High-Efficiency Parking Lighting in Federal Facilities

Army Reserve 63d RSC Achieves 85% Savings in Parking Lot Lighting

In early 2013 the Army Reserve 63d Regional Support Command (63d RSC) began working with Pacific Northwest National Laboratory (PNNL) and the Army Reserve Installation Management Division (ARIMD) to identify energy and water conservation opportunities. The following year, the 63d RSC installed LED fixtures for outdoor lighting at several facilities.

One of these projects, a parking lot lighting retrofit in Little Rock, Arkansas, won a Lighting Energy Efficiency in Parking (LEEP) Campaign award for "highest percentage savings in a retrofit at a single parking lot." The 63d RSC replaced twelve 1,000-W high-intensity discharge (HID) fixtures at the Military Equipment Parking (MEP) area at Camp Pike with twelve 120-W LED fixtures, resulting in a dramatic 85% reduction in energy use.

Compared to the original HID fixtures, the LED fixtures are more efficient at generating light and thus use less energy. Energy and cost savings being the top considerations, the ARIMD Energy Team and 63d RSC conducted an economic analysis and return on investment (ROI) calculations to prioritize use of the limited funds available. Making the business case was especially challenging given the site's low energy cost of 6.5 cents per kWh.

"One of the quickest payback projects with the largest energy savings turned out to be replacing traditional lighting in parking lots with LED lights," said Colonel Stewart Fearon, director of public works at the 63d RSC.

In addition to energy savings, the longer life of LED fixtures means maintenance costs are lower over time. In this case, maintenance cost savings were not considered in the calculations, but it is recognized that these savings augment the energy savings. Depending upon project specifics and service call and repair costs, the maintenance savings have proven to be even greater than the energy savings at some sites.

Camp Pike Military Equipment Parking Area by the Numbers

Total parking area	78,000 ft²
Number of parking spots	240
Simple payback (for parking lot fixtures)	4.4 years
Total annual energy savings	62,000 kWh
Total annual energy cost savings	$4,000

Project Drivers and Successes

The 63d RSC provides support to over 40,000 Army Reserve soldiers in seven states in the southwestern United States and is responsible for complying with a host of laws, orders, and regulations.

Energy Managers Hays Kinslow and Rickey Johns from the 63d RSC worked with PNNL and the ARIMD Energy Team to identify ways to conserve power to comply with Executive Order (EO) 13423 and EO 13693.

EO 13423, Strengthening Federal Environmental, Energy and Transportation Management, was enacted in 2007. This EO requires all Federal agencies to reduce energy intensity by 3% annually through fiscal year 2015. EO 13423 was followed by EO 13693, Planning for Federal Sustainability in the Next Decade, which was enacted in March 2015 and calls for a reduction of energy intensity in Federal buildings by 2.5% per year through fiscal year 2025.

This is the main entrance of Camp Pike in North Little Rock, Arkansas, where replacing 12 old light fixtures with LED fixtures in one parking lot resulted in energy savings of 85% and cost savings of $4,000 a year for the base.
Photo courtesy of the 63d RSC.

This retrofit project is part of a larger initiative encompassing not only outdoor and indoor lighting upgrades, but also water conservation and other energy efficiency improvements.

All of the parking lot retrofits together at Camp Pike encompassed 7,866 parking spaces lighted by medium-wattage HID fixtures that were replaced with

Old Versus New Fixtures at MEP: 85% Savings

	HID	LED
Number of fixtures	12	12
Rated lamp wattage	1,000 W	120 W
Input power	1,080 W	133 W
Lighting power density	0.15 W/ft²	0.02 W/ft²
Annual Energy use	73,000 kWh	11,000 kWh

low-wattage LED fixtures. These camp-wide retrofits resulted in a decrease in energy use from 360,000 kWh to 78,000 kWh, for an annual energy savings of 282,000 kWh or 78%.

The energy managers faced challenges in achieving the expected results. First, delays in getting the contracts awarded led to delays in product delivery and installation. It took almost three years for all products to be installed. Second, since the MEP lot is not metered separately, it is nearly impossible to quantify the actual energy savings.

Lessons Learned

- Contact the local utility with enough lead time to apply and receive applicable incentives.
- If possible, work with a contractor that has multiple supplier options as it will reduce the risk of project delay.
- Costs are coming down while product options are increasing, therefore choosing a knowledge-able contractor is important.
- Current LED product quality can vary significantly among manufacturers; thermal and electrical design weaknesses in some products can lead to rapid lumen depreciation or premature failure. Due diligence is required in their proper selection and use.
- 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.

Feedback has been very positive since the lighting has been replaced. In addition to the energy-saving benefits, a reduction in maintenance costs is anticipated as a result of the increased life span and greater reliability of the LEDs.

While HID lights have an estimated life of 10,000 to 30,000 hours, LEDs have an estimated life of approximately 50,000 hours, or roughly 2 to 6 years for the HID lights versus about 15 years for LEDs, if the lights are on 12 hours per day.

In addition, the new LED lights provide improved overall lighting quality due to their whiter, more evenly distributed light. They also deliver excellent color, improving safety and user comfort.

Next Steps

The 63d RSC has received considerable recognition for the successful parking lot lighting retrofit, including the LEEP award presented at the annual conference of the Building Owners and Managers Association (BOMA) in Los Angeles in June 2015, and an article in the Army Reserve ARIMD national newsletter.

The recognition associated with the MEP lighting project has generated increased momentum and interest in high-efficiency parking lighting as the 63d RSC continues its ongoing lighting retrofits. The RSC Energy Team has plans to conduct retrofits at another 20 sites in Arkansas, Texas, and California in 2016.

These low-wattage LED parking lot fixtures use only 133 W per lamp while the HID lamps they replace consume 1,080 W of input power per lamp.
Photo courtesy of the 63d RSC.

Night and Day photos of the Military Equipment Parking (MEP) Area at Camp Pike. The bright white light of the LEDs provided excellent color rendering and the fixture design provided good ground coverage while also cutting energy use 85% compared to the old lamps they replaced.
Photo courtesy of the 63d RSC.

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 U.S. Department of Energy (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 the 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, the Army Reserve 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. The Army Reserve 63d RSC won the Highest Percentage Savings in a Retrofit at a Single Parking Lot award, achieving an 85% reduction in energy use 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.