

Remaining Opportunities for Residential Energy Efficiency Programs: Lighting

The simple choice for energy efficiency.



Even after decades of utility program investment in energy-efficient lighting and efficiency gains from the phase-in of federal minimum efficiency standards enacted through the Energy Independence and Security Act (EISA), there remains a significant opportunity to achieve additional energy savings for the foreseeable future.

Despite Progress, Light Bulb Market Not Yet Transformed

The average American home has approximately 50 sockets and about 60%¹ of them still contain an inefficient bulb. Many programs shifted focus from CFL to LED technology in 2015-2016. LED bulbs have grown in popularity and prices continue to fall, in part due to heavy promotion by utility programs. Despite this, less than 30% of light bulbs sold in the U.S. in 2016 were LED. The least efficient option on the market—the halogen bulb—continues to dominate sales. There is, however, variation

in market share by state, with LED bulb sales ranging from 10-43% of total state bulb sales. In the handful of states with above average market share, opportunity likely remains in populations that are slower to adopt efficient technology. For example, past experience with utility CFL programs suggests that low income and senior households are less likely to participate in utility programs. In addition, some attention to specialty lighting is often needed to convert remaining inefficient sockets.

Exhibit 1: Savings Estimates with ENERGY STAR Certified Lighting vs. EISA Baseline

Standard Lamp Prior to EISA (Old Baseline)	EISA Effective Dates	EISA's Intended Replacement Lamps (New Baseline)	Typical ENERGY STAR Certified Lighting Replacement Option	Savings Over New Baseline
100 W incandescent (approx. 1,690 lumens)	2012	72 W (1,490 – 2,600)	12 – 17.5 W LED (1,600 – 1,999 lumens)	54.5 – 60 W
75 W incandescent (approx. 1,190 lumens)	2013	53 W (1,050 – 1,489)	10 – 14 W LED (1,100 – 1,599 lumens)	39 - 43 W
60 W incandescent (approx. 840 lumens)	2014	43 W (750 – 1,049)	6.5 – 13 W LED (800 – 1,099 lumens)	30 - 36.5 W
40 W incandescent (approx. 490 lumens)	2014	29 W (310-749 lumens)	4 – 10 W LED (440 – 799 lumens)	19 – 25 W
NA	2020	TBD (45 lm w/ backstop + lumen-based efficacy targets for LED & CFL ²)	≥80 lumens per watt	TBD

Significant Energy Savings Potential Above Federal Standard

The effects of EISA have phased in over the past five years. As a result, the lighting market has moved toward a slightly more efficient minimum baseline. Importantly, the law only required slightly higher efficiency levels for standard lamps and certain lamp types remain exempt until further federal action. As shown in Exhibit 1, while EISA-compliant bulbs deliver some efficiency gains over traditional incandescent bulbs, ENERGY STAR certified lamps remain significantly more efficient than the statutory baseline. Despite increased sales of LED bulbs, inefficient technologies (halogen and incandescent) still dominate sales.

Lighting Program Design

The vast majority of utility efficiency programs rely on ENERGY STAR certification as the basis for program promotion and incentives:

- ENERGY STAR criteria are designed with a quality consumer experience in mind to ensure energy efficiency comes with no sacrifice in performance or features—avoiding the pitfalls associated with the early consumer experience with CFLs.
- ENERGY STAR specifications are established through an open and transparent public process, creating a level playing field for all manufacturers wanting to capitalize on energy efficiency claims. The program does not arbitrarily pick winners and losers based on perceived reputation but rather relies on demonstrated performance.
- ENERGY STAR specifications are designed with market realities in mind, including ensuring that certified products are available from multiple manufacturers, that consumers experience a reasonable payback period, and that utility program needs are considered.
- ENERGY STAR certification offers quality assurance to the public and utility program administrators. All products are independently certified based on testing in EPA recognized laboratories and a sample of products is verified “off-the-shelf” annually. This ensures each bulb delivers on energy performance.
- Consumers appreciate and recognize the difference: ENERGY STAR certified light bulbs receive statistically higher satisfaction ratings compared to non-certified bulbs.³

¹ EPA contractor modeling and socket surveys.

² DOE is in the process of reviewing general service lamp standards after a request for data. Data received could result in a reassessment of assumptions and determinations made in the general service lamp (GSL) definition rule. This determination is expected to take place around February 2018. EISA specifies the effective date of any revision would not take effect until three years after finalization.

³ <https://www.energystar.gov/awareness>

As efficiency programs develop market intervention strategies, it is important to stage the intervention to the state of the lighting market and make adjustments over time. As shown in Exhibit 2, typical programs initially focus on general use bulbs and introduce specialty technologies over time. Advanced stage programs often need to target underserved customer groups to continue to justify investment in lighting, particularly general service lighting.

Given the recent precipitous drop in prices of LED lighting, program design is becoming more flexible. Incentive levels may need to be adjusted to react to market conditions. In addition, engaging manufacturers and retailers in program design and implementation ensures products are available where ratepayers commonly shop.

Exhibit 2: Sample Progression of Residential LED Lighting Portfolio

Early Stage Program	Mid Stage Program	Advanced Stage Program
Focus incentive dollars on general use ENERGY STAR certified LED bulbs in the short-term; gradually migrate to a more diverse technology mix.	Continue to offer incentives for basic general use ENERGY STAR certified LED bulbs in the short-term; steadily phase in incentives for a more diverse technology mix, such as specialty LED (e.g. dimmable, decorative, 3-way, high lumen, and reflector style) lamps. Focus some or all marketing efforts of ENERGY STAR certified LED bulbs to target markets with lower adoption rates.	Target incentives for hard-to-reach populations and focuses the general population on specialty lighting. Limit incentives for general use ENERGY STAR certified LEDs to select target markets that have lower adoption rates.
Educate consumers on how to choose appropriate lighting to meet their needs.		

Education helps consumers understand changing lighting choices, how to evaluate these choices using the lumen-based labels required by the Federal Trade Commission, and which technologies are best suited for their home. Online resources to assist in consumer education are available at energystar.gov/lighting.

Program Cost-Effectiveness

Despite the change in efficiency baselines due to EISA, lighting programs are expected to remain among the most cost-effective residential program options for the foreseeable future. However, lighting program costs may increase in advanced markets, due to the need to increase

program focus on specialty lamps that have not decreased in price at the same rate as general service lamps. In the near-term, for programs that offer incentives for both specialty and general service LEDs, the increase in incentive costs required for specialty lamps may be offset by the declining cost of general service lamps.

Importantly, savings potential remains significant. Converting the remaining 60% of light sockets in the United States that still contain inefficient light bulbs to ENERGY STAR certified bulbs would save roughly 200 billion kWh per year, avoiding more than 140 million metric tons of carbon dioxide (CO₂) emissions.

Exhibit 3. 2015-2016 LED Bulb Sales as a Percentage of other Technologies Sold by CENSUS Region and Division*

