

## OPPORTUNITY

How much energy could GSA save by converting LFLs to LEDs?

**134 GWH**  
ELECTRICITY/YEAR

**REPLACING 1.53 MILLION LINEAR FLUORESCENT LAMPS (LFLS)**  
**\$15 MILLION ANNUAL SAVINGS**

at national average utility rate of \$0.11/kWh<sup>1</sup>

## TECHNOLOGY

How do these LED Retrofits work?

## REPLACE LAMP AND LED DRIVER

USING EXISTING LENS & FIXTURE; NO NEED TO ALTER CEILING GRID

Compatible with advanced lighting controls (ALCs)

## M&V

Where did Measurement and Verification occur?

**PACIFIC NORTHWEST NATIONAL LABORATORY** assessed two LED retrofits ("LED-A" and "LED-B") provided by NEXT Lighting and Cree in three federal buildings: GSA's regional headquarters in Auburn, Washington; the Cabell Federal Building in Dallas, Texas; and the Veterans Administration Center in Philadelphia, Pennsylvania

## RESULTS

How did LED Retrofits perform in M&V?

**27-29%**  
ENERGY SAVINGS<sup>2</sup>

ADDITIONAL SAVINGS POSSIBLE WITH ALC

**EASY**  
INSTALLATION

SIMILAR TO LFL LAMP AND BALLAST REPLACEMENT<sup>3</sup>

**6**  
YR PAYBACK

AT NAT'L AVG. UTILITY RATE (\$0.11/kWh) & \$50 FIXTURE COST<sup>4</sup>

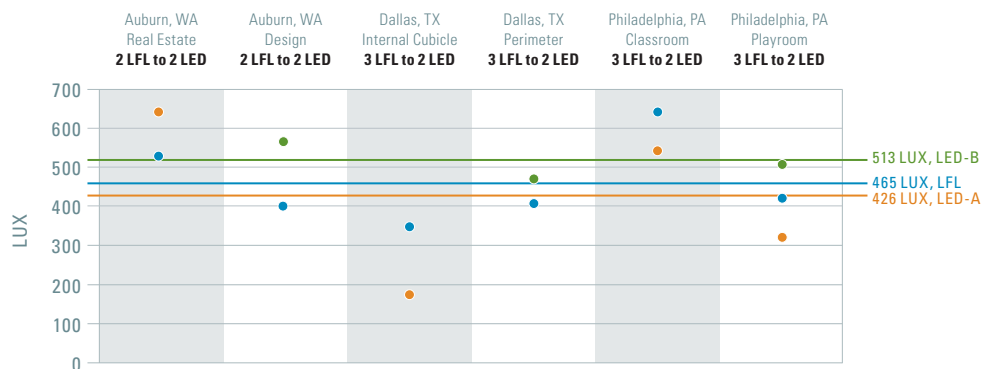
### Average Light Levels Across Test-Bed Sites

LED retrofits had similar illuminance levels but different light output (LED-A, 4500 lumens; LED-B, 4400 lumens)

Key

- LFL
- LFL AVERAGE
- LED-A
- LED-A AVERAGE
- LED-B
- LED-B AVERAGE

A difference of less than 100 Lux is typically not noticeable by the human eye.



## DEPLOYMENT

Where does M&V recommend deploying LED Retrofits?

## FIXTURES WITH LENSES AND SOCKETS IN GOOD CONDITION

And where ALC is desired or useful. To assess fit, light levels, color temperature and glare, test a small number of lights before committing to purchase.

### LED Retrofit Options Assessed During M&V

Consider compatibility and controls when selecting an LED replacement

	PROS	CONS	COST*
<b>LED-A</b> Replacement lamp uses alternative mounting, LED driver	<ul style="list-style-type: none"> <li>• Lamps can be repositioned in the fixture</li> <li>• Dimming &amp; ALC possible</li> </ul>	<ul style="list-style-type: none"> <li>• Performance depends on optics &amp; lens of existing fixture</li> <li>• Self-tapping screws could cause electrical problems</li> <li>• Wire harnesses won't always fit legacy situations</li> <li>• Not compatible with master/remote configurations or shunted lamp holders</li> </ul>	<p><b>Equipment:</b> \$40–\$70</p> <p><b>Installation:</b> \$34–\$68</p>
<b>LED-B</b> Replacement lamp uses existing socket, LED driver	<ul style="list-style-type: none"> <li>• Familiar installation process</li> <li>• Compatible with shunted and unshunted lamp holders</li> <li>• Dimming &amp; ALC possible</li> </ul>	<ul style="list-style-type: none"> <li>• Performance depends on optics &amp; lens of existing fixture</li> </ul>	<p><b>Equipment:</b> \$40–\$70</p> <p><b>Installation:</b> \$34–\$68</p>

\* 50% and 100% RS Means derived labor estimates; similar cost to lamp + ballast replacement

<sup>1</sup>Linear LED Lighting Retrofit Assessment, EE Richman, JJ McCullough, TA Beeson (PNNL), September, 2016, p.2 <sup>2</sup>Ibid, p.5

<sup>3</sup>Ibid, p.61 <sup>4</sup>Ibid, p.10