High-Efficiency Parking Lighting in Federal Facilities

MC Realty Group Saving Energy and Money with the IRS

MC Realty Group, LLC, won a 2014 LEEP Award for cutting energy use by 76% at the Internal Revenue Service (IRS) Facility Parking Garage in Kansas City, Missouri.

MC Realty replaced 1,500 metal halide fixtures with an equal number of T8 fluorescent fixtures in the five-story parking structure to cut energy use by 2 million kilowatt-hours (kWh) annually, which resulted in the project winning a 2014 LEEP Award for Highest Absolute Annual Energy Savings in a Retrofit at a Single Parking Structure.

The project was a joint initiative between IRS headquarters and local facilities managers from MC Realty, a property management company that has served the Midwest for more than 25 years. The team's goal was to identify opportunities for cost-effective energy savings in support of U.S. Department of Energy (DOE) energy-efficiency mandates. The IRS parking garage was an easy choice, with its inefficient metal halide fixtures consuming almost 2.7 million kWh per year. The 1.35-million-square-foot parking garage was built in 2006 and houses about 3,800 parking spaces. The garage is owned by Pershing Road Development and is used primarily by federal employees who work at the IRS building.

MC Realty by the Numbers

Total area of parking structure	1.35 million ft²
Number of parking spots	3,800
ROI	39%
Simple payback	2.5 years
Total annual energy savings	2 million kWh
Total annual energy cost savings	$122,076

MC Realty Group, LLC, replaced 1,500 old metal halide fixtures in a five-story parking garage in Kansas City used by federal employees of the Internal Revenue Service. MC Realty achieved a 76% reduction in energy use by replacing the metal halide fixtures with T8 linear fluorescent fixtures. Installing motion sensors on two-thirds of the fixtures accounted for 22% of the savings. *Photo courtesy of MC Realty.*

The project team's primary goal was to cut energy use, but maintenance cost savings were another important goal because maintaining the existing lamps and ballasts in the garage was almost a full-time job for maintenance staff.

The garage's original lighting system consisted of 1,500 175-Watt metal-halide lamps. All of the lights were switched on 24 hours a day, 7 days a week, or 8,760 hours per year. These metal halide lamps have a typical lifespan of 14,000 hours; so, with continuous operation, the lamps were burning out after about a year and a half, which would average out to a little over four lamps per day. Of course, the lamps did not all fail at the same time, so the parking garage had to devote nearly the equivalent of a full-time staff person's time to traveling around the very large parking structure hunting for and replacing burned-out lamps.

MC Reality sought a lighting technology solution that would offer high efficiency, long life, and low maintenance.

The technology solution they settled on ultimately met all of these objectives. The team selected three-lamp T8 vapor-tight linear fluorescent fixtures, drawing 85 watts per fixture. When the project was initiated in 2011, MC Realty considered LED fixtures but decided against them because, at the time, LED fixtures were still more expensive, and few LED fixtures provided the needed light distribution. According to Joe Campfield, Director of Building Operations at MC Realty, "the payback was insufficient to justify the use of LEDs over T8s."

One concern for the project team was how to address energy savings through lighting controls while ensuring IRS employees did not have to walk into dark areas of the garage, compromising their safety. MC Realty assessed the options and arrived at a solution that addressed both concerns. The company decided to keep every third fixture in the garage turned on continuously.

The other two-thirds of the fixtures would be controlled by motion sensors that would switch the light fixture on for 20 minutes after the sensor detected movement.

The fixtures were spaced every 30 feet across the ceiling of the parking garage, so there was a continually lighted fixture every 90 feet. This strategy maintained a minimum level of light in the parking garage at all times, while ensuring a well-lighted environment during peak traffic periods or whenever there was activity in any part of the parking structure. As a result, IRS employees would benefit from good lighting when needed, and nearly 1,000 fixtures could be turned off when not in use.

The motion sensors made an immediate impact on the electrical consumption. The motion sensors alone were estimated to account for 22% (437,000 kWh) of the total savings. Also, the new T8s lasted longer, with an estimated operating life of 30,000+ hours, which helped ensure that maintenance was limited. Lastly, the light emitted from the T8s was better color quality than the existing metal halide lighting.

Old Fixtures Versus New Fixtures: 76% Savings

	Metal Halide	T8 Linear Fluorescent
Number of fixtures	1,500	1,500
Rated lamp wattage	175 W	32 W
Input power	209 W	85 W
Lighting power density	0.23 W/sf	0.09 W/sf
Manufacturer rated life	14,000 hours	30,000 hours
Energy use	2,691,335 kWh	656,737 kWh

As Campfield said, "with the newly installed motion sensors, we are able to keep the facility well lighted while keeping maintenance time to a minimum."

Although the 76% reduction in energy consumption was very impressive, the return on investment was equally impressive. It was estimated at 39% based on an electricity rate of $0.06 per kWh and an annual energy cost savings of $122,076. The project had a simple payback of 2.5 years. This did not include the maintenance staff labor savings, which were estimated to be about $30,000 annually.

MC Realty and the IRS were both happy with the results. The IRS was also pleased that the retrofit stayed on schedule with limited interruption to employees' commuting schedules. The contractor kept to the schedule to perform most of the lighting upgrades during off-peak hours and minimized the number of parking spaces that were blocked at any given time.

"The project went very smoothly. The materials were readily accessible and the contractor was very cooperative and respectful of employee needs," said Campfield.

Taking it One Step Further

Because of the success of the IRS Facility Parking Garage project, MC Realty has moved forward with other lighting retrofits. MC Realty is now using LED fixtures, given the technology's advancements in terms of both performance and cost competitiveness. In fact, all exterior lighting fixtures at the IRS site (not including the parking garage) have since been upgraded to LED fixtures.

Campfield acknowledges that, if the parking structure project started today, MC Realty would likely use LED fixtures instead of T8s, but he concluded that T8 fixtures were the right decision when the project began.

MC Realty is now assessing the feasibility of upgrading to LED fixtures at two other large parking garages for other clients.

Before replacing the fixtures, it was practically a full-time job to keep up with burned out lamps. The metal halide lamps were burning out at a rate of four a day. The new T8 lamps have twice the lifespan, and those on motion sensors are on for far fewer hours per day than the old metal halide lamps (which were lighted 24/7). The reduced hours and longer lifespan resulted in fewer lamp changes at an estimated labor cost savings of $300,000 annually.

Photo courtesy of MC Realty.

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 the DOE's Better Buildings Alliance, 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

Lessons Learned

- When doing a multi-phase project, revisit cost assumptions as costs continue to drop on LEDs.
- Investigate maintenance costs (number and difficulty of bulb changes) and consider including labor cost savings when estimating project savings.
- For facilities open around the clock, install motion sensors on most but not all lighting fixtures, so some fixtures stay on continually for safety and security.
- Consider ways to minimize disruption by replacing fixtures during off-peak hours. Work should be sequenced to minimize the number of parking spaces blocked at any one time. Avoid blocking access routes.

Lighting Energy Efficiency in Parking (LEEP) Campaign

On April 15, 2014, MC Realty Group, LLC, was one of 12 organizations recognized for energy savings in parking lot and parking structure lighting at an award ceremony conducted in Washington, D.C. by the LEEP Campaign, an effort to promote high-efficiency lighting in parking facilities. MC Realty won for achieving 76% energy savings in a parking structure lighting retrofit that cut energy use by 2 million kWh.

Together winning projects achieved savings of 36 million kWh or $3.5 million in electricity savings by providing energy-efficient lighting to 140 million ft^2 of parking lots and structures, with an average payback of less than 6 years.

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 levels specified in ASHRAE Standard 90.1-2010. LEEP's overall goal is to achieve 500 million ft^2 of planned or installed high-efficiency parking lighting by March 2015.

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 expected and actual energy savings by March 2015 for a chance to be recognized at the LEEP awards at the BOMA International 2015 Every Building Conference and Expo in Los Angeles, CA, June 28-30, 2015.

LEEP Award Categories

- Highest *absolute savings* at a single site (parking lot): retrofit
- Highest *absolute savings* at a single site (parking structure): retrofit
- Highest *percentage savings* at a single site (parking lot): retrofit
- Highest *percentage savings* at a single site (parking structure): retrofit
- Highest *absolute savings* at a single site (parking lot): new construction
- Highest *absolute savings* at a single site (parking structure): new construction
- Highest *percentage savings* at a single site (parking lot): new construction
- Highest *percentage savings* at a single site (parking structure): new construction
- Best use of controls
- Largest number of sites upgrades
- Largest percentage of sites upgraded
- Largest portfolio-wide energy savings

For more information visit *www.leepcampaign.org*

The LEEP Campaign is sponsored by the 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.