

Pop Quiz! LED Lighting Can Generate Significant Savings in Nonresidential Buildings?

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Agenda

Introduction

Background

- □ CPUC impact evaluations
- Data Collection
- Impact Parameters
 - □ Installation Rates
 - □ Operating Hours
 - □ Wattages
- Conclusions and Recommendations

Introduction

Focus of LED Impact Evaluations

LED Lamps

LED Reflector Lamps





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Background

Rebated LED Lamps and Reflector Lamps by 3 California IOUs

Percent ex-ante savings represents all deemed/non-residential/downstream lighting measures



Background

Rebated LED Lamps and Reflector Lamps by 3 California IOUs

Percent ex-ante savings represents all deemed/non-residential/downstream lighting measures



Background

CPUC Impact Evaluations

- 2010-12 LED Impact Evaluation
 - □ 2010 2013 (Q2)
 - □ 200+ on-site visits
 - \Box ~400 lighting loggers installed
- 2013 Nonresidential Deemed ESPI Lighting Impact Evaluation
 - □ 2013 2014 (Q2)
 - □ 150+ additional on-site visits
- 2013-14 Nonresidential Deemed ESPI Lighting Impact Evaluation
 - □ Final results not included here (2016)
 - □ 2013 2014 (Q4)
 - □ 250+ additional on-site visits
 - □ ~1,000 additional lighting loggers

Data Collection

Participant Phone Survey and On-Site Verification

Phone Survey

Stratification by Building type and Lamp Type

On-Site Verification

- Measure Installation
 - Installation rates
 - □ Installed and operable, in storage, removed, failed?
 - Activity Areas
 - □ Where were measures installed and how many?
 - □ Customer self-reported schedule for each area
- Wattages
 - Retrofit lamp wattage
 - Baseline equipment

Data Collection

Time of Use (TOU) Monitoring and Adjusted Self-Reports

Lighting Loggers

- □ 9 week average
- □ Extrapolated to a full year (8,760 hours)
- Self-Reports and Business Hours
 - Business Hours
 - Identify open, closed, shoulder periods
 - Develop a usage rate (based on actual logger data) for closed and shoulder periods
 - □ Adjusted Self Reports
 - Ratio of actual usage to self-report during open hours

Data Collection

Example Application of Adjustments/Usage Rates for Small Office



Installation Rates

LED A-Lamps



Installation Rates

LED Reflector Lamps



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Installation Rates

Reasons for Removal and Failure Period

Removal Rates

□ Light was too bright

Replaced by incandescent or halogen lamps

Light was too directional

- Replaced by incandescent or halogen lamps
- □ Remodel and did not replace
- □ Office tenants removed them

Failure Rates

□ 6-8 month average

Operating Hours

LED A-Lamp

- Lodging
 - □ 882 hours
 - □ 23 sites
 - Guest rooms 96%
 - Hallway/Lobby 43%
- Small Office
 - □ 1,024 hours
 - \Box 46 sites
 - Restrooms 76%
 - Hallway/Lobby 26%

LED Reflector Lamp

- Large Retail
 - □ 3,682 hours
 - □ 8 sites
 - Retail Sales 100%
- Small Office
 - □ 1,822 hours
 - □ 38 Sites
 - Office 47%
 - Hallway/Lobby- 29%

Operating Hours

LED A-Lamp

- Small Retail
 - □ 883 hours
 - □ 43 sites
 - Restrooms 72%
 - Storage 21%
- Restaurants
 - □ 3,403 hours
 - □ 68 sites
 - Dining area 60%
 - Restrooms 53%

LED Reflector Lamp

- Small Retail
 - □ 3,443 hours
 - □ 45 sites
 - Retail Sales 76%
 - Office 16%
- Restaurants
 - □ 3,752 hours
 - □ 77 Sites
 - Dining area 77%
 - Hallway/Lobby- 16%

Baseline Wattage

- Installed non-retrofitted equipment
- Baseline lamps in storage
- Review of any documentation
- Customer self-report
- Average wattages

Retrofit Wattage

- Collection of wattage information from lamp
- Average wattages
 - When lamps were inaccessible beyond visual verification (~2%)

LED A-Lamps



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LED Reflector Lamps



Distribution of Baseline Equipment



Conclusions

LED A-Lamps

Installation Rates

- □ 91% average
- Removal/storage/failure rates

Operating Hours

- Generally installed in lower usage areas (restrooms)
- □ Restaurant dining areas

Wattages

- □ 9W average
- Generally replacing incandescent (some CFL)

LED Reflector Lamps

Installation Rates

- □ 93% average
- Removal/storage/failure rates

Operating Hours

- Generally installed in higher usage areas (dining/retail)
- □ Restaurant dining areas

Wattages

- □ 13W average
- Generally replacing halogens (some CFL and incandescent)

Recommendations

For Future Impact and Market Studies

Measure disposition

- □ Installed...Failed...Removed...Stored?
- □ More importantly...Why?
- Measure installation
 - □ Where are the measures being installed?
 - Low usage vs High usage areas
 - Changes in the distribution of activity area will affect operating hours
- Make and Model information
 - □ More detailed wattage information
 - □ Rated lamp life (EUL consideration)
 - □ Identify failing and removed products

Recommendations Continued

For Future Impact and Market Studies

Baseline Lamp Characteristics

- □ What is being replaced?
- □ Halogen or Incandescent to LED? CFL replacement?
- \Box Changes in distribution of baseline wattage will affect Δ wattage

Lighting Logger Data

- □ Building types and activity areas
 - Not only where the measures are being installed, but the load profile of those buildings and areas
 - Significant impact on peak demand and annual operating hours
 - Effective useful life (EUL) of the measures

Questions?

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