

Parking Lot LED

Technology Description

A light-emitting diode (LED) is a semiconductor-diode that emits light. LEDs present some advantages over conventional light sources including long lifetime, improved robustness, small size, fast switching, and greater durability. However, they are currently relatively expensive and require more specific current and precise thermal heat management than conventional light sources. A driver is used, much as a ballast, to provide the precise current to the LEDs. LEDs are typically integrated with the fixture and heat sink (thermal management system).

LEDs are a directional light source emitting typically in only 180 degrees because of the way they are made. With good luminaire design, the LED light output can be aimed to where it is desired with minimal light going in unneeded directions, and therefore

with minimal redirection and energy loss. This also allows the LED luminaire to provide more uniformity of illumination. The result is less overlighting of the area, such as immediately under the luminaire and, in some cases, less light spilling over into unneeded areas. Better use of lumens providing illumination where needed (and not providing illumination where it is not needed) allows LEDs to outperform other sources with respect to illumination per applied Watt.



Close up view of the new LED luminaires atop an existing light pole.

Value to the Warfighter

The advantages of LED technology in outdoor lighting applications are:

- LED provides a longer lamp life (expectations of 50,000 hours). However, the technology is too new for true lamp life to be validated.
- Based on the current state of LED technology, 50% reduction in power and energy while maintaining or improving maintained illumination levels is possible.
- LEDs offer improved optical control, which results in improved quality of light, improved uniformity ratios, and reduced waste in light.
- LEDs are mercury free. However, at end of life, LED equipment should be treated as electronic waste requiring recycling.
- LEDs are more durable, resulting in less lamp breakage.

Economics of the Technology: ROI or Payback

Table below summarizes the energy and economic performance of the demonstration projects.

Energy and Economic Performance Comparison

Lighting Technology	NBVC NAVFAC EXWC Bldg 1100 Parking		NBVC NEX Parking		NSPH Dormitory Complex Parking	
	HPS	LED	HPS	LED	HPS	LED
Total number of luminaires	23	19	14	14	34	34
Number of light poles	12	12	9	9	24	24
Rated lamp power, Watts	400	156	400	207	150	104
Total measured power, kW	10.88	2.81	5.81	2.88	5.01	3.42
Reduction in measured power, %		74.2%		50.4%		31.7%
Operation [*] , hours per year	1046	1046	4015	4015	3832	3832
Annual energy consumed, kWh/yr	11,968	3,091	23,327	11,563	19,198	13,105
Annual energy reduction, kWh/yr		8,437		11,764		6,093
Annual energy cost reduction [†] , \$/yr		\$1,012		\$1,412		\$1,280
Installed cost		\$49,808		\$36,746		\$88,072
Simple payback, years		49.2		26.0		68.8
[*] Operating hours based on timer control set points						
[†] Electric energy cost = \$0.21/kWh (NSPH) and = \$0.12/kWh (NBVC). Reference: FY2007 Energy Management Reports						

Annual operating hours and local energy rates can have a major impact on cost effectiveness. In the case of the LED demonstration at building 1100, the reduction in load (kW) was significant. However, as a result of the extremely low operating hours, the resulting simple payback was very long.

It should also be noted that since these demonstrations were performed, cost has continued to come down resulting in better economics.

Technology Transition Documentation

Category 4. The transition of Research knowledge into products that provide information for the NAVFAC community to purchase services for SRM, special projects and energy performance performing contractual mechanisms.

Site Implementation

- NAVFAC EXWC office building parking lot, Building 1100, Naval Base Ventura County, Port Hueneme, CA
- Navy Exchange parking lot, Naval Base Ventura County, Port Hueneme, CA
- 1300 Dormitory Complex parking area, Naval Station Pearl Harbor, HI.

Specific Applications

Contact: Mr. Paul Kistler, EXWC PW61, paul.kistler@navy.mil, 805-982-1387