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Major New DOE Study on Residential Lighting Use

DOE recently completed a new study focused on developing reliable estimates of residential lighting usage and energy consumption at the national and regional levels. A report describing the study and highlighting some of its findings, *Residential Lighting End-Use Consumption Study: Estimation Framework and Initial Estimates*, was just published and is available [online](#).

DNV KEMA and the Pacific Northwest National Laboratory collaborated on the design and development of the study, which leveraged data collected on behalf of the U.S. Energy Information Administration, the California Public Utilities Commission, the U.S. Census Bureau, and more than a dozen utilities nationwide. The study developed a framework that allows for the estimation of U.S. lamp usage and energy consumption not only nationally and by region, but also by household characteristics, lamp characteristics, and the particular room within the home – as well as limited combinations of these parameters. The framework was designed to incorporate new data collected under similar protocols – for example, by a state or regional organization – which creates opportunities to further improve estimation accuracy.

So what were some of the key findings? Well, for starters, the estimated daily hours of use (HOU) per lamp averaged 1.6 hours for all lamps in the U.S., and regional averages were lowest in Missouri and Virginia (<1.5 hours/day) and highest in Massachusetts, New York, Texas, Oklahoma, Arkansas, and Louisiana (>1.6 hours/day). However, this depended on where the lamp was deployed. For example, exterior lamps averaged close to 3 HOU/day, while hallway lamps averaged less than 1 hour. Lamps in bedrooms, bathrooms, living rooms, and kitchens consumed the most energy, on average, of all spaces within a home.

The average lamp power in a given region was affected significantly by whether the general household preference was for CFLs or for incandescent lamps. While the country as a whole averaged 47.7 W per lamp, this varied considerably, with the

Midwest showing the highest average and the Northeast the lowest. Several states in the Northeast averaged less than 43 W per lamp, led by New York with 40.5 W; while Illinois had the highest average (53.5 W), followed by several other Midwestern states averaging at least 53 W.

The regional variation found in the average number of lamps per household was driven, in large part, by a variation in home sizes. For example, California and New York contain a higher concentration of apartments than, say, Wyoming – where larger, single-family residences are more typical. Regional variation in the number of lamps per type of room can also impact these household estimates. For example, the estimated number of lamps per living room varies by almost a factor of two across the country - from 4.1 in Massachusetts to 7.9 in Illinois.

The average annual lighting energy consumption per residence is a function of three factors: number of lamps, lamp power, and lamp hours of use. Massachusetts, New York, and California had the lowest household lighting energy consumption, each averaging fewer than 1,500 kWh per home per year. At the other end of the spectrum, Idaho, Montana, Utah, Wyoming, Missouri, and Arizona had the highest consumptions, each averaging over 2,100 kWh per home per year – considerably higher than the national average of just over 1,700 kWh per home per year.

By improving our understanding of residential lighting-energy usage and quantifying it across many different parameters, the new study will be of use to anyone doing energy estimates – such as utilities, market and investment analysts, and government agencies. It will also help manufacturers design products that not only better serve consumers' needs, but that maximize the energy savings that technologies like SSL make possible.

The report, a companion spreadsheet, and an interactive map are available [online](#). The spreadsheet contains the full set of estimates generated by the study, as well as instructions for filtering the set down to specific levels of interest. The map highlights some of the key regional findings.

DOE would welcome hearing from organizations that plan to use these estimates. Questions or clarifications regarding the methodology used in this study, as well as interest in contributing to the further improvement of these estimates by providing or funding the collection of new data, should be sent to DOE.SSL.Updates@ee.doe.gov.

As always, if you have questions or comments, you can reach us at postings@lightingfacts.com.