



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Demonstrating LED and Fiber Optic Lighting in Commissary Applications

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GOAL OF THE PROJECT

- Promote New Lighting Technology
- Document Energy Savings
- Duplicate the technology
- Expand Alternative Financing Opportunities
- Include Lighting Technology in Government Projects within Utility Service Territory



History

- FEMP sponsored E4 audits
- Audit designed to review Utility Cost, Operations and Maintenance, New Technology Application
- 3 Defense Commissary Agency (DeCA) received services under the agreement with DOE
- Fort George G Meade pays a high electricity rate Electricity cost \$0.171/kWh (PWC sub-metered rate)
- Commissary was previously unmetered
 - Meter installed during installation of lighting project. New meter showing higher consumption than previously estimated
- New EPACT and EISA energy goals



E4 Audit Leads to Pilot Projects

- DeCA elected to pursue 3 pilot lighting projects
- Fiber optic lighting for reach-in display freezer cases
- LED lighting for large storage freezer
- LED lighting for loading docks
- Other systems still under consideration



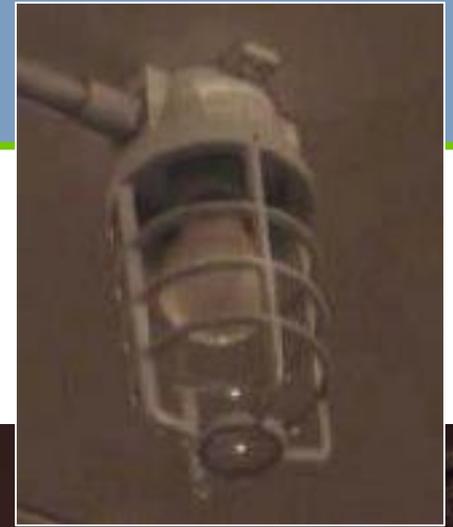
Issues DeCA Wanted Resolved

- Unfamiliar with technology
 - Wanted savings independently validated
 - FEMP sponsor of technology demonstrations
- Procurement mechanism
 - Energy Focus products not in GSA or DLA catalogs
- If systems proved successful
 - DeCA would consider changing design standards
 - DeCA would consider UESC and ESPC for replication



Storage Freezer—Before

- 36 globe fixtures
- 100-watt, A-line, gel-coated, incandescent lamps
- 1,000-hr life
- 24 x 7 operation
- -15°F room temperature





Storage Freezer—After

- 36 new globe fixtures
- 15-watt LED
- 6500K CCT
- 50,000-hr life (5.7 yr)
- 85% power reduction
- 3.6 kW removed from refrigerated space
- Site reports -3°F cooler in space
- Reduced M&O





LED Globe Lights

- Cost \$14,400
- Savings \$4,561/year (26,659 kWh/yr)
 - Additional savings in materials and labor costs
 - Maintenance contractor realizes M&O savings
 - Excludes reduction in refrigeration load*
- Payback 3.2 years
- * **Concluded refrigeration controls need to be recommissioned based on monitoring**





Reach-in Display Cases—Before

- 79 illuminated doors
- 87 HO fluorescent 60-watt lamps
- Mix of 3500K and 4100K CCT
- -5 to -10°F case temperatures
- Commissary uses top of cases for promotional displays





Reach-in Display Cases—After

- Removed light heat source from refrigerated space
- Reduced lighting power and energy
- Reduced illumination on product
- Change in light color





Fiber Optic Lighting



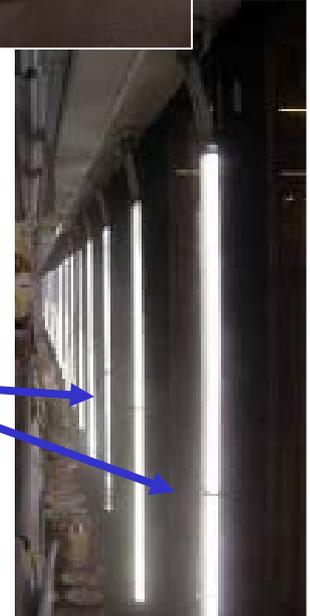
**Metal Halide
Remote Light Source**



**Fiber Optic
Cables**

- Features of the Fiber Optic System

**Acrylic Rods
(Luminaires)**





Reach-in Display Cases—After

- 28 metal halide 70-watt source lights
- Lighting power reduced to 2281 Watts from 4968 Watts (54%)
- 6500K CCT (DeCA standard is 3500K)
- Top of display cases still used for promotional material (limited)





Illumination Comparison

Fiber optic (left)

Fluorescent (right)





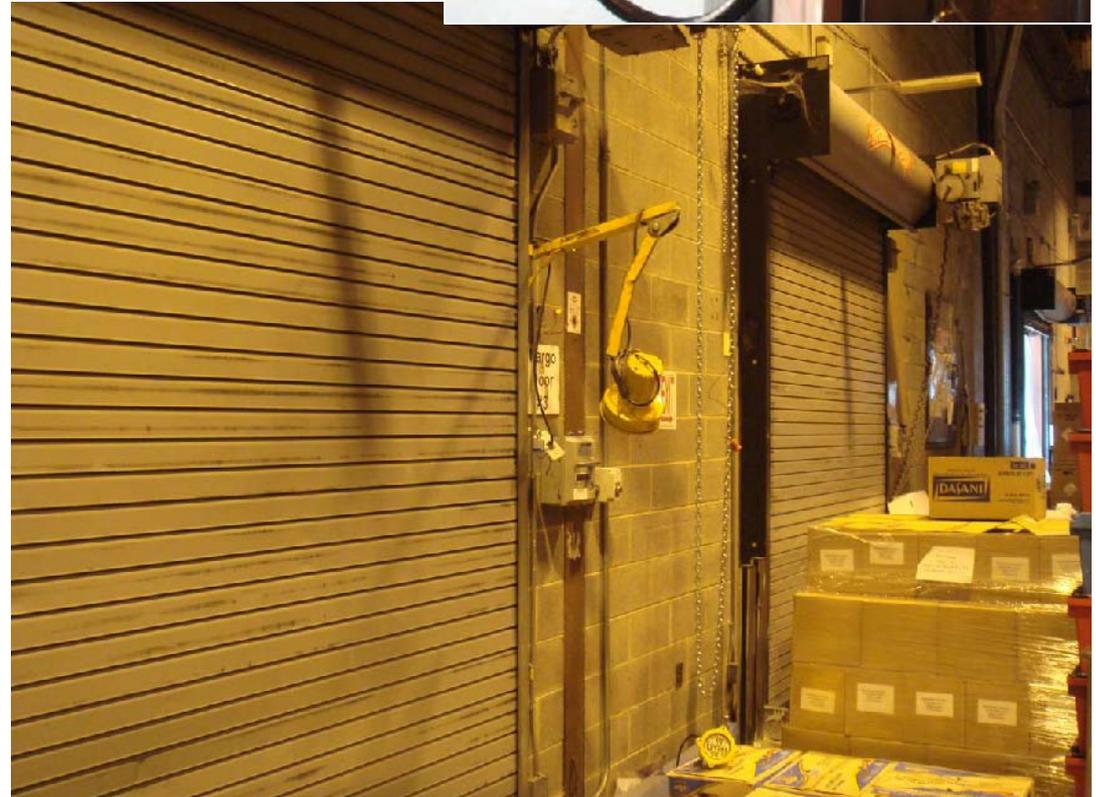
Fiber Optic Lights

- Cost \$30,000
- Savings \$2,253/year (13,168 kWh/yr)
 - Additional reduction in labor maintenance requirement
 - Some increase in annual material (lamp) costs
 - Excludes reduction in refrigeration load*
- Payback 13.3 years
- * **Concluded refrigeration controls need to be recommissioned based on monitoring**



Loading Docks—Before

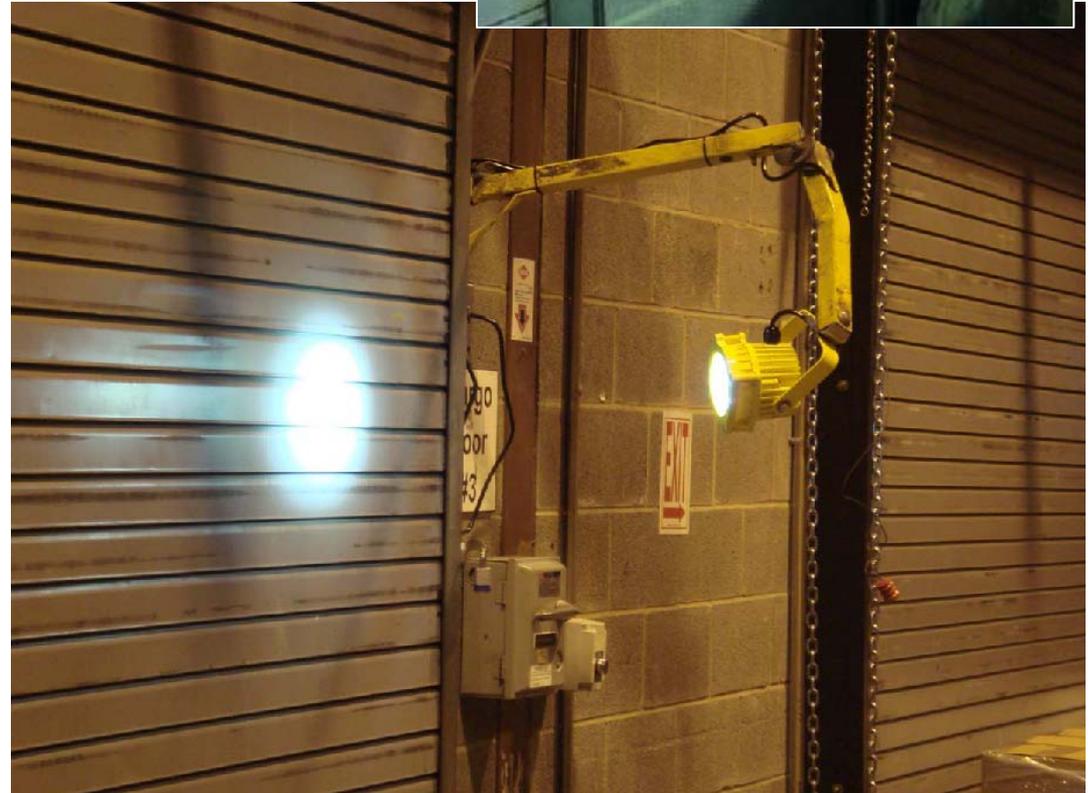
- 4 loading docks
- 150-watt PAR incandescent spotlights
- Issues
 - Short lamp life
 - Fragile





Loading Docks—After

- 15-watt LED spotlights
- 90% reduction in power
- Resolution
 - Long lamp life
 - Rugged





Light directed into 40-foot deep trailer at dock





LED Dock Lights

- Cost \$1,600
- Savings
 - Unknown because run-time not documented
- Payback
 - 17,300 run hours (~2 years at 24x7)



Conclusions

- Refrigerant system savings not detected
 - Heat load reduced but unable to verify in LED and Fiber Optic systems
 - Refrigerant system controls need to be re-commissioned
- Maintenance savings not realized
 - Maintenance contract could be renegotiated
- LED lights provided reasonable payback
 - ESPC/UESC involvement to expand to other commissaries and federal facilities



Conclusions

- LED Globe Lights have been adopted as standard by DECA
- LED Dock Lighting Received Positive Feed Back from store manger
- Fiber optic lights need further documentation
 - Energy use reduced (6 light were replaced by 1)
 - Operations and Maintenance savings not documented
 - New light color did not match DeCA standard (3500K)
 - Visual impact (look) and the space for promotional material



Fiber Optic Lights

- Payback could be improved
 - If product purchased in bulk reduced overall cost
 - If refrigeration system re-commissioned and heat load reduction benefit realized
 - If M&O savings realized by commissary instead of contractor



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New Items to Note

Website address for light publications. Location:

<http://www1.eere.energy.gov/femp/information/publications.html#lighting>