

# Energy Saving Options for Small ISDs

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Presented by Casey Stone, PE, CEM

We change the way  
people use energy™



**SCORE<sup>®</sup>**

# True Story\* .....

- Big City ISD has lots of students & budget, and has been building new schools
- Each new school was carefully designed by architects to be LEED certified
- CLEAResult benchmarking revealed that the new schools used more energy than the old schools
- The reason was simple. What was it?

\*names have been changed to protect the guilty



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- Score Program
- Lighting Features to Consider
- **Gymnasiums and Metal Halides**
- **Exterior Lighting: Parking and More**
- **Auditoriums and Dimmable Lights**
- **Fluorescent Tube Retrofits**
- **LED Luminaires**
- **Controls, Controls, Controls!**
- Load Management

**Typical  
Projects**



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## Today's Agenda



**SCORE<sup>®</sup>**

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## SCORE Program

# SCORE Program

- TNMP wants to help customers reduce energy usage and peak electric load
- CLEAResult implements program to provide vendor-neutral assistance
- This assistance is at no additional cost

# SCORE Program

- You must pre-qualify!

- Contact CLEAResult:

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Program Consultant

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817-291-6591

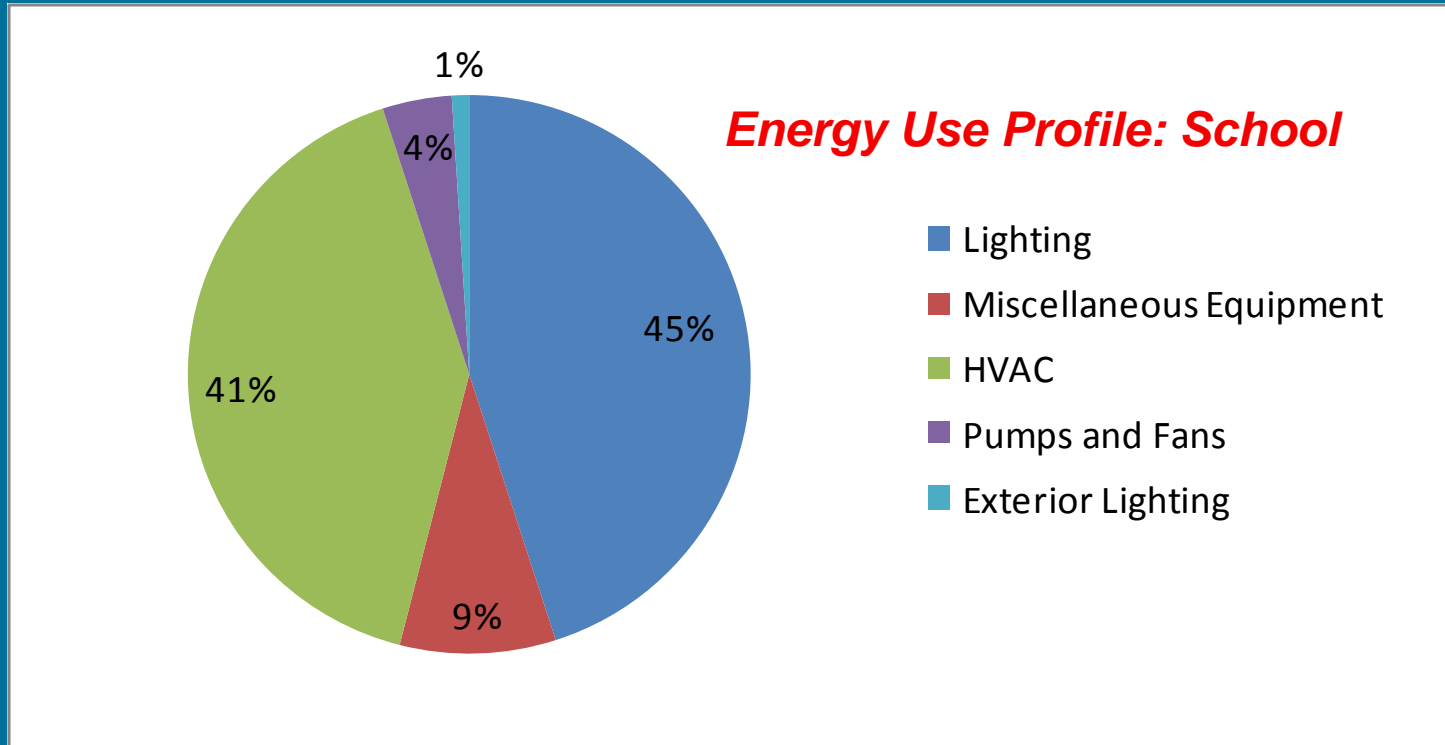


# SCORE Program Best Practices

- Contact CLEARResult early!
  - Never too early to inform us of a potential project
  - Hard to help with a project that is already out for bid, underway, or built
- Implement design guides
  - Lighting, HVAC, Envelope
  - We can help assess any kind of retrofit—HVAC, Roofing, Kitchen
- Commission Building





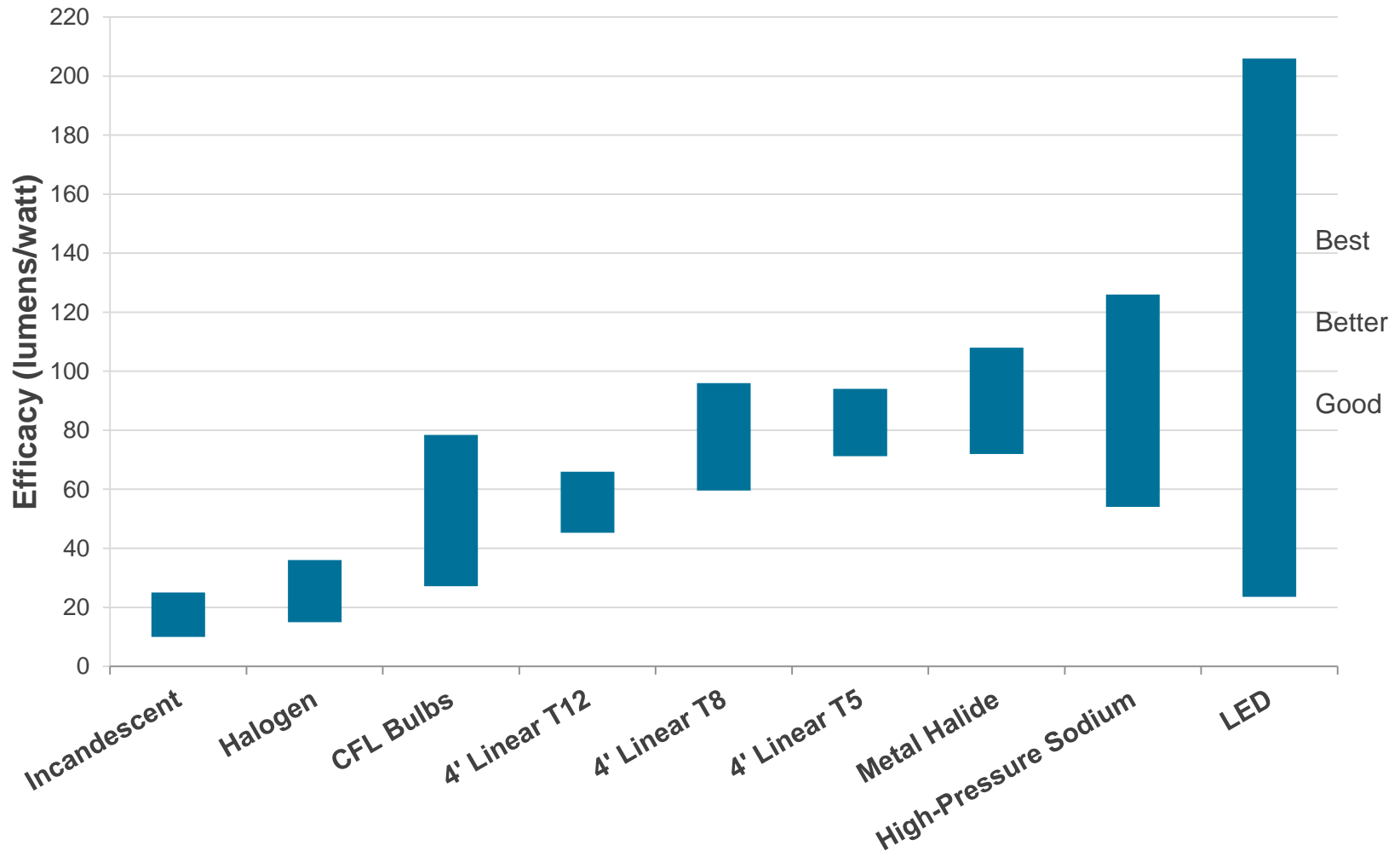


## Lighting Features to Consider

# Lighting Features to Consider

- Lighting Efficacy & Light Levels
- Color, CRI, and Lumen Maintenance
- Life Cycle Costs & Other Benefits

# Lighting Efficacy: Light Output per Energy Input



# Light Level Recommendations

From the Illumination Engineering Society



**Orientation and Simple Tasks** These tasks occur in public spaces where reading and visual inspection are only occasionally performed. Visual performance is largely unimportant.

Public Spaces	Atriums	3 fc
Simple Orientation for Short Visits	Hallways	5 fc
Working Spaces for Simple Visual Tasks	Kiosks	10 fc

**Common Visual Tasks** Visual performance is important for these. Higher light levels are recommended for visual tasks involving low contrast or small size.

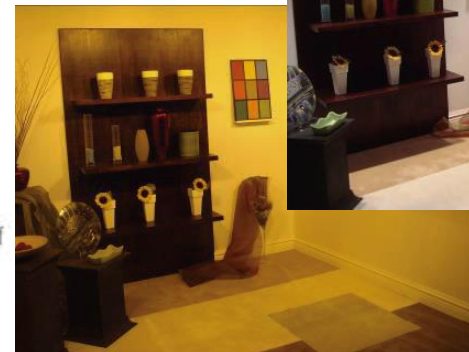
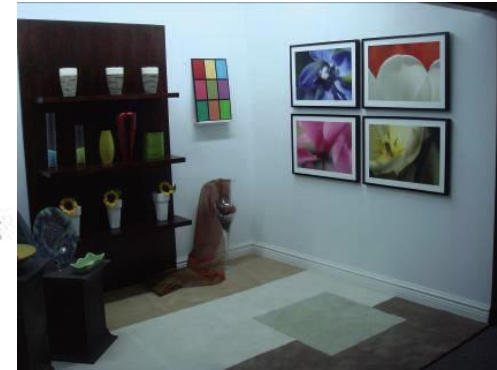
Tasks with High Contrast and Large Size	Classrooms & Offices	30 fc
Tasks with High Contrast and Small Size OR Low Contrast and Large Size	Assembly Line	50 fc
Tasks with Low Contrast and Small Size	Operating Room	100 fc



# Lighting Features to Consider

- Lighting Efficacy & Light Levels
- Color, CRI, and Lumen Maintenance
- Life Cycle Costs & Other Benefits

# Correlated Color Temperature (CCT)



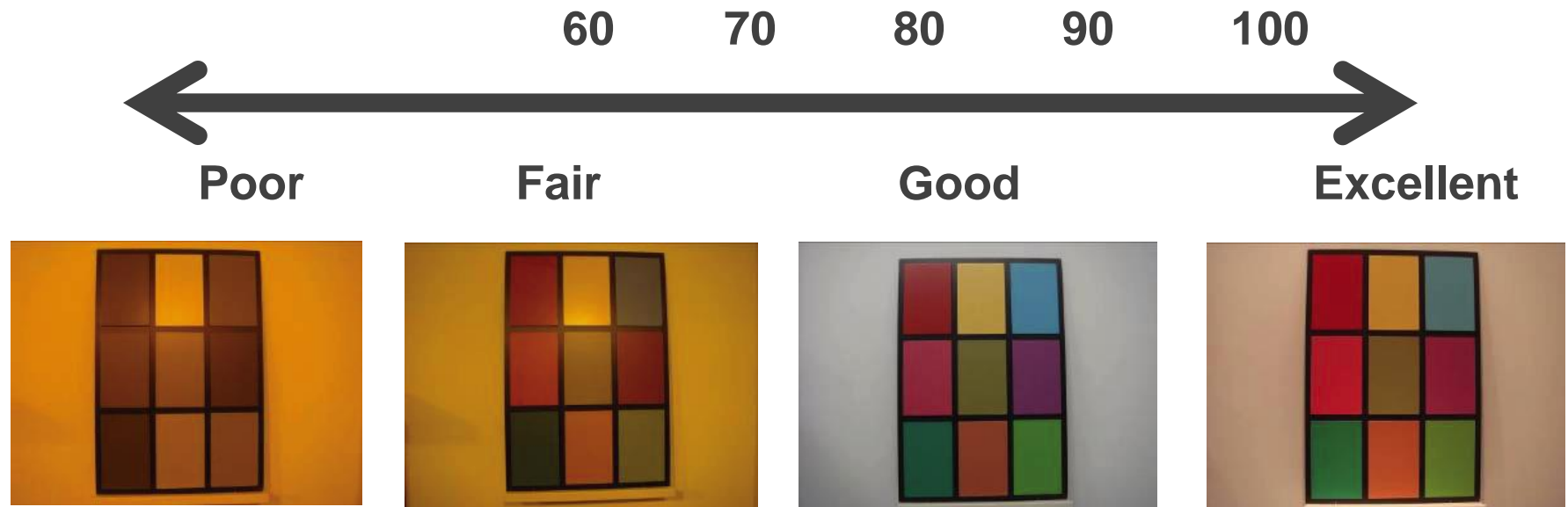
**CHOOSE A  
COLOR TEMPERATURE  
And STICK TO IT**

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# Color Rendering Index (CRI)

**Color Rendering Index (CRI)** - how well colors are rendered by different illumination conditions in comparison to a standard.

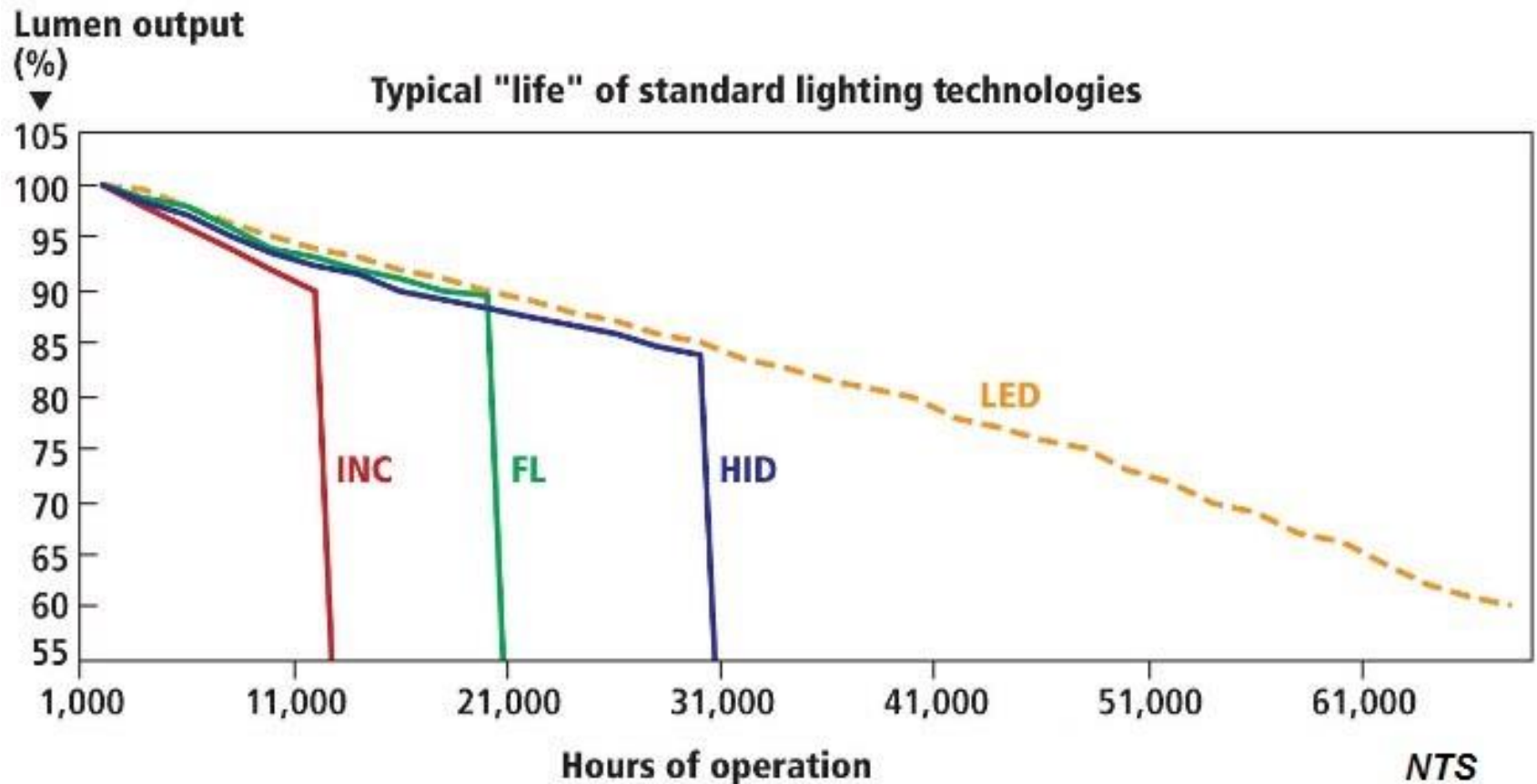
**Higher number means it will represent the color of objects more “naturally.”**





# Lumen Maintenance

How long will your lamps last, on average?



# Lighting Features to Consider

- Lighting Efficacy & Light Levels
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# Life Cycle Costs

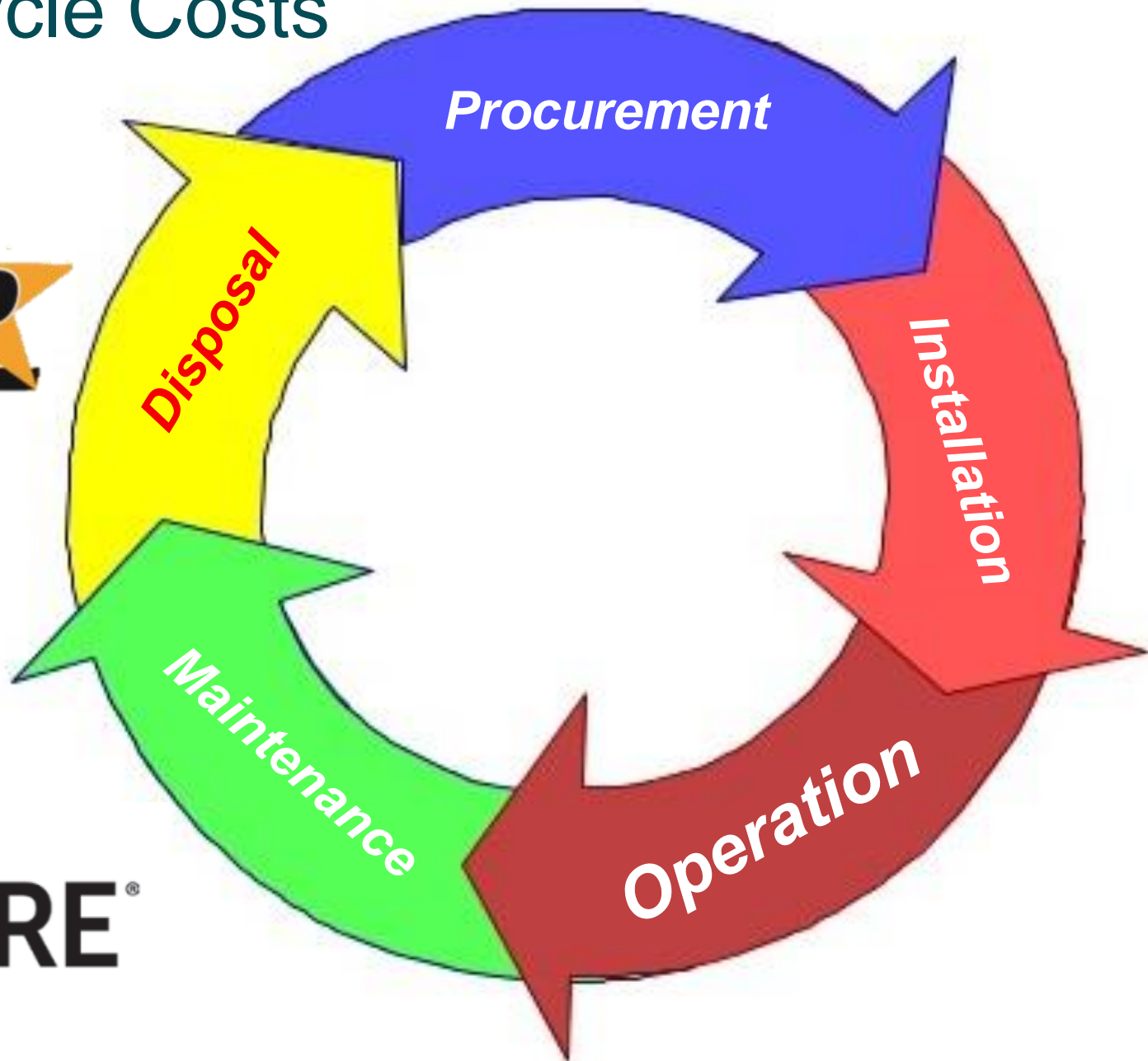


**CAN  
HELP  
YOU!**



**SCORE®**

CLEAResult®



# Non-Cost Benefits

- Added Security
- Increased Productivity
- Special Needs



# Lighting Features to Consider

- Lighting Efficacy & Light Levels
- Color, CRI and Lumen Maintenance
- Life Cycle Costs & Other Benefits



# Typical Projects....



# Gymnasiums and Metal Halides

Recommendation: Use either T5HO or Super T8 lamping systems.  
The main difference affecting the choice between these two systems is ceiling height and required footcandle levels based on activity.



# Gymnasiums and Metal Halides



Before



After



# 400W MH vs. Super T8 System

**1 X 400W MH Lamp  
Probe Start Ballast**

**6 X T8-HO Lamps  
Instant Start**

Life (hours)	<b>20,000</b>	<b>26,000</b>
System Watts	<b>456</b>	<b>162</b>
CRI	<b>65</b>	<b>85</b>
Mean System Lumens	<b>23,000</b>	<b>18,000</b>
Relative Mean Lumens	<b>100%--</b>	<b>80%++</b>
Annual Energy Cost*	<b>\$150</b>	<b>\$53</b>
Annual Energy Savings*	<b>--</b>	<b>\$97</b>

# Exterior Lighting: Parking and More

Before: Metal Halide



After: LED



*From an LSI Industries Crossover Case Study in Conley, GA*

# Exterior Lighting: Parking and More

*All about the LED...*



# Minimize Spill Light



# LED Exterior HID Options

				
	LED Luminaire w/ Controls	LED Luminaire: Parking Lot	LED Luminaire: Wallpack	LED Retrofit Kit or Lamp
<b>Bottom Line</b>	Deepest Savings where Applicable	Great Option if No Controls	Great Option; Can Add Controls	Proceed with Caution
<b>Customer Cost of Electricity</b>	\$0.024 per kWh	\$0.022 per kWh	\$0.014 per kWh	\$0.017 per kWh
<b>Project Savings (MWh; %)</b>	284 MWh; 78%	250 MWh; 69%	266 MWh; 74%	25 MWh; 66%
<b>Trade Ally (Sales Revenue)</b>	\$69,000	\$61,000	\$36,000	\$41,000
<b>Important Dates</b>	Best option now if controls	Best option now if no controls	Best option now; Good w/ controls	Better Options come 2016

\* Parking lot example: Retrofit of 200 Metal Halide (400W) Heads or Wallpack

# Auditoriums and Dimmable Lights

Any can light (incandescent, halogen, CFL) is a good LED retrofit opportunity

- Retrofit Kits
- Lamps





# Lamps and Downlights

			
	LED Trim Kit	LED Lamp	CFLs
<b>Bottom Line</b>	Best Option where Trim Desired	Best Option where No Trim Needed	Inferior Option, in particular pin-base
<b>Customer Cost of Electricity</b>	\$0.007 per kWh	\$0.005 per kWh	\$0.021 per kWh
<b>Project Savings (MWh; %)</b>	74 MWh; 82%	74 MWh; 82%	63 MWh; 70%
<b>Trade Ally (Sales Revenue)</b>	\$5,000	\$2,600	\$2,500
<b>Important Dates</b>	Best option now; Longer EUL	Great option now if don't need trim	No longer best option**

# Fluorescent Tube Retrofits



*HIGH PERFORMANCE  
T8 RETROFIT*



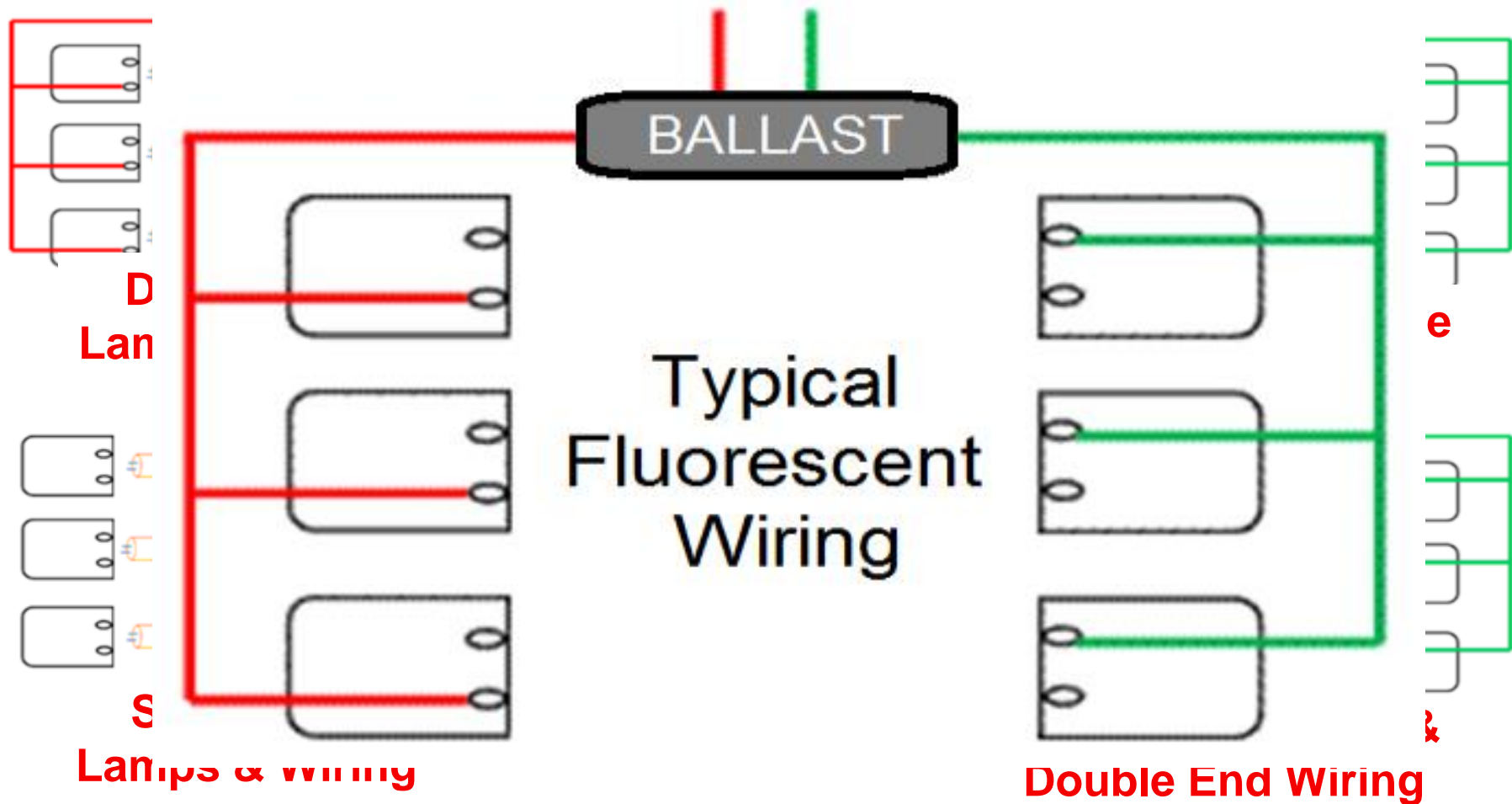


# Real Life Classroom Example

Room Type	Area (ft2)	Fixture Type	# of Fixtures	Total Watts	LPD (W/ft2)	Measured FC
Classroom	790	4-lamp Standard 32W T8	9	1,044	1.322	75-110
Classroom	790	2-lamp High Performance 32W T8	9	522	0.661	35-60

**Lighting Op  
Costs Halved**

# LED Tube Lamps



# Optimal LED Tube Features

- Safety Switches
- Replaceable Driver
- Rotatable End Cap



# DesignLights: Product Search

[+ New Search](#)

REFINE YOUR SEARCH

194 RESULTS FOUND [Update Search](#)

☐ Include De-Listed Products

Categories

Measured Criteria

Rated Criteria

Manufacturer

Type and Select one or more Organizations

[Download Results](#) [Share Results](#) [Voir en Français](#)

194 RESULTS FOUND

SHOW 10 25 50 100 SORT Date Qualified (newest first)

Green 1 2 3 4 5 6 7 8 ...

Date Qualified: 09/03/2013 [Compare](#)

Manufacturer: Think Green Solutions/Reonac Energy Systems

Brand Name: Think Green Solutions/Reonac Energy Systems

[VIEW DETAILS](#) [VIEW FAMILY \(1\)](#)

Model No.: LED-THK-TUBE-110-4K4E-22W

Categories: Four-foot Linear Replacement Lamps

[View Expanded Details](#)

TEST DATA		RATED DATA	
Light Output	3,006 lm	Efficacy	113.92 lm/w
Wattage	26.39 w	CRI	83.6
CCT	3,980 K		

Date Qualified: 09/03/2013 [Compare](#)

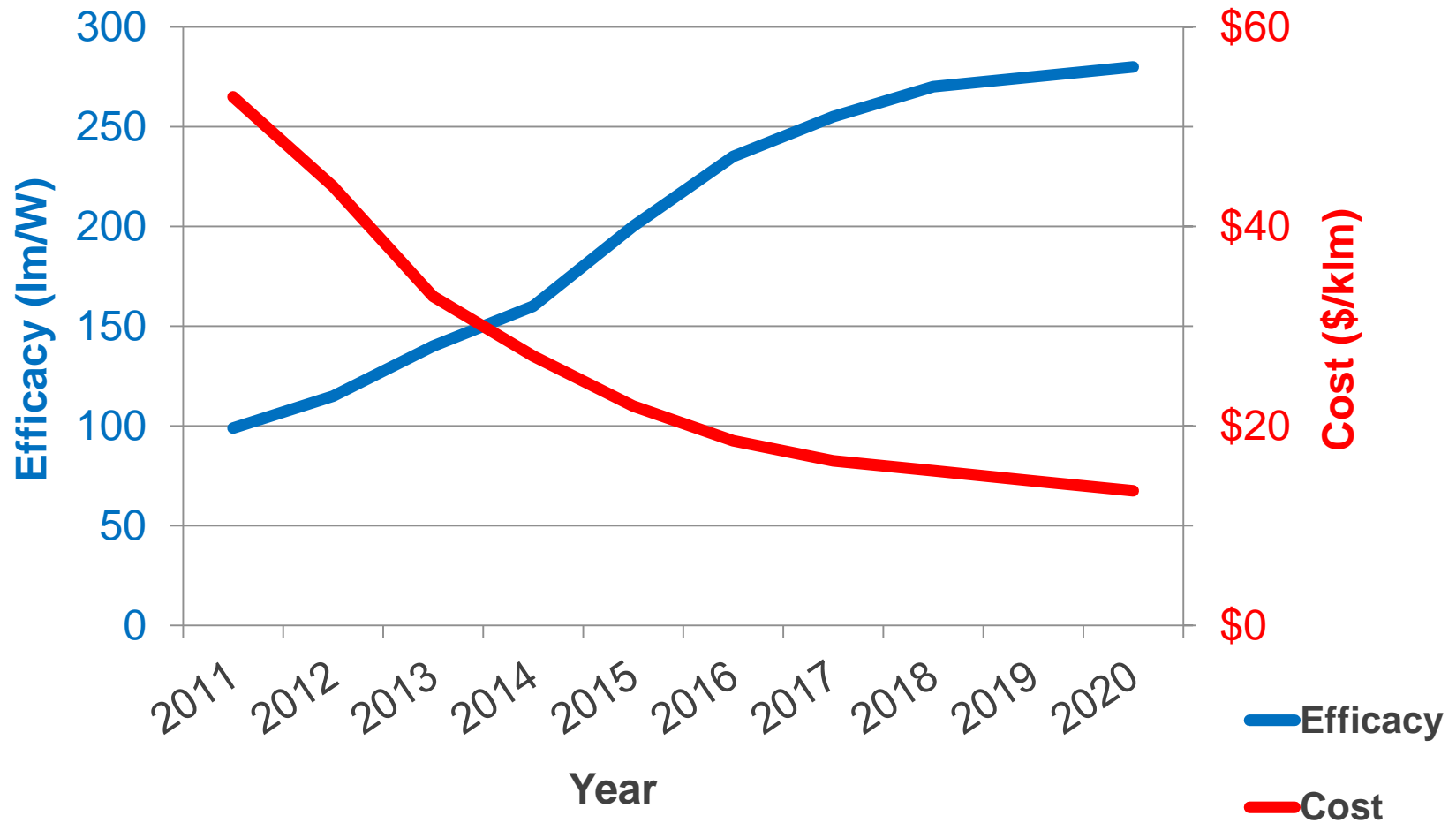
Manufacturer: Think Green Solutions/Reonac Energy Systems

Brand Name: Think Green Solutions/Reonac Energy Systems

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# LED Luminaires



*LED Cost and Efficacy—Rapid Improvement*

# Classrooms Scenario

				
	Super T8	LED Integrated Controls	LED Troffer or Kit	LED T8 Lamp
<b>Bottom Line</b>	Best Current Value	Deepest savings	Good Option	Proceed with Caution
<b>Customer Cost of Electricity</b>	\$0.024 per kWh	\$0.028 per kWh	\$0.033 per kWh	\$0.027 per kWh
<b>Project Savings (MWh; %)</b>	27 MWh; 62%	36 MWh; 82%	28 MWh; 64%	25 MWh; 57%
<b>Trade Ally (Sales Revenue)</b>	\$8,500	\$12,500	\$11,250	\$6,600
<b>Important Dates</b>	Reconsider in 2016	Great option in 2016 where apply	Good option in 2016	Not Best Lighting Quality; Safety

\* Example: Retrofit of 100 four-lamp standard electronic T8 fixtures

# Controls, Controls, Controls!



Let Technology  
Be Your Friend

# Controls, Controls, Controls!

## LIGHTING CONTROL TYPES

### Dimming Controls

Dimming controls lower light levels in order to reduce the energy consumed. Dimming can be continuous or involve step controls.

### Daylight Controls

Daylight controls dim or turn off lights when ambient light is sufficient. Daylight sensors can be indoor or outdoor.

### Occupancy Controls

Occupancy controls sense occupancy or vacancy in order to turn lights on or off. There are two main types: infrared and ultrasonic. Controls that use both technologies are the most reliable.

**THESE ARE INCENTIVIZED**



# Occupancy and Daylighting Sensors

## Occupancy

- Passive Infrared - Detects movement of body heat
- Ultrasonic - Detects shift in sound wave frequency
- Dual technology - Infrared & ultrasonic combined

Wall  
Mount  
(Occ)



Ceiling  
Mount  
(Occ)



Ceiling  
Mount  
(DC)

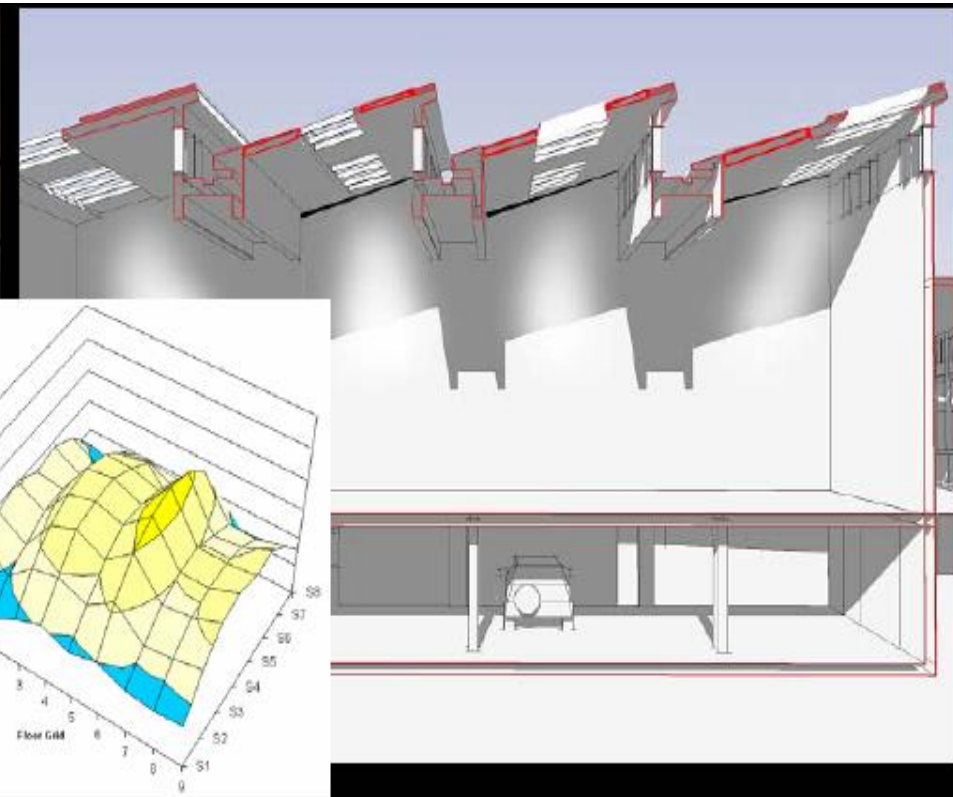
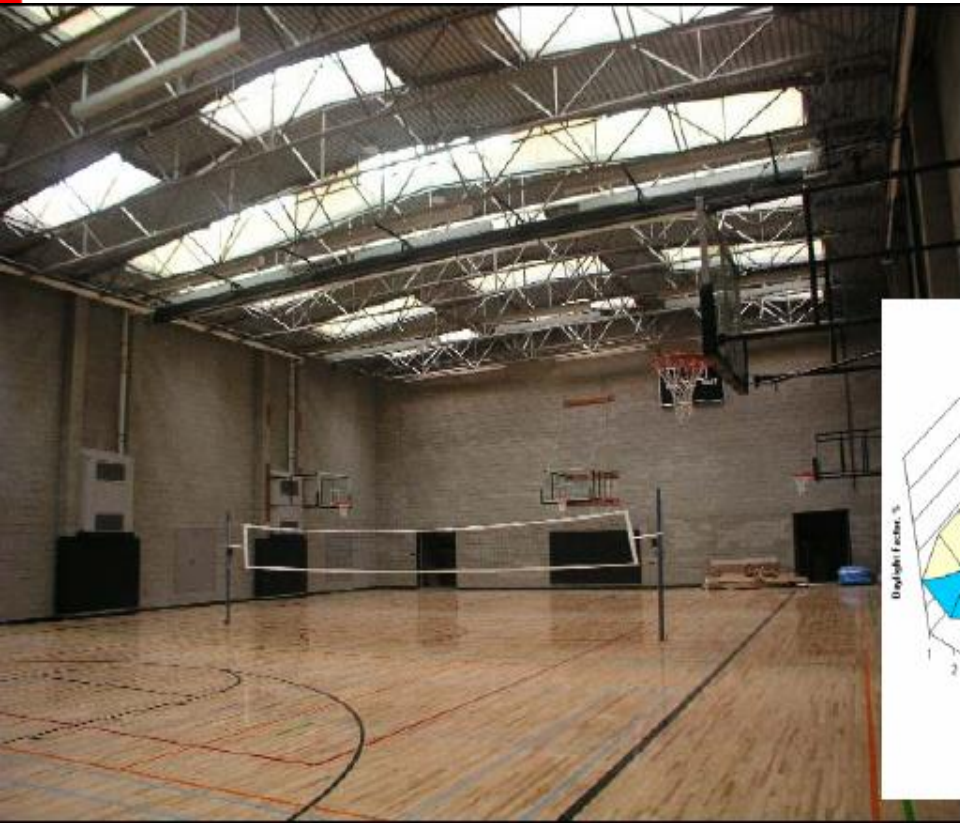


## Daylighting Control/Photosensor

- Detects the light level to adjust electric lighting based on the available daylight

# Daylight Harvesting




- Control lights in day-lit area separate from non-day-lit areas
- Utilize photocells and continuous dimming (in continuously occupied areas; ceiling  $< 14$  ft)



# Lighting Controls Applications

Best: Integrated Controls Built into Luminaire



	 Office/Classroom	 Gymnasium	 Parking Garage/Lot
<b>Bottom Line</b>	Use in all New Construction; Carefully consider in all Retrofits	Use in all projects in all intermittent spaces	Use in all dusk-to-dawn applications w/ intermittent (low night) traffic
<b>Savings from Efficient Tech (%)</b>	40% to 60%	50% to 80%	40% to 60%



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# Load Management

# Load Management

- In Peak emergencies TNMP must shed power load to supply all demand on grid
- TNMP will pay an incentive for C&I customers that are willing and able to reduce load if called upon
  - \$50/kW

# Load Management

- Timeframe:
  - June 1 – September 30
  - Weekdays 1PM – 7PM
  - 30 minutes notice from TNMP Phone Call
- Curtailable load target: 50 kW minimum
  - One site or multiple sites
- One scheduled curtailment test will occur

# Load Management

- Sign up now! Deadline: April 8th
- Contact CLEAResult:
  - Michael Skeen
  - Program Consultant
  - [michael.skeen@clearesult.com](mailto:michael.skeen@clearesult.com)
  - 817-291-6591



# True Story\*.....

Why did the new Big City ISD schools  
use **more** energy than their old schools?

\*names have been changed to protect the guilty

# Commissioning: make sure it works like it's supposed to

To identify equipment/processes for commissioning:

- ☐ Review your energy consumption
- ☐ Review your work order logs
- ☐ Review other BAS outputs

Gain the most energy savings

Proactive prevent potential problems

Re-commission equipment and processes on a regular schedule

Define your organization's Cx Program

To manage commissioning projects:

- ☐ Identify a facility commissioning champion
- ☐ Form a commissioning team

# [www.TNMPefficiency.com](http://www.TNMPefficiency.com)

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## Thank you