# CALiPER

## Snapshot **Outdoor Area Lighting**

Featuring **Area/Roadway Luminaires**
**Parking Garage Luminaires**
**Canopy Luminaires**
**Directional Luminaires**

Outdoor area lighting is a major contributor to nationwide energy use, and the market segment has been an important player in the transition to solid-state lighting. LED outdoor area luminaires must compete with other luminaires that are relatively energy-efficient—such as high-pressure sodium, for example—making lifetime cost savings more challenging in a market that is dominated by retrofits and replacements. In well-designed LED luminaires' favor, however, are longer life and reduced maintenance, as well as much better color quality and operating characteristics than those of the primary incumbent sources, high-pressure sodium (HPS) and metal halide.

This report focuses on *outdoor area/roadway luminaires*, *parking garage luminaires*, *canopy luminaires* (e.g., those used for gas station fuel pump areas), and *outdoor directional luminaires* (e.g., flood lights, accent lights, wall packs).[1] Although the aforementioned products are grouped together in this report as "outdoor area lighting" luminaires, the included products may be used in applications that are not strictly outdoors (e.g., parking garages).

LED outdoor area lighting has been a major component of the LED Lighting Facts® database since its inception, consistently being one of the categories with the most products. As of July 1, 2014, area/roadway products alone comprised 23% of the database, with the other three product categories featured in this report comprising approximately 7%. Compared to the previous Snapshot report on the same category (July 1, 2013), outdoor area lighting products make up a notably larger proportion of the total LED Lighting Facts database, indicating a particular high growth rate for these categories.

As shown below and on the next page, the total number of products listed by LED Lighting Facts is growing rapidly, and by all statistical measures, the efficacy of LED products generally continues to increase. The subsequent pages document similar positive trends for LED outdoor area lighting products. While the performance of the best products is especially notable, specifiers should be aware that substantial variation still exists.

1 LED Lighting Facts provides a product classification system, but proper classification is the responsibility of the manufacturer submitting each product.

LED lighting facts®

**July 1, 2014**

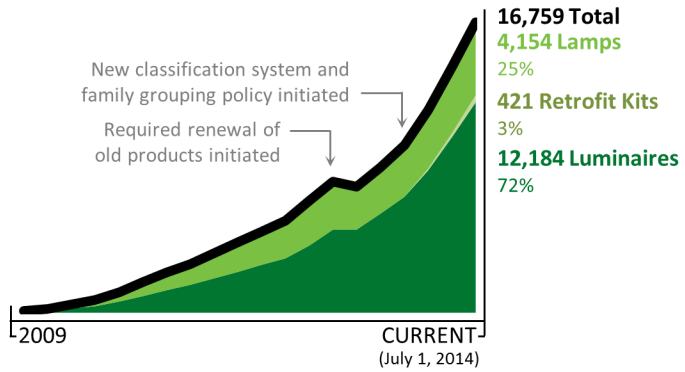
**1,698** Partners

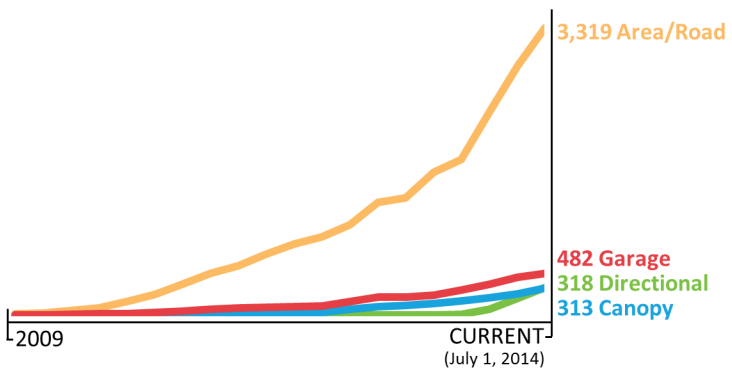
**16,759** Total Active Products

### Report Highlights

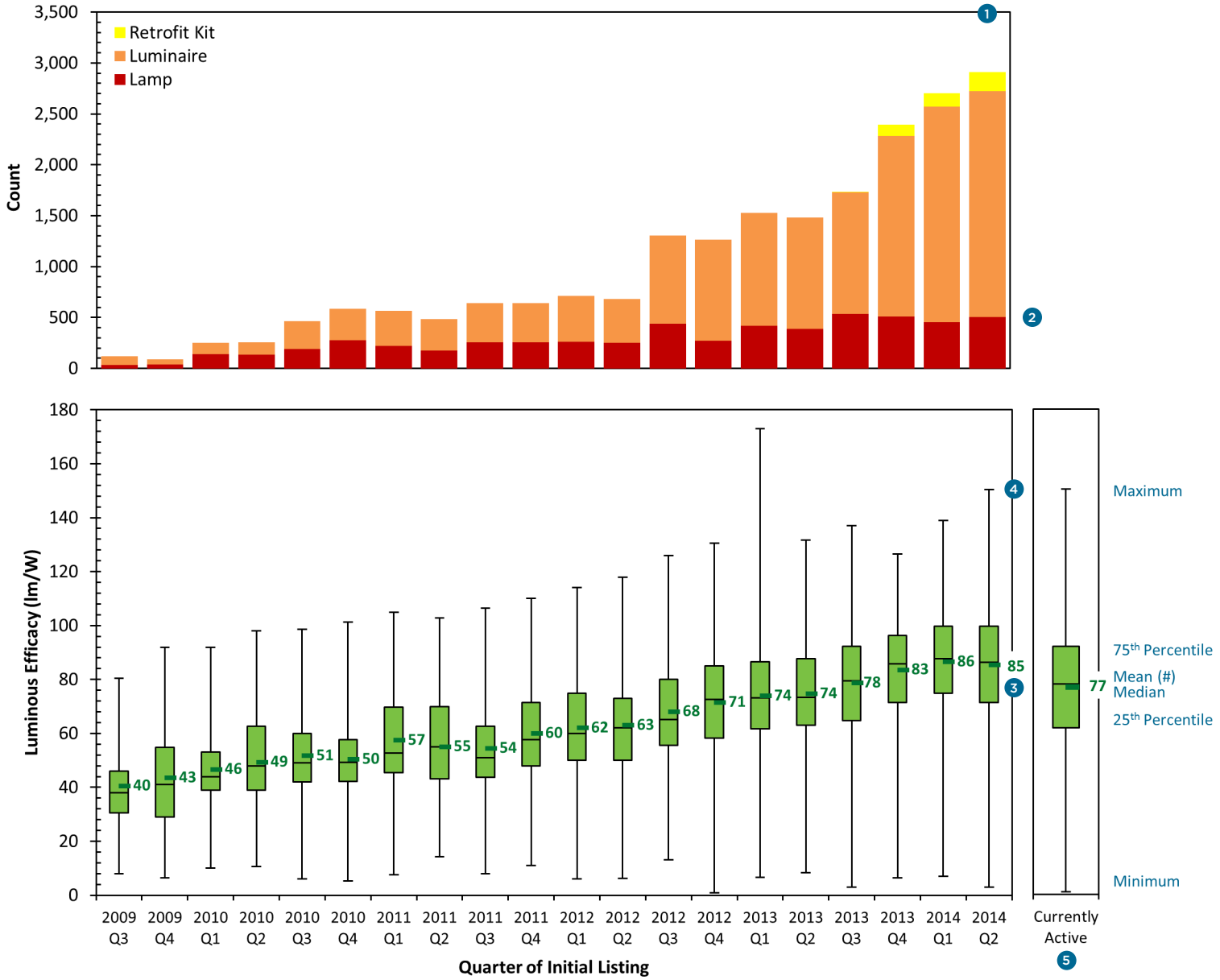
- The number of products listed by LED Lighting Facts continues to grow rapidly. An increasing percentage of those products are luminaires, and more and more of those luminaires are outdoor area lighting products.
- The efficacy of outdoor area lighting products continues to rise, with mean performance now around 80–90 lm/W and the most efficacious products around 120–150 lm/W.
- Likewise, lumen output has continued to increase. For example, there are now several listed products with lumen output comparable to a 400 W HPS streetlight. This is a notable change since the last Snapshot report on this product category, which was published one year ago.
- Early LED outdoor area lighting products were often known for their higher CCTs (e.g., 6500 K). Today, 4000 K and 5000 K are the most common, and mean CCT has shown a continual downward trend.

AT A GLANCE **NUMBER OF PRODUCTS LISTED BY LED LIGHTING FACTS**



# All Products **New Listings & Efficacy Performance by Quarter**




1. The growth of the LED Lighting Facts database continues to accelerate, with more than 2,900 new products added in the second quarter of 2014 alone. That is nearly as many products as were listed in the first two years of the program.

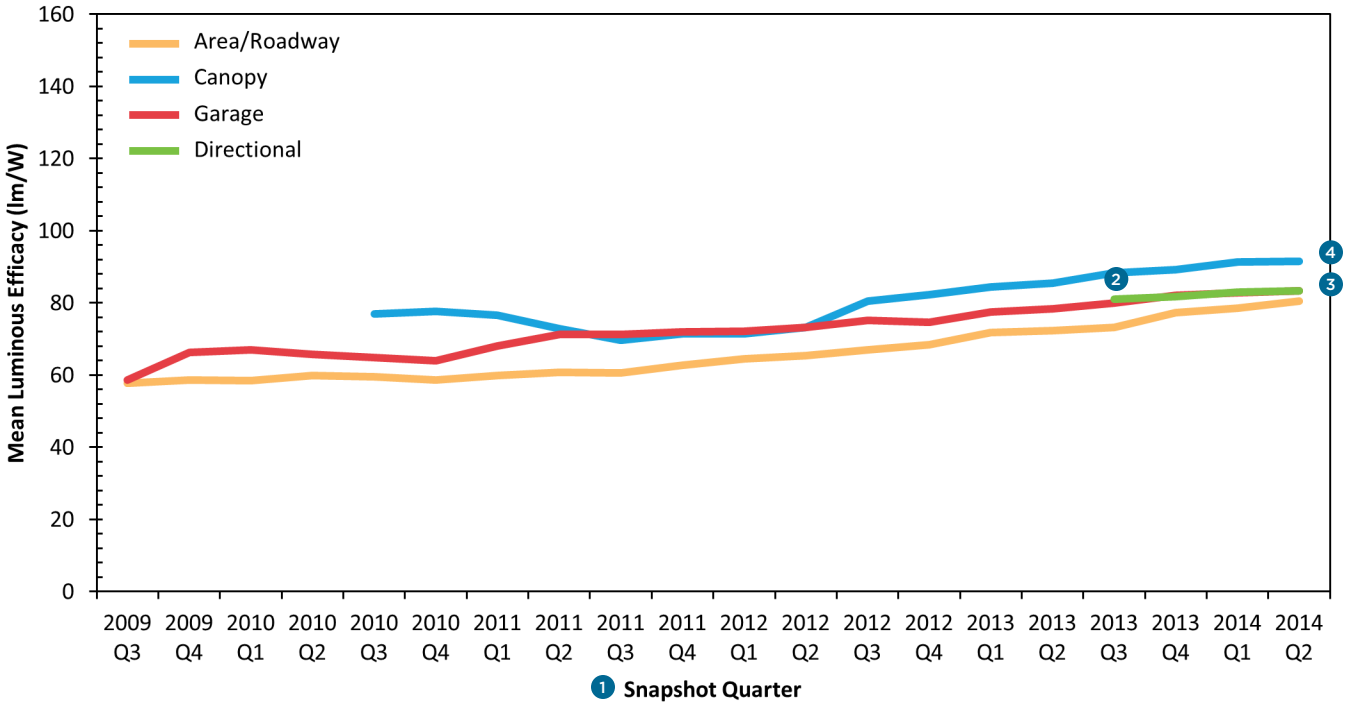
2. While the number of luminaires being listed each quarter has increased, the number of new lamps listed has remained fairly constant over the past two years. That is, the increasing growth rate of the LED Lighting Facts database has been due almost entirely to the addition of LED luminaires.

3. The mean efficacy for products initially listed in the second quarter of 2014 (85 lm/W) is similar to that of the previous quarter. The efficacy of newly listed products has more than doubled since the inception of the LED Lighting Facts program, with an average increase of about 10 lm/W per year. In fact, the mean efficacy for products listed in the past quarter is higher than the maximum efficacy for products listed in the LED Lighting Facts program's first quarter.

4. After some potential stagnation, maximum efficacy appears to be continuing on an upward trend. In the past quarter, more than 700 newly-listed products had an efficacy greater than 100 lm/W, with 22 above 130 lm/W.

5. As would be expected given the age of some of the products that remain active in the database, the overall mean efficacy of currently active products (77 lm/W) remains slightly below the performance from recent quarters. However, it is higher than the mean efficacy for all products ever listed (73 lm/W), which indicates that lower-efficacy products are being deactivated, and it has risen every quarter since DOE began issuing Snapshot Reports.

# Outdoor Area Luminaires **Efficacy Trends**



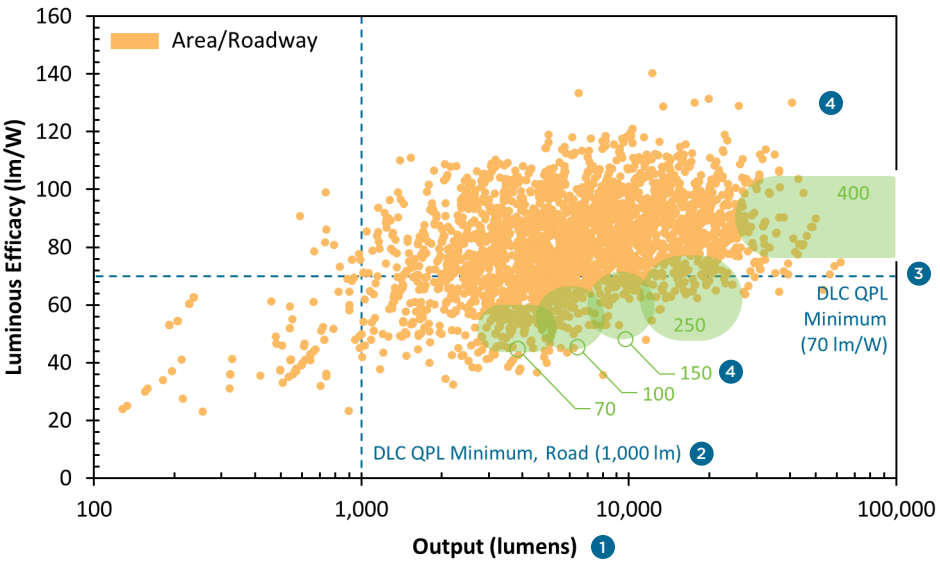

1. This "Snapshot" chart documents the mean efficacy of products active in the LED Lighting Facts database at any given time. It is different from charts that show the performance for products newly listed in any given quarter. Under the scheme depicted here, old products that remain listed will partially mask increases for newly listed products, but the result may be a better representation of what was on the market at a given point in time.

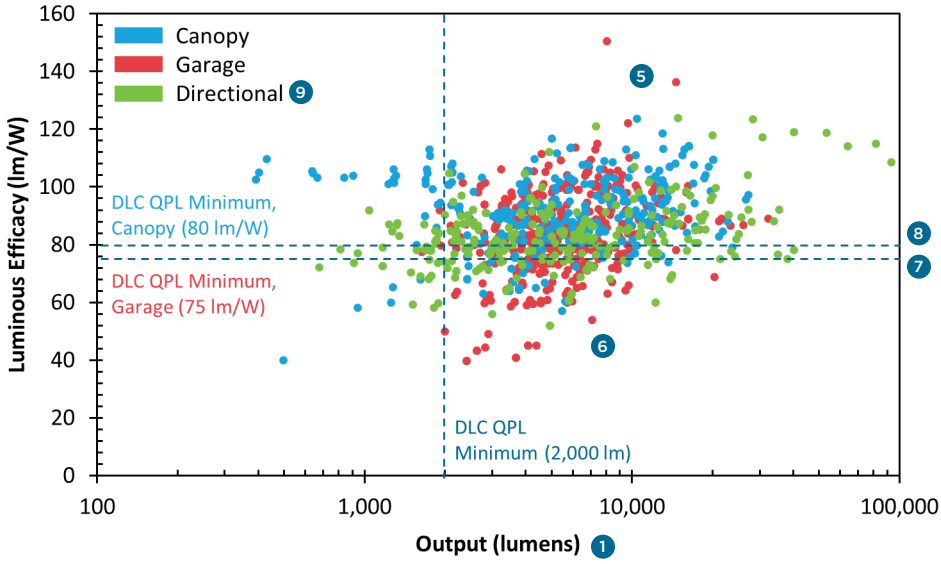
2. The directional luminaire classification was added to LED Lighting Facts in August 2013. Only products that listed outdoor as a use location were included in this analysis.

3. All four luminaire types included in this Snapshot report have shown similar trends in efficacy since the inception of LED Lighting Facts. The mean efficacies for currently listed roadway, garage, directional, and canopy luminaires are 81, 83, 83, and 91 lm/W, respectively. Roadway and parking garage luminaires have exhibited approximately 50% increases in efficacy since the inception of LED Lighting Facts in 2009.

4. Canopy luminaires have a mean efficacy that is approximately 10% higher than the other outdoor area luminaire types considered in this report. The exact reason for this difference is unknown, but it may result because of differences in typical optical systems. As shown on the next page, however, the most efficacious canopy luminaires have similar efficacies to the most efficacious luminaires in the other outdoor area luminaire categories.

# Outdoor Area Luminaires **Current Efficacy & Output**




1. Note that the two charts shown in this section have a logarithmic scale for the x axis.

2. The DesignLights Consortium® Qualified Product List (DLC QPL) qualification criteria shown are for roadway luminaires. The data shown include both area and roadway luminaires; it is likely that the products emitting fewer than 1,000 lm are area luminaires.

3. Approximately 75% of the currently listed area/roadway luminaires exceeded the DLC QPL criterion (for both area and roadway luminaires, which are classified separately) of 70 lm/W.

4. The green shaded areas indicate the approximate performance ranges of typical HPS streetlights of the noted wattage. Over the past year, LED area/roadway luminaires listed by LED Lighting Facts have become more comparable to 400 W HPS luminaires in terms of lumen output, and have generally maintained an efficacy advantage.

5. Sixteen products from the four categories under consideration exceeded 120 lm/W. The mean CRI of those 16 products was 77, with seven of the products having a CRI above 80. Only one of the 16 products had a CRI below 70.

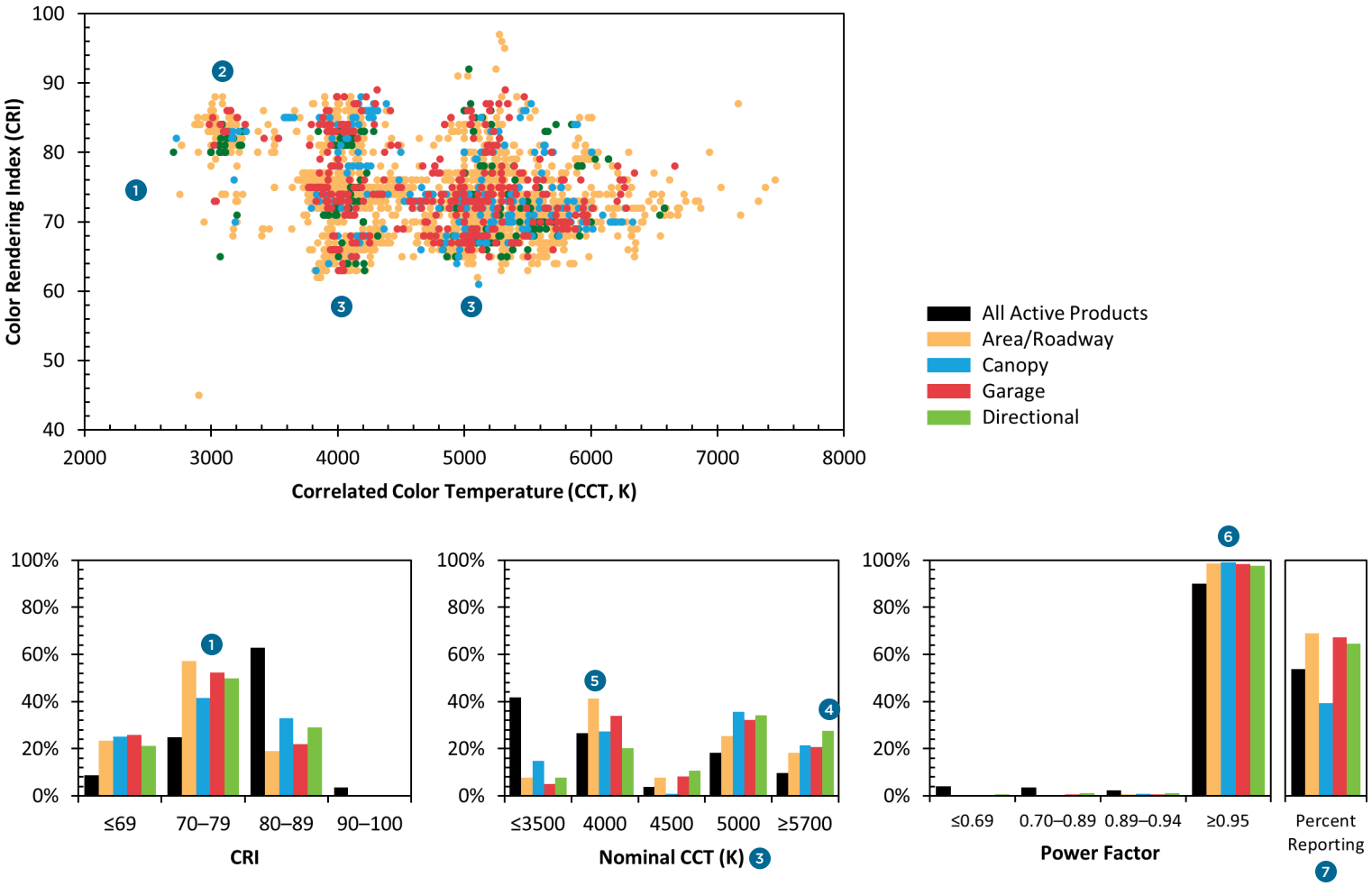
6. Overall, the parking garage, canopy, and directional luminaires had similar ranges for lumen output and efficacy. Most products were between 2,000 and 11,000 lm, and between 70 and 110 lm/W.

7. Approximately 78% of the parking garage luminaires currently listed by LED Lighting Facts meet the DLC QPL criteria for lumen output (2,000 lm) and efficacy (75 lm/W).

8. Similarly, about 77% of the LED canopy luminaires exceeded 80 lm/W and 2,000 lm, the minimum efficacy and output criteria of the DLC QPL.

9. The DLC does not directly define a category for outdoor directional luminaires.

# Outdoor Area Luminaires **Current Color Quality & Power Quality**




1. For each of the four categories more than 42% of the products listed by LED Lighting Facts had a CRI in the 70s. The remainders were approximately evenly split between CRIs in the 60s and 80s.

2. A vast majority of products (88%) with a nominal CCT of 3500 K or less had a CRI in the 80s. In general, CRI was negatively correlated with CCT, with very similar trends for all four product categories.

3. Although the majority of products in each category had a nominal CCT of either 4000 K or 5000 K, there was a substantial number of products in each category having lower (e.g., 3000 K) or higher (e.g., 6500 K) CCTs.

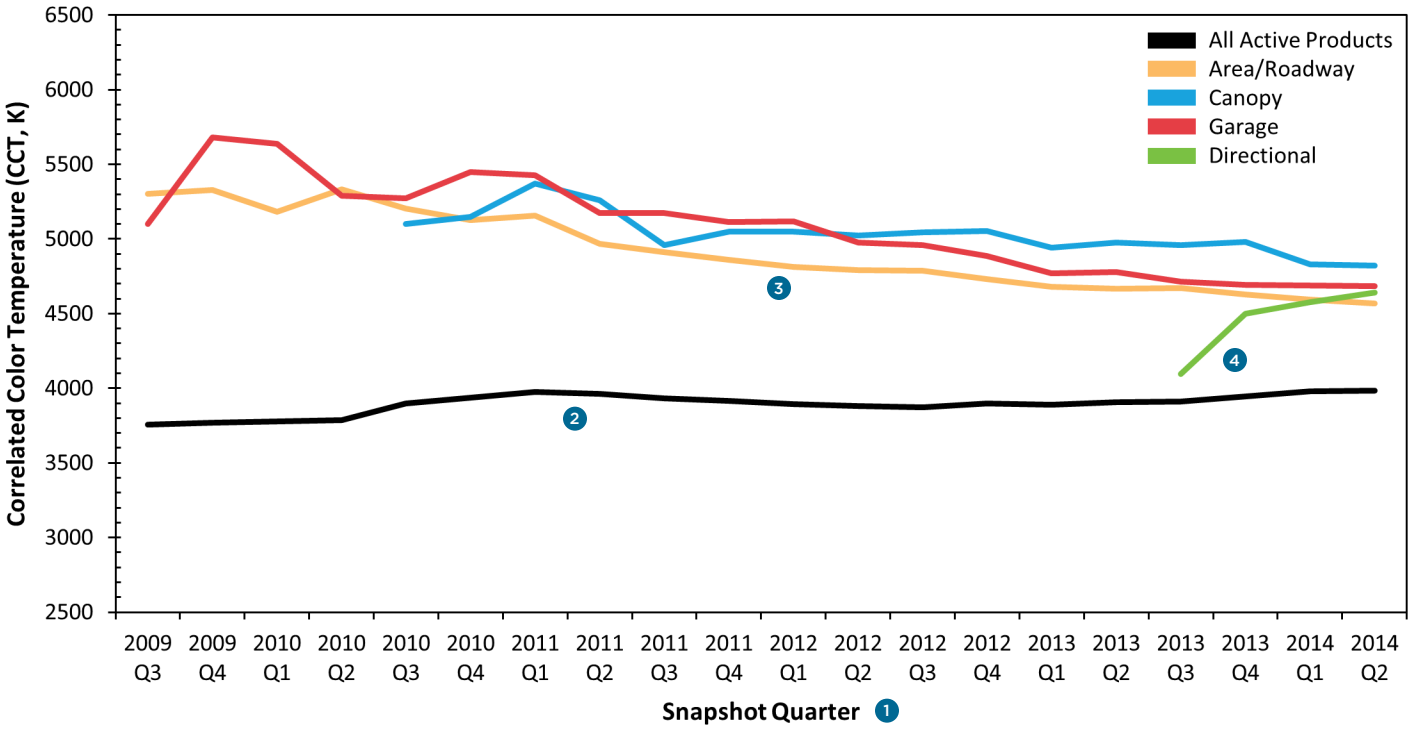
4. As of July 1, 2014, currently listed canopy luminaires had the highest mean CCT (4823 K). They were followed by parking garage luminaires (4685 K) and directional luminaires (4641 K). Area/roadway luminaires had the lowest mean CCT (4568 K).

5. More than 40% of LED area/roadway luminaires listed by LED Lighting Facts as of July 1, 2014 had a nominal CCT of 4000 K, and nearly 60% had a CCT of 4500 K or less. This is perhaps counter to common thinking and is a notable change since LED Lighting Facts began, as shown on the next page.

6. A vast majority (more than 98%) of currently listed products in each of the four luminaire categories had a power factor of 0.95 or greater, if the value was reported at all. Less than 1% of products reporting the metric had a power factor less than 0.90.

7. Power factor is an optional metric for listing with LED Lighting Facts. As such, not all product entries include the value. The four luminaire categories that are the focus of this Snapshot report have reporting rates between 39% and 69%.

# Outdoor Area Luminaires **Correlated Color Temperature Trends**




1. Like the chart on page 3, this "Snapshot" chart documents the performance of products active in the LED Lighting Facts database at any given time. It is different from charts that show the performance for products newly listed in any given quarter. Under the scheme depicted here, old products that remain listed will partially mask changes seen with newly listed products, but the result may be a better representation of what was on the market at a given point in time.

2. The mean CCT for all products listed by LED Lighting Facts has risen slightly over the past five years. This is likely due to LED luminaires—which generally have higher CCTs than LED lamps—comprising an increasing percentage of the total products listed.

3. For area/roadway luminaires, canopy luminaires, and parking garage luminaires listed by LED Lighting Facts, the mean CCT has been decreasing consistently. For example, in the third quarter of 2009, listed area/roadway luminaires had a mean CCT of 5318 K, but in the second quarter of 2014, the mean CCT was 4568 K.

4. Directional luminaires do not follow the same decreasing-CCT trend as the other three categories considered in this report. This is likely due to the small number of products listed after the category's inclusion in late 2013, as well as the diverse range of products included in the group.

# Discussion **LED Outdoor Area Luminaires**

The four types of luminaires discussed in detail in this Snapshot report are the core products used to light surfaces or large areas outdoors (or in parking garages), and are categories where LED technology has made significant inroads. Roadway lighting, for example, was one of the first major product categories to see competitive LED products, with GATEWAY demonstration projects dating back to 2007.[1] While those early products may be inferior to what is available today, they provided an important starting point for a product type that is now seeing widespread deployment, and providing substantial energy savings. Further evidence of the importance of LED roadway lighting is its share of the LED market, with those products making up nearly a quarter of the LED Lighting Facts database.

Using that database, it is possible to track and understand how performance has changed over time, as well as how performance may continue to change in the future. As with the broader set of products, the efficacy of LED outdoor area products continues to improve. Mean efficacies for the four product categories are between 81 and 91 lm/W, with some products as high as 150 lm/W—according to the data supplied by manufacturers to LED Lighting Facts. This has occurred despite substantial decreases in mean CCT—within a product family, higher-CCT products are generally more efficacious. While many early LED area lighting products were 5000 K or higher, there has been a measurable shift toward 4000 K products, and there is now a wide range of products at different CCTs from which specifiers can choose.

Although not shown in this report, the trends for lumen output have been less straightforward: area/roadway luminaires have seen a steady increase, whereas mean output for garage luminaires has remained relatively constant and mean output for canopy luminaires has been more variable. Lumen output can be a more difficult variable to track, because higher is not necessarily better, although it is often more difficult to achieve. Further, LED Lighting Facts relies on manufacturers to accurately categorize products using a predetermined set of criteria. CALiPER does not independently verify product classifications or attempt to identify specialty products that may be included in a given category; these products may have lower lumen output than would be typical of the category.

Overall, the performance of LED luminaires offers a compelling option for specifiers of outdoor area lighting. LED Lighting Facts does not capture cost data, however, which is often a critical consideration in the decision-making process. Further, superior performance is not universal to all LED products (i.e., many poor-performing products are still available), so specifiers must understand the needs of their application and the desired performance levels.

1 Results available at: http://www1.eere.energy.gov/buildings/ssl/gatewaydemos_results.html

## The Fine Print **About LED Lighting Facts Snapshot Reports**

Snapshot Reports analyze the dataset—or subsets—from DOE's LED Lighting Facts product list. They are designed to help lighting retailers, distributors, designers, utilities, energy efficiency program sponsors, and other industry stakeholders understand the current state and trajectory of the solid-state lighting market. Product classifications are at the discretion of the manufacturer, and Snapshot Reports generally reflect the raw data listed in the LED Lighting Facts database. Minimal action is taken to adjust for inconsistencies.

The LED Lighting Facts database is not a statistical sample of the overall market. LED Lighting Facts is a voluntary reporting program in which manufacturers submit data for products tested in accordance with IES LM-79-08. Within any category, the data may be skewed not only by what is submitted, but also by the reporting practices of different manufacturers (e.g., reporting each small variation of a product). Given the broad nature of some of the predetermined categories, not all individual products may be directly comparable (i.e., the form factor may be substantially different). Despite these limitations, the LED Lighting Facts database is the largest of its kind, and is generally considered indicative of market trends. The product list includes a wide variety of product types, from manufacturers large and small, and from lighting-industry veterans and brand-new companies alike.

LED Lighting Facts and the Snapshot Reports focus on five core metrics: lumen output, input power, luminous efficacy, color rendering index, and correlated color temperature. Data for other performance metrics can be voluntarily submitted, and all data is available on the LED Lighting Facts website. Specifiers should thoroughly consider all aspects of performance when evaluating different products.

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

**For more information, visit:** www.lightingfacts.com

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