

New Carrollton Federal Building Lighting Retrofit Captures Cool Savings

The U.S. General Services Administration (GSA) cut a \$291,000 annual lighting electric bill down to an estimated \$53,500 by installing LED troffer lights and lighting controls in the New Carrollton Federal Building in Lanham, Maryland. The lighting project yielded a 82% reduction in energy use and earned GSA two awards from the U.S. Department of Energy Interior Lighting Campaign: “Highest Absolute Annual Savings for Troffer Lighting Retrofits - Large Project” and “Highest Percentage of Annual Savings for Troffer Lighting Retrofits - Large Project.”

The New Carrollton project was one of 30 projects conducted as part of a National Deep Energy Retrofit (NDER) initiative the GSA launched in 2012. The 1.9 million square feet 1994-era New Carrollton Federal Building was a good candidate for a lighting retrofit because the large building had high energy demand and the 20-year-old fluorescent light design was inefficient compared to new technology and controls available today.

Project at a Glance - New Carrollton Federal Building

Project Location	Lanham, MD
Total Area of Project	1.9 million gross square feet
# of Troffers Upgraded	11,800
Annual Energy Savings	2.7 million kWh energy savings
Equals the Energy Usage of	250 Homes
Energy Use Reduction	82%
Annual Energy Cost Savings	\$237,500
Payback	10 years



GSA conducted a major energy-efficiency upgrade at the New Carrollton Federal Building in Lanham, Maryland, which included an extensive lighting retrofit that yielded a 82% reduction in energy use and earned GSA two awards from the U.S. Department of Energy Interior Lighting Campaign
Photo courtesy of GSA

GSA hired Amaresco, Inc., an energy service company, to conduct the upgrades, which included replacing 12,100 fluorescent troffer fixtures with 11,800 LED fixtures by Eaton Cooper Lighting. Amaresco used a mock-up process to identify the best lighting option and the Eaton Cooper fixtures were chosen for their long life (rated at 50,000 hours), 10-year warranty, low glare, high efficacy, and ease of installation.

Amaresco also installed 2,000 occupancy sensors and incorporated an open-protocol, digitally addressable lighting (DALI) system, as specified by the GSA P100 building standards. DALI is able to detect the status of an entire floor of lighting or focus in on an individual light and it can communicate that status to the building automation system, allowing remote troubleshooting and control.

Project Drivers and Successes

The lighting retrofit was part of a larger energy-efficiency project conducted by GSA and Amaresco that included new high-efficiency chillers, a geothermal heat rejection loop, an exhaust-heat

recovery system, solar water heating, 875 kW of solar photovoltaics, and building automation and control systems that together are expected to save \$3 million the first year. The lighting upgrade had a 10 year payback, which included utility incentives. The average payback of all energy conservation measures was over 14 years, and the relatively lower payback of the lighting portion helped to subsidize the inclusion of higher payback items like roof replacements, window upgrades, and a solar PV carport structure.

The New Carrollton Building was retrofit in conjunction with another building.

Before and After Retrofit

	Before	After
	Fluorescent	LED
Number of Troffers	12,100	11,800
Wattage per Troffer	71-116-W	17-30-W
Annual Energy Use	3,307,200 kWh	608,000 kWh
Number of Fixtures Operated by Controls	None	9,900

ILC Awards Won

- Highest Absolute Annual Savings for Troffer Lighting Retrofits - Large Project;
- Highest Percentage of Annual Savings for Troffer Lighting Retrofits - Large Project



Amaresco retrofit 11,800 troffers with LEDs and added integrated controls to reduce GSA's annual energy use from 3,307,200 kWh to 608,000 kWh, a savings roughly equivalent to the energy use of 250 homes.

Photo courtesy of GSA

Lessons Learned

- The learning curve for installing new luminaires and commissioning controls can be steep for all parties.
- Combining lighting retrofits with other measures can extend energy savings while expanding project scope and benefits.
- Utility rebates can include many energy-efficiency measures, and savings may be increased by creating a custom package that includes lighting and controls.
- LED technology is evolving quickly, so a project may span multiple product generations.
- Commissioning should be undertaken as soon as possible after the retrofit is complete to resolve any issues with the new lighting.

Retrofitting both buildings under one contract while both were fully occupied pushed the construction duration to almost 18 months. During this time, a new generation of the lighting product was released. GSA was able to work with the manufacturer to finish one building with the original version of the LED product and the other building with the newer version. They also procured extra fixtures for spare parts after the 10-year warranty ends.

Including the second building added time and complexity to the project resulting in some early occupant complaints, primarily because of a lag time between when the lighting was installed and when the fixtures and controls were commissioned. The most common complaint was that the lights were too bright. This was initially solved by using DALI broadcast commands to dim all lights to 50% until the system could be commissioned. Other complaints involved the vacancy sensors in some of the smaller offices, which would turn the lights off with occupants in the room. This was remedied by changing the sensor lenses for all spaces programmed in vacancy mode, eliminating the false trips.

Despite these early hiccups, Bryan Zach, Project Manager at the GSA Denver Federal Center concluded that the project

went very well with “quick and easy acceptance by the tenants with a minimal number of complaints.”

Next Steps

Measurement and verification of the project's energy success is important to GSA. Prior to conducting any upgrades, 90 data loggers were put in place in order to document actual energy usage. Thanks to the DALI system, the lighting controls are not only more flexible, but the data loggers capture data on a much more granular level. In February of 2017, GSA plans to release additional information about their project energy savings, which will help validate the implementation of many of the lighting controls strategies used.

Lighting retrofits will continue to be a part of the NDER projects underway by GSA. “The advances in LED lighting technology and controls leave no doubt that this is the new NORM for office building lighting,” said Mr. Zach, the Project Manager for the GSA.

Learn More

United States General Services Administration

<http://www.gsa.gov/portal/category/100000>



The LED troffer replacements provided improved color rendition along with extensive energy savings. These changes, combined with new chillers, solar photoelectric and water heating, and other changes combined to provide GSA with \$237,500 in annual cost savings.

Photo courtesy of GSA

Federal Energy Efficiency Requirements for Interior Lighting

Although every site, whether federal, private, commercial, or industrial, can benefit from the energy savings, maintenance savings, and lighting quality improvements, offered by energy-efficient lighting, 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.

ENERGY STAR® Lighting

Federal purchasers must buy, specify, and contract for ENERGY STAR®-compliant products. To find ENERGY STAR-qualified lighting products, see www.energystar.gov/productfinder/.

Federal Efficiency Requirements

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 interior LED lighting must meet to be eligible for purchase by federal agencies.

LED Luminaire Efficiency Requirements for Federal Purchases

Luminaire Type	Light Output	Luminaire Efficiency (LE)
Commercial, linear ambient	≥375 lm/ft	≥103 lm/W
Commercial, 1-foot by 4-foot troffers	≥1,500 lm	≥99 lm/W
Commercial, 2-foot by 2-foot troffers	≥2,000 lm	≥100 lm/W
Commercial, 2-foot by 4-foot troffers	≥3,000 lm	≥103 lm/W
Industrial, low bay	≥5,000 to <10,000 lm	≥103 lm/W
Industrial, high bay	≥10,000 lm	≥100 lm/W

as of October 2015

FEMP LED Purchasing Guidance

For more information on high-efficiency lighting technologies and information for federal agencies, including lighting requirements language for contracts, visit energy.gov/eere/femp/purchasing-energy-efficient-commercial-and-industrial-led-luminaires.

FEMP and the DOE LED Lighting Facts® program have partnered to offer a tool that allows federal users to identify LED lighting products that meet the minimum federal efficiency requirements.

The FEMP Acquisition Guidance Product List allows users to search for interior lighting products in the six categories in the table below that meet federal requirements. The tool provides a pre-screened list of products and federal users can screen on a large range of other product metrics, including color temperature, power factor, and beam angle. Find qualifying products at www.lightingfacts.com/LFPowered/FEMP.

Helpful Guides

Wireless Occupancy Sensors for Lighting Controls: An Applications Guide for Federal Facility Managers — This guide describes the different types of sensors, appropriate applications, and expected energy savings. www.energy.gov/sites/prod/files/2016/03/f30/wireless_occupancy_sensor_guide.pdf

Measurement and Verification of Energy Savings and Performance from Advanced Lighting Controls — This document provides a framework for measurement and verification. energy.gov/sites/prod/files/2016/03/f30/mv_lighting_control_wireless.pdf

Proven Specifications

Use these specifications, developed by DOE’s Better Buildings Alliance and the Designlights Consortium, to specify performance expectations, warranty, and testing requirements for your lighting projects.

Better Buildings Alliance Model Technical Specification: High-Efficiency Troffers
[betterbuildingsolutioncenter.energy.gov/sites/default/files/attachments/High Efficiency Troffer Performance Specification.pdf](http://betterbuildingsolutioncenter.energy.gov/sites/default/files/attachments/High%20Efficiency%20Troffer%20Performance%20Specification.pdf)

Designlights Consortium Networked Lighting Control Systems Specification
www.designlights.org/content/CALC/SpecificationAndQPL

“The marketplace is seeing a rapid adoption of highly-efficient indoor lighting and green leasing practices, as the price of cutting edge technologies and the risk of creative market approaches continue to decline. This is exemplified by the increasing number of organizations partnering with DOE to adopt the next technology or novel market strategy—and through this, showing the will to push the limits and benefits of energy efficiency in commercial buildings.”

Kathleen Hogan,
 Deputy Assistant Secretary for Energy Efficiency, U.S. Department of Energy

Interior Lighting Campaign



On June 27, 2016, the GSA was one of 13 organizations recognized for exemplary energy savings at an award ceremony conducted in Washington, DC, by the ILC, an effort to promote high-efficiency troffer lighting and control systems in buildings. The U.S. GSA won both Highest Absolute Annual Savings for Large Retrofit Project plus the Highest Percentage of Annual Savings for Large Retrofit Project for the New Carrellton Federal Building lighting upgrades.

In one year alone, 650,000 new high-efficiency troffer upgrades were planned or completed, equating to savings of 130 million kWh, and \$13.5 million. With nearly 50 participants and over 130 supporters, the ILC continues to accelerate the reduction in the amount of energy consumed by lighting in buildings nationwide.

The ILC encourages facilities to install energy-efficient lighting and to install lighting occupancy or daylight controls to cut energy use and deliver occupant satisfaction. By adopting more efficient troffer lighting, such as systems that meet the Better Buildings Alliance (BBA) [specification](#) for troffers, building owners can save up to 70% on a one-for-one basis, and up to 80% with the use of controls.

The ILC's overall goal is to achieve the replacement of 1 million planned or installed high-efficiency troffer lighting systems by April 2017.

The ILC is sponsored by the Building Owners and Managers Association (BOMA) International, the Illuminating Engineering Society, the International Facility Management Association, the U.S. General Services Administration, and the U.S. Department of Energy Better Buildings Alliance.



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

For more information, visit:
www.interiorlightingcampaign.org

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FEMP
Federal Energy Management Program



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 and 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 Interior Lighting Campaign, www.interiorlightingcampaign.org.

Photo courtesy of Pacific Northwest National Laboratory.

Join the ILC

Federal sites are encouraged to join the ILC. The ILC will provide you with:

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

Federal sites commit to:

- building or retrofitting at least one building space with high-efficiency lighting. (Sites built or retrofitted with complying fixtures any time after January 1, 2013, are eligible to compete.)
- Share your results.

Report your actual energy savings by April 2017 for a chance to be recognized at the ILC awards event at the BOMA 2017 International Conference & Expo, June 24-27, 2017, in Nashville, Tennessee.

ILC Award Categories

The award categories for the interior lighting campaign include the following:

- Highest Absolute Annual Savings for Troffer Lighting Retrofits
- Highest Percentage of Annual Savings for Troffer Lighting Retrofits
- Highest Absolute Annual Savings for Troffer Lighting New Construction
- Highest Percentage of Annual Savings for Troffer Lighting New Construction
- Special Recognition Categories:
 - Best Use of Lighting Controls in a Single Building
 - Largest Number of Facility Projects
 - Largest Portfolio-wide Annual Absolute Energy Savings
- Exemplary Performance Awards may also be presented to participants in the federal sector.