



Moving Targets and Moving Markets in Commercial Lighting

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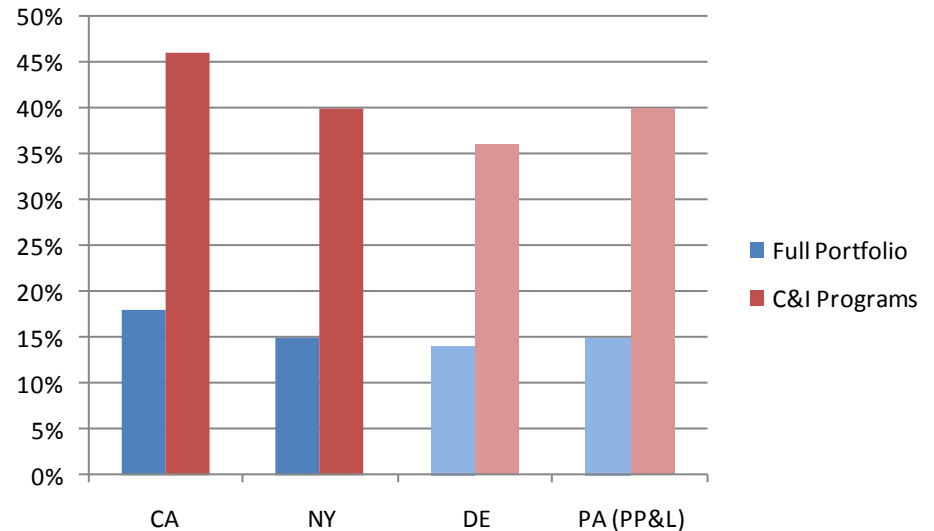
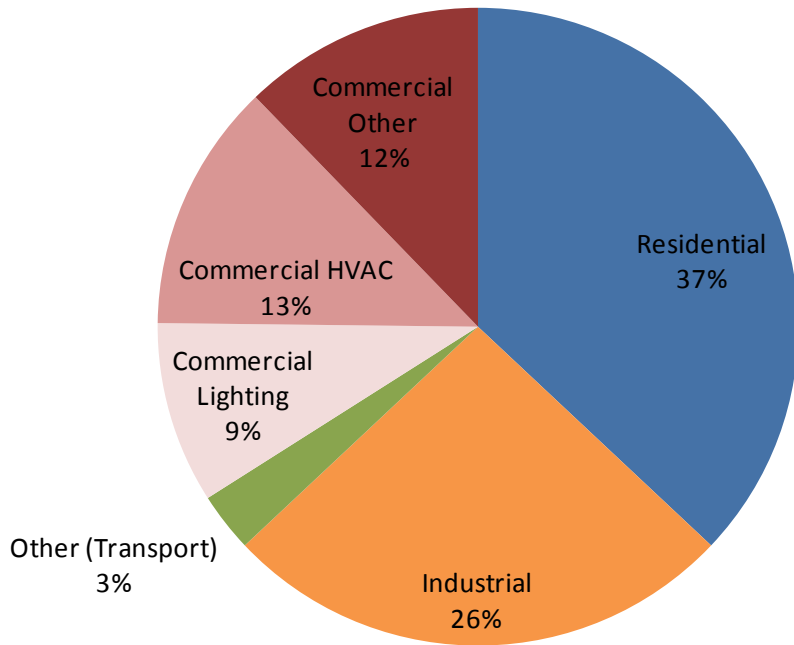


Overview of Presentation

- Commercial Lighting Consumption and Portfolio Savings
- Technology and Controls Saturation
- Efficiency-related Performance, Saturation, Market Share
 - Linear Fluorescent
 - High Bay
 - Medium Screw Base
 - Automated Controls
- Commercial Lighting Program Support by Measure Type
- Implications for Commercial Lighting Programs

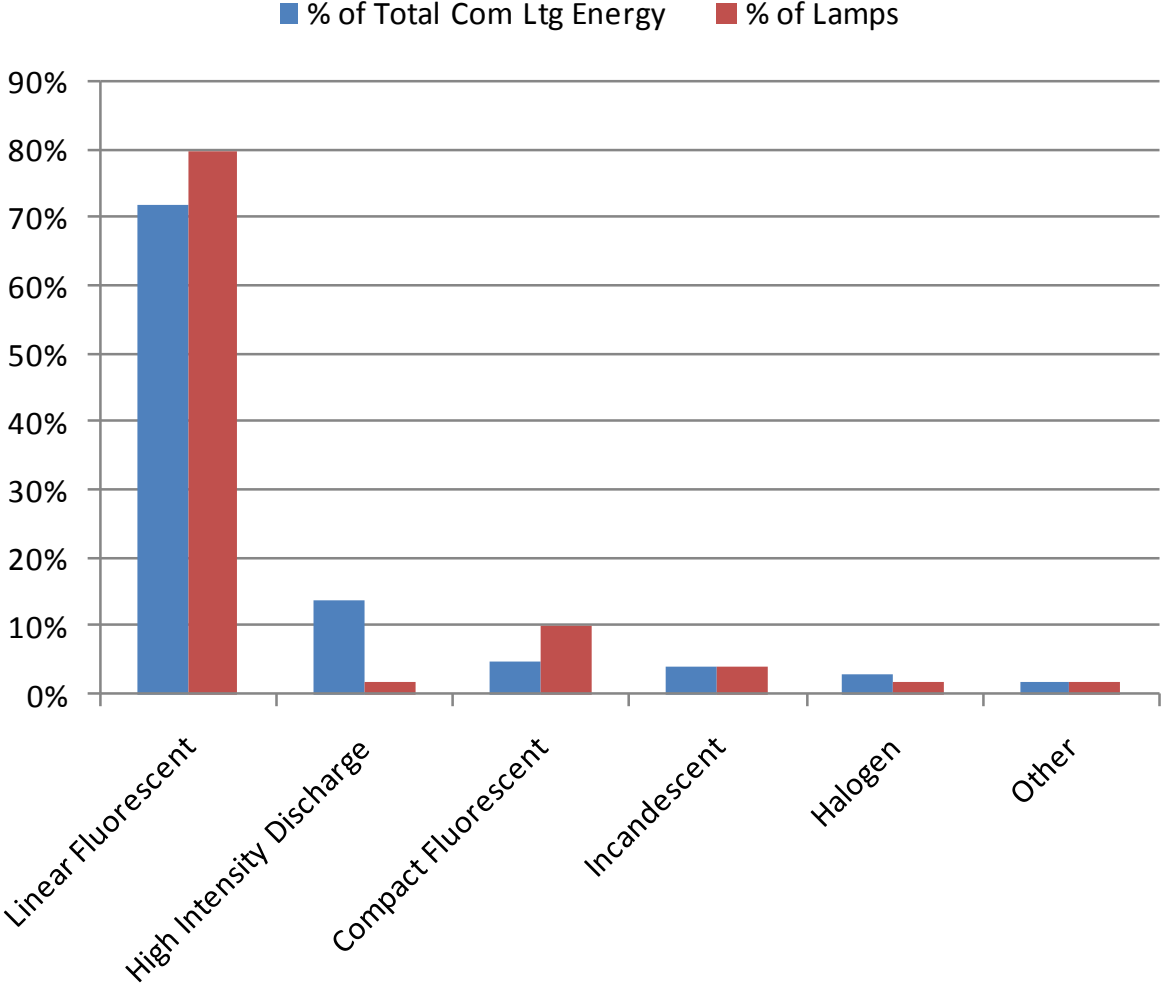
Commercial Lighting: Share of Use and Program Portfolios

Distribution of Total U.S. Electric Use

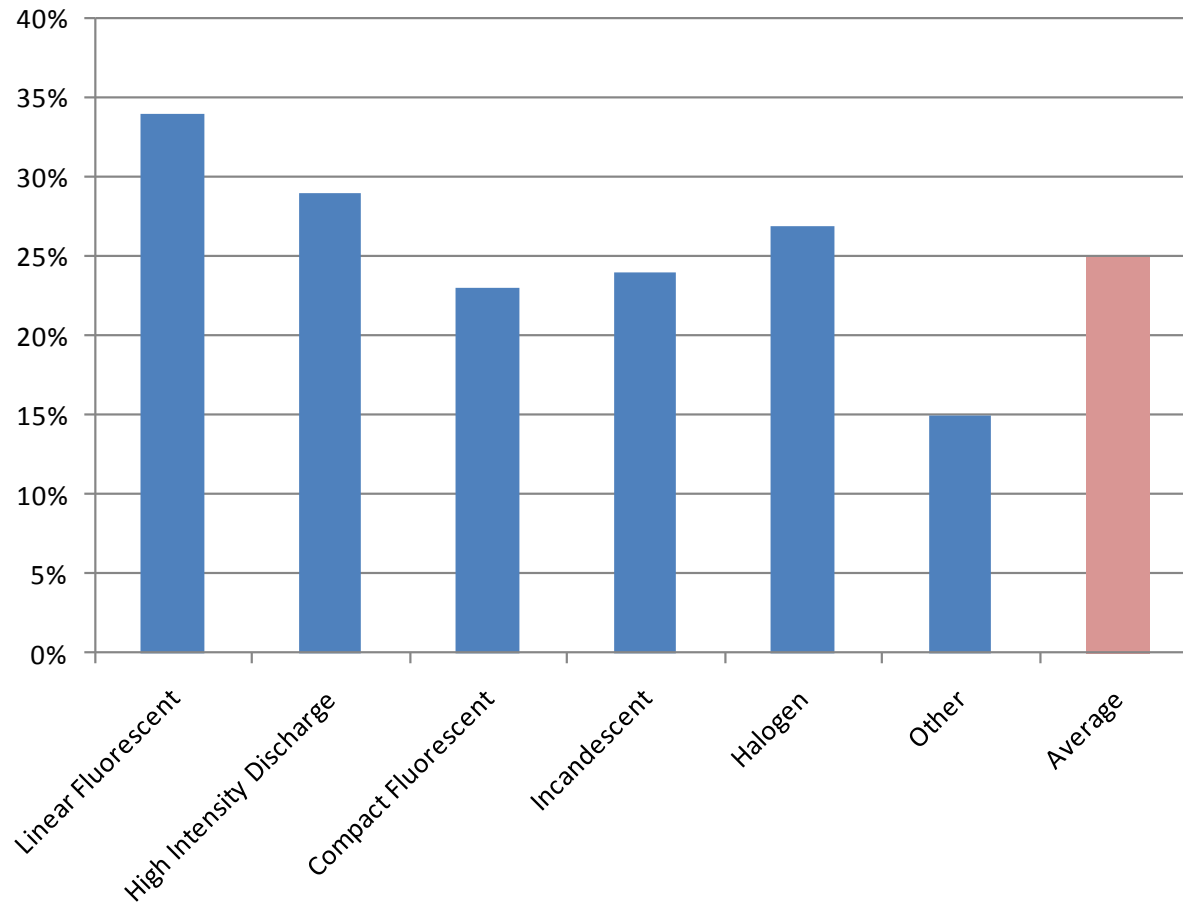


Commercial Lighting Share of Planned Savings

Commercial Lighting: Technology Saturation



Commercial Lighting: Automated Controls Saturation



Linear Fluorescent Measures: Price & Performance

Retrofit Unit Savings, Costs, Payback

| <u>Technology/Application</u> | | Baseline Wattage (w) | Measure Savings (w) | Measure Cost | Simple Payback (Yrs) |
|---|-----------------------|----------------------|---------------------|--------------|----------------------|
| Measure | Baseline Unit | | | | |
| <u>Linear Fluorescent: 3 lamp 4' Fixture</u> | | | | | |
| Retrofit: Electronic Ballast/T8 | Magnetic Ballast/T12 | 136 | 47 | \$90 | 5.8 |
| Retrofit: Electronic Ballast/HPT8 | Magnetic Ballast/T12 | 136 | 64 | \$100 | 4.7 |
| Replace: Electronic Ballast/HP T8 | Electronic Ballast/T8 | 89 | 17 | \$25 | 4.5 |
| Replace: Electronic Ballast/RW T8 | Electronic Ballast/T8 | 89 | 28 | \$25 | 2.7 |

Payback calculations assume 3,000 operating hours/year; electricity cost @ \$0.11/kWh

- **Replace-on-burnout costs are lower, paybacks quicker.**
- **Federal standards effectively proscribing T-12s take effect 2010.**
- **Federal standards effectively requiring elect. ballasts take effect 2014**

Linear Fluorescents: Saturation and Market Share

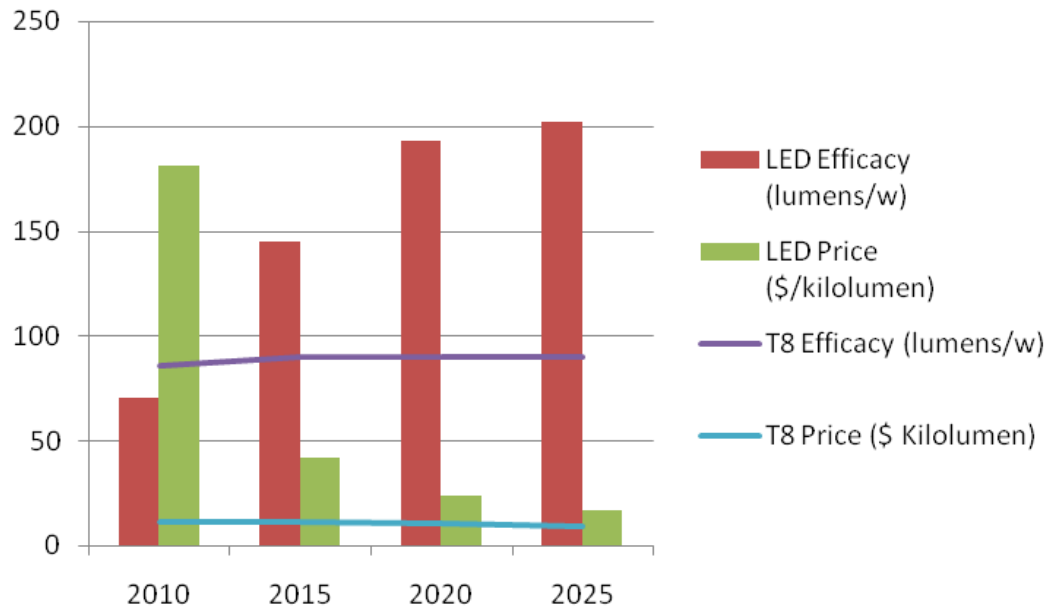
Results of Commercial Saturation and Market Share Studies

| Sponsor | Region | Year | Mag/T12 | Elec/T8 (HP) | T5 | Other |
|--|------------|------|---------|--------------|-----|-------|
| SATURATION STUDIES: ON-SITE END-USER LIGHTING INVENTORIES | | | | | | |
| NEEA | OR, WA, ID | 2009 | 35% | 55% | 3% | 6% |
| MD PSC | MD | 2009 | 30% | 65% | 5% | |
| VT PSC | VT | 2007 | 40% | 41% (5%) | 4% | 17% |
| XCEL | CO | 2006 | 50% | 50% (6%) | | |
| MARKET SHARE STUDIES: BASED ON CONTRACTOR SURVEYS | | | | | | |
| MD PSC | MD | 2009 | 7% | 80% (21%) | 13% | |
| WECC | WI | 2005 | 10% | 70% (22%) | 20% | |

- **Saturation of Mag/T12s trending down, even in states without large programs, such as MD.**
- **Sales of Mag/T12s very low even before fed standard effective dates**
- **BUT: T8 saturation still very low in the Small Commercial Sector**
24% in XCEL CO territory in facilities < 10k sf; 45% in mid-sized.

LED Forecasted Technology Trends

Forecasted Development of LED Luminaire Price and Efficacy



- **First cost of linear fluorescents remains lower than LED through 2025**
- **LEDs will compete on the basis of longer useful life, greater flexibility in application, better dimming capability, aesthetics, lower maintenance costs.**

Effect of LEDs on Linear Fixture Retrofit Economics

Retrofit Unit Savings, Costs, Payback, including LEDs

| <u>Technology/Application</u> Measure | Baseline Unit | Baseline Wattage (w) | Measure Savings (w) | Measure Cost | Simple Payback (Yrs) |
|---|-----------------------|----------------------|---------------------|--------------|----------------------|
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| LED Luminaire – 2010 | Electronic Ballast/T8 | 89 | N/A | | |
| LED Luminaire – 2015 | Electronic Ballast/T8 | 85 | 53 | ~\$270 | 17.0 |
| LED Luminaire -- 2020 | Electronic Ballast/T8 | 85 | 60 | ~\$140 | 7.8 |

- **By 2020, retrofit economics of Electronic/T8 →LED will approach those of currently available linear fixture upgrades; until then the paybacks are considerably longer**
- **Other current barriers: uncertainty over technology and business model for delivery**

High Bay Lighting Measures: Price and Performance

Retrofit Unit Savings, Costs, Payback, including LEDs

| TECHNOLOGY/APPLICATION Measure | Baseline Unit | Baseline Wattage | Measure Savings | Fixture Cost | Payback Range (Yrs) ¹ |
|--|-----------------|------------------|-----------------|--------------|----------------------------------|
| HIGH BAY LIGHTING: 320W PULSE START HID FIXTURE EQUIVALENT | Probe Start HID | | | \$164 | |
| Pulse Start HID | Probe Start HID | 506 | 142 | \$203 | 0.8 – 1.1 |
| Fluorescent T8, 6 lamp/ Electronic Ballast | Pulse Start HID | 365 | 139 | \$210 | <1 |
| Fluorescent T5, 4 lamp/ Electronic Ballast | Pulse Start HID | 365 | 131 | \$283 | <1 |
| LED Luminaire – 2010 | Fluorescent T5 | 234 | -16 | N/A | N/A |
| LED Luminaire – 2015 | Fluorescent T5 | 234 | 113 | \$885 | 22 |
| LED Luminaire – 2020 | Fluorescent T5 | 234 | 143 | \$471 | 10 |

- **Retrofit economics for linear fluorescent v. HID for indoor applications is very strong; leapfrogs pulse start technologies.**
- **Other advantages for linear fluorescent: longer lumen maintenance; lower O&M costs, better dimmability, shorter restrike**
- **LEDs may be cost-effective by 2020, taking O&M and performance benefits into account**

High Bay Lighting: Market Share

Results of Commercial Market Share Studies

| Technology Type | California (2006 - 8) | Massachusetts (2006 - 9) | Comparison (2006 - 8) |
|---|--------------------------|-----------------------------|--------------------------|
| Fluorescent Tube: T5HO/Electronic Ballast T5HO | 65% | 64% | 29% |
| Fluorescent Tube: T-8 /Electronic Ballast T-8 | 14% | 13% | 16% |
| Fluorescent Tube: All other, including T12 | 1% | 1% | 11% |
| FLUORESCENT TUBE SUBTOTAL | 80% | 78% | 58% |
| HID: Pulse-start metal halide | 14% | 3% | 31% |
| HID: High-pressure sodium | 3% | 1% | 8% |
| HID: Other HID: probe-start metal halide | 1% | 1% | 3% |
| HID SUBTOTAL | 18% | 4% | 42% |
| OTHER: INDUCTION, LED, CFL, INCANDESCENT | 2% | 17% | 2% |

- **Probe start is often identified as baseline – was largely absent from the national market by 2006**
- **Linear fluorescent share in comparison non-program area is 58%; 45% for efficient varieties**
- **In areas with established programs, efficient fluorescent share ~ 80%**

Medium Screw Base Lighting: Price and Performance

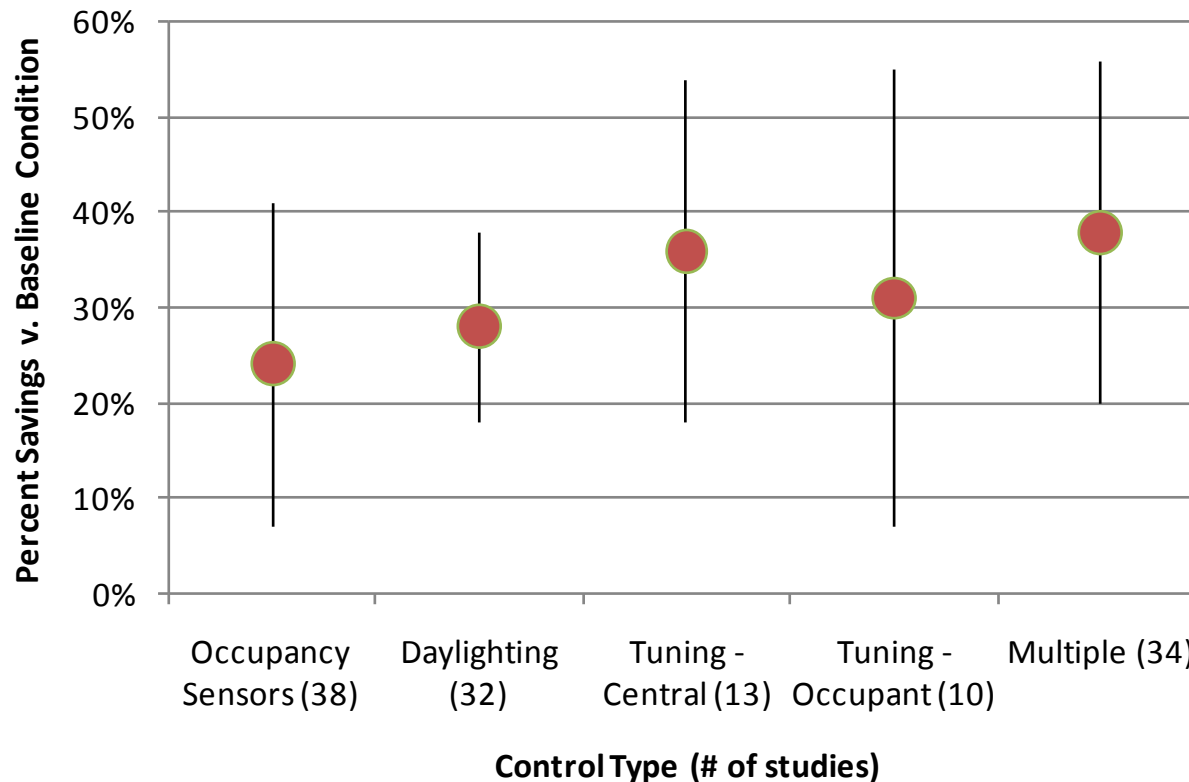
Retrofit Unit Savings, Costs, Payback, including LEDs

| TECHNOLOGY/APPLICATION Measure | Baseline Unit | Baseline Wattage | Measure Wattage | Measure Savings | %Savings v. Baseline | Lamp Cost |
|--|--------------------------------|------------------|-----------------|-----------------|----------------------|-----------|
| MEDIUM STANDARD BASE LAMP: 60 W INCANDESCENT EQUIVALENT | | | | | | |
| CFL | Incandescent | 60 | 14 | 46 | 77% | \$3 |
| LED 2012 | Incandescent | 60 | 12 | 48 | 80% | \$15 |
| LED 2015 | EISA-compliant Incandescent | 43 | 8 | 35 | 81% | \$10 |
| LED 2020 | EISA-compliant Incandescent | 43 | 5 | 38 | 88% | \$6 |

- **Currently, maximum LED omnidirectional bulb output ~ 60w.**
- **Even with forecasted price/performance improvements, payback v. CFLs will be relatively long until 2020 or beyond**
- **Programs may need to stress other benefits: longer life, better controllability, better control over color.**

Energy Savings from Lighting Control Retrofits

Results of LBL Meta-Analysis of Evaluated Savings



- **Recent technical innovations such as wireless and fixture-integrated controls increase cost-effectiveness**

Commercial Lighting Program Support by Measure Type

SCE Tracking System Savings Q1 2010 – Q3 2011

| Program Type | Deemed | Calculated | Direct Install | Total |
|--------------------------------------|--------------|--------------|----------------|--------------|
| Total Lifecycle Savings (GHW) | 2854 | 916 | 2,765 | 6,535 |
| T8 replace T12 | 5.4% | 32.8% | 56.7% | 30.9% |
| RW T8 replace T8 | 1.2% | 0.0% | 15.6% | 7.1% |
| High bay fluorescent | 52.5% | 1.8% | 4.7% | 25.2% |
| Controls | 15.2% | 3.5% | 3.1% | 8.5% |
| CFLs | 0.3% | 0.0% | 3.6% | 1.6% |
| LED replace Incandescent | 0.0% | 0.4% | 0.0% | 0.1% |
| Other Lighting | 12.2% | 11.3% | 3.5% | 8.4% |
| Non Lighting | 13.2% | 50.2% | 12.8% | 18.2% |

- T12 → T8 conversion in small commercial accounts for largest single pool of savings, including all non-lighting measures
- High bay fluorescent largest rebated measure.

Implications for Commercial Lighting Programs

■ For Mature Lighting Technologies

- Continue to support T12 → T8 retrofits, taking remaining useful life into account in setting incentive levels
- Suspend support for fluorescent high bay lighting, particularly in areas with long-standing programs
- Focus incentives, technical assistance, and contractor training on integration of automatic controls into lighting retrofit & replacement

■ For Emerging Technologies

- Cooperate closely with national programs that support LED development and pilot deployment
- Monitor development of LED products, price, and performance on a continuous basis

Thank You!

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