**OPPORTUNITY**

How much energy could GSA save by converting CFL downlights to LED?

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**TECHNOLOGY**

How do direct replacement LED downlight lamps work?

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**M&V**

Where did Measurement and Verification occur?

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**RESULTS**

How did LED downlight lamps perform in M&V?

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**DEPLOYMENT**

Where does M&V recommend deploying LED downlight lamps?

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**LED Replacement Options for CFL Downlights**

Consider compatibility and controls when selecting an LED replacement

### COMPATIBILITY

- **CFL ballast is verified to work with LED replacement lamp (per manufacturer or by testing).**
- **Lamp is incompatible with CFL ballast (consult manufacturer specifications).**
- **New construction or renovation.**

### CONTROLS

- **No controls are necessary.**
- **Dimming is desired and CFL ballast does not support it.**
- **Integrated advanced lighting controls are desired (tuning, occupancy sensing, daylighting).**

### PAYBACK

- **PAYBACK – 2.9 years**
  - Cost $39
  - Material $22
  - Install $17
  - With ballast replacement $94
  - PAYBACK = 2.9 years

- **PAYBACK – 10.4 years**
  - Cost $137
  - Material $81
  - Install $56

- **PAYBACK – 12.4 years**
  - Cost $165
  - Material $109
  - Install $56

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**DEPLOY BROADLY**

Where advanced lighting controls are not desired or useful

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**LED Downlight Lamps for CFL Fixtures**

- 40-50% ENERGY SAVINGS
- $6.37 ANNUAL SAVINGS
- Over typical CFL lamp at avg. utility rate of $0.11/kWh
- < 3 YR PAYBACK
- AT AVERAGE UTILITY RATE

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**GPG FINDINGS**

The GPG program enables GSA to make sound investment decisions in next generation building technologies based on their real world performance. [www.gsa.gov/gpg](http://www.gsa.gov/gpg)

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**ONE-TO-ONE LAMP REPLACEMENT**

POWERED BY THE EXISTING CFL BALLAST

Light directed down toward living and work surfaces

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**PACIFIC NORTHWEST NATIONAL LABORATORY** assessed LED downlight lamps provided by Lumera 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

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**Light Levels Between CFL and LED Were Comparable**

- Average Horizontal Light Levels
  - Work Surface or Floor
  - Key:
    - **CFL:** Across test beds
    - **LED:** Across test beds
    - A difference of less than 100 Lux is typically not noticeable by the human eye.
  - Dallas Lobby: 316 Lux
  - Philadelphia Daycare: 300 Lux
  - Auburn Dining: 278 Lux

- Average Vertical Light Levels
  - Wall
  - Dallas Lobby: 167 Lux
  - Philadelphia Daycare: 178 Lux

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- **REPLACE LAMP IF:**
  - CFL ballast is verified to work with LED replacement lamp (per manufacturer or by testing).
  - Lamp is incompatible with CFL ballast (consult manufacturer specifications).
  - New construction or renovation.

- **INSTALL RETROFIT KIT IF:**
  - No controls are necessary.
  - Dimming is desired and CFL ballast does not support it.
  - Integrated advanced lighting controls are desired (tuning, occupancy sensing, daylighting).

- **INSTALL NEW Fixture IF:**
  - Dimming is desired and CFL ballast does not support it.
  - Integrated advanced lighting controls are desired (tuning, occupancy sensing, daylighting).

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