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

High-Efficiency Parking Lighting in Federal Facilities

Camp Pendleton Saves 91% in Parking Lot Lighting

Camp Pendleton Marine Corps Base (MCBCP) won a 2015 Lighting Energy Efficiency in Parking (LEEP) Award for cutting energy use by 91% at one Camp Pendleton parking lot, which was part of a base-wide initiative to retrofit parking areas across the 125,000-acre training facility.

Prior to the retrofit, the parking lot was lighted with 1,000-W high-pressure sodium (HPS) lamps. HPS lamps are commonly used for outdoor lighting and have a signature yellow-tinted light. The HPS fixtures were replaced with 100-W induction fixtures, which use long-lasting circular fluorescent-based lamps.

The new lamps cut energy use from 63,000 kWh to 6,000 kWh for an annual energy savings of 57,000 kWh, or a 91% reduction in energy costs. These savings earned the base the 2015 LEEP Award for Highest Percentage Energy Savings in a Retrofit at a Single Parking Lot. The U.S. Department of Energy and industry associations are collaborating to promote the use of energy-efficient lighting in parking lots and structures.

Camp Pendleton Building 2653 Motor Pool Parking Lot by the Numbers

Total parking area	78,000 ft²
Number of parking spots	240
ROI	4%
Simple payback	2.9 years
Total annual energy savings	57,000 kWh
Total annual energy cost savings	$5,700

Project Drivers and Successes

Although a project payback of 10 years is acceptable, the single parking lot retrofit is estimated to have a simple payback of only 2.9 years.

The award-winning parking lot retrofit was one of several lighting upgrade projects conducted around the base. Camp Pendleton is the largest Marine Corps training facility on the West Coast. It covers more than 125,000 acres. It is also the business installation for the U.S. Department of Defense, offering training for many Marine, Army, and Navy units in addition to national, state, and local agencies. To support the many activities and missions taking place at the base, the MCBCP incorporates efficient use of energy resources as a critical component of mission readiness through reductions in facility operating costs.

The Base Energy Team works every day on improving energy efficiency and reducing waste, and this parking lot lighting project is a natural continuation of sustainability efforts. One driving force behind this is the Energy Independence and Security Act of 2007, which requires that the U.S. Department of Defense reduce building energy consumption by 30% by 2015, relative to a 2003 baseline. MCBCP met this objective with a 34% reduction from 2003 levels in 2015.

Several factors helped make a strong business case for conducting the lighting upgrades. Lighting retrofits across the base were calculated to reduce energy use by more than 50%. The Marine Corps Energy Investment Program provided funding and the base received utility rebates. Overall, MCBCP received $340,000 in utility incentives for retrofits across the base.

Site-wide a total of 2,500 low-wattage induction fixtures were put into place across more than 6 million ft² of parking area. These base-wide upgrades yielded an overall annual parking area lighting energy savings of 1 million kWh and a cost savings of $100,000.

Camp Pendleton Marine Corps Base replaced the old HPS fixtures in one parking lot with high-efficiency induction fixtures for 91% savings in energy use. Sitewide upgrades yielded annual savings of 1 million kWh.
Photo courtesy of PFC Cole Johnson

Old Versus New Fixtures at Building 2653 Parking Lot: 91% Savings

	HPS	Induction
Number of fixtures	12	12
Rated lamp wattage	1,000 W	100 W
Input power	1,100 W	103 W
Lighting power density	0.17 W/ft²	0.02 W/ft²
Manufacturer rated life	12,000 - 20,000 hours	100,000 hours
Energy use	63,000 kWh	6,000 kWh

In addition to the energy savings netted, the project is expected to see maintenance staff labor savings because the induction lamps have a long lamp life, which should result in fewer lamp replacements and a corresponding reduction in purchasing costs. Induction lamps can reach 100,000 hours of lamp life; in comparison, HPS lamps last typically 12,000 to 20,000 hours. In addition MCBCP was able to negotiate with the vendor to extend the warranty from 5 to 10 years.

Another very important driver for the project was improved security. Prior to the retrofit project, the lighting quality and distribution of the HPS fixtures was poor. Charles Howell, the resource efficiency manager who developed the project as part of the Base Energy Team, noted that "in addition to the fantastic savings, the new lighting also greatly improved staff safety and user comfort." He has received positive feedback from staff who say they feel safer and can see better since the light fixtures have been replaced.

Lessons Learned

- Ensuring that the products specified for the project meet the utility reimbursement guidelines is an important step in maximizing savings.
- Working with vendors can benefit the project through negotiations such as extending the product warranty.
- When doing a multi-phase project, revisit cost assumptions as costs continue to drop on LEDs.
- LED technology is improving very rapidly. Interested users should check information sources on product performance and lifetime, such as the DOE Solid-State Lighting website www.ssl.energy.gov.

Next Steps

As part of the base's energy goals, MCBCP continues to explore additional areas for increasing energy savings.

The parking lot lighting project specifications were drawn up in 2013. At that time, LED prices were higher. As costs have come down, interest in using LEDs has increased.

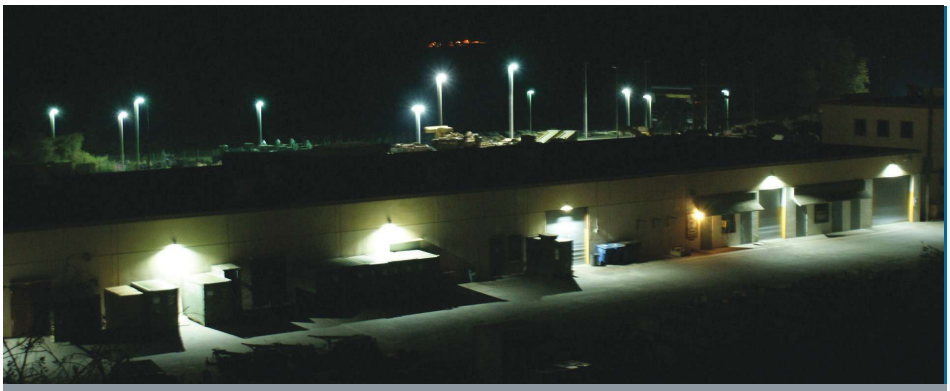
LEDs offer several features that would enhance site safety and security such as the improved visibility resulting from higher color rendering and increased uniformity. LEDs also offer instant-on performance, with no run-up or re-strike delays.

Around the base, additional lighting projects are underway with over 10,000 exterior wall packs slated for replacement. MCBCP is also planning to conduct some lighting retrofits inside its buildings, replacing less efficient interior lighting with LED lamps and fixtures.

Sitewide, as of October 2015, the MCBCP had replaced 6,795 exterior lighting fixtures with highly efficient LED light fixtures, for an annual savings of $197,800 in energy costs or 1,968,000 kWh in energy use, the equivalent of taking 42 cars off the road.

The new LED fixtures provide greatly improved light quality with reduced glare, better color rendering, and more even light levels, for better visibility at night, increasing safety and security at the base. In addition, the new fixtures are Dark Sky compliant, with fixtures designed to direct light downward to minimize “glow and glare.” All of the LED lights selected are UL listed and DesignLights Consortium (DLC) qualified, allowing MCBCP to be eligible for utility rebates for an even better return on investment. And, the products are fully “Buy American Act” compliant, which means they were completely assembled in the United States.

The pre-retrofit high-pressure sodium lamps produced a yellow light while the new induction lamps produce a bright white light , improving color rendering and visibility.
Photo courtesy of MCBCP.



New parking lot lighting is visible in the background while the building in the foreground is lighted by new LED exterior lighting fixtures.
Photo courtesy of MCBCP.

Federal Energy Efficiency Requirements for Exterior Lighting

Although every site, whether federal, private, commercial, or industrial, can benefit from the energy savings, maintenance savings, and lighting quality improvements, federal sites have another motivator. They must ensure compliance with the multiple laws, executive orders, and Federal Acquisition Regulations which mandate that federal agencies meet efficiency requirements in all procurement and acquisition actions that are not specifically exempted by law.

Federal purchasers must buy, specify, and contract for ENERGY STAR® compliant products. In cases where there is no ENERGY STAR® product category, the agency should comply with FEMP-designated efficiency requirements.

The table below lists the minimum federal efficiency requirements that various categories of exterior lighting must meet to be eligible for purchase by federal agencies.

For more information on high-efficiency lighting technologies and information for federal agencies, including lighting requirements language for contracts, visit energy.gov/eere/femp/covered-product-category-exterior-lighting. See below and to the right for links to guides and sample specifications documents.

Find qualifying products at
www.lightingfacts.com/LFPowered/FEMP

FEMP and the DOE LED Lighting Facts® program have partnered to offer a tool that allows federal users to identify LED exterior lighting products that meet the minimum federal efficiency requirements for the six categories of exterior lighting shown in the table below. In addition to having a pre-screened list of products, federal users can screen on a large range of other product metrics, including color temperature, power factor, and beam angle.

Efficiency Requirements for Federal Purchases

Category - Exterior Lighting	Luminaire Efficacy Rating (Lumens/Watt*)
Fuel pump canopy luminaires	70
Parking garage luminaires	70
Outdoor pole/arm-mounted area and roadway luminaires	65
Outdoor pole/arm-mounted decorative luminaires	65
Outdoor wall-mounted luminaires	60
Bollards	35

* Luminaire Efficacy Rating (LER) = total light output emitted by the luminaire divided by the total power input. "Fixture" and "luminaire" are interchangeable terms and refer to the overall light fixture.

Design Guidance for Federal Sites

These guides provide design guidance for FEMP-designated product categories such as outdoor, roadway, and parking garage luminaires.

Guide to FEMP-Designated Parking Lot Lighting
energy.gov/eere/femp/downloads/guide-femp-designated-parking-lot-lighting

Guide to FEMP-Designated Parking Structure Lighting
energy.gov/eere/femp/downloads/guide-femp-designated-parking-structure-lighting

Proven Specifications

Use these specifications, developed by DOE's Better Buildings Alliance and the DOE Municipal Solid-State Street Lighting Consortium to specify performance expectations, warranty, and testing requirements for your exterior lighting projects.

LED Site Lighting (Parking Lot) Specification
apps1.eere.energy.gov/buildings/publications/pdfs/alliances/cbea_led_site_lighting_spec.pdf

High Efficiency Parking Structure Specification
apps1.eere.energy.gov/buildings/publications/pdfs/alliances/creea_parking_structure_spec.pdf

Wall Pack Lighting Specification and Appliance Guidance
www4.eere.energy.gov/alliance/sites/default/files/uploaded-files/high-efficiency-wall-pack-specification.pdf

Model Specification for LED Roadway Luminaires
http://energy.gov/eere/ssl/downloads/model-specification-led-roadway-luminaires-v20

"It might only take one person to change a light bulb, but it took dedicated efforts by the many thoughtful leaders of LEEP award winners to demonstrate how much can be gained through advanced, cost effective lighting technologies in parking lots and garages. These innovative solutions also enhance safety and improve working conditions for customers, tenants and employees."

David Danielson,
Assistant Secretary for Energy Efficiency and Renewable Energy

Lighting Energy Efficiency in Parking (LEEP) Campaign

On June 29, 2015, Camp Pendleton Marine Corps Base (MCBCP) was 1 of 18 organizations recognized for exemplary energy savings at an award ceremony conducted in Los Angeles, CA, by the LEEP Campaign, an effort to promote high-efficiency lighting in parking facilities. MCBCP won the Highest Percentage Savings in a Retrofit at a Single Parking Lot award, achieving 91% energy savings through a lighting retrofit at a parking lot.

Together winning projects achieved savings of about 70 million kWh or $7 million in electricity savings by providing energy-efficient lighting to 200 million ft^2 of parking lots and structures, with an average payback of less than 6 years. LEEP Participants are collectively saving over 160 million kWh and over $17 million annually, based on 470 million ft^2 of high-efficiency parking lighting logged as of September 2015.

LEEP encourages facilities to install energy-efficient lighting and/or to install lighting occupancy or daylight controls to cut energy use by 30% compared to the lighting power density values specified in ASHRAE/IES Standard 90.1-2010. LEEP's overall goal is to achieve 750 million ft^2 of planned or installed high-efficiency parking lighting by May 2016.

Through the Better Buildings Alliance, members in different market sectors work with the U.S. Department of Energy's (DOE) exceptional network of research and technical experts to develop and deploy innovative, cost-effective, energy-saving solutions that lead to better technologies, more profitable businesses, and better buildings in which we work, shop, eat, stay, and learn. Join today to start saving energy in your commercial buildings through programs like the Lighting Energy Efficiency in Parking (LEEP) Campaign, www4.eere.energy.gov/alliance, www.leepcampaign.org.
Photo courtesy of MC Realty.

Join the LEEP Campaign
www.leepcampaign.org

Federal sites are encouraged to join the LEEP campaign. LEEP will provide you with

- technical assistance
- information on financing and incentives
- lighting savings calculators.

Federal sites commit to

- building or retrofitting at least one parking lot or structure with high-efficiency lighting. (Sites built or retrofitted with complying fixtures any time after January 2010 are eligible to compete.)
- Share your results.

Report your actual energy savings by May 2016 for a chance to be recognized at the LEEP awards at the International Parking Institute Conference and Expo in Nashville, TN, May 17-20, 2016.

LEEP Award Categories Include:

- Highest *absolute savings* at a single site (parking lot): retrofit and new construction
- Highest *absolute savings* at a single site (parking structure): retrofit and new construction
- Highest *percentage savings* at a single site (parking lot): retrofit and new construction
- Highest *percentage savings* at a single site (parking structure): retrofit or new construction
- Best use of controls
- Largest number of sites upgrades
- Largest percentage of sites upgraded
- Largest portfolio-wide energy savings
- Exemplary award for achievement in federal facilities.

To see past years' winners go to: https://www4.eere.energy.gov/alliance/activities/technology-solutions-teams/lighting-electrical/leep-campaign

The LEEP Campaign is sponsored by the Building Owners and Managers Association (BOMA) International, the Green Parking Council, the International Facility Management Association (IFMA), the International Parking Institute (IPI), and the U.S. Department of Energy Better Buildings Alliance.

BOMA International · GREEN PARKING COUNCIL · IFMA International Facility Management Association · IPI INTERNATIONAL PARKING INSTITUTE · Better Buildings U.S. DEPARTMENT OF ENERGY

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For more information, visit:
femp.energy.gov

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FEMP Federal Energy Management Program