

# A New Approach to Lighting Controls: Low Voltage



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# Learning Objectives

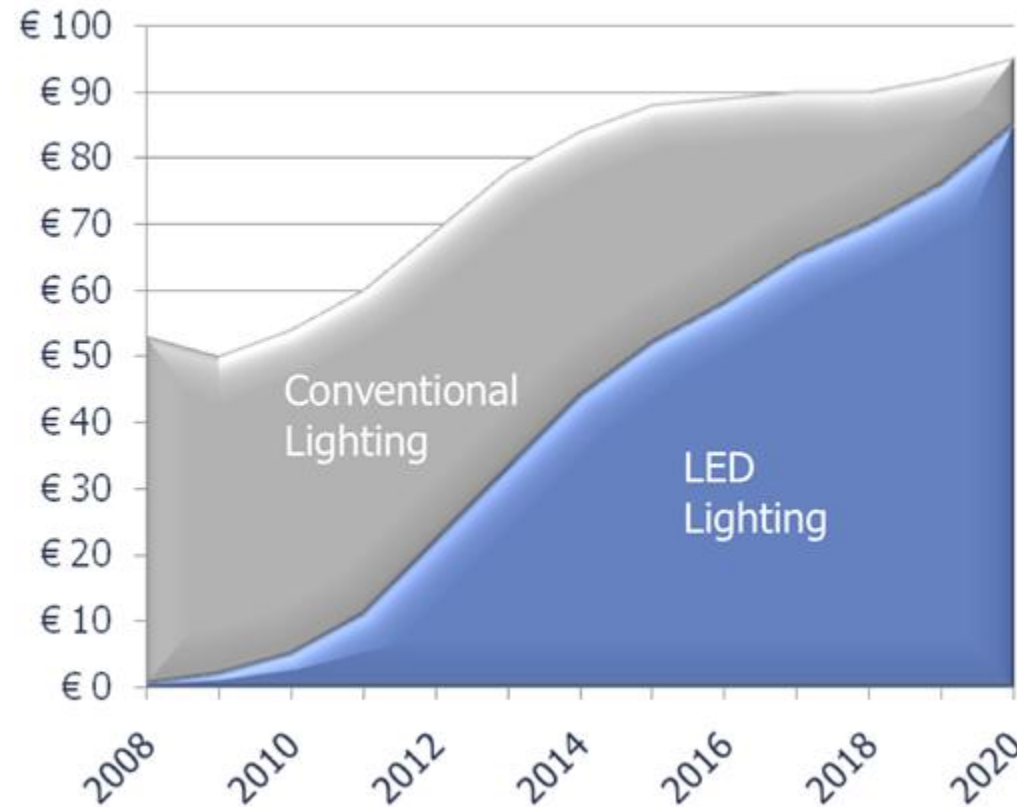
1. Analyze current status of LEDs and their benefits
2. Compare how low voltage lighting controls work in conjunction with LEDs
3. Measure energy savings opportunities with low voltage lighting
4. Identify additional value that low voltage lighting systems bring to building owners with building intelligence

# Overview

- A Look at LEDs and Controls Market Status
- Traditional vs. New Controls Technology
- An introduction to Low Voltage Lighting
- DC Powered Lighting and Its Potential for Smart Controls and Building Intelligence
- Key Forces Driving Demand for this New Approach

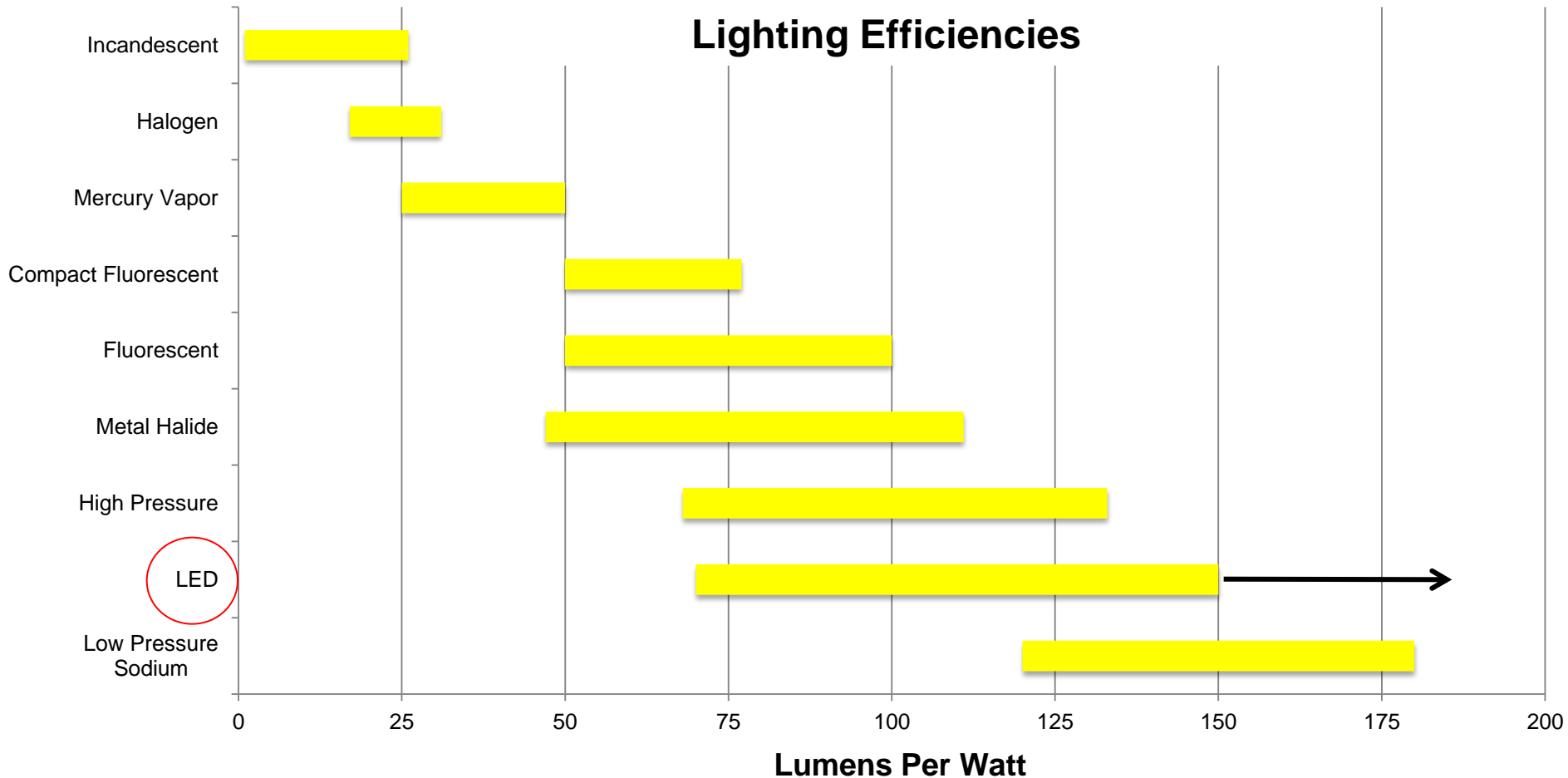
# The Rise of LEDs

**Global General Illumination Market\*\***

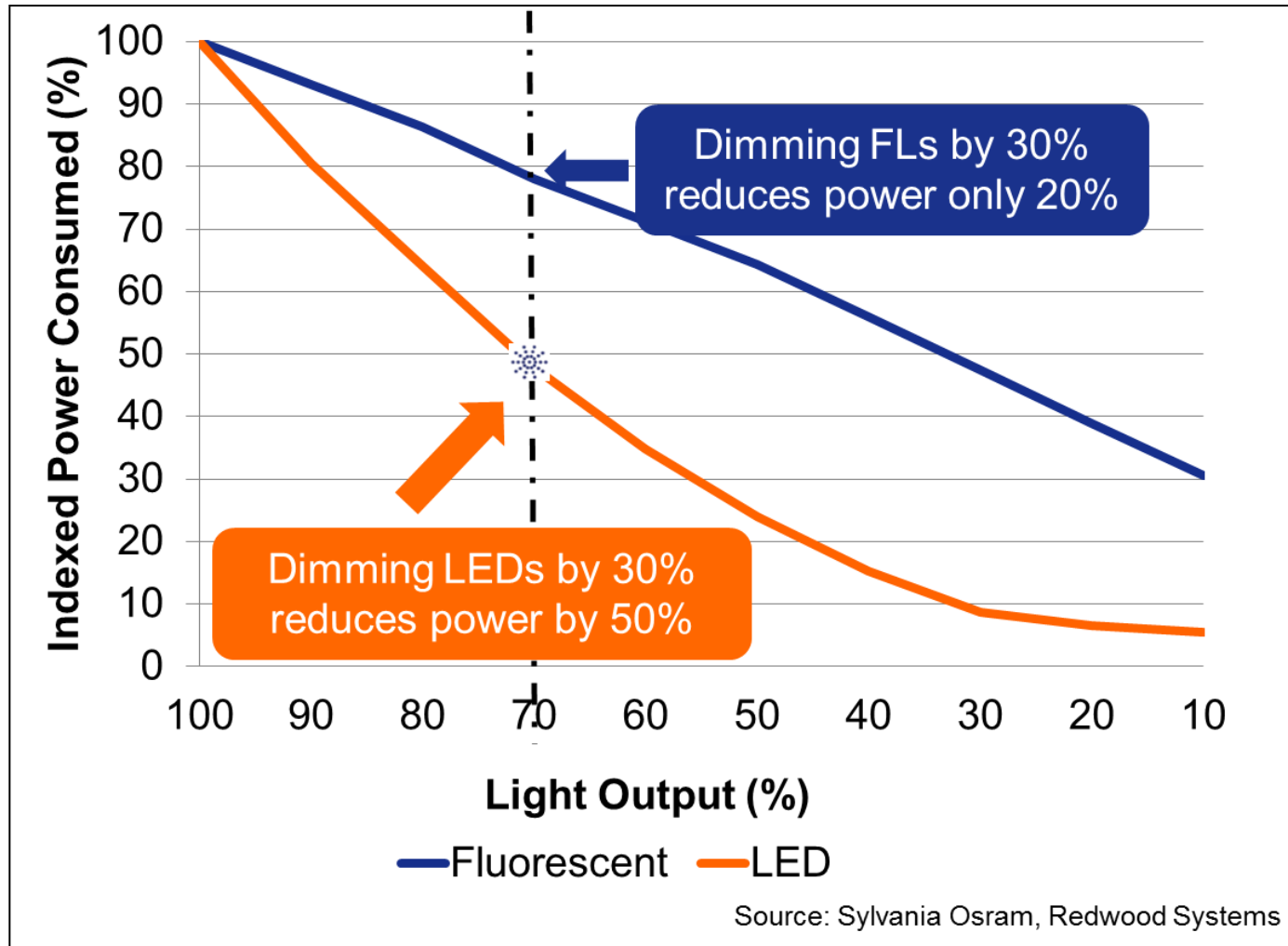


- Very long life (50,000 hrs)
- Lower maintenance costs
- Small heat footprint
- Cost dropping dramatically
- Super efficient – digital light source that is uniquely dimmable and controllable

# LEDs Surpass Fluorescents in Efficacy



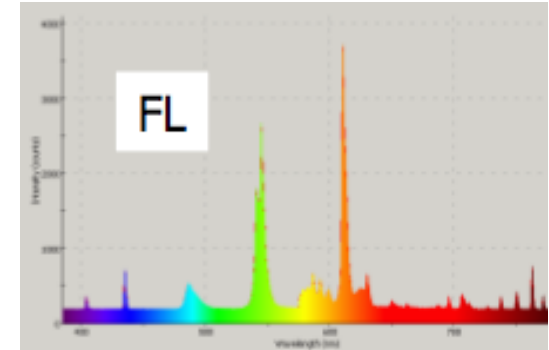
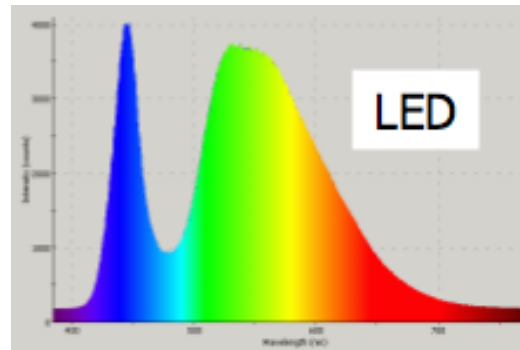
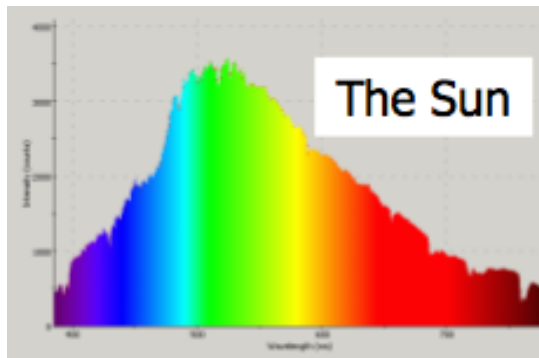
# LEDs Dim More Effectively than Fluorescents





# LED Light Quality Closer to Natural Sunlight

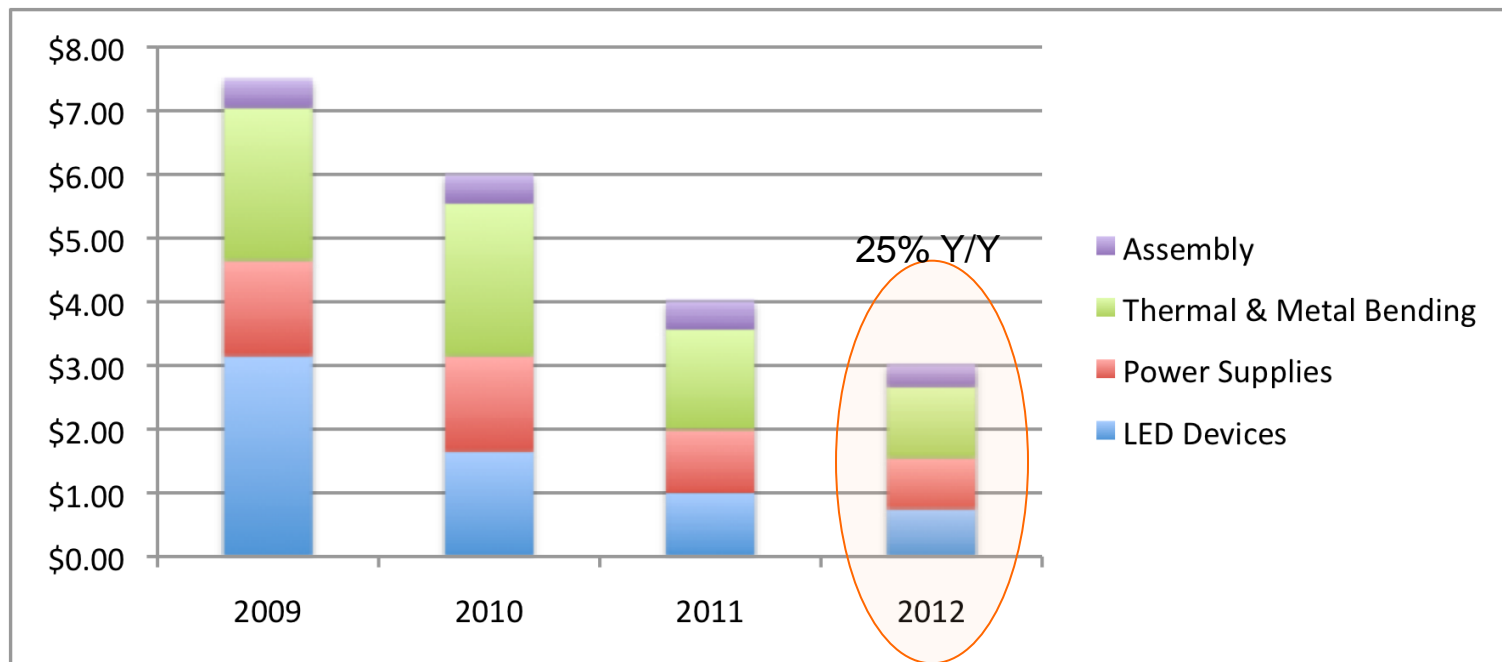
- Full Spectrum - Closer to natural sunlight
- High Color Rendering Index (CRI) >85 @ 4000K



Source: Lunera Lighting

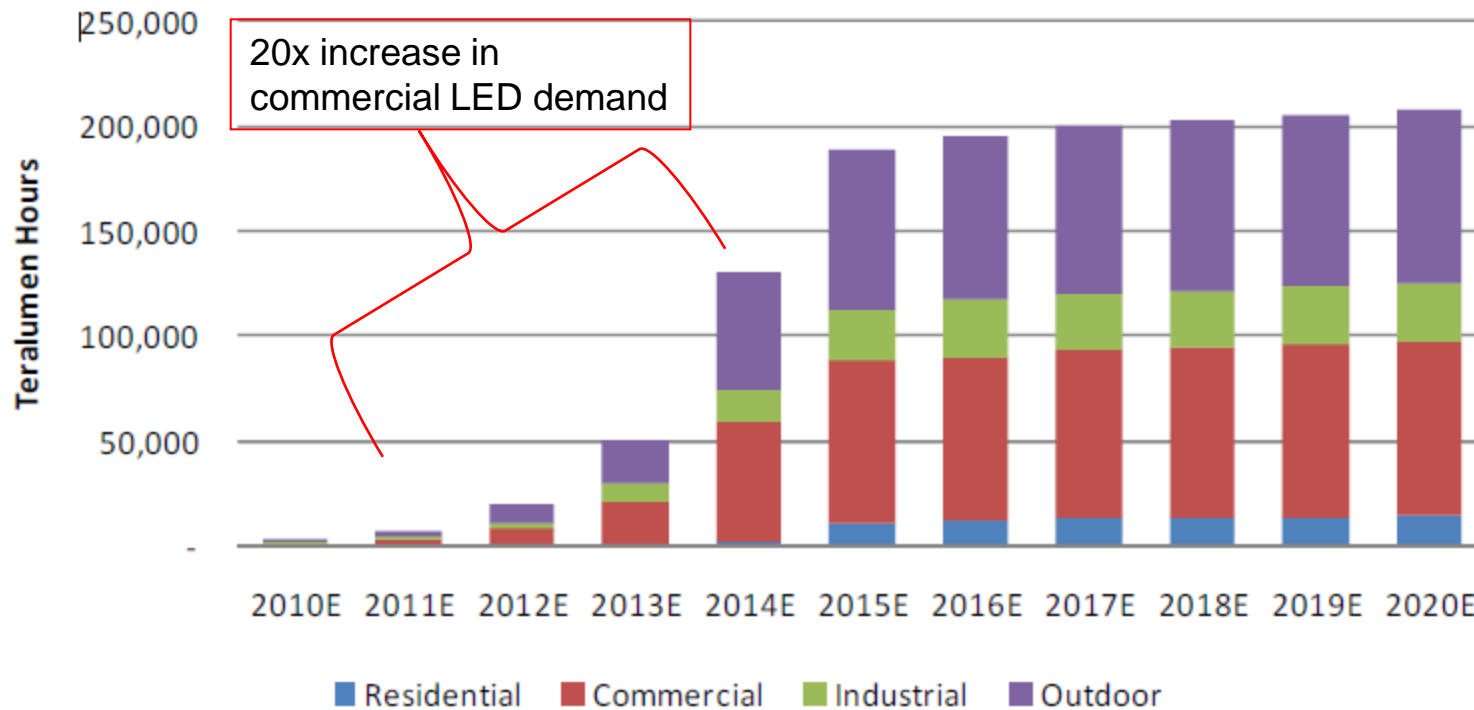
# LED Fixture Prices Dropping Quickly

## Relative Cost (\$/sq ft) Projections for LED Fixtures



# LED Lighting – Happening Faster Than You Think

GLOBAL ANNUAL LED LIGHTING DEMAND BY BUILDING SEGMENT (TERALUMEN-HOURS)

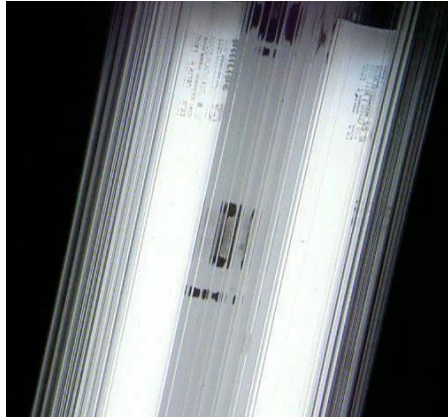


Source: Department of Energy, Piper Jaffray Research

\*\*Source: Philips Lighting

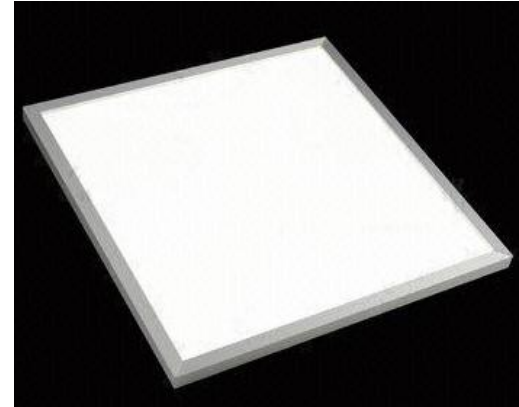
# LEDs Create Opportunity for New Approach to Power and Control

Fluorescent



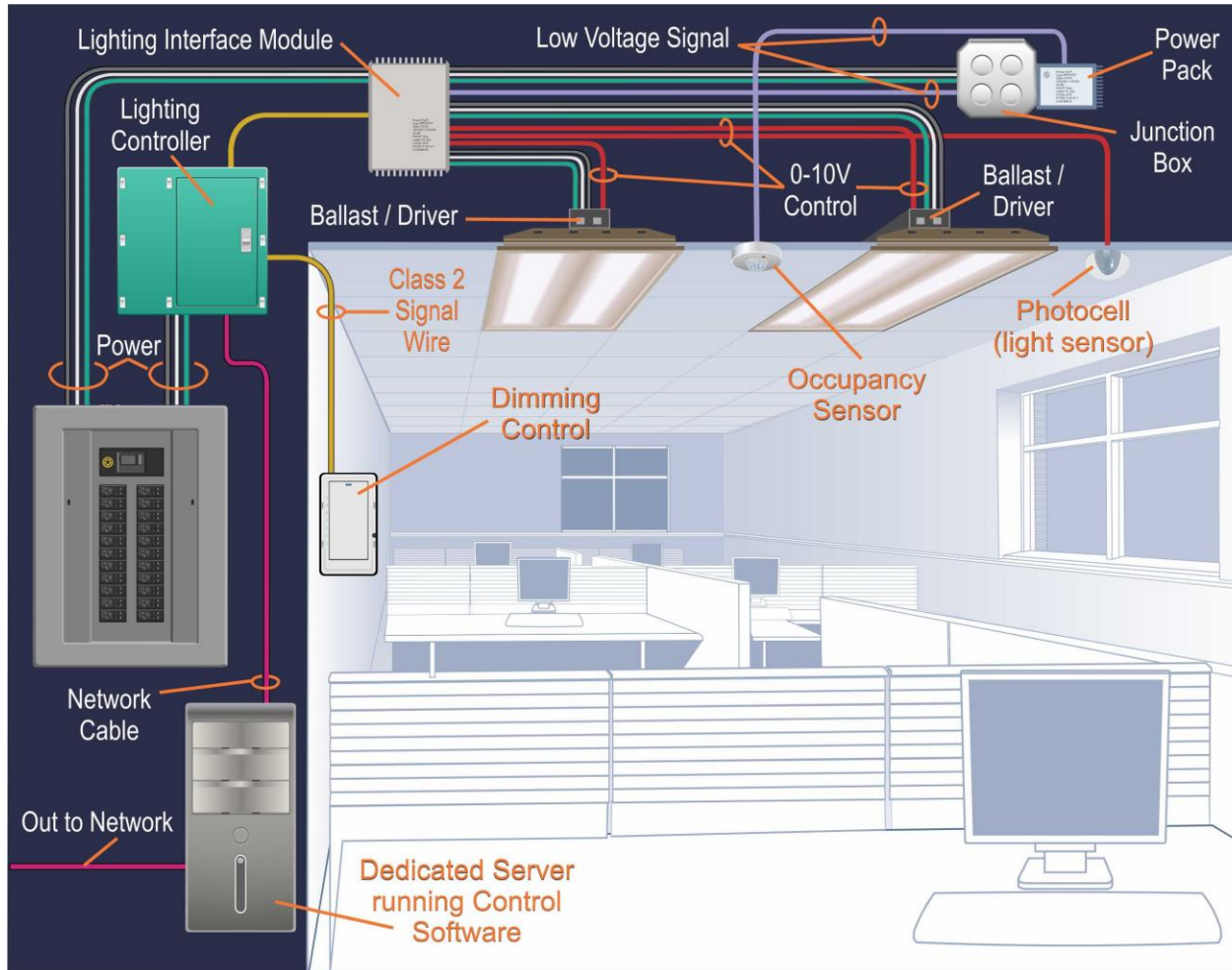
- High voltage device
- High voltage infrastructure
- Requires local ballast
- Unreliable and insecure communications
- Zone-level sensing

LED



- Low voltage device
- Low voltage infrastructure
- Remote power conversion
- Full duplex communications
- Fine-grain sensing

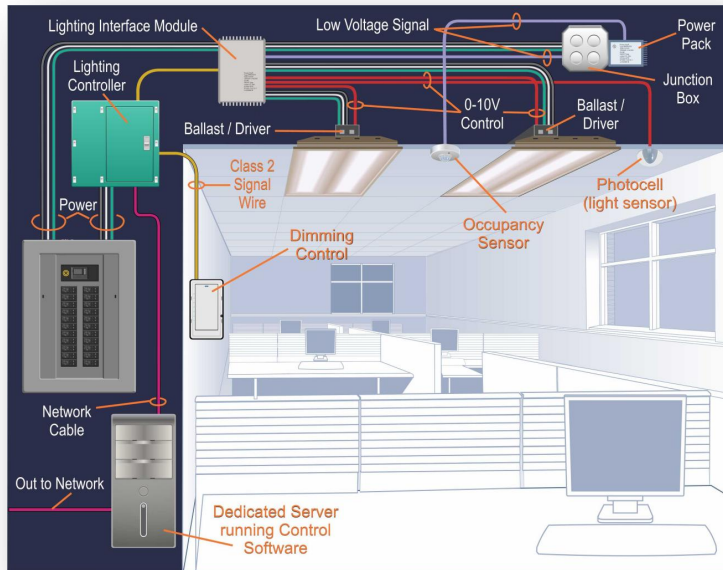
# Traditional Lighting and Controls Wiring



- 3 separate systems for power, control and measurement
- Significant design time and field set up
- Limited control – zone/per-room
- Limited Intelligence
- Not easily expanded, upgraded or re-provisioned

# Traditional vs. New Lighting Controls Technology

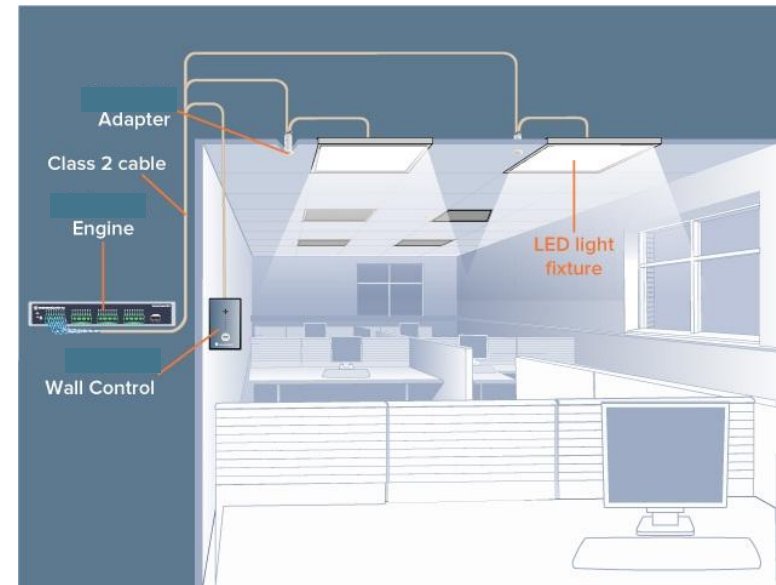
## Traditional Lighting Controls



OLD Technology

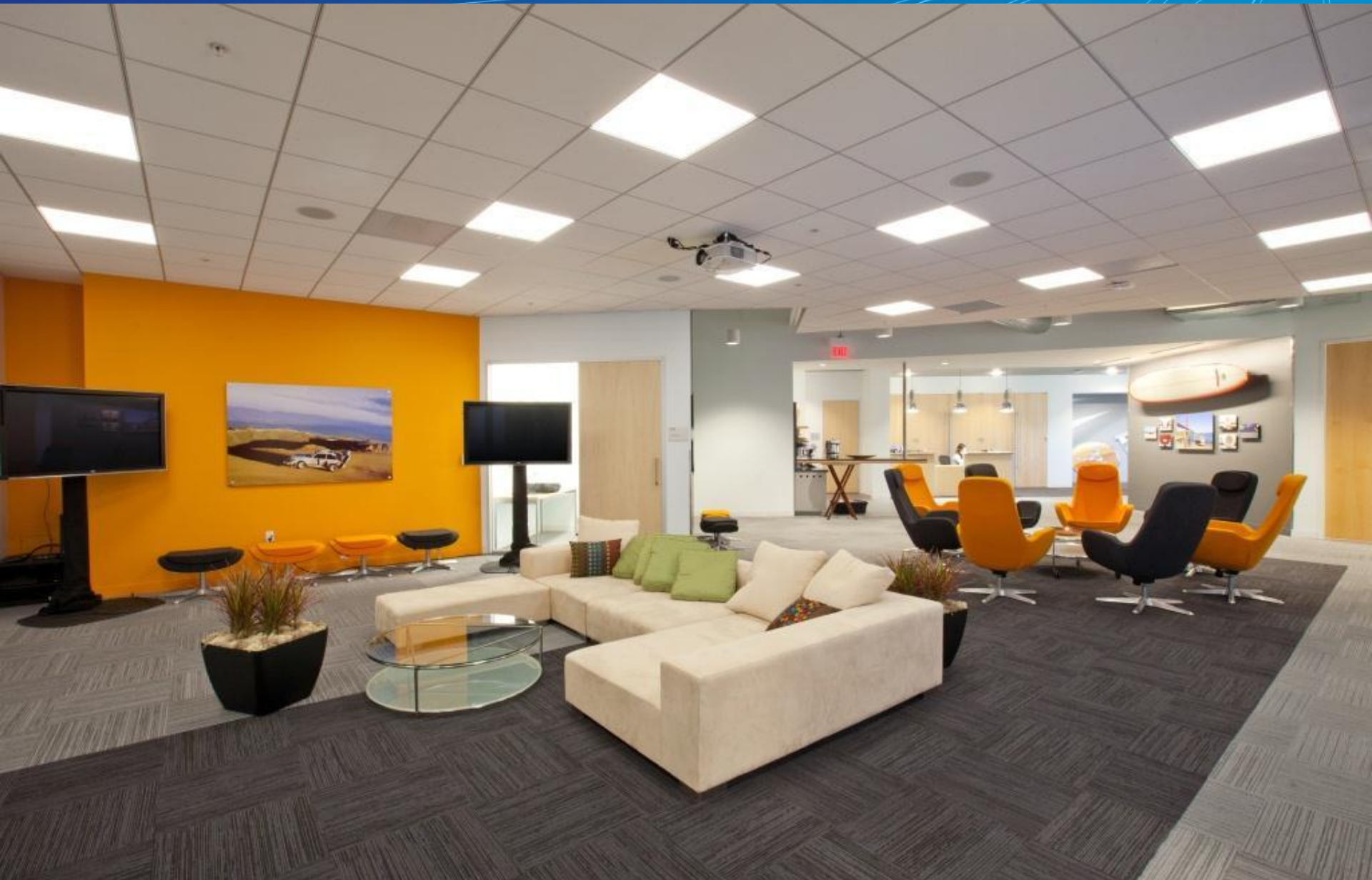
VS.

## Low Voltage, Networked Lighting



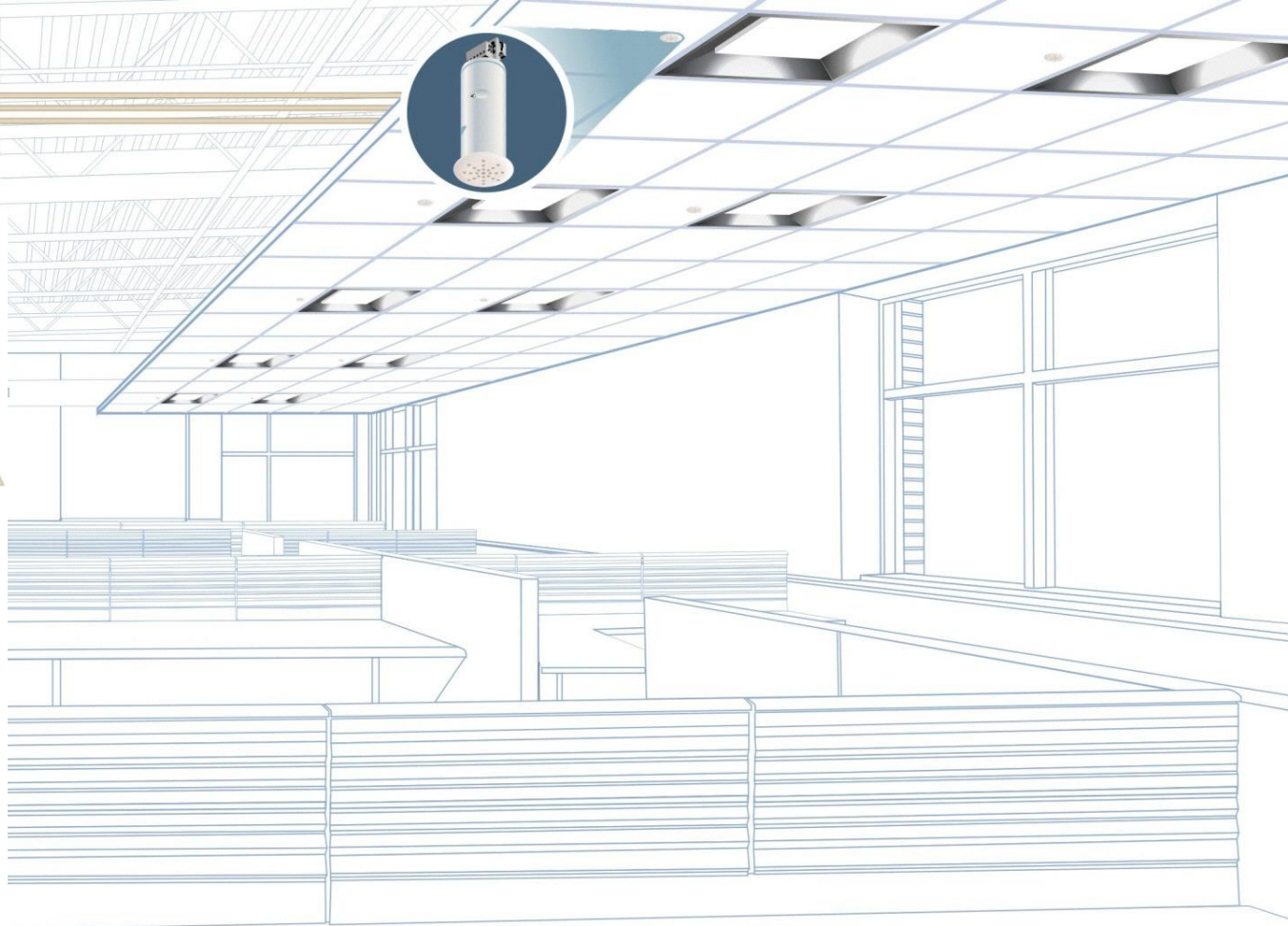
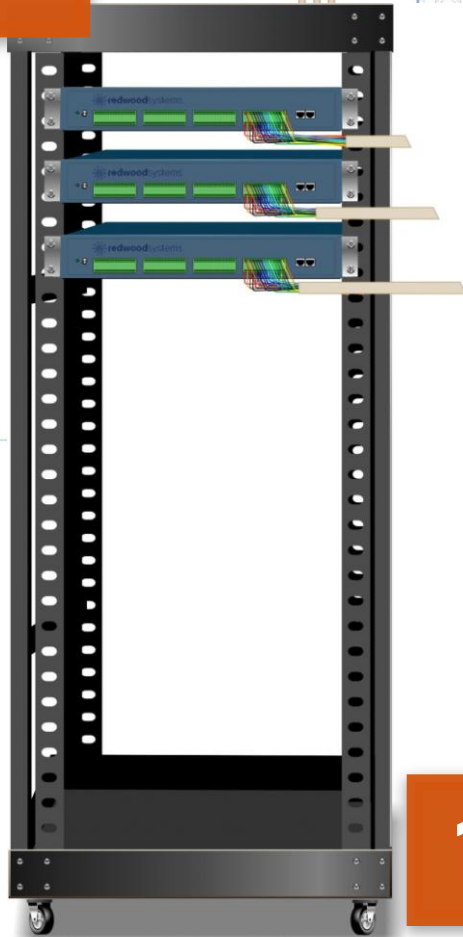
NEW Technology

# A Single Cost-Effective Platform to Power, Control and Measure Lighting



# Centralized AC-DC Power Conversion

1

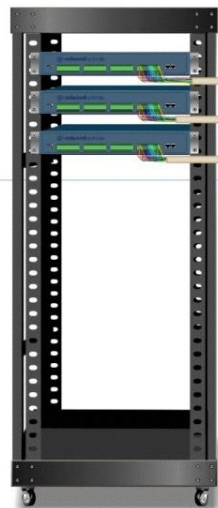


1

- Centralized power conversion directly powers, controls and communicates with fixtures
- Drives LED more efficiently
- Power infrastructure moves to low voltage cable = eliminates conduit, relays, etc.



# DC Enables Digital Network of High-Density Sensors

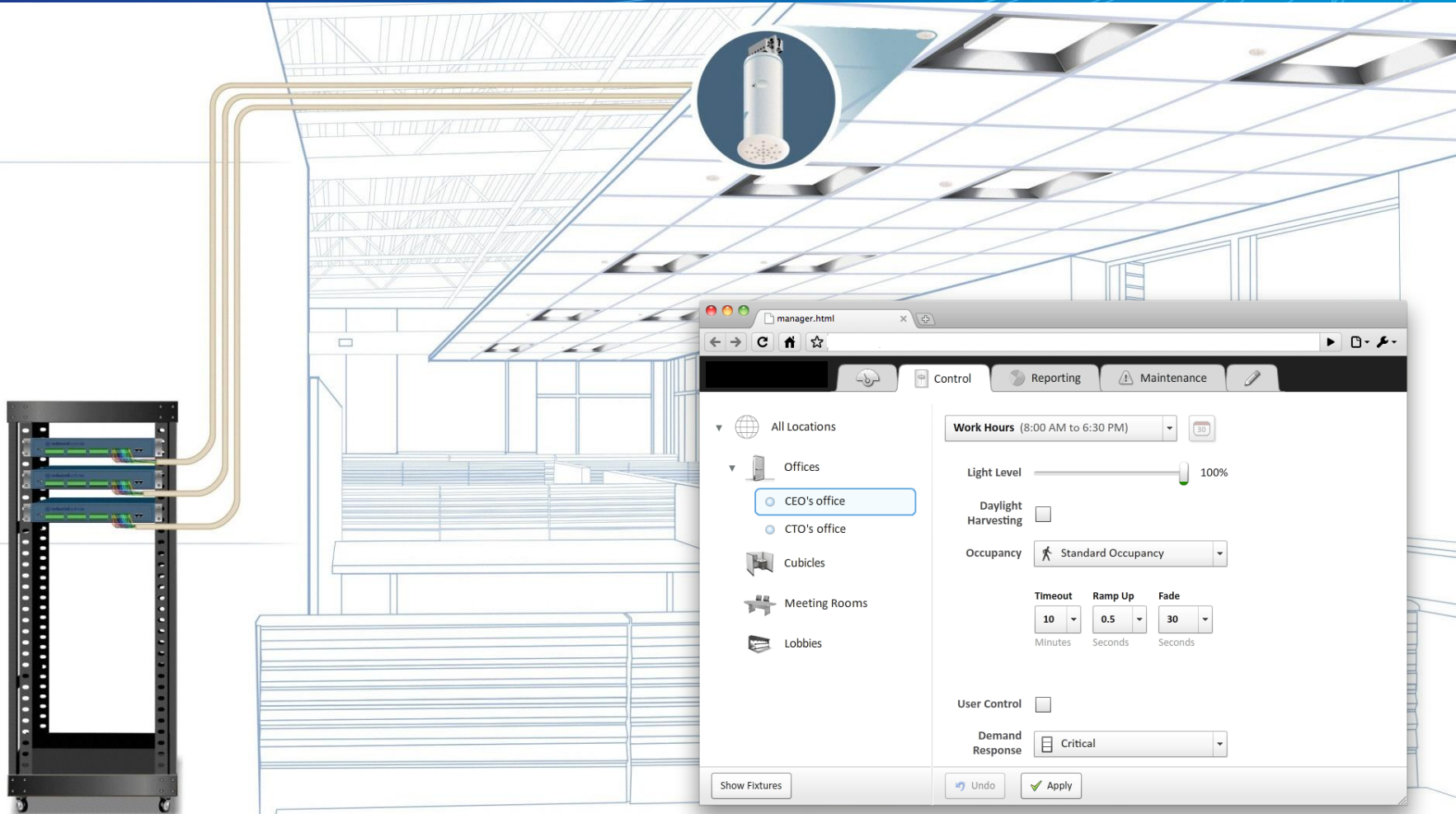


2

2

- Per fixture power, control and communication over single wire
- Sensors at each fixture detect light, occupancy, temperature and power levels
- Profiles fixture and upgradeable
- Enables smart building applications

# Platform Enables Scale, Reliability and New Applications



3

- Platform includes HW, Sensors, Networking
- Platform driven by software - apps, APIs
- Flexible, scalable, reliable, secure, open

# Key Parts of a Low Voltage Control System

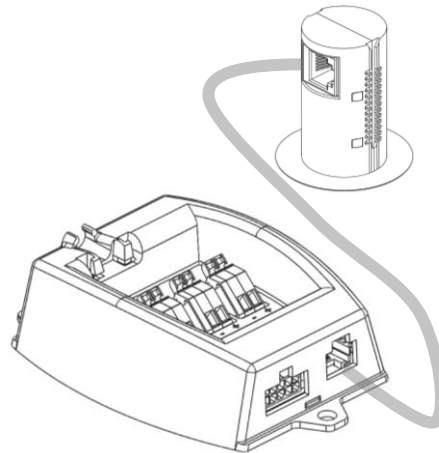
## Engine



120 -  
277VAC

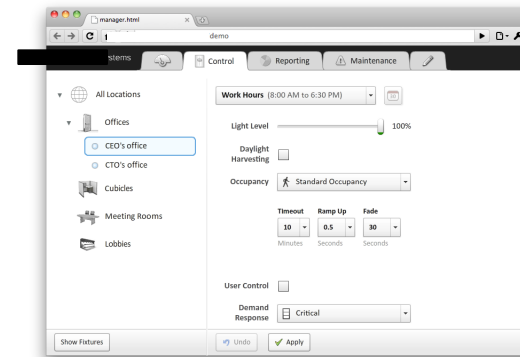
- Powers / controls 2000-3000 sq ft of lighting
- Power, control and data to each fixture

## Gateway & Sensor



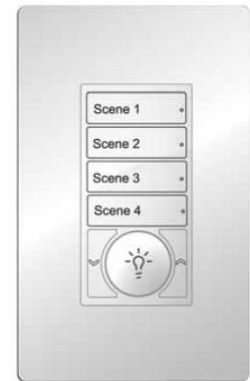
- Uses 18AWG or category cable
- Sensors for motion, occupancy, light, temperature

## Control Software



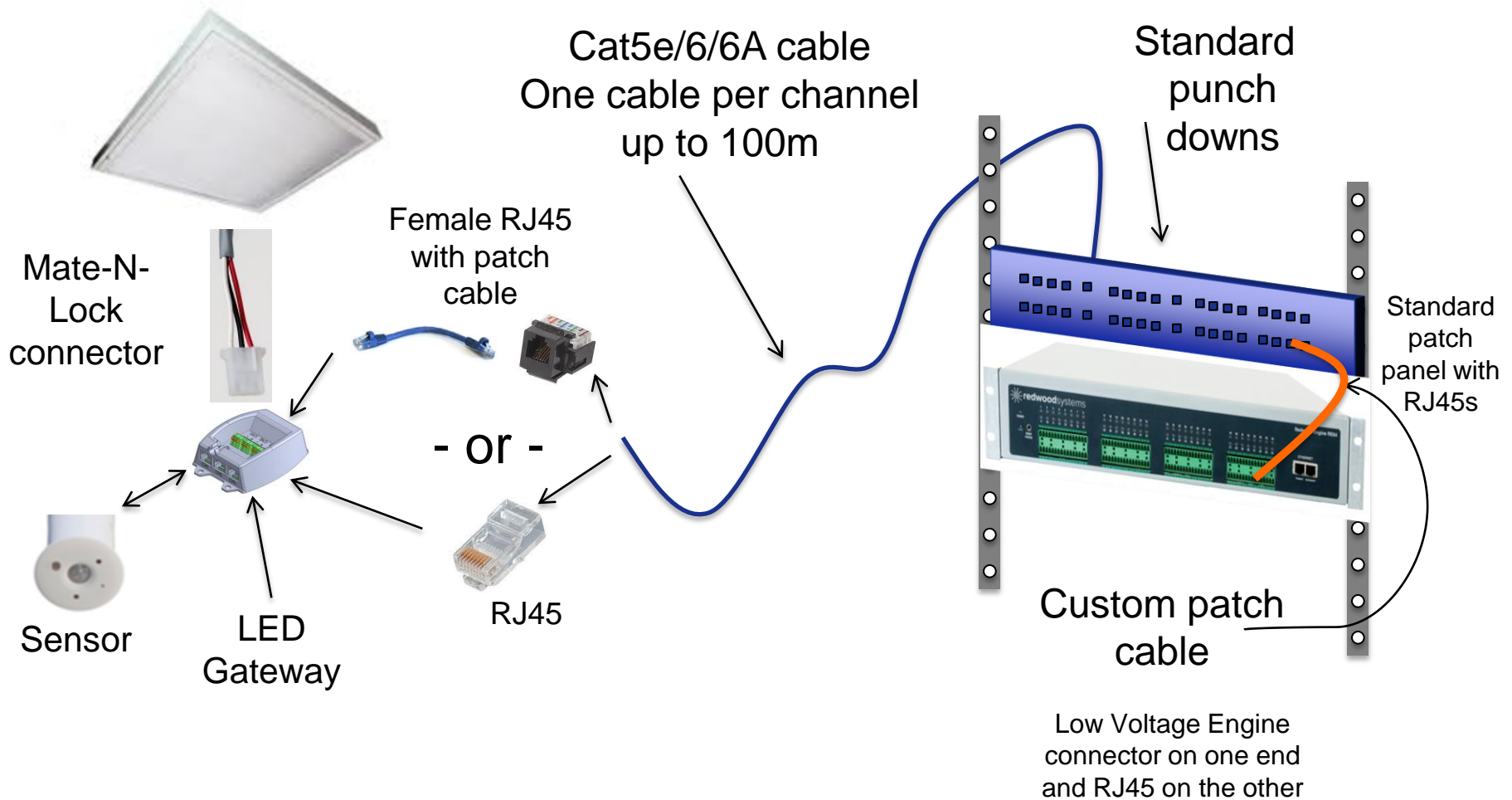
- Web-based monitoring and reporting platform
- Auto-commissioning
- Real-time energy metering and reporting

## Dimmer



- Dimming, on/off control
- Scene selection capabilities
- Sensors for occupancy, light-level, temperature

# Category Compliant Connection Scheme



# Opportunities for Smart Controls & Building Performance

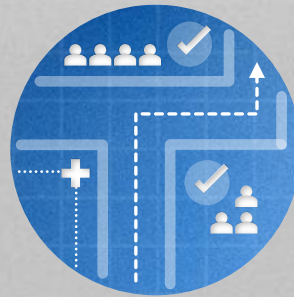
## MINIMIZED OPERATIONAL COSTS

Energy Efficiency  
Maintenance  
Other Building  
Services



## OPTIMIZED FACILITY RESOURCES

Space  
Utilization  
Traffic patterns  
Re-Provisioning

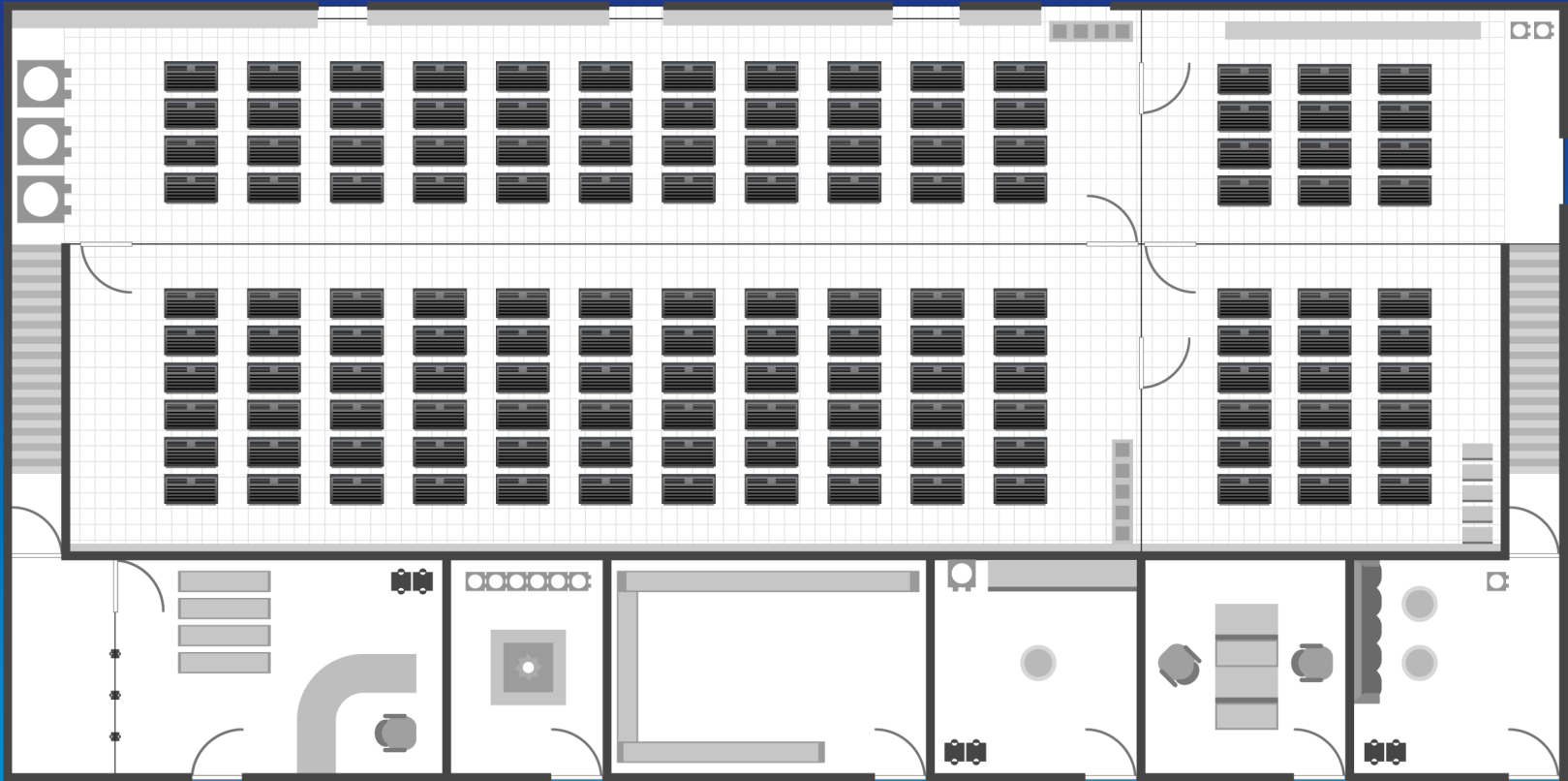


## ENHANCED PEOPLE PRODUCTIVITY

Comfort  
Control  
Ability to do  
Best Work



**What can lighting do in a data center  
when you put it on a low voltage network?**



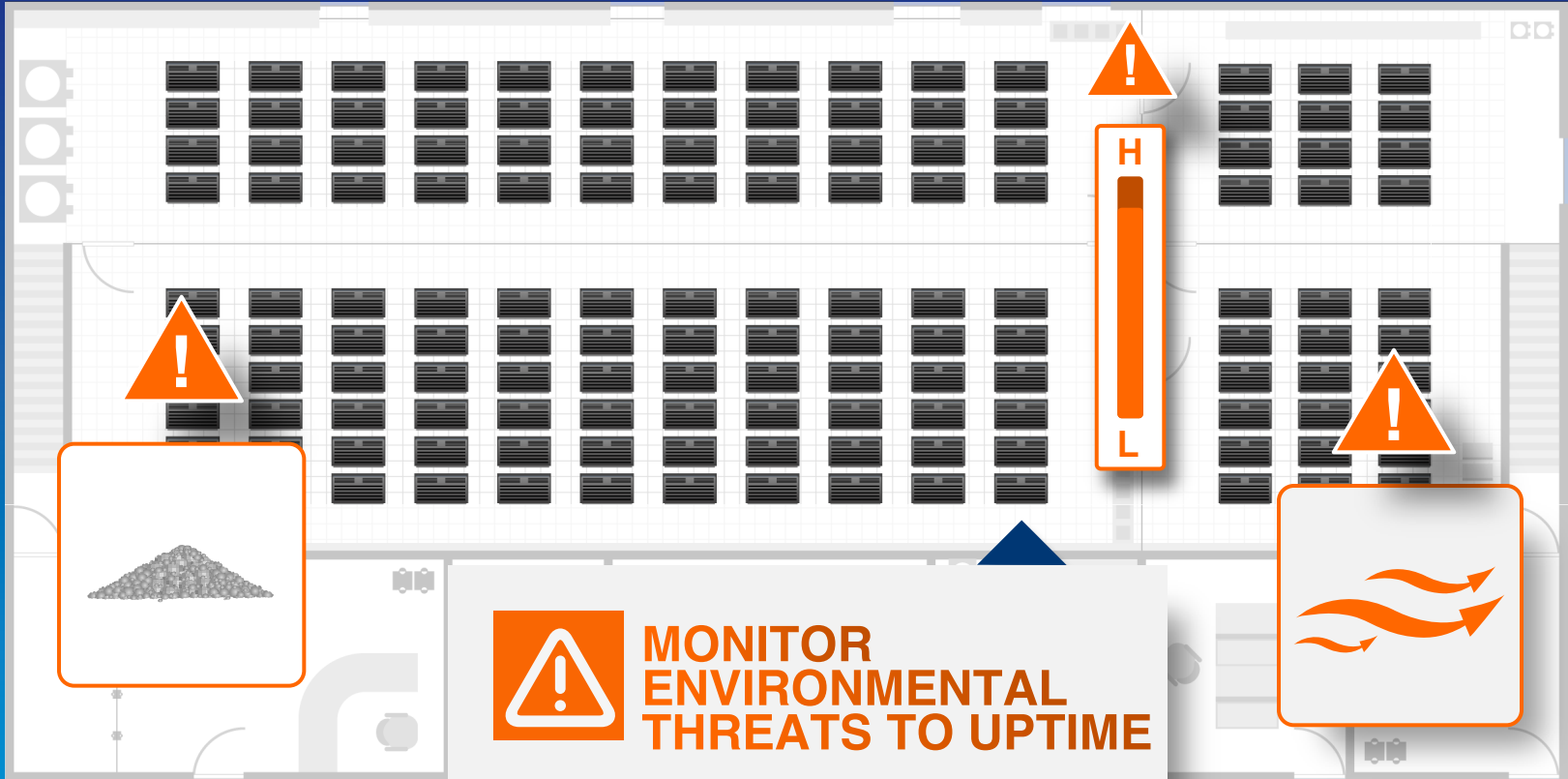


## CUT NON-SERVER ENERGY USAGE

Reduce lighting and HVAC load with fine-grain LED control; improve PUE; contribute LEED points

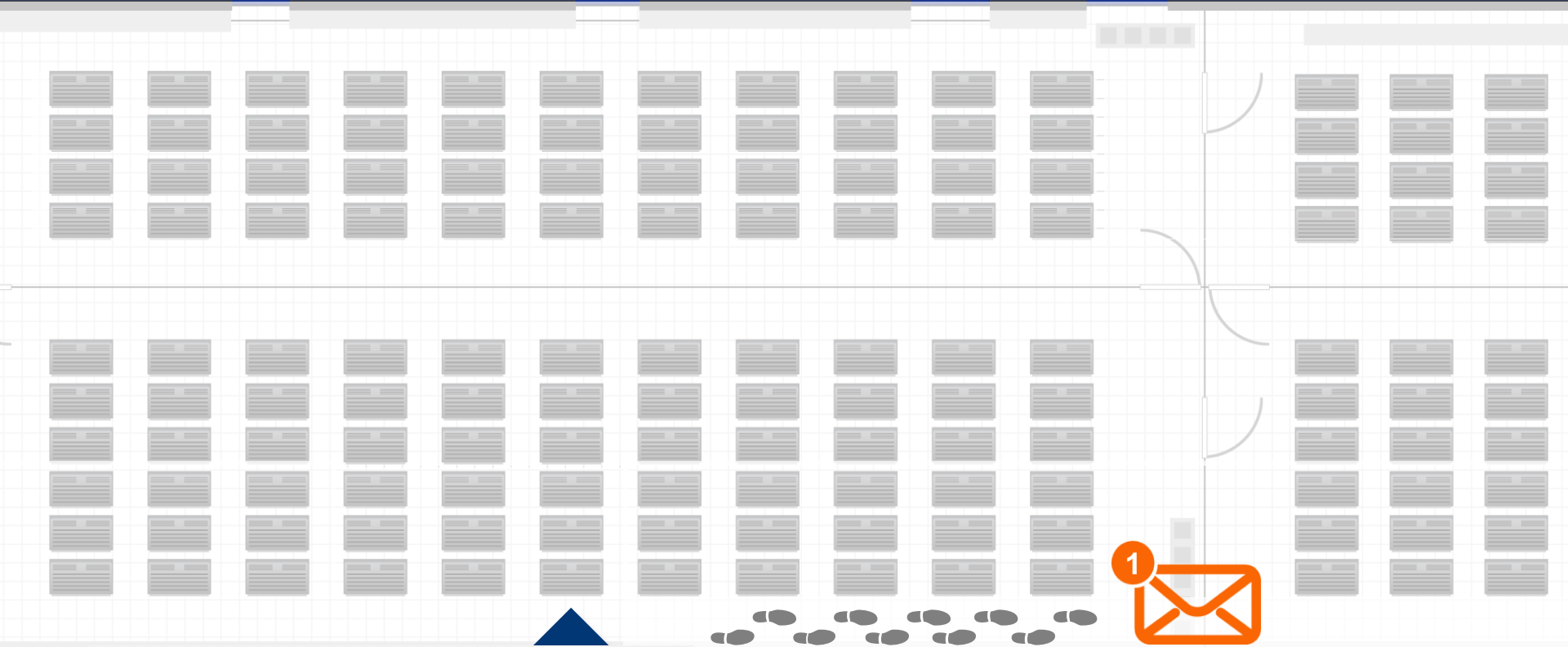






## MONITOR ENVIRONMENTAL THREATS TO UPTIME

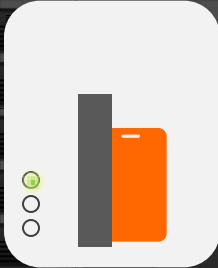
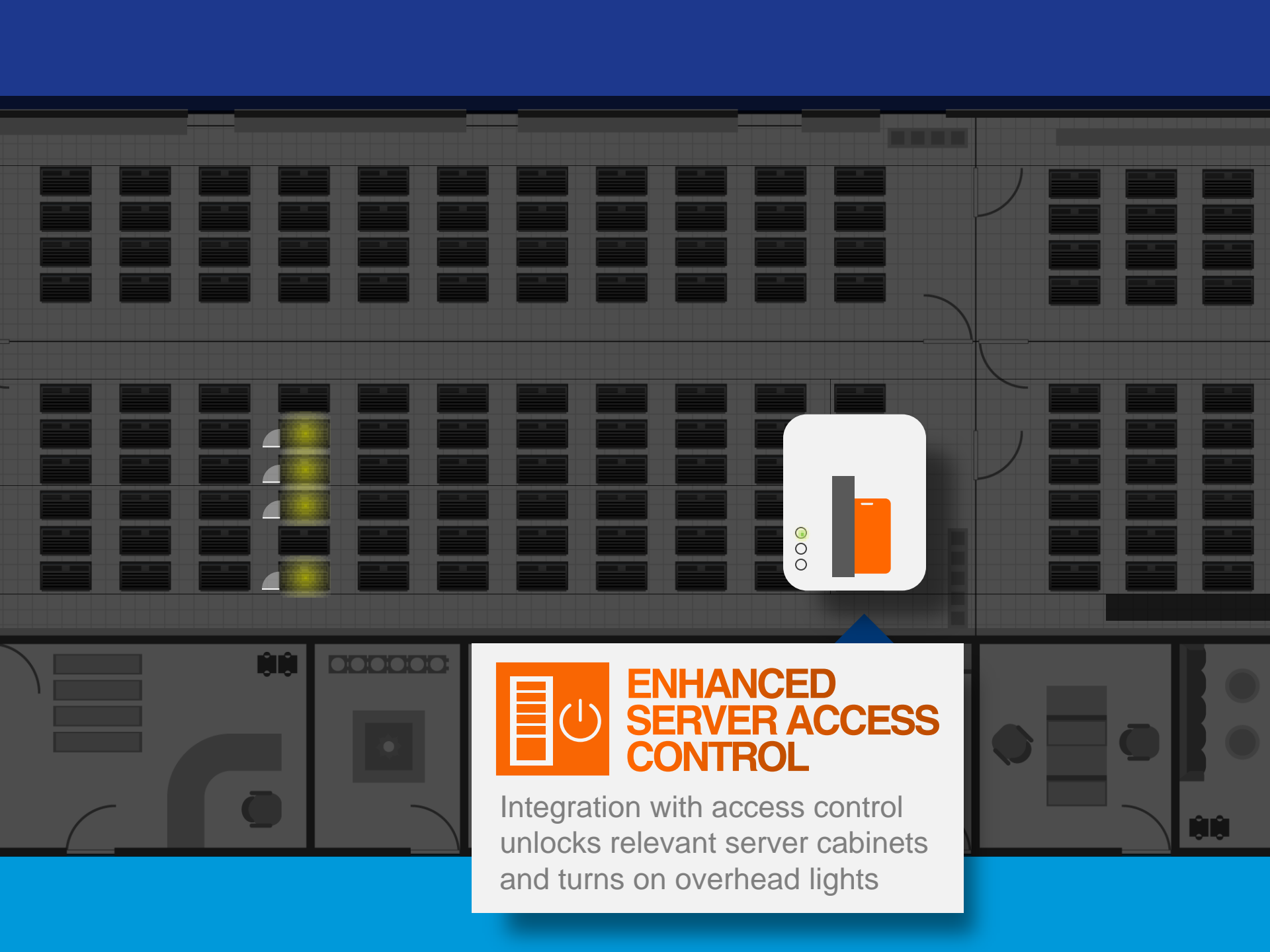
One system monitors potential disruptions based on temperature, air flow, humidity, particulates



## SECURITY ALERTS

Know precise location where and when people are moving through the data center





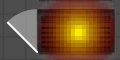
## ENHANCED SERVER ACCESS CONTROL

Integration with access control  
unlocks relevant server cabinets  
and turns on overhead lights



## VISUAL ALERTS

Flash lights over open doors to prevent temperature change and security breach

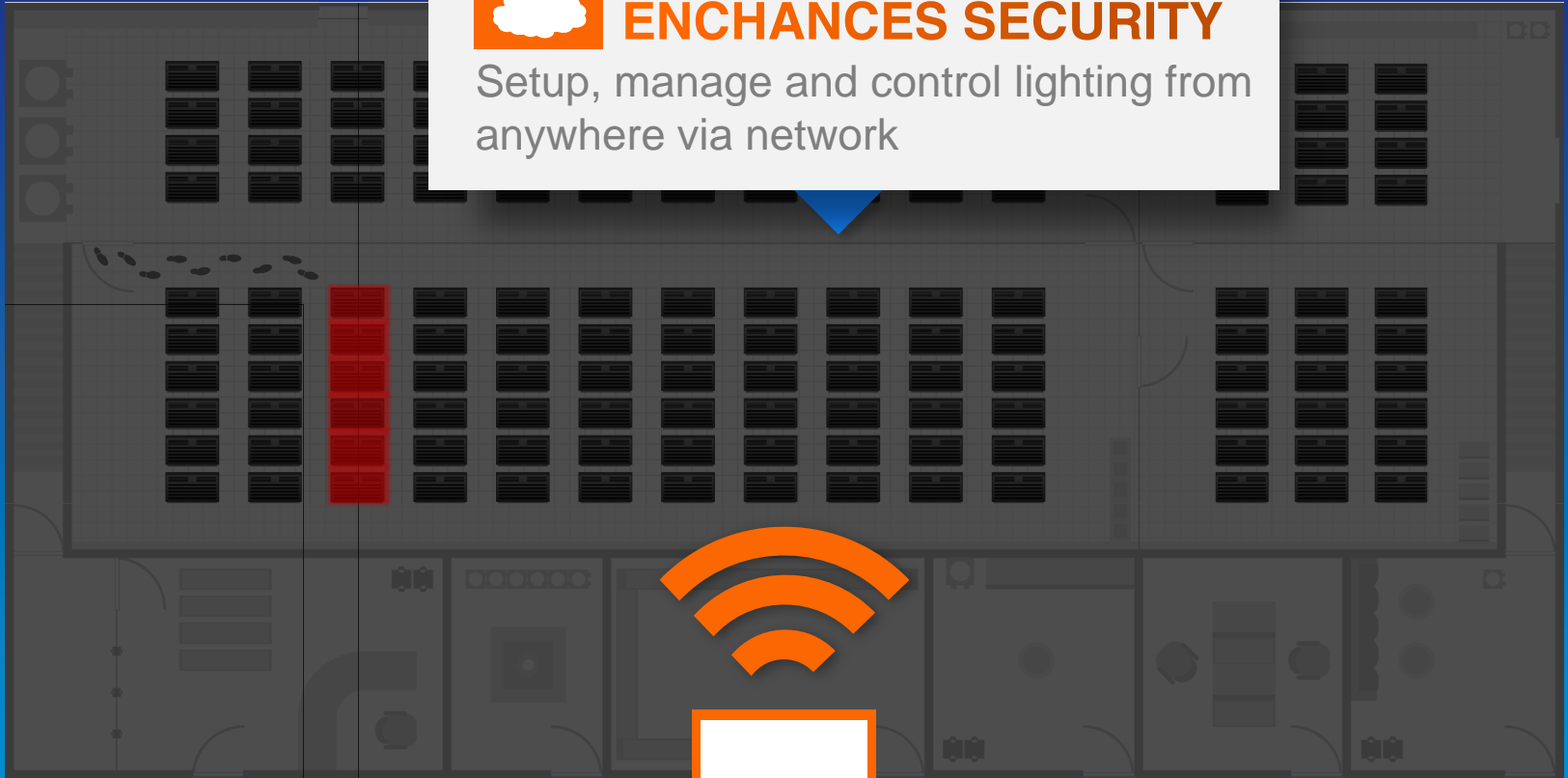




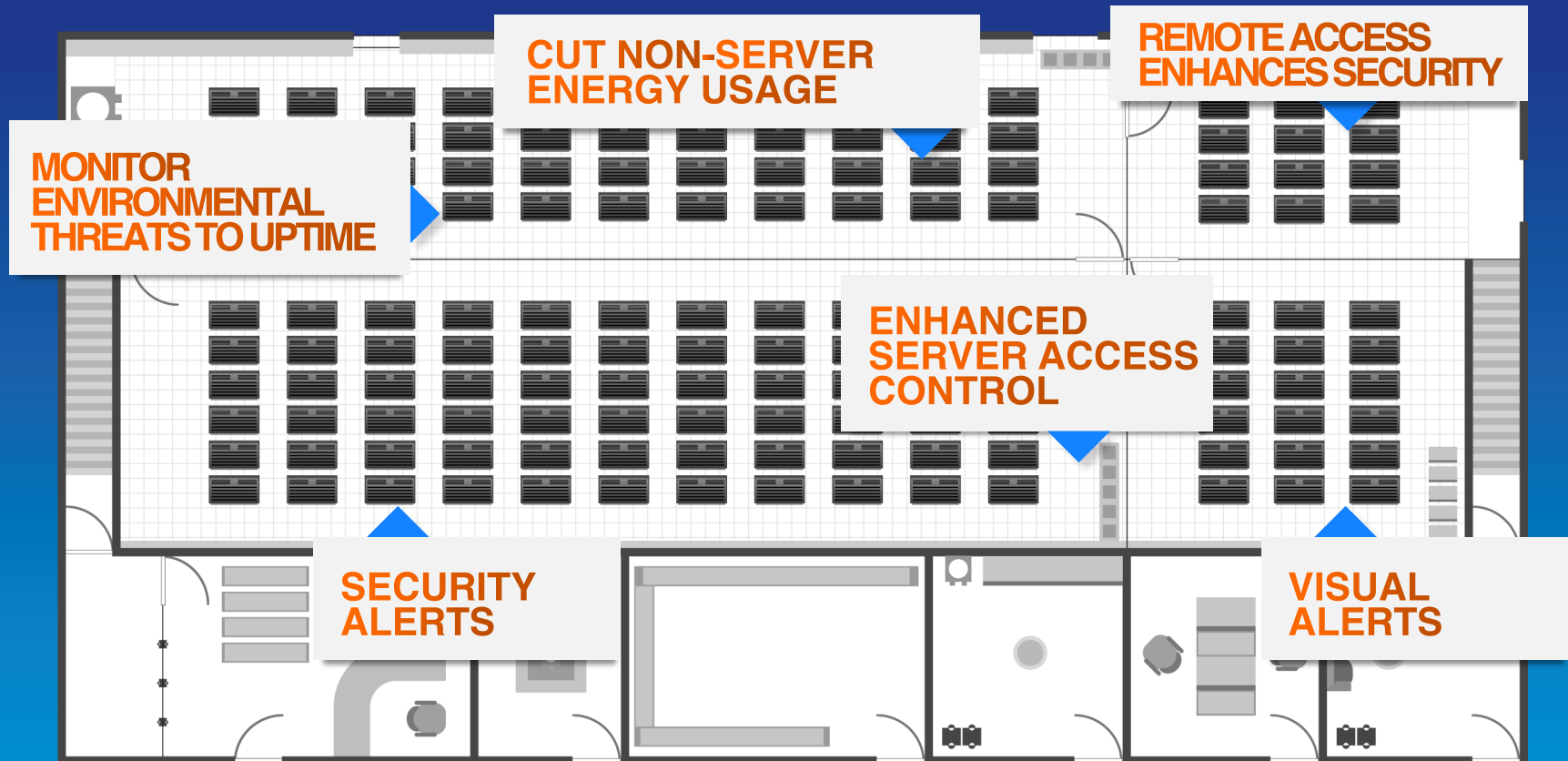


## REMOTE ACCESS ENCHANCES SECURITY

Setup, manage and control lighting from  
anywhere via network



# The Power of Low-Voltage Lighting



# ANSI/TIA-942 and Energy Efficient Low Voltage Lighting in Data Centers

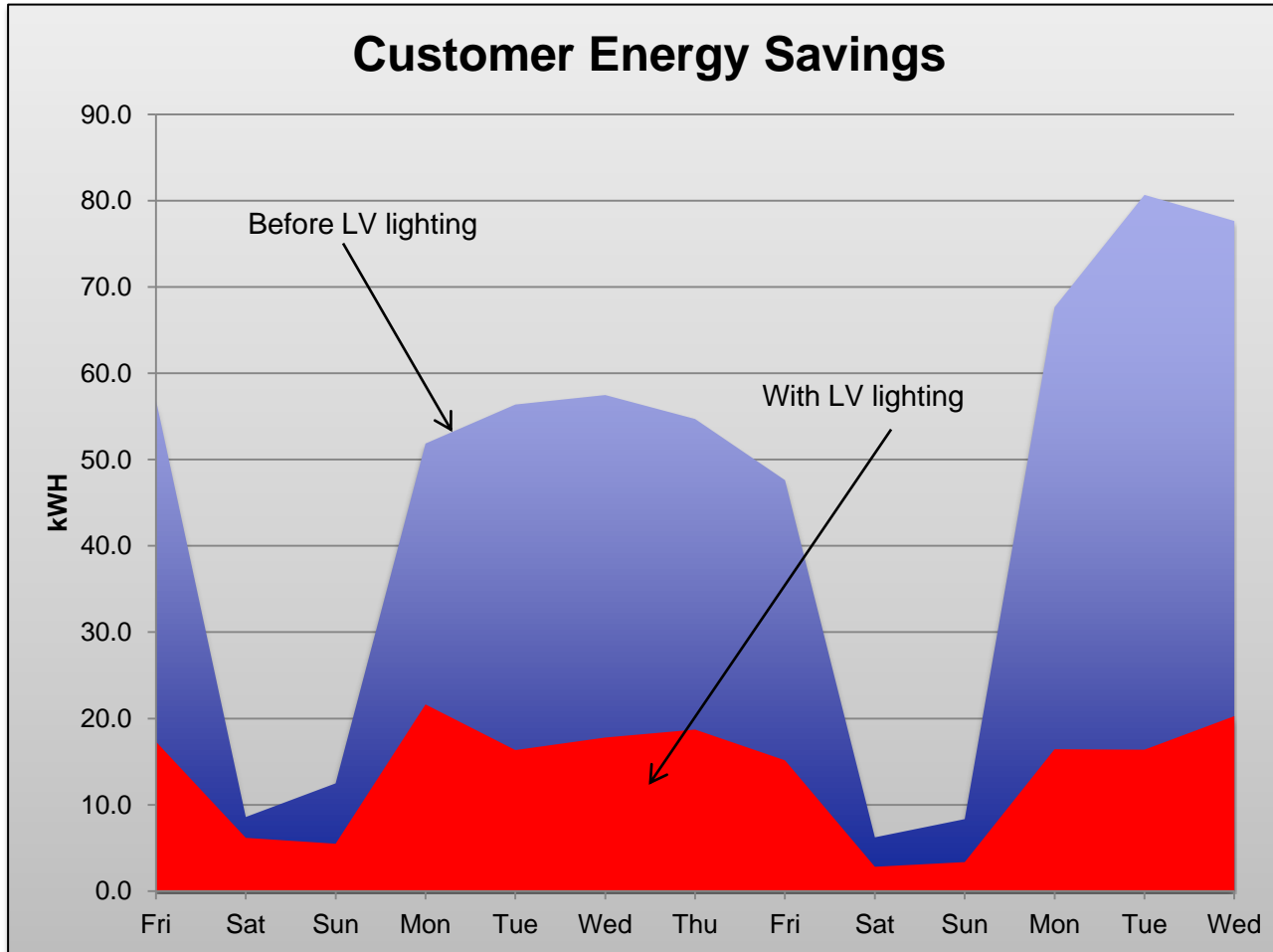
*TIA is leading the charge in developing cabling standards to improve energy efficiency in data centers and adopted content that includes energy efficient lighting in its next revision to this Standard (942-A).*





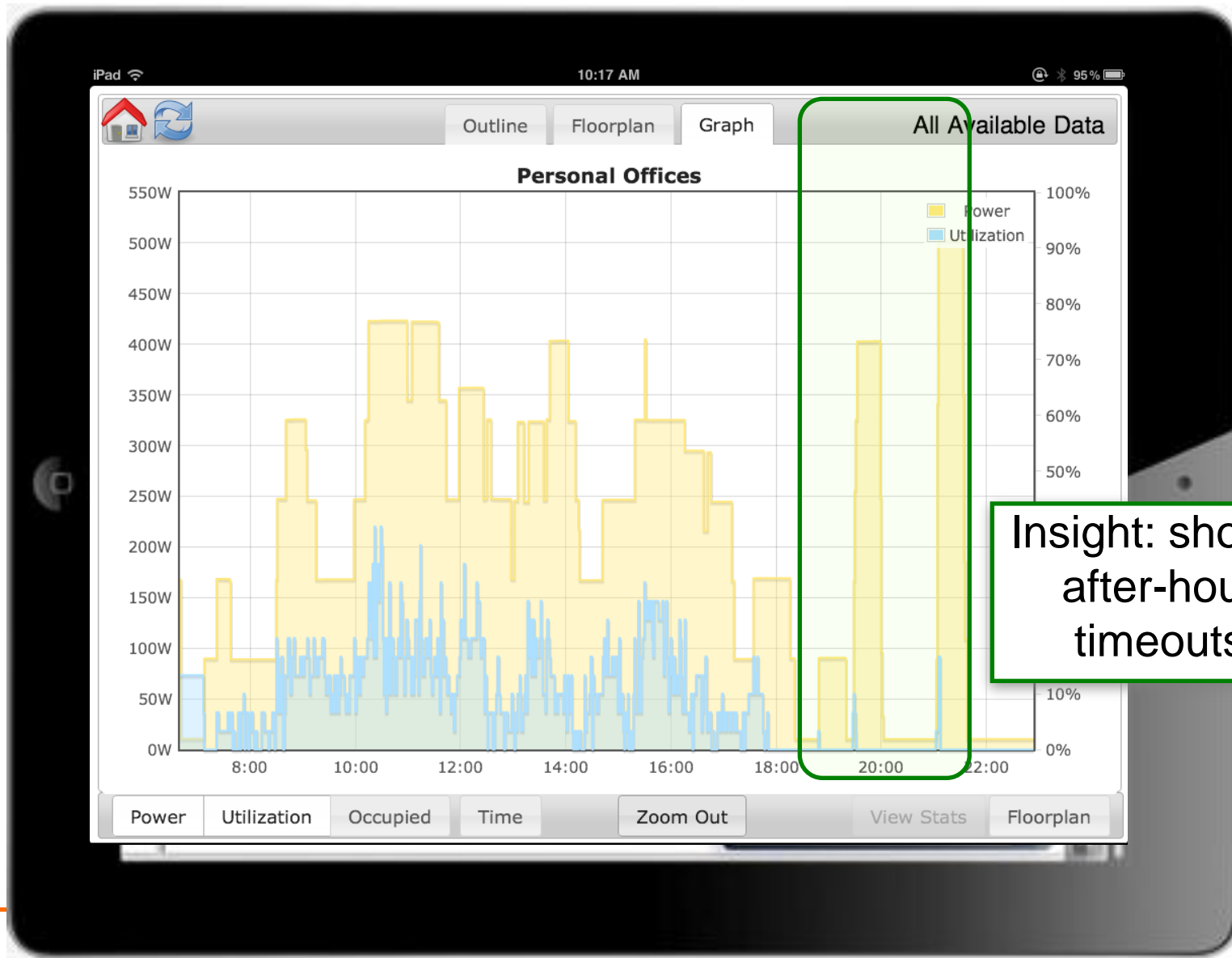
# Fortune Global 500 Using Low Voltage Lighting

## Customer Energy Savings

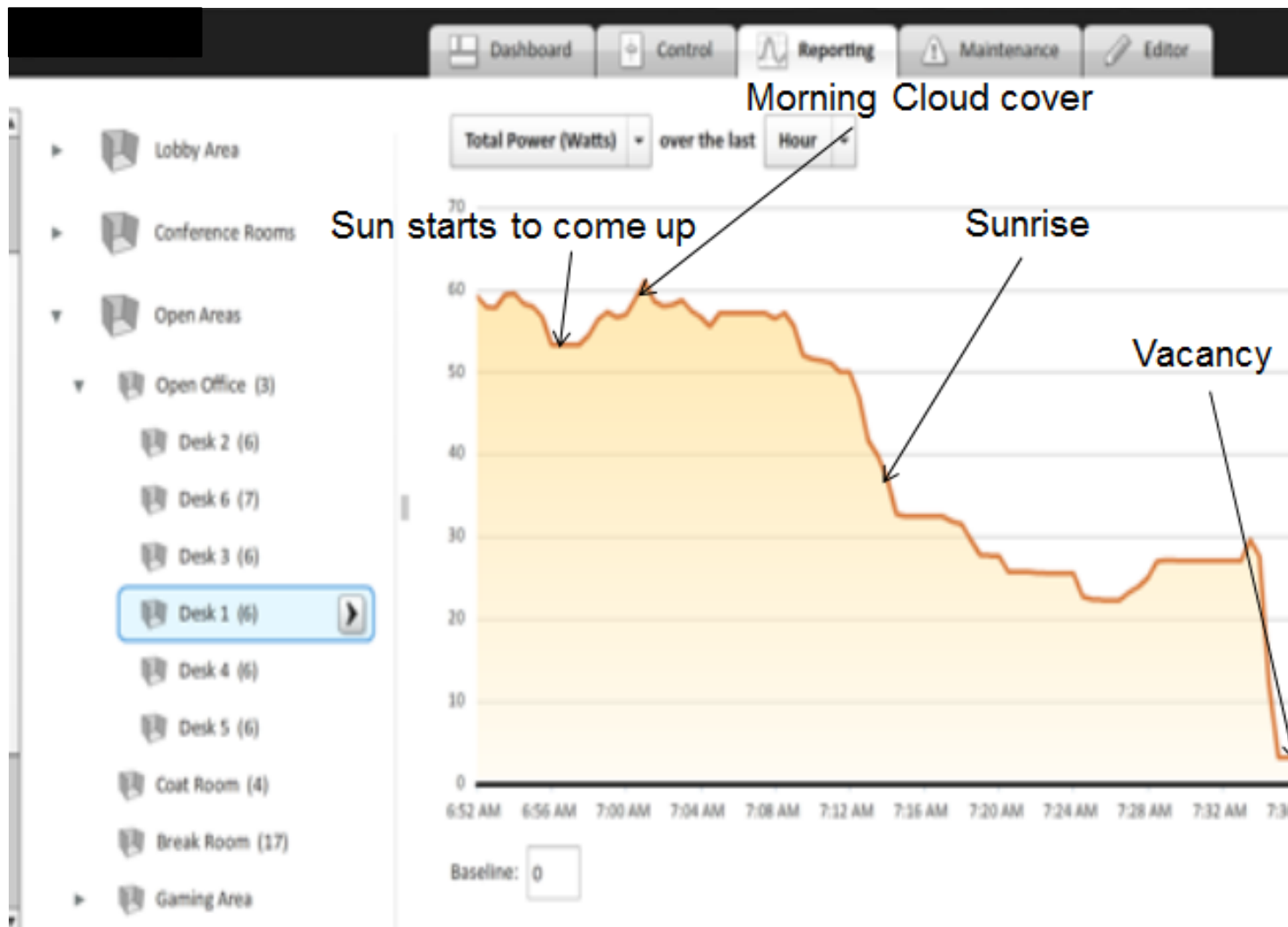


- ~75% energy savings overall
- Most energy saved during peak building usage
- More aggressive timeout policies, follow me lighting, 85% light levels

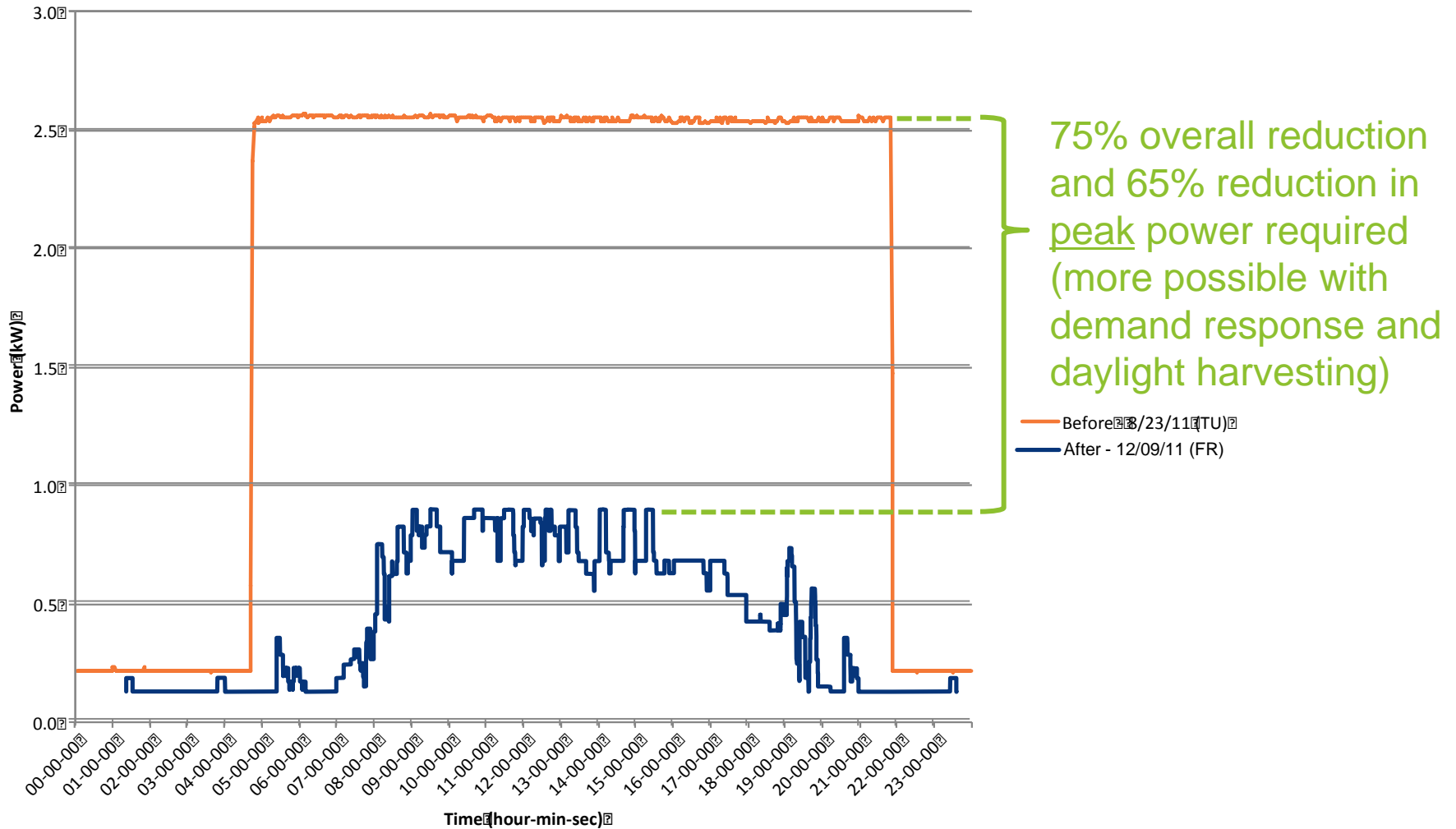
# Energy Savings – Occupancy Based



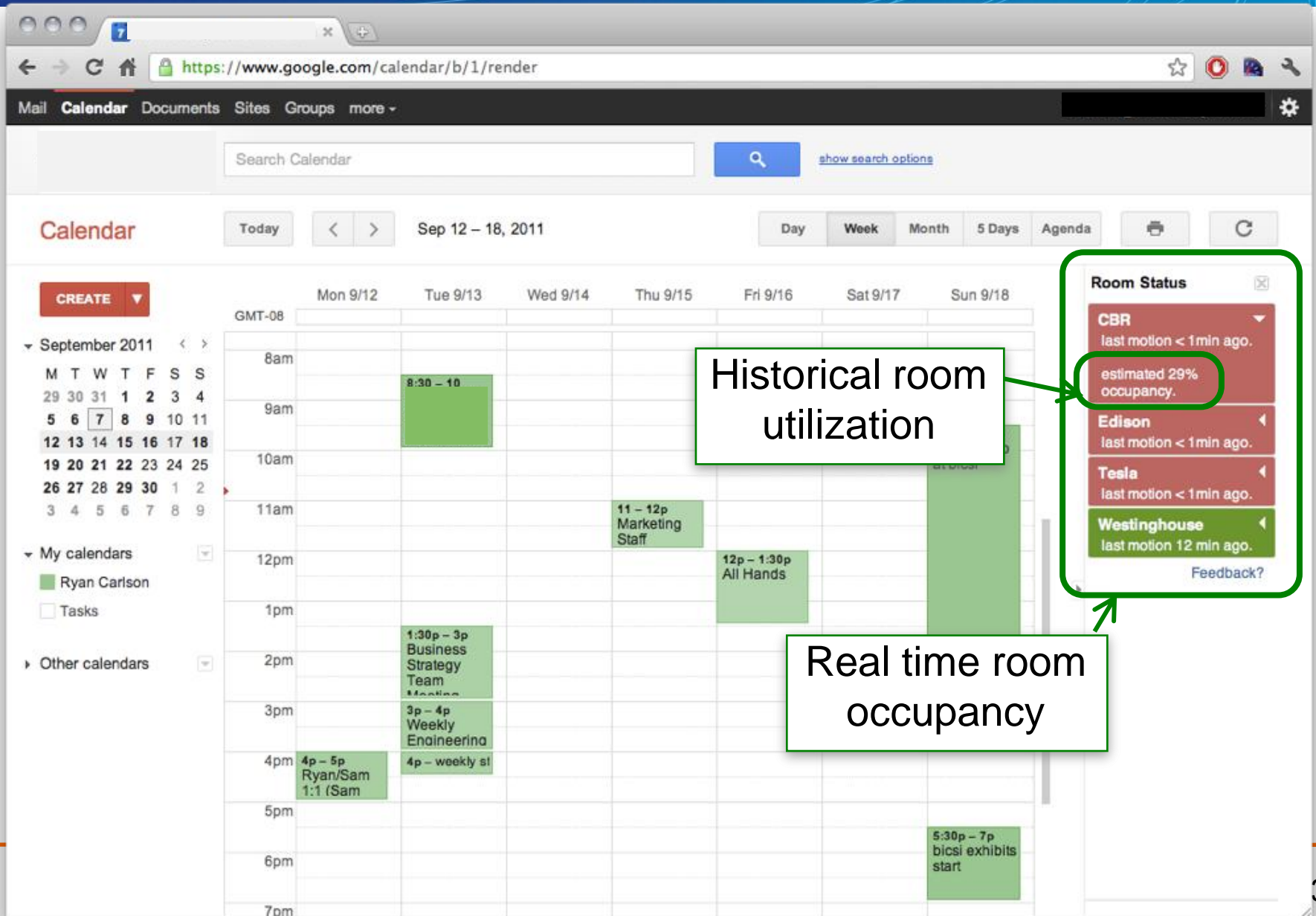
# Energy Savings - Daylight Harvesting



# Fortune Global 500 Using Low Voltage Lighting



# Conference Room Utilization



# Low Voltage Applications



## Data Centers

- Reducing non-server energy usage
- Protect uptime from environmental threats
- Match light levels to exact space/time/technician needs
- Full remote Internet management to the fixture level with networking/web standards support



## Commercial Buildings & Offices

- Flexible Scheduling - On/off time by fixture, room, floor, building, time of day, automatic DST adjustment
- Advanced Occupancy Sensing – many sensors enables follow-me lighting policies, partial room dimming, advanced daylight harvesting, and conference room utilization, security alerts
- Demand charge and peak time pricing avoidance – save money and energy with priority based lighting policies

# Low Voltage Applications



## Schools & Classrooms

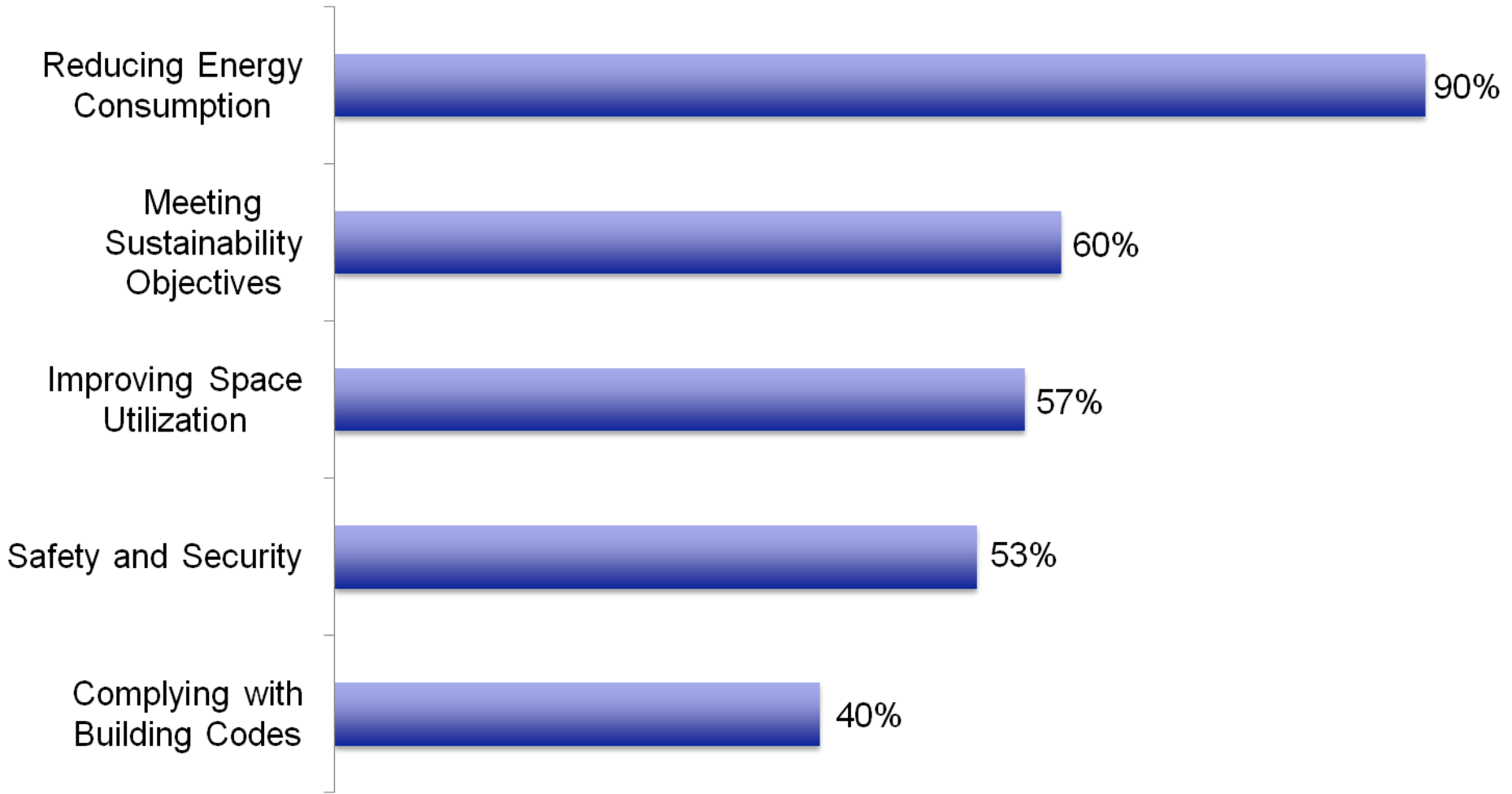
- Build and design rich learning environments with highly customized lighting policies
- Reduces energy and maintenance operating expenses
- Accelerates LEED and CHPS projects & meets all Title 24 standard requirements
- Life safety support via sensor grid that measures “presence” during emergency



## Retail

- Dimming with 65,000 smooth increments of light levels
- Create dynamic and catered light spaces with full schedule and per light full range control
- Use full and comprehensive sensor knowledge to optimize space utilization, where and how long people are staying and moving through spaces

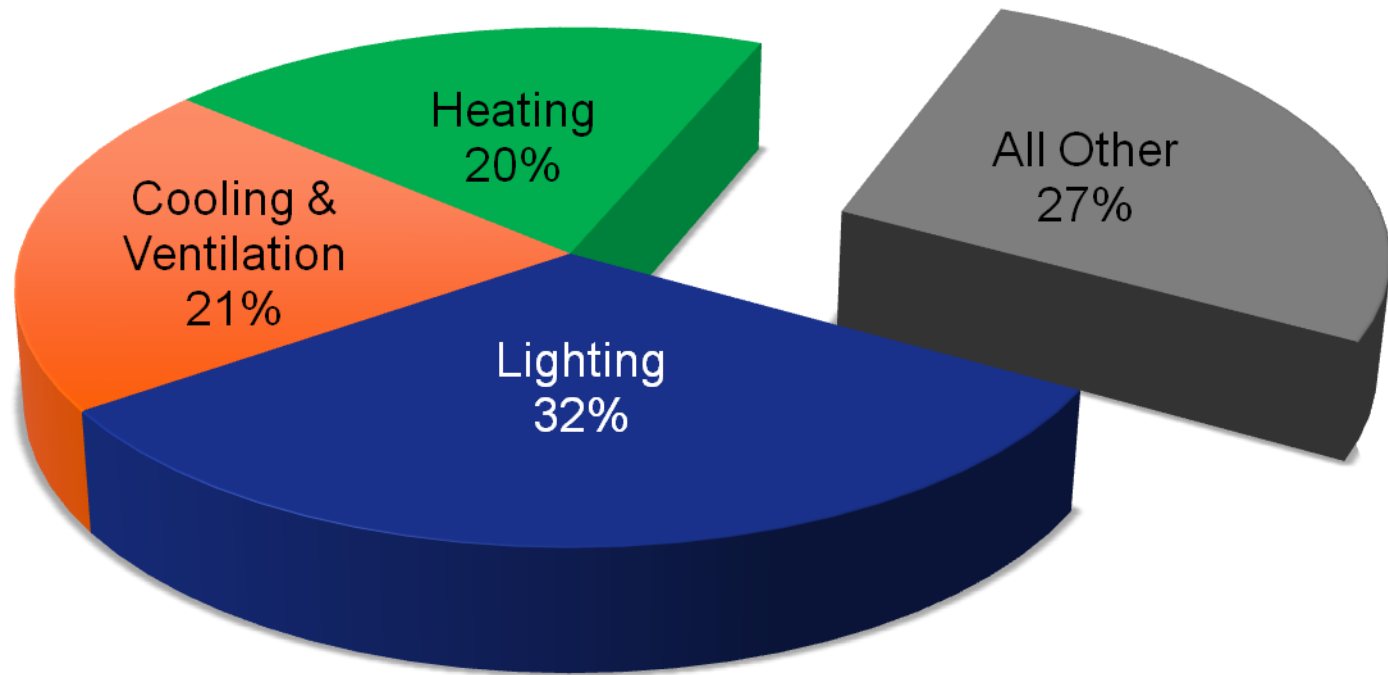
# Key Challenges Facing Facility Professionals



Source: Today's Facility Manager 12/11

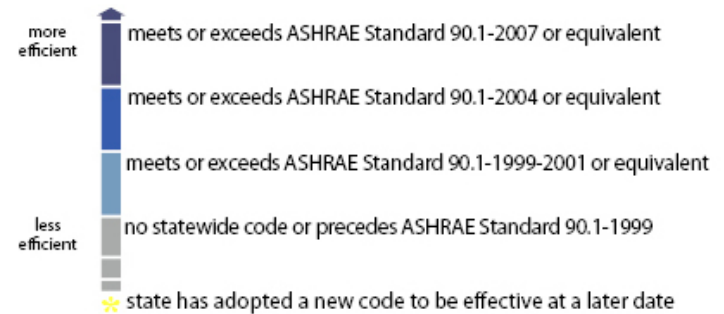
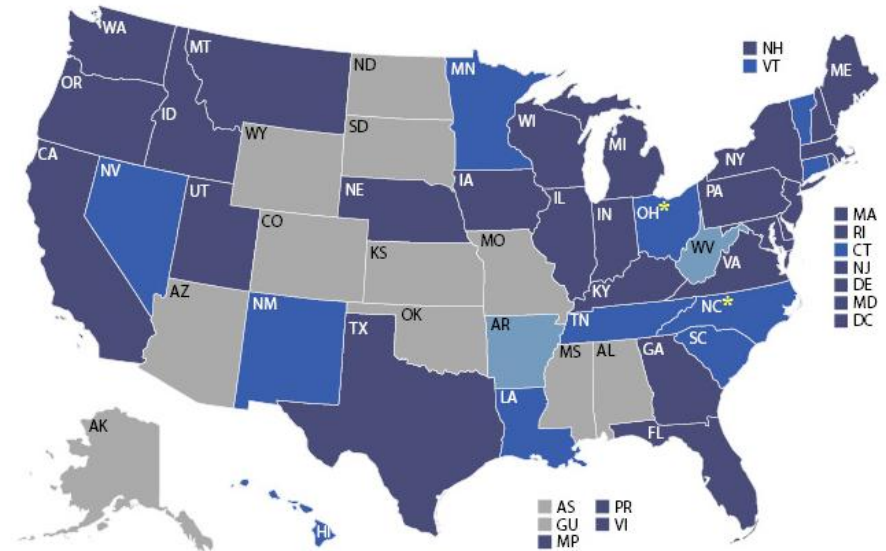


# >70% of Energy Use Can be Impacted by Low Voltage Lighting System



# Energy Efficiency in Building Codes Gaining Momentum

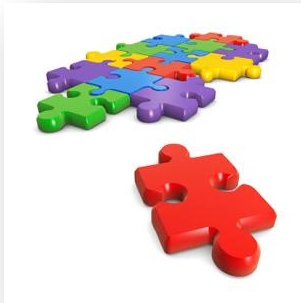
- ASHRAE code req's accelerating
- Defines minimum energy performance for building envelope, HVAC, power distribution, lighting, and water heating
- Requiring measurement and verification



# Market Forces Driving New Facility Requirements



Consolidation – do more with less space



Versatility – being able to quickly re-purpose spaces as business needs change



21% increase in productivity in well-designed working environments.”<sup>(1)</sup>

# Potential LEED Credits

Category / Credit	Possible Points
Optimize Energy Performance	1-19
Enhanced Commissioning	2
Measurement & Verification	3
Thermal Comfort—VERIFICATION	1
Innovation in Design	3
Controllability of Systems—Lighting	1
<b>Total Possible Credits</b>	<b>29</b>

Traditional lighting controls are limited to contributing points here

Lighting on a DC Grid can help address all these areas



# Key Takeaways

- Traditional lighting controls are not equipped to take full advantage of LEDs
- As the market continues to adopt LED technology it's time to look into new technologies developed specifically for LEDs
- Today's environment provides the Perfect Storm for intelligent building systems and smarter lighting due to:
  - Rising costs of energy and new energy codes
  - Corporate "green" and LEED building initiatives
  - Need for facility professionals to do more with less
- Low voltage lighting systems provide all the control and more relative to traditional systems, but also provide building intelligence tools that create additional value for building owners



# Final Remarks and Questions

**Thank you for your time!**

**QUESTIONS??**

**This concludes The American Institute  
of Architects Continuing Education  
Systems Program**

