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Demystifying Fluorescent Retrofits:
Helping Clients Upgrade Fluorescent Lighting While Preserving Existing Fixtures

Presented by Tom Shearer

March 19, 2025

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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Learning Objectives

At the end of this course, participants will be able to:

1. Understand how to become a trusted advisor for guiding clients effectively through the transition to smart building control systems in the post-fluorescent era.
2. Learn how to assess lighting upgrades, including the transition from fluorescent to LED, while considering sustainability and fixture types.
3. Survey and analyze lighting systems for code compliance and feature enhancements, including understanding the current system's use and identifying necessary changes.
4. Explore and implement strategies to leverage advancements in lighting technology to benefit clients, emphasizing long-term investment opportunities and enhancements such as automated shading systems.

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Introductions

Tom Shearer

Manager, Commercial Business Development

Lutron Ballast Retrofit Kit Product Manager

Lutron Electronics

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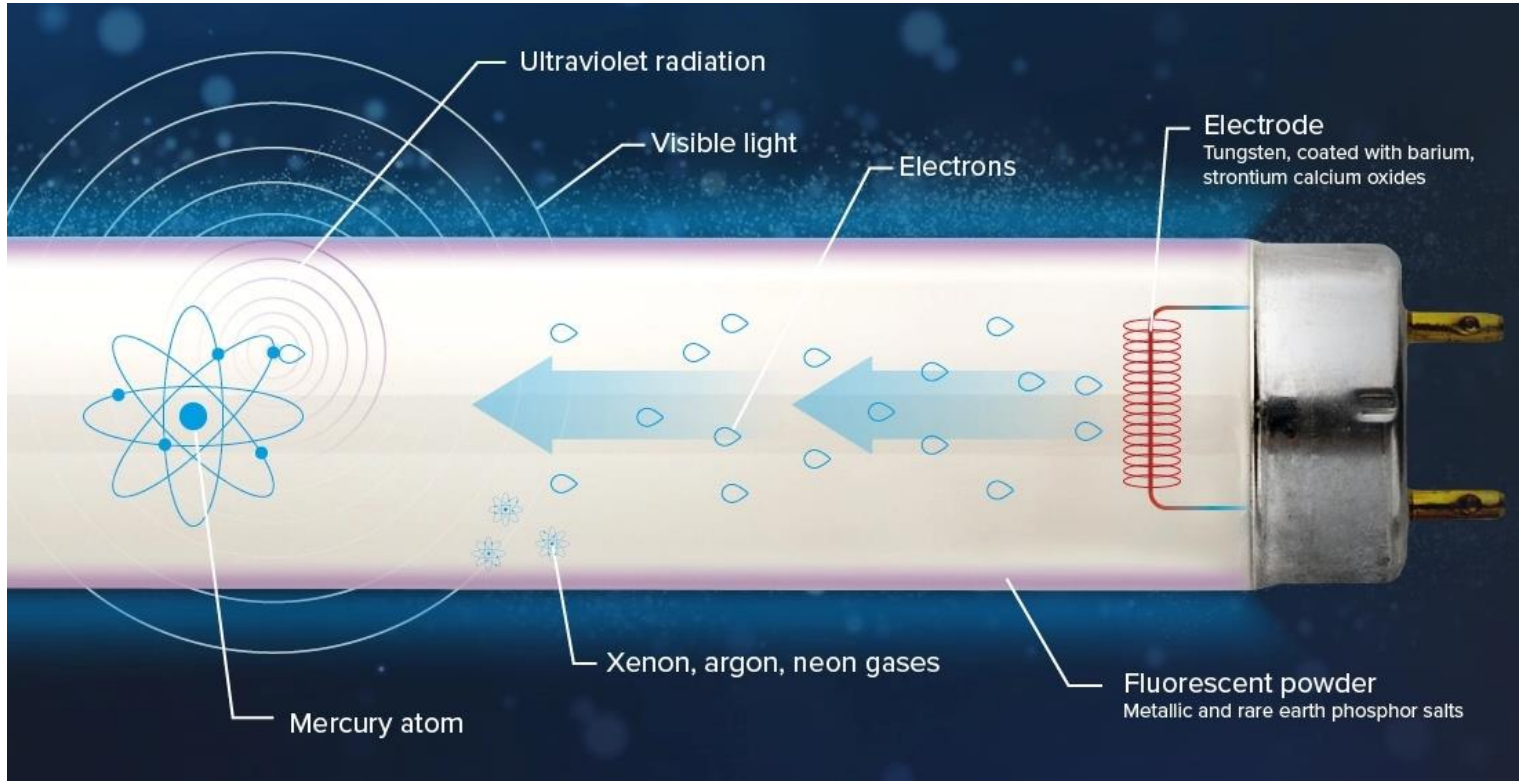
Lighting Technology – Fluorescent

- Phosphor converted UV to “white” light
- *Radial* emission
- More efficacious than incandescent, less than LED
- Failure Mode: failure (open or short) of one of the lamp electrodes, preventing electron sourcing



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Fluorescent Lighting

- Became the standard in the 1950s
- Lamps contain mercury
- Difficult to dispose of
- More efficient and longer lasting than incandescent lighting
- Requires a ballast to operate the lamp

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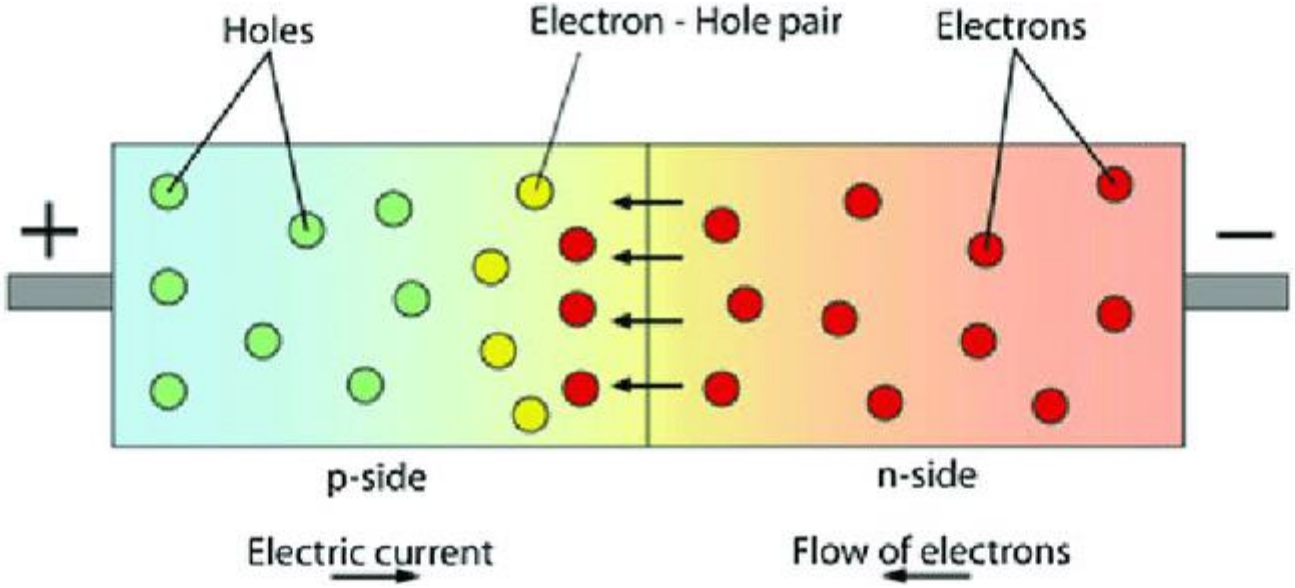
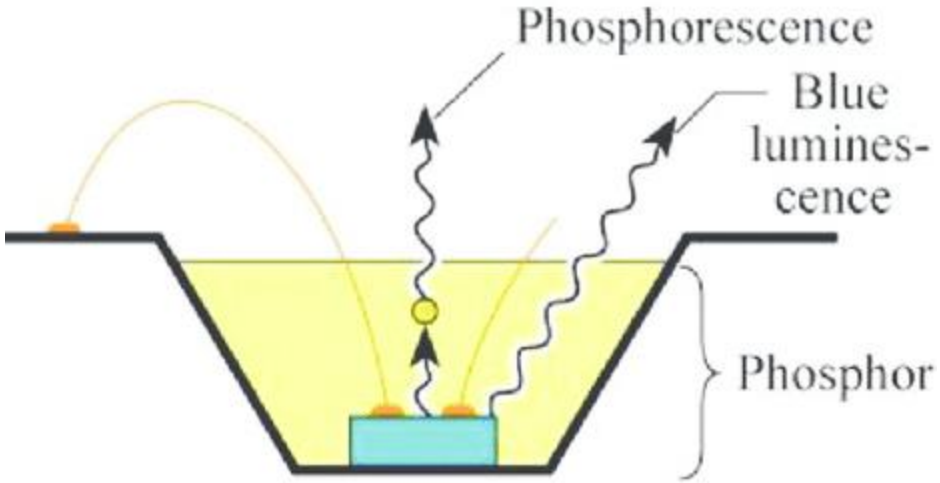
Lighting Technology – LED

- Phosphor converted blue to “white” light
- *Directional* emission
- More efficacious than incandescent, **and** fluorescent
- Failure Mode: lumen depreciation
  - Electrons are able to pass through the *pn* barrier without pairing and creating a photon. This increases over time based on current, temperature, die packaging, and other factors.





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LED Lighting

- Became the standard in the 2010s
- Different failure mode that fluorescent. Gradual light loss (LM-80)
- More efficient and longer lasting than incandescent & fluorescent lighting
- Requires an LED driver to operate the LED load (or LED lamps)

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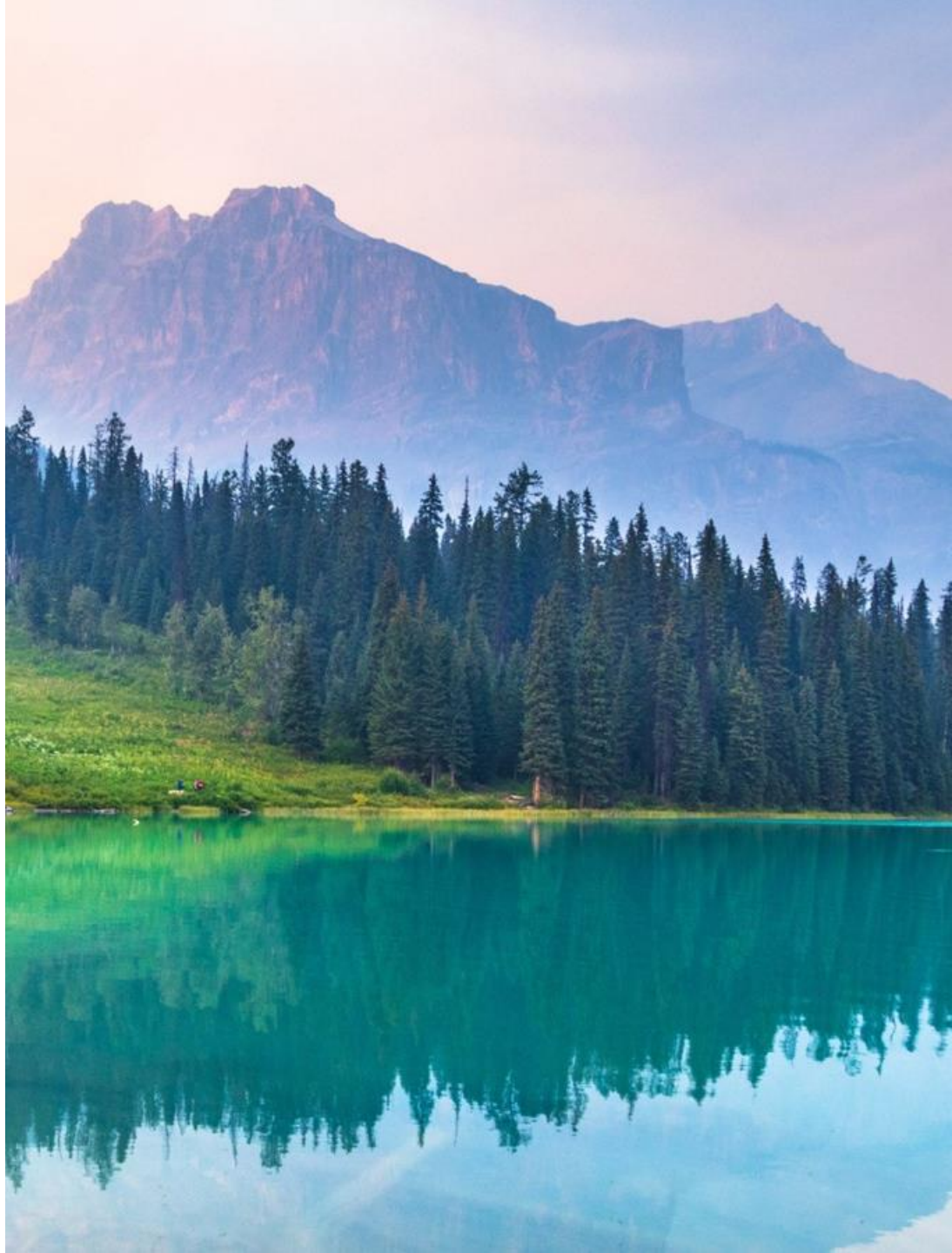
LEDs are the better option

More sustainable
- Use less energy
- Longer lasting

Better performance
- Instant-on
- Consistent color over time
- Improve light quality
- Cheaper to operate and maintain

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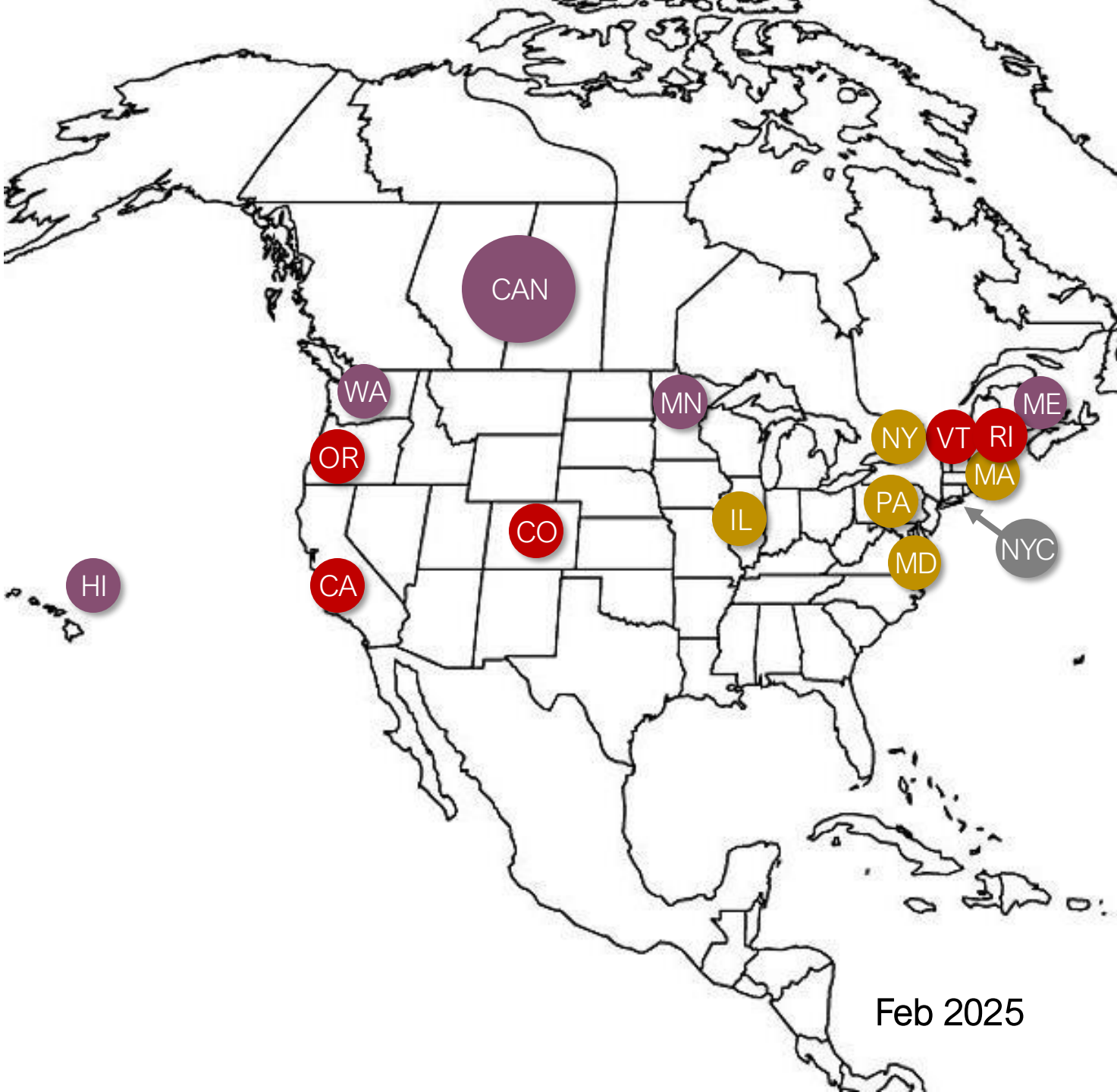
The forces behind the switch to LED

Active State Laws - 2025 compliance
Laws where compliance will be enforced starting in 2025

Active State and Canadian Laws – 2026+ compliance
Laws where compliance will be enforced starting in 2026

Pending legislation
All fluorescents

Building Codes – 2024 Compliance
NYC has an energy code that can only be achieved by LED



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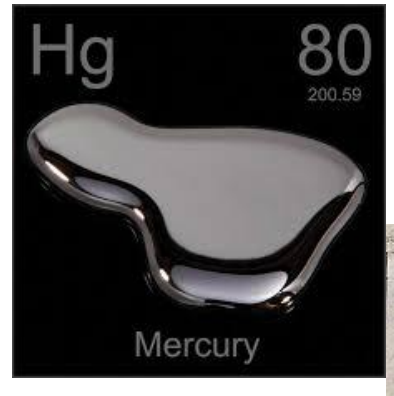
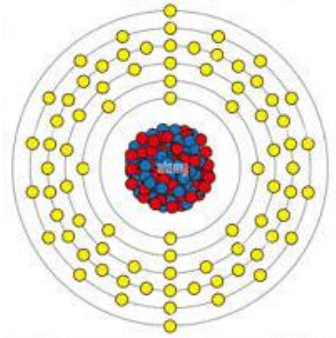
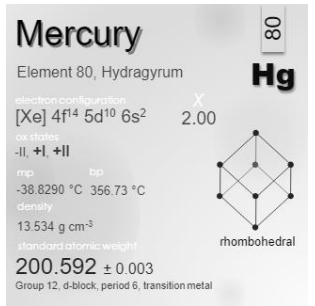
Why were fluorescents banned?

- State bans of mercury-containing lamps started several years ago
- Mercury vapor is a critical component of fluorescent lamps
- Mercury poses health and environmental risks when improperly contained during disposal







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The industry has standardized around LEDs

…but there is a *massive* number of installed fluorescent ballasts on specified projects.

Your clients need help to understand how to upgrade their lighting without disrupting their operations.

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Determine the goals of your customer:

1. What does the client want the lighting to do?
   - More light?
   - Less energy?
   - CCT control?
   - Shades?
2. What is the current use of the lighting control system?
3. Are they getting the most out of it?
4. What can be better?

Are we keeping the fixtures, or replacing them?

1. How do they look?
2. Are they in a drop ceiling?
3. Are there consequences for going into the ceiling?
4. Would they be easy to replace?
5. What about decorative fixtures?
6. What are the client's plans for the space?

Identify which fixtures to keep and retrofit, and which to replace.

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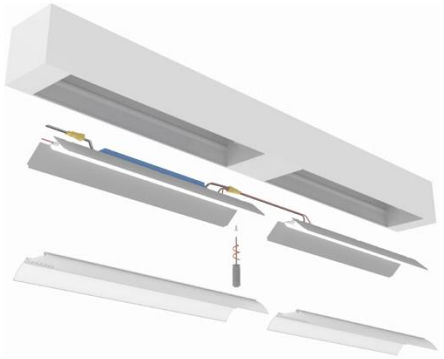
Adjacent Switched Fluorescent Lighting

TLED

Switched Troffers: Door Kits



Custom Fixture Replacements

New Fixture

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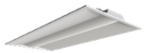
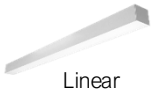
Lighting Retrofit Options

Key			
$	Inexpensive	☑	Good
$ $	Moderate	☑ ☑	Better
$ $ $	Expensive	☑ ☑ ☑	Best
		☒	Inapplicable

	Keeping your fixtures						Not keeping your fixtures	
Control Type	TLED		Door Kit		Custom Retrofit		New Fixtures	
Lighting Type	Cost	Applicable	Cost	Applicable	Cost	Applicable	Cost	Applicable
 Downlight	$	☑		☒	$ $		$ $ $	
 Troffers	$	☑	$	☑ ☑	$ $		$ $ $	
 Linear	$	☑		☒	$ $	☑ ☑	$ $ $	
 Pendant	$	☑		☒	$ $		$ $ $	
 Cove	$	☑		☒	$ $		$ $ $	

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	Keeping your fixtures						Not keeping your fixtures	
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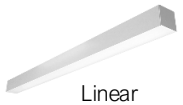
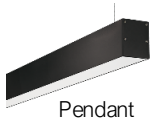
 Downlight	$	☑		☒	$ $		$ $ $	
 Troffers	$	☑	$	☑☑	$ $		$ $ $	
 Linear	$	☑		☒	$ $	☑☑	$ $ $	
 Pendant	$	☑		☒	$ $		$ $ $	
 Cove	$	☑		☒	$ $		$ $ $	

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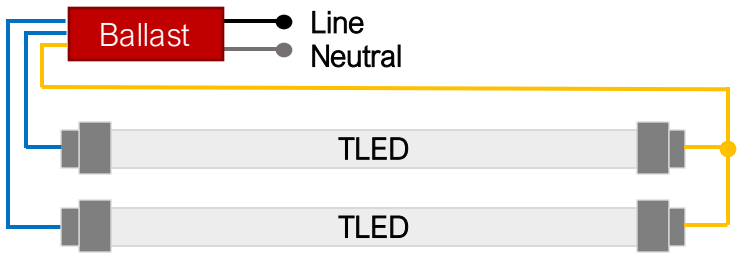
For dimming, avoid Type A & Type B retrofit kits

✗ Type A Retrofit

Replace the lamps only and use with fluorescent dimming ballast



Cons:

- Poor dimming (can damage dimming ballasts!)
- Ballasts may already be near end of life

✗ Type B Retrofit

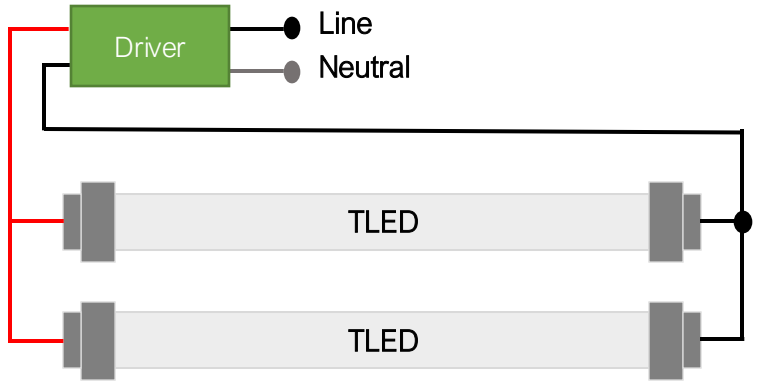
Hard-wire power directly to lamps, bypassing the ballast

Cons:

- Not dimmable
- High inrush current can damage switching controls
- Fixture is no longer connected to your control system

✓ Type C Retrofit

Kit of compatible lamp and driver

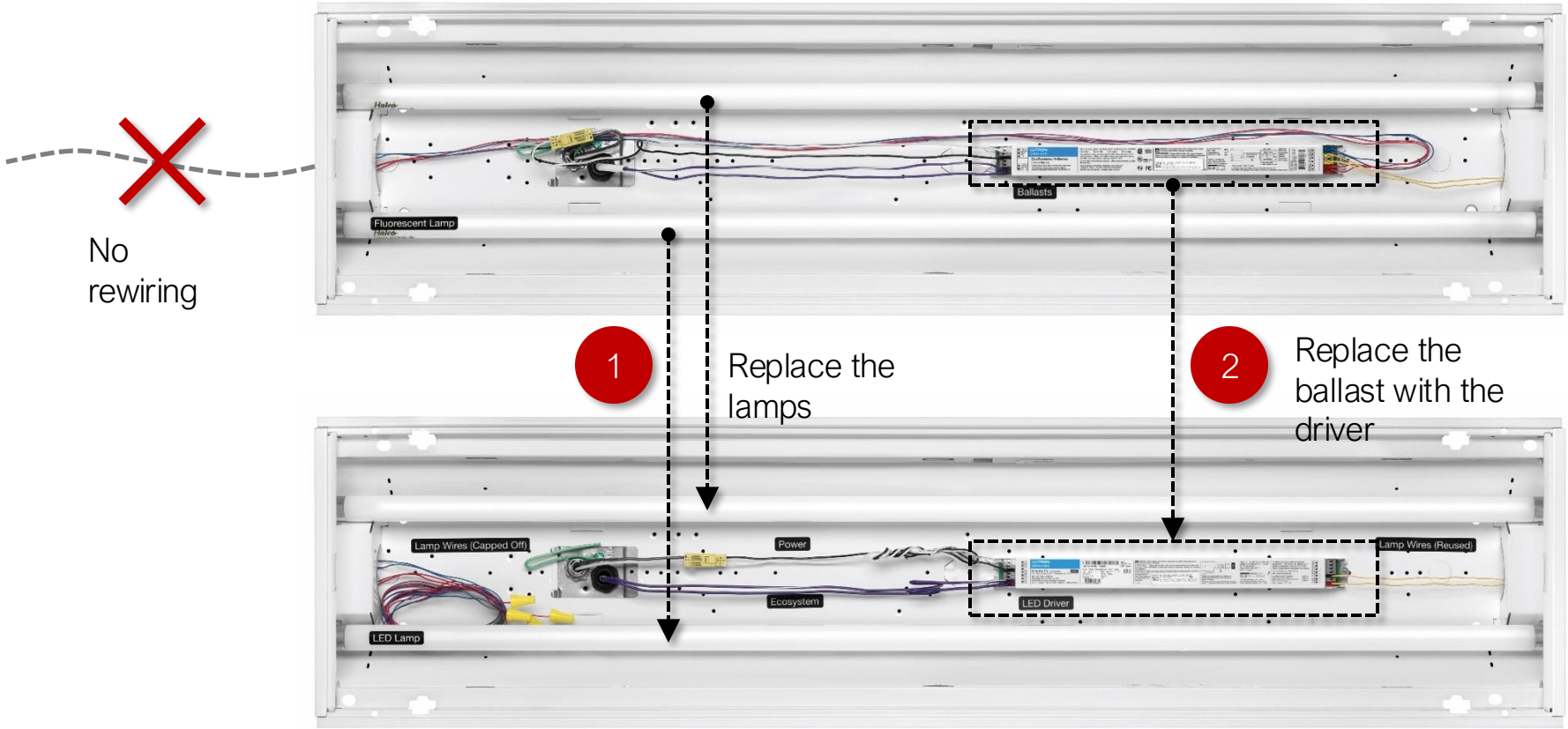


Pros:

- Best dimming performance and existing controls compatibility
- Resets the usable life of the fixture
- Brand new critical fixture components

Type C kits are simple to install

After the kits arrive, swap out the ballast and fluorescent lamps for the driver and LED lamps



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Emergency lighting

- What type of emergency lighting do your facilities use?
- Battery backup ballasts
- Emergency power systems with ALCRs
- Emergency generators

Make sure you have a plan for emergency lighting.

Lighting control system

- What does the system do today?
  - Occupancy?
  - Dimming?

- How much do they get out of it?
- Are they aware of what a lighting control system can do for them?
- Is the building in an area which has code requirements for lighting?

- What would the customer like to do?
  - Scheduled scenes
  - Daylighting
  - Occupancy
  - A/V integration

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Importance of mockups

Single kits enable you to mock-up one or a few fixtures.

- Experience and validate the color temperature
- Test how long a fixture takes to install
- Make sure the lamp size and light distribution meets your needs.
- Decorative and specialty lighting may require custom solutions

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Planned use of resources

As your clients create a plan for their lighting, they should consider the inventory of lighting maintenance products they have on hand

- How many ballasts are in shelf stock now?
- Which fixtures/ballasts most commonly go out?
- Kits can replace lamps or ballasts one at a time.

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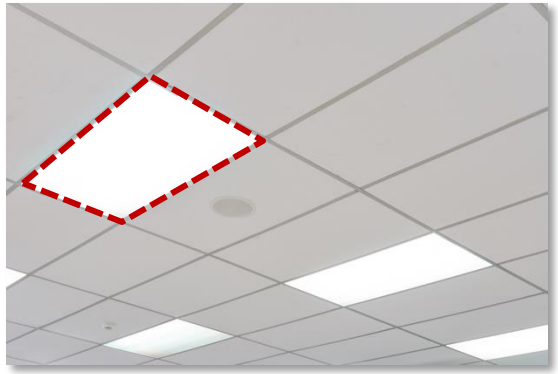
Budgetary planning…

- The cost of a retrofit kit may be less than a ballast.
- Opex is easier for the Facilities Manager to access. A major retrofit will come from a capital expense.
- Use a phased approach when upgrading your client's lighting.
- Plan the system upgrade for the latest technology.



1 Start with a mock-up

2 Move on to a floor or two

3 Then the whole building

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Checklist for customers

1. Will a lighting retrofit trigger code compliance? This will affect what lighting controls need to be upgraded
    a) Is the lighting on a control system?
        i. What does the system do?
2. Which fixtures (if any) does the client need to keep in place?
    a) Pay particular attention to decorative lighting, and lighting “built in” to ceilings, walls, etc.
3. Is there a clear benefit for retrofitting areas or lighting types
    a) Should you retrofit all the fixtures of one type, or retrofit an area/floor of a building?
4. For fixtures chosen to retrofit, what are the options?
    a) TLED, door kit, custom retrofit
    b) Compact fluorescent applications, especially decorative applications
5. What is the desired CCT for the new lighting?

Checklist for customers

6. Emergency lighting
    a) Are there battery backup ballasts that need to be replaced?
    b) Are there emergency circuits on an ALCR?
7. Control-related questions
    a) Is there a need for daylighting?
    b) Is there a need for tunable white lighting?
    c) Will the system control motorized window shades?
    d) Is there additional switched lighting that needs to come onto the control system?

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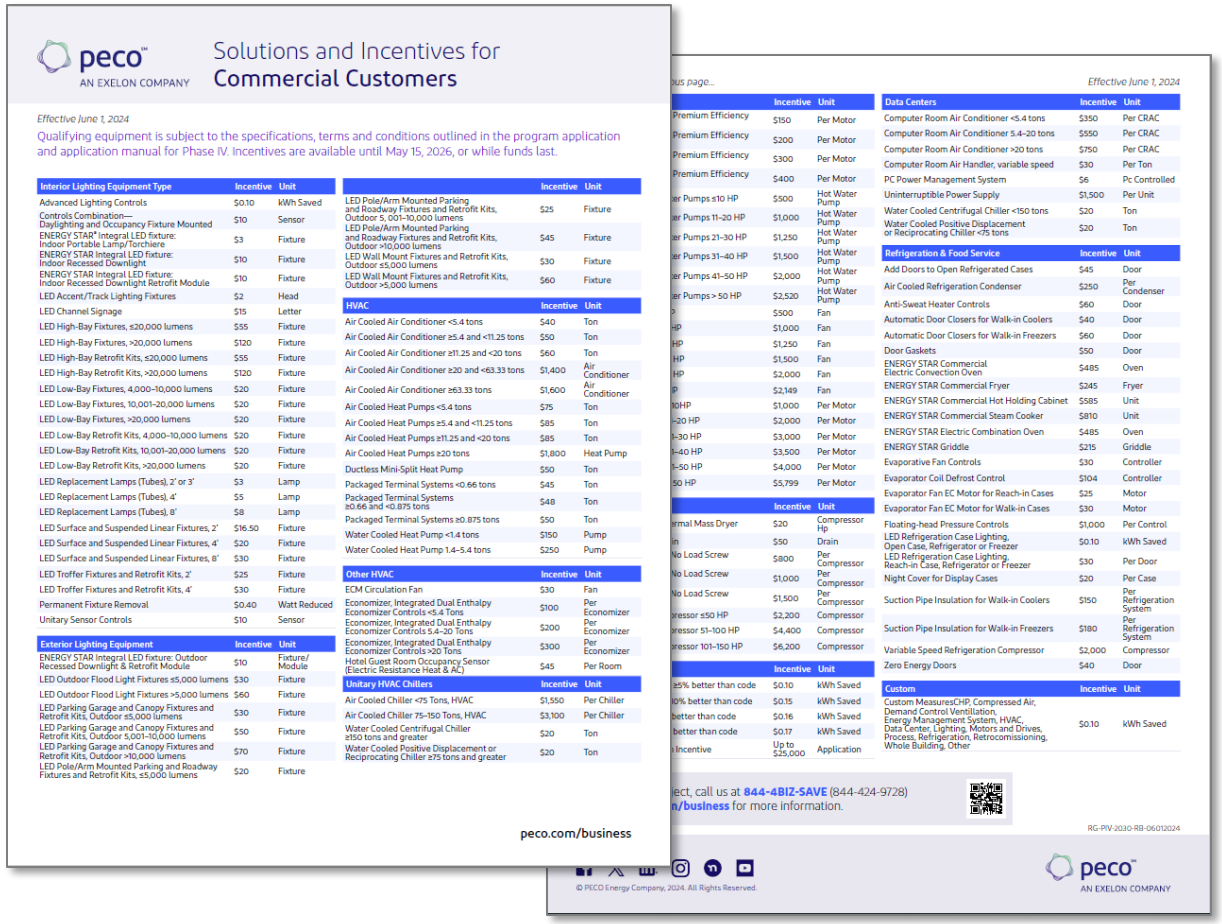
Take advantage of lighting rebates



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Solutions and Incentives for
Commercial Customers

Effective June 1, 2024

Qualifying equipment is subject to the specifications, terms and conditions outlined in the program application and application manual for Phase IV. Incentives are available until May 15, 2026, or while funds last.

Interior Lighting Equipment Type	Incentive	Unit
Advanced Lighting Controls	$0.10	kWh Saved
Controls Combination—Daylighting and Occupancy Fixture Mounted	$10	Sensor
ENERGY STAR® Integral LED fixture: Indoor Portable Lamp/Torchiere	$3	Fixture
ENERGY STAR Integral LED fixture: Indoor Recessed Downlight	$10	Fixture
ENERGY STAR Integral LED fixture: Indoor Recessed Downlight Retrofit Module	$10	Fixture
LED Accent/Track Lighting Fixtures	$2	Head
LED Channel Signage	$15	Letter
LED High-Bay Fixtures, ≤20,000 lumens	$55	Fixture
LED High-Bay Fixtures, >20,000 lumens	$120	Fixture
LED High-Bay Retrofit Kits, ≤20,000 lumens	$55	Fixture
LED High-Bay Retrofit Kits, >20,000 lumens	$120	Fixture
LED Low-Bay Fixtures, 4,000–10,000 lumens	$20	Fixture
LED Low-Bay Fixtures, 10,001–20,000 lumens	$20	Fixture
LED Low-Bay Fixtures, >20,000 lumens	$20	Fixture
LED Low-Bay Retrofit Kits, 4,000–10,000 lumens	$20	Fixture
LED Low-Bay Retrofit Kits, 10,001–20,000 lumens	$20	Fixture
LED Low-Bay Retrofit Kits, >20,000 lumens	$20	Fixture
LED Replacement Lamps (Tubes), 2' or 3'	$3	Lamp
LED Replacement Lamps (Tubes), 4'	$5	Lamp
LED Replacement Lamps (Tubes), 8'	$8	Lamp
LED Surface and Suspended Linear Fixtures, 2'	$16.50	Fixture
LED Surface and Suspended Linear Fixtures, 4'	$20	Fixture
LED Surface and Suspended Linear Fixtures, 8'	$30	Fixture
LED Troffer Fixtures and Retrofit Kits, 2'	$25	Fixture
LED Troffer Fixtures and Retrofit Kits, 4'	$30	Fixture
Permanent Fixture Removal	$0.40	Watt Reduced
Unitary Sensor Controls	$10	Sensor

Exterior Lighting Equipment	Incentive	Unit
ENERGY STAR Integral LED Fixture: Outdoor Recessed Downlight & Retrofit Module	$10	Fixture/ Module
LED Outdoor Flood Light Fixtures ≤5,000 lumens	$30	Fixture
LED Outdoor Flood Light Fixtures >5,000 lumens	$60	Fixture
LED Parking Garage and Canopy Fixtures and Retrofit Kits, Outdoor ≤5,000 lumens	$30	Fixture
LED Parking Garage and Canopy Fixtures and Retrofit Kits, Outdoor 5,001–10,000 lumens	$50	Fixture
LED Parking Garage and Canopy Fixtures and Retrofit Kits, Outdoor >10,000 lumens	$70	Fixture
LED Pole/Arm Mounted Parking and Roadway Fixtures and Retrofit Kits, ≤5,000 lumens	$20	Fixture
LED Pole/Arm Mounted Parking and Roadway Fixtures and Retrofit Kits, Outdoor 5, 001–10,000 lumens	$25	Fixture
LED Pole/Arm Mounted Parking and Roadway Fixtures and Retrofit Kits, Outdoor >10,000 lumens	$45	Fixture
LED Wall Mount Fixtures and Retrofit Kits, Outdoor ≤5,000 lumens	$30	Fixture
LED Wall Mount Fixtures and Retrofit Kits, Outdoor >5,000 lumens	$60	Fixture

HVAC	Incentive	Unit
Air Cooled Air Conditioner <5.4 tons	$40	Ton
Air Cooled Air Conditioner ≥5.4 and <11.25 tons	$50	Ton
Air Cooled Air Conditioner ≥11.25 and <20 tons	$60	Ton
Air Cooled Air Conditioner ≥20 and <63.33 tons	$1,400	Air Conditioner
Air Cooled Air Conditioner ≥63.33 tons	$1,600	Air Conditioner
Air Cooled Heat Pumps <5.4 tons	$75	Ton
Air Cooled Heat Pumps ≥5.4 and <11.25 tons	$85	Ton
Air Cooled Heat Pumps ≥11.25 and <20 tons	$85	Ton
Air Cooled Heat Pumps ≥20 tons	$1,800	Heat Pump
Ductless Mini-Split Heat Pump	$50	Ton
Packaged Terminal Systems <0.66 tons	$45	Ton
Packaged Terminal Systems ≥0.66 and <0.875 tons	$48	Ton
Packaged Terminal Systems ≥0.875 tons	$50	Ton
Water Cooled Heat Pump <1.4 tons	$150	Pump
Water Cooled Heat Pump 1.4–5.4 tons	$250	Pump

Other HVAC	Incentive	Unit
ECM Circulation Fan	$30	Fan
Economizer, Integrated Dual Enthalpy Economizer Controls <5.4 Tons	$100	Per Economizer
Economizer, Integrated Dual Enthalpy Economizer Controls 5.4–20 Tons	$200	Per Economizer
Economizer, Integrated Dual Enthalpy Economizer Controls >20 Tons	$300	Per Economizer
Hotel Guest Room Occupancy Sensor (Electric Resistance Heat & AC)	$45	Per Room

Unitary HVAC Chillers	Incentive	Unit
Air Cooled Chiller <75 Tons, HVAC	$1,550	Per Chiller
Air Cooled Chiller 75–150 Tons, HVAC	$3,100	Per Chiller
Water Cooled Centrifugal Chiller ≥150 tons and greater	$20	Ton
Water Cooled Positive Displacement or Reciprocating Chiller ≥75 tons and greater	$20	Ton

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Data Centers	Incentive	Unit
Computer Room Air Conditioner <5.4 tons	$350	Per CRAC
Computer Room Air Conditioner 5.4–20 tons	$550	Per CRAC
Computer Room Air Conditioner >20 tons	$750	Per CRAC
Computer Room Air Handler, variable speed	$30	Per Ton
PC Power Management System	$6	Pc Controlled
Uninterruptible Power Supply	$1,500	Per Unit
Water Cooled Centrifugal Chiller <150 tons	$20	Ton
Water Cooled Positive Displacement or Reciprocating Chiller <75 tons	$20	Ton

Refrigeration & Food Service	Incentive	Unit
Add Doors to Open Refrigerated Cases	$45	Door
Air Cooled Refrigeration Condenser	$250	Per Condenser
Anti-Sweat Heater Controls	$60	Door
Automatic Door Closers for Walk-in Coolers	$40	Door
Automatic Door Closers for Walk-in Freezers	$60	Door
Door Gaskets	$50	Door
ENERGY STAR Commercial Electric Convection Oven	$485	Oven
ENERGY STAR Commercial Fryer	$245	Fryer
ENERGY STAR Commercial Hot Holding Cabinet	$585	Unit
ENERGY STAR Commercial Steam Cooker	$810	Unit
ENERGY STAR Electric Combination Oven	$485	Oven
ENERGY STAR Griddle	$215	Griddle
Evaporative Fan Controls	$30	Controller
Evaporator Coil Defrost Control	$104	Controller
Evaporator Fan EC Motor for Reach-in Cases	$25	Motor
Evaporator Fan EC Motor for Walk-in Cases	$30	Motor
Floating-head Pressure Controls	$1,000	Per Control
LED Refrigeration Case Lighting, Open Case, Refrigerator or Freezer	$0.10	kWh Saved
LED Refrigeration Case Lighting, Reach-in Case, Refrigerator or Freezer	$30	Per Door
Night Cover for Display Cases	$20	Per Case
Suction Pipe Insulation for Walk-in Coolers	$150	Per Refrigeration System
Suction Pipe Insulation for Walk-in Freezers	$180	Per Refrigeration System
Variable Speed Refrigeration Compressor	$2,000	Compressor
Zero Energy Doors	$40	Door

Custom	Incentive	Unit
Custom MeasuresCHP, Compressed Air, Demand Control Ventilation, Energy Management System, HVAC, Data Center, Lighting, Motors and Drives, Process, Refrigeration, Retrocomissioning, Whole Building, Other	$0.10	kWh Saved

Save on total project costs –

- Look for retrofit kits & fixtures that are DLC certified
- Many utility companies offer rebates for LED fixtures, advanced lighting controls, energy savings, etc.
- There are third party resources to help find available rebates like dsireusa.org

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While you have the hood open…

Upgrade the lighting control system!

- If your client is operating fluorescent fixtures, it's likely that the control system is out of date and at risk of failure.
- The installed system may not meet the required energy code.
- There may be features of a new control system that improve the space.
- A new system will have a warranty and features to meet code and improve performance.

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Take advantage of wireless controls

There are many benefits of modern wireless lighting systems.

Wireless controls are typically integrated into the fixtures and are much less costly.

- Tunable white
- Synchronized light and shade control
- Individual fixture control
- Update your system wirelessly
- App and cloud-connected lighting control management software

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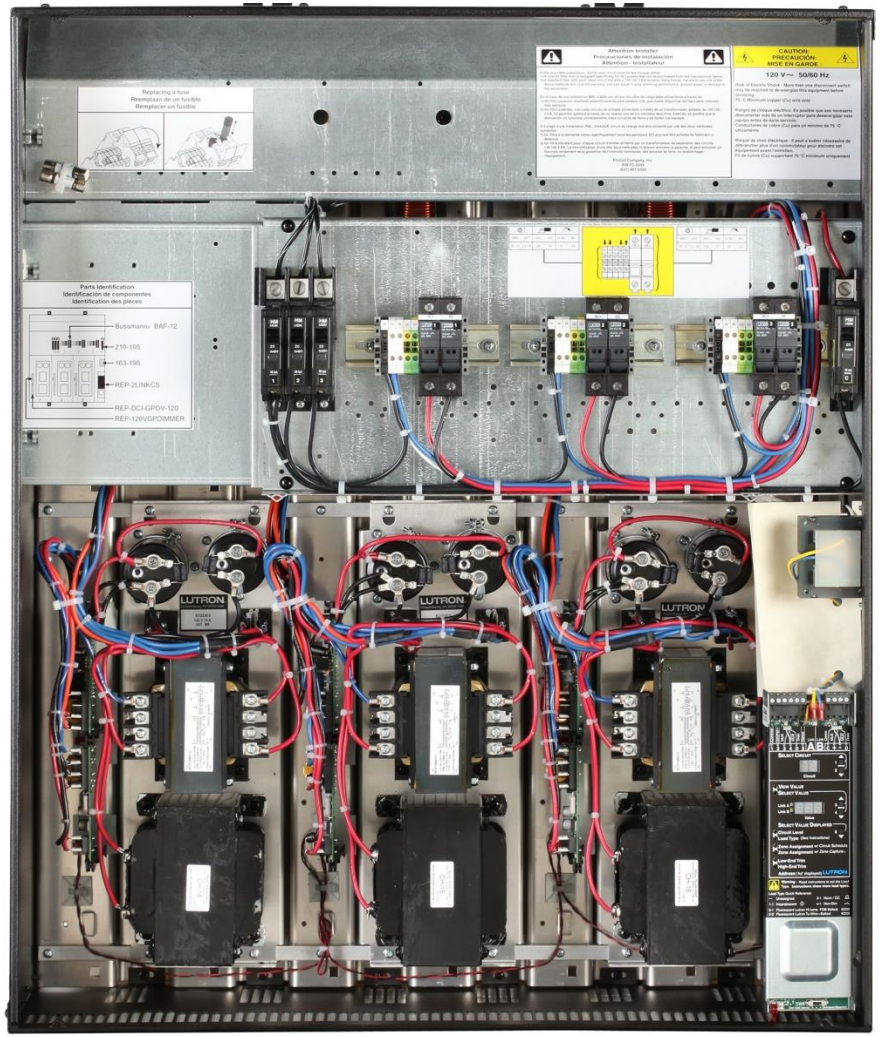
Some systems offer integration with installed lighting systems

There are many panel-based systems that are still in great shape.

These systems can be integrated into the latest system with interface modules that allow for control of the panel through the new system



Lighting and system upgrades

A good plan is critical for success

- Lighting Upgrades
  - Consider the building plan
  - Don't forget about emergency lighting!
- System upgrades
  - Think about the controls *before* you upgrade the lighting
  - Look out for adjacent switched lighting!
- Plan for the future
  - What is the long-term plan for the smart building?

Conclusions/End

This concludes The American Institute of Architects Continuing Education Systems Course

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