A FEMP Outdoor SSL Initiative

Resources for Outdoor SSL Applications

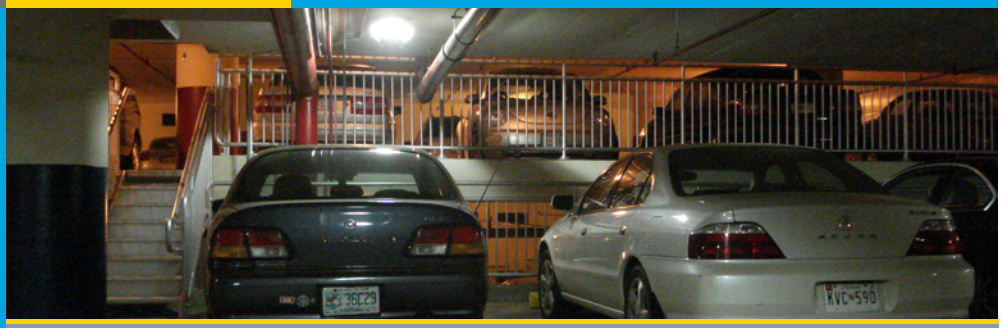


Photo credit: PNNL

LED lighting installed in the parking garage of the Frances Perkins Building, U.S. Department of Labor headquarters, Washington, D.C.

Outdoor Solid-State Lighting in the Federal Sector

The Federal Energy Management Program (FEMP) is encouraging Federal agencies to accelerate the thoughtful application of outdoor solid state lighting luminaires. The FEMP Outdoor SSL Initiative offers a unique opportunity for the Federal sector to lead a large-scale implementation effort focused on an (SSL) application that is ripe for near term implementation through a process that recognizes the technology's potential, as well as its challenges. This initiative is intended to help Federal energy managers overcome the widespread misinformation they are encountering, learn about this technology and its unique attributes, and provide the tools needed to make good decisions that result in cost effective energy savings, and good quality lighting.

As part of this initiative, FEMP will leverage existing SSL outdoor tools and materials, and will develop new ones as needed to meet the unique needs of Federal agencies. This paper provides an overview of existing outdoor SSL resources developed by the US Department of Energy's SSL Program and other Federal initiatives including:

- SSL Street/Roadway Lighting
- SSL Site (Parking Lot/Garage) Lighting
- General SSL Resources

Municipal Solid-State Street Lighting Consortium Fact Sheet – The Consortium shares technical information and experiences related to LED street and area lighting demonstrations. The Consortium also serves as an objective resource for evaluating new products on the market intended for street and area lighting applications.

http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/consortium_fs.pdf

DOE SSL GATEWAY Demonstration Project Results – DOE GATEWAY demonstrations showcase high-performance LED products for general illumination in a variety of commercial and residential applications. Demonstration results provide real-world experience and data on state-of-the-art SSL product performance and cost effectiveness.

DOE CALiPER Test Results – The DOE Commercially Available LED Product Evaluation and Reporting (CALiPER) program supports testing of a wide array of SSL products available for general illumination, using industry-approved test procedures. DOE allows its test results to be distributed in the public interest for non-commercial, educational purposes only. Summary results as well as detailed test reports are available.

Street/Roadway Lighting

A variety of resources are available for facility managers interested in pursuing SSL street and roadway lighting, including DOE SSL GATEWAY demonstration project results, a Fitted Target Efficacy Calculator, and DOE CALiPER test results.

According to the U.S. Department of energy, no other lighting technology offers as much potential to save energy and enhance the quality of our building environments, contributing to our nation's energy and climate change solutions.

http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/dec2010_guiding-market_factsheet.pdf

- ***Model Specifications for LED Roadway Lighting.*** Specifications for LED Roadway Luminaires that enables cities, utilities, and other local agencies to assemble effective bid documets for LED street lighting products.

  http://www1.eere.energy.gov/buildings/ssl/specification.html

- ***LED Roadway Lighting: Palo Alto, California.*** Assessment of energy, economic, and performance impacts of replacing high-pressure sodium street lights with LED and induction street lights.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_palo-alto.pdf

- ***LED Street Lighting: Lija Loop, Portland, Oregon.*** Analysis of the energy and performance impacts of replacing eight high-pressure sodium street lights on one residential street with LED luminaires.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_lija-loop.pdf

- ***LED Roadway Lighting: I-35W Bridge.*** Analysis of Phase 1 results, completed in September 2008; Phase 2 involves long-term monitoring to evaluate lumen depreciation, physical effects, and performance impacts over time.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_i-35w-bridge.pdf

- ***LED Street Lighting: City of San Francisco.*** Study of performance of LED street lights from four different manufacturers, installed on four public avenues to replace 100-watt nominal high-pressure sodium luminaires.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_sf-street-lighting.pdf

- ***LED Street Lighting: City of Oakland.*** Assessment of energy, economic, and safety impacts of replacing 15 high-pressure sodium street lights on two public streets with LED luminaires.

  Oakland Report Brief Phase II:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/oakland_demo_brief.pdf

  Oakland Report Phase II:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/emerging_tech_report_led_streetlighting.pdf

  Oakland Report Phase III:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_oakland-phase3.pdf

DOE CALiPER Test Results – The following summary reports include information on SSL street and roadway lighting products:

- ***Arm-Mounted Roadway and Post-Top Luminaires.*** Includes results and analysis for products tested, including roadway arm-mount and post-top luminaires, linear replacement lamps, high-bay luminaires, and small replacement lamps.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round-11_summary.pdf

- ***Street Lights and Bollards.*** Includes results and analysis for products tested, including three bollards, lamped with SSL, compact fluorescent, and metal halide sources for street or area lighting.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round_7_summary_final.pdf

- ***Roadway Fixtures.*** Report includes test results and analysis for products tested in Round 5, including one roadway, metal halide outdoor fixture.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round_5_summary_final.pdf

- ***High-Watt Area Light and Street Light.*** Report includes test results and analysis for products tested in Round 4, including two higher wattage outdoor lights (one 'area' light and one 'street' light).

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round4_summary_final.pdf

Parking Lot/Parking Structure Lighting

A variety of resources are available for facility managers interested in pursuing SSL parking lot and parking structure lighting projects, including DOE SSL GATEWAY demonstration project results, DOE Commercial Building Energy Alliances (CBEA) Performance Specifications, and DOE CALiPER test results.

DOE SSL GATEWAY Demonstration Project Results – The following studies have been completed on parking lot and parking structure lighting:

- ***LED Parking Lot Lighting: Raley's Supermarket.*** At a Raley's Supermarket in West Sacramento, California, several metal halide (MH) luminaires were replaced with new LED luminaires incorporating bi-level operation (dim state and full state) controlled by motion detectors.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_raleys.pdf

- ***LED Parking Garage Lighting: Providence Portland Medical Center (PPMC).*** With an eye on replacing its aging stock of luminaires campus-wide, PPMC wanted to evaluate more energy-efficient lighting options. In this project, PPMC replaced several high-pressure sodium fixtures in the hospital parking garage with LED luminaires.

  PPMC Report:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_ppmc.pdf

  PPMC Report Brief:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_ppmc_brief.pdf

- ***LED Parking Lot Lighting: T.J. Maxx.*** In a shopping plaza parking lot in Manchester, New Hampshire, high-pressure sodium and metal halide luminaires were replaced with LED luminaires controlled by integral occupancy sensors that vary between "high" and "low" light output settings.

  T.J. Maxx Report:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_tjmaxx.pdf

  T.J. Maxx Report Brief:
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/ns/led_tjmaxx_brief.pdf

- ***LED Parking Lot Lighting: Walmart.*** At a new Walmart Superstore in Leavenworth, Kansas, LED parking lot luminaires were installed that achieved a 63% energy savings against a theoretical baseline (since the site was new construction, no baseline system was actually installed). Simple payback for the LED system was 6.1 or 7.5 years, depending on the respective hypothetical baseline.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_walmart.pdf

DOE CALiPER Test Results – The following summary reports include information on parking lot/parking structure lighting.

- ***Parking Structure and Outdoor Wallpack Luminaires.*** Includes results and analysis for products tested, including parking structure luminaires, outdoor wallpack luminaires, cove lighting luminaires, and replacement lamps.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round-10_summary.pdf

- ***Streetlights and Bollards.*** Includes results and analysis for products tested, including three bollards, lamped with SSL, compact fluorescent, and metal halide sources for street or area lighting.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round_7_summary_final.pdf

- ***Ourtdoor Area Acorn Insert and Outdoor Wall Lantern.*** Includes results and analysis for products tested, including two different SSL outdoor fixtures: a wall-mounted lantern and an acorn insert for outdoor area lighting.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round_6_summary_final.pdf

- ***High-Watt Area Light and Street Light.*** Report includes test results and analysis for products tested in Round 4, including two higher wattage outdoor lights (one 'area' light and one 'street' light).

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round4_summary_final.pdf

- ***Outdoor Wall, Area, Parking and Path Lights.*** Report includes test results and analysis for products tested in Round 3, including SSL area and parking lights.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_round_3_summary_fnl.pdf

Photo credit: PNNL

LED roadway installation by BetaLED on the St. Anthony's I-35W Bridge over the Mississippi River, Minneapolis, MN

- ***Outdoor Area Lights.*** Report includes test results and analysis for products tested in Round 1, including one outdoor area light.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/cptp_round_1_testing_results_summary.pdf

Commercial Building Energy Alliance (CBEA) Performance Specifications – The U.S. Department of Energy's (DOE) Commercial Building Energy Alliances (CBEAs), which includes the Retailer Energy Alliance, the Commercial Real Estate Energy Alliance, and the Hospital Energy Alliance, are driven and managed by key industry partners whose goal is to transform the energy efficiency of commercial buildings. The CBEAs have developed performance specifications for the following:

- ***LED Site (Parking Lot) Lighting Technology Specification.***

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/dec2010_guiding-market_factsheet.pdf

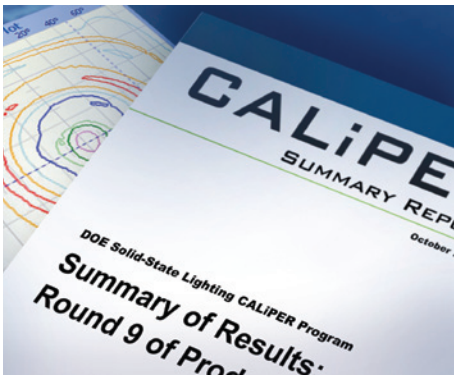
  Describes product performance specifications and evaluation procedures for using LED lighting in retail parking lots. http://www1.eere.energy.gov/buildings/alliances/parking_lot_lighting.html

- ***High Efficiency Parking Structure Lighting Technology Specification.*** Presents performance specifications for converting traditional HID parking structure lighting technology to high-efficiency alternative technologies (LED, induction, and fluorescent).

  http://www1.eere.energy.gov/buildings/alliances/parking_structure_spec.html

- ***Application Considerations for LED Site Lighting Projects Using the CBEA Performance Specification: A Review of DOE GATEWAY Demonstration Projects.*** Light-emitting diode (LED) technology can deliver significant energy savings and high-quality lighting in commercial parking lots, especially when paired with controls. Explore the considerations commercial building owners need to keep in mind to take full advantage of LED capabilities. The CBEA completed a site (parking lot) lighting performance specification designed to support effective application of LEDs based on the latest understanding of the technology.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/gatewaydemo_factsheet.pdf.



General Resources

Solid-State Lighting – A wealth of information exists from DOE's Solid-State Lighting Program on the important performance characteristics of solid state lighting for general illumination, with particular emphasis on energy efficiency and lighting quality. The following resources should be of particular interest to Federal Energy Managers.

- ***Outdoor Area Lighting Fact Sheet.*** Review of the concerns and potential for LED luminaires in outdoor area lighting applications.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/outdoor_area_lighting.pdf

- ***Outdoor Lighting Guidance.*** This document provides basic guidance for common outdoor lighting applications: wall-mounted area lighting, parking garage lighting, canopy lighting, and pole mounted street and area lighting. Minimum performance recommendations are provided for lifetime, warranty, energy efficiency, and light distribution.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/outdoor_lighting_guidance.pdf

- ***Guide to Evaluating LED Lumen Maintenance.*** Demonstrate compliance with 6,000 hour lumen maintenance thresholds by Component Performance or Luminaire Performance.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/guide_lumen_maintenance.pdf

- ***Comparing White Light LEDs to Conventional Light Source Fact Sheet.*** Current LED products compared to conventional lighting on the basics: energy efficiency, life, lumen depreciation, light output/distribution, and color quality.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/comparing_white_leds.pdf

- ***LED Luminaire Reliability Fact Sheet.*** Outline of issues concerning long-term performance and reliability of LED luminaires, and suggestions for interpreting LED product life claims.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/luminaire_reliability.pdf

- ***Understanding Photometric Reports for SSL Products Fact Sheet.*** Overview of typical elements in IES LM-79 reports for LED luminaires and integral replacement lamps.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/understanding_photometric_reports.pdf

- ***Light at Night: The Latest Science.*** Update on current research related to nighttime exposure to light.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/ssl_whitepaper_nov2010.pdf

- ***Lighting Facts® Fact Sheet.*** SSL Quality Advocates—a voluntary pledge program to assure LED lighting is accurately represented in the marketplace, illustrated by the Lighting Facts label to disclose product performance data.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/dec2010_lighting_factsheet.pdf

- ***DesignLights Consortium™ (DLC).*** DLC—a collaboration of utility companies and regional energy efficiency organizations has established performance criteria and maintains a "qualified products list" of high performance SSL products.

  http://www.designlights.org/solidstate.about.php

- ***Next Generation Luminaires™ (NGL).*** The NGL competition recognizes excellence in the design of energy-efficient LED commercial lighting luminaires.

  www.ngldc.org

- ***Exterior Lighting for Energy Savings, Security and Safety.*** Report discussing exterior lighting opportunities and the security and safety challenges that exist for exterior environments.

  http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/exterior_lighting_savings.pdf

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