metric tons, which is the equivalent of removing 8,900 passenger vehicles from the road each year, according to the EPA’s greenhouse gas equivalency calculator. The goal is to reach one million lamp replacements by the end of 2019.

THE AUTHOR



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SIMILAR EFFORTS

While the “Million LED Challenge” is unique for the UC system and its partners, it is among friends in the California market at large. The California investor owned utilities, which include Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric, have a regulated program called Energy Savings Assistance which provides qualified customers with free energy-saving improvements for their homes.

Utility customers must live in a home, mobile home or apartment that is at least five years old, and meet the household income guidelines to qualify. For lighting updates, the program provides LED lamps for torchieres, exterior fixtures and interior fixtures that are currently using incandescent lamps. The program also includes inspections to verify operation and appliance performance in the home.

Resources:

Learn more at www.millionLEDchallenge.com.

Learn more about the Voluntary California Quality LED Lamp Specification and database at www.energy.ca.gov/appliances/.

Learn more about the UC Office of the President’s Carbon Neutrality Initiative at www.ucop.edu/carbon-neutrality-initiative.

Learn more about PG&E’s Energy Savings Assistance Program at www.pge.com/esa.

Just like the “Million LED Challenge” program, the Energy Savings Assistance program selects the LED lamps they install based on lamps that are registered to the California Energy Commission as meeting the performance criteria in the *Voluntary California Quality LED Lamp Specification*. In PG&E’s territory alone, the Energy Savings Assistance program has installed 1.75 million lamps that meet the criteria since January 2017.

Looking ahead, the second phase of the program will include additional lamp types, such as linear LED replacement lamps. “Our goal is to take the guesswork and confusion out of the process and ensure that everyone gets a great light at a great price,” says Michael Siminovitch, director of the UC Davis California Lighting Technology Center. The launch of this second phase is anticipated July 2019.

The procurement team at UC is actively working to expand the “Million LED Challenge” procurement program model by exploring collaborations with other universities and agencies throughout the country. Please contact the author for more information on how to participate. □