THE ROAD TO LOW VOLTAGE DC POWERED BUILDINGS

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- Have your badge scanned at the door
- Attend 90% of this presentation
- Fill out the online evaluation for this session

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BUILDING CONSTRUCTION MARKET NEEDS

The need for **greater energy efficiency** will rapidly shape the built environment.

A need for **innovative, integrated building automation and wiring solutions** (Smart Buildings)

Building Technology Needs:

- New ways of interacting with the room/building functions – user experience UX/UI, e.g. **personalized user experiences**
- Devices that help **lower the energy consumption**
- Solutions that gather **data/insights** from room through Multifunctional Smart Sensors / Multipurpose smart sensor
- Artificial Intelligence and Machine Learning solutions based on user and room information

Source: ABB Smart Home/Building Challenge

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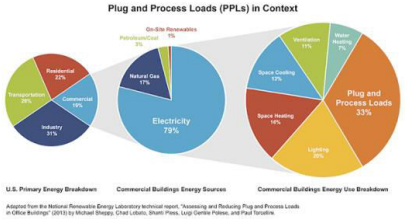

PPLs account for 33 percent of the total energy consumed by commercial buildings. Adapted from the National Renewable Energy Laboratory technical report, "Assessing and Reducing Plug and Process Loads in Office Buildings" (2013) by Michael Sheppy, Chad Lobato, Shanti Pless, Luigi Gentile Polese, and Paul Torcellini. Figure by Daniel Overbey.

PLUG LOADS:
The Largest Unaddressed Energy Problem in Buildings

- Number of Electronic Device Loads continues to accelerate
- Small loads dificult to measure with line voltage
- Outlet Control hard to integrate to user needs

More Importantly:

- All Devices have low cost **AC->DC conversion** which **generate heat** and are **vampire loads** when devices are off.

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ELECTRICAL vs ELECTRONIC:

THE SUBTLE DIFFERENCE

THE UNNOTICED - UNSPOKEN TRANSITION

THE SEARCH FOR ENERGY EFFICIENCY HAS EVOLVED BUILDING DEVICES:FROM ELECTRIC DEVICES TO ELECTRONIC DEVICES

BUILDING ELECTRICAL INFRASTRUCTURE HAS NOT CHANGED

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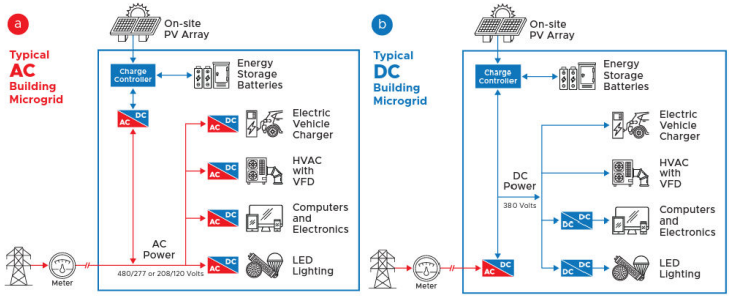
EFFICIENCY

ALTERNATING CURRENT VS DIRECT CURENT



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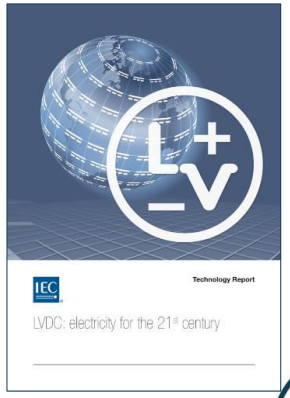
IEC REPORT:

LOW VOLTAGE DC FOR THE 21ST CENTURY

- IEC - International Electrotechnical Commission:
  - an international standards organization that prepares and publishes International Standards for all electrical, electronic and related technologies.
  - IEC standards cover a vast range of technologies from power generation, transmission and distribution to home appliances and office equipment, semiconductors, fiber optics, batteries, solar energy, nanotechnology and marine energy as well as many others.
- Report Summary:
  - electronics, devices we use have changed to operate with direct current (DC)
  - washing machines, refrigerators, fans, or heating/cooling systems have also adopted DC motors, allowing speed control and improved energy efficiency. Power generation has also moved to DC with the proliferation of renewable energy power systems using solar and wind energy
  - DC has also become the most used form of stored energy



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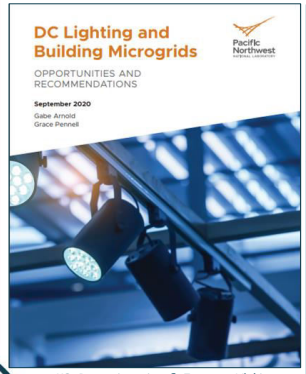
THE IT DC POWER TECHNOLOGY TRIFECTA



US Department of Energy Whitepaper

FMP (Fault Managed Power) New
2023 US NEC Article 726, Class IV Power

- Non-Hazardous Shock
- Eliminates Fire Risk
- High Voltage, Bulk Power Delivery
- Follows Low Voltage Installation means and methods
- Initially used to power Digital Antenna Systems

POE Std 802.3bt Newest

- Low Voltage Power delivery to 90W of IP/Ethernet data connected devices
- Facilitates easy adds, moves, changes with data and power consolidation
- X-POE extends to 120W for driverless lighting controls; lighting controlled directly by the switch

USB-C Std 3.2 Newest

- Developed to minimize footprint and consolidate data and power for Computer Connected Accessories
- Extended to Laptops, Phones, and Tables
- Further Extended for video displays
- 100W power delivery increasing to 240W

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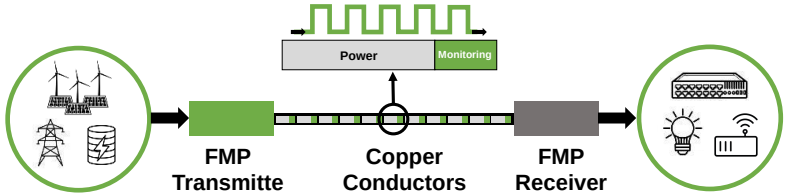
What is Fault Managed Power?

- Discrete “packets” of electricity, each checked for safe transfer from transmitter to receiver
- Packets contains a tiny amount of energy that is not harmful to people or building systems



Power Source
AC or DC analog electricity from the grid, battery plant or UPS

FMP Transmitter
Converts AC or DC to Digital Electricity

Copper Conductors
Low-Cost Class 4 Copper Cable

FMP Receiver
Converts Digital Electricity into DC Power

AC inversion output is also possible

Powered Devices
DC can power remote loads and devices such as network switches

Faults must be managed before Hazardous shock possible as established by IEC 60479-1 Shock curve; NEC 2023 - Article 726

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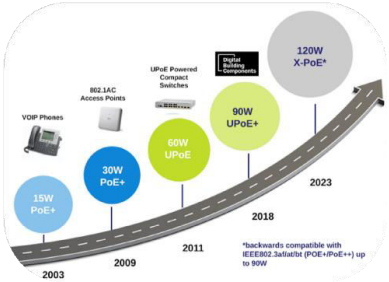

Power over Ethernet (PoE)

An IEEE network technology that converges low voltage power and resilient data communications capabilities. PoE network power has increased over time as more devices take advantage of its plug-and-play converged low voltage power and resilient data communications capabilities.

Extended – PoE (X-PoE)

A mechanism that incorporated lighting controls within the network switch turning Cat6 cabling into two 60W channels for lighting power & control.

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CASE STUDY

SINCLAIR HOTEL Technology V1.0

MARRIOTT AUTOGRAPH
FORT WORTH, TX

The Sinclair Hotel inspired and featured these products for the first time allowing for the first (low voltage) digital building DC Microgrid:

- Lithium Ion ESS (Life Safety Approved)
- Full Building Fault Managed Power (VoltServer Digital Electricity) Deployment for POE Switches
- Extensive use of POE for Digital Building Applications

POE Device Details:

- 350 Cisco 60W UPOE switches in distributed topology
- 150 POE Smart Mirrors
- 165 POE Minibars
- 1200+ Somfy Motors
- 1100+ POE Lighting Drivers
- 30 Cameras
- 180 Meraki AP’s
- 165 GPON ONT’s
- 8 POE Door Locks

Other Details:

- 110,000 Sq Ft
- 300 Tons of LG VRF HVAC
- **Average Monthly Power Bill ~$7K**

- Architectural Digest Article November 5, 2019
- Today Show Video, Feb 2020

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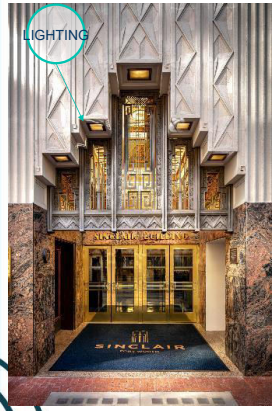

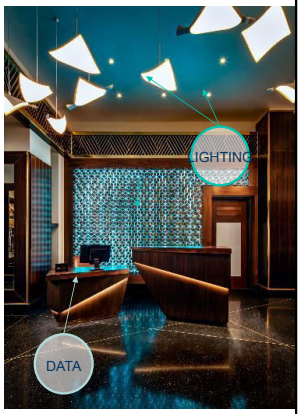

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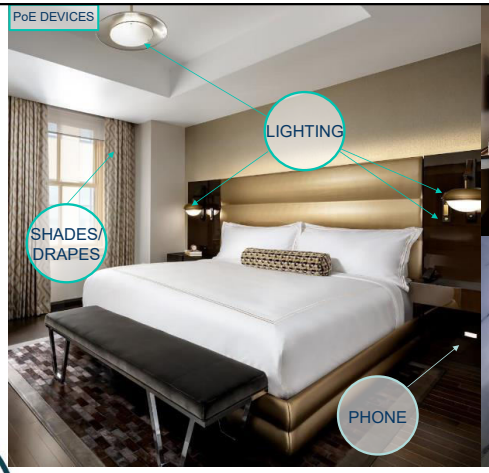
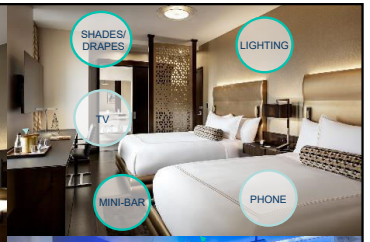




DATA
DEVICES

CASE STUDY

HOTEL MARCEL

Technology V1.5

HILTON TAPESTRY

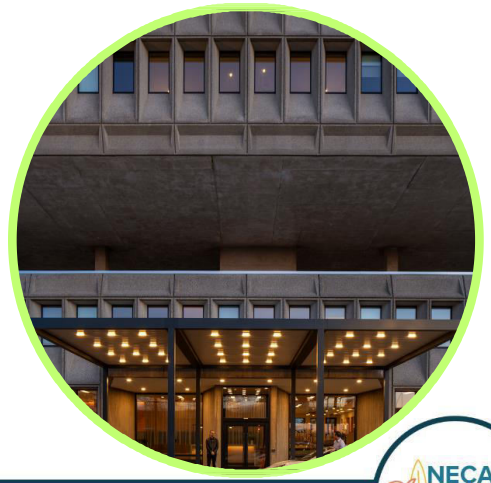
NEW HAVEN, CT

100% Electric, No Natural Gas
First Passive House Hotel in the US First NET ZERO Hotel in the US

Dual 500 KwHr Energy Storage Systems
1 MW of Solar Generation + another 500KWh coming online soon

DC Digital Building Technologies include:

- Fault Managed Power Backbone
- PoE Lighting
- PoE Window Treatments
- Touchscreen Controls with HVAC Integration



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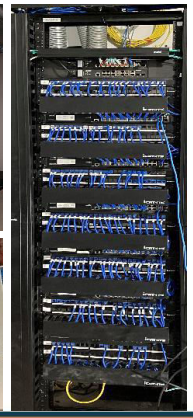
DC TECHNOLOGY IN ACTION



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DC TECHNOLOGY IN ACTION

Ageto Energy
1,511 followers
19h •

What is the Value of Resiliency?

Today at 7:25 AM the New Haven grid had a power outage around Hotel Marcel. The guests at the hotel didn't even notice as the resilient microgrid kicked in and seamlessly provided backup power to the entire Hotel. The hotel was able to carry on with the scheduled 150 person breakfast event without disruption while the Ikea next door was rolling in temporary diesel generators to power their freezers.

Event duration: 2h 36 minutes
Energy delivered by the microgrid: 516 kWh
Solar production during the outage: 292 kWh
Energy delivered by the BESS: 255 kWh
Carbon based fuel consumed: 0
Disruptions to the hotel: 0

#microgrids #hotel #resilience

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PROJECT PHOTOS




KEY PROJECT TAKEAWAYS

HOTEL MARCEL

DC TECHNOLOGIES ALLOWED THE HOTEL TO MEET THE ENERGY GOALS FOR NET ZERO

HOTEL MARCEL DID NOT COST ANY MORE TO BUILD THAN A TRADITIONAL HOTEL

THE SUSTAINABLE FEATURES ARE ALSO THE TOP CONTRIBUTERS TO GUEST EXPERIENCE & COMFORT

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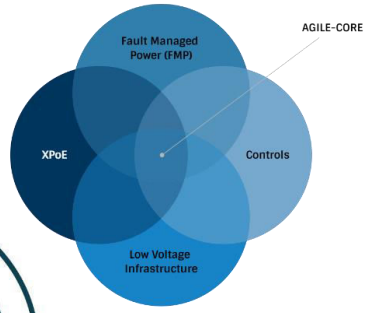
SINCLAIR DIGITAL EVOLVES

SUPPLYING THE ELECTRICAL INDUSTRY WITH PACKAGED TECHNOLOGY SOLUTIONS

AGILE-CORE™



How do we do it?

Taking the cost and complexity out of DC Buildings

We use a combination of different DC low voltage products and solutions taken from different markets and industries, to craft easy to install packages that a productized by target market.

We have more experience working with a wide array of DC solutions and products than anyone else in the business.

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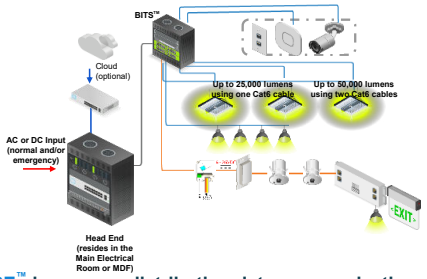
AGILE-CORE™ Reference Architecture

The AGILE-CORE™ system Architecture is designed with Modularity and installed in a plug and play manner.



AGILE-CORE™ is a power distribution data communications network therefore the foundation for Monitoring, Control, Automation, Analytics, and Continuous Optimization software modules.

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AGILE-CORE™ Hardware Components: BITS Family

Product	Power Density	Ports	Form	Notes
BITS™ nano	240 W	8	Panel	Standalone (no HCC) Wall Mounted, Local Powered
BITS™ micro	500 W	8	Panel, Enclosure	Wall or Ceiling Mounted, Local or Remote Powered
BITS™ mini	1 KW	8-16	Panel, Enclosure	Wall or Ceiling Mounted, Local or Remote Powered
BITS™	2 KW	16	Rack	Wall or Suspended, Local or Remote Powered
BITS™ Super	4 KW	32	Rack	Wall mounted, Local or Remote Powered

A variety of **BITS™** Module power densities and port counts facilitate a Lego-like approach to Building Infrastructure power design.

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CASE STUDY WAREHOUSES, AIRPORTS & BIG BOX STORES

AGILE-CORE™ V1.0

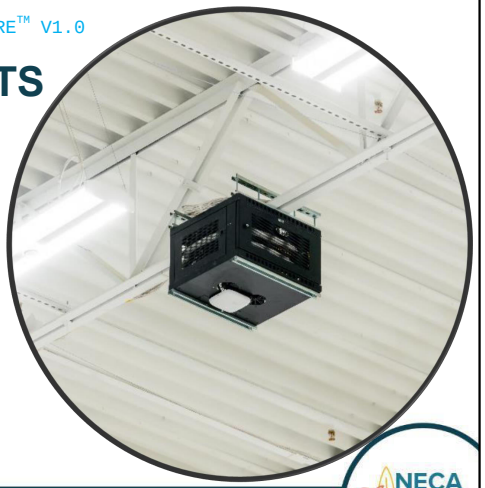
MOUSER ELECTRONICS

Mansfield, TX

New 400,000 sqft Mouser Electronics automated distribution center warehouse in Mansfield, Texas, All PoE lighting on a Fault Managed Power Backbone.

- 1678 Light Fixtures (Phase I)
- 2218 Light Fixtures (Phase II) in a 3 Story Mezzanine Adder
- Phase III Adder in design
- All wired communication
- Fixture level smart occupancy sensors
- Coordinated Site Lighting Control

MEP – BHB (Baird, Hampton, & Brown)
EC – Trico Electric
LV EC – Polarity Networks



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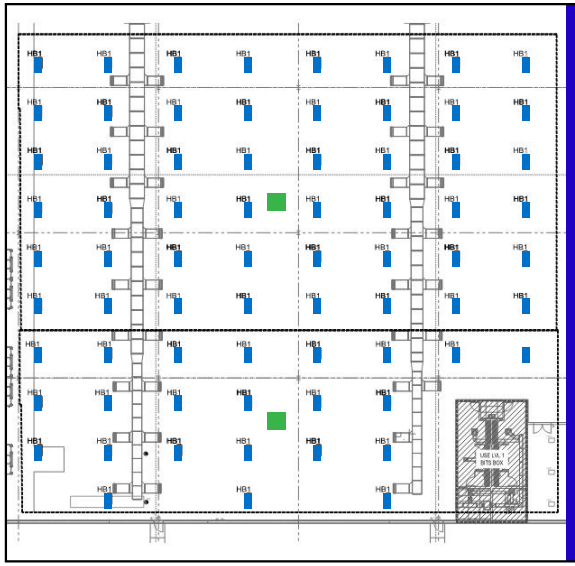


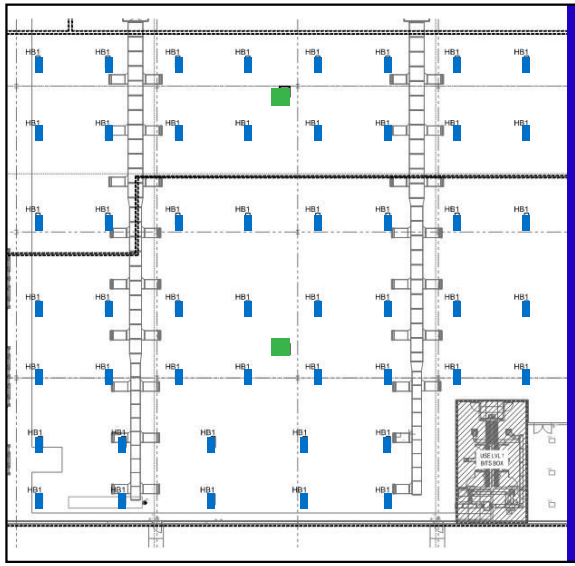
Where we started

PoE++ Deployment: Phase 1

Light Fixtures
Total Count: 1452
12,000 Lumens, 150 lumens/watt 80 Watt Light Fixtures

PoE++ Drivers
Total Count: 1452
90 Watts in, 80 Watts Max output with distance

AGILE-CORE™
31 Distributed BITS boxes to support: 48 Ports
2 Fully Loaded Powered Headend DC Distribution Racks



Generation 2

XPoE Deployment: Phase 1

Light Fixtures

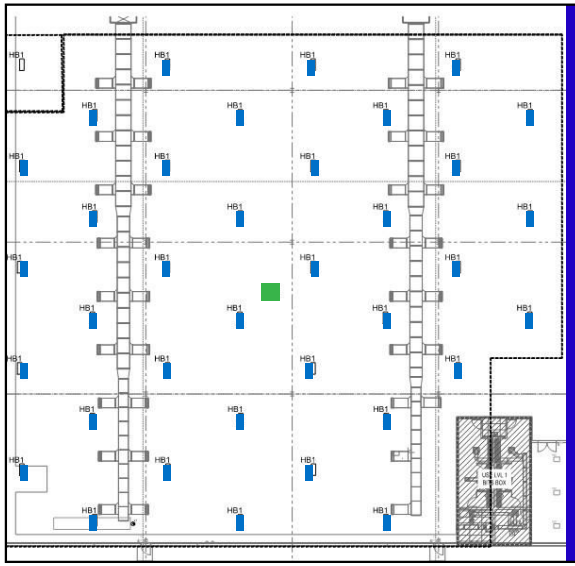
Total Count: 968
18,000 Lumens, 150 lumens/watt 120 Watt Light Fixtures

X-PoE Controllers

Total Count: 121

AGILE-CORE™

32 Distributed BITS boxes to support: 32 Ports
2 Fully Loaded Powered Headend DC Distribution Racks



Generation 2.1

XPoE with High Efficiency LEDs

Light Fixtures

Total Count: 726
24,000 Lumens, 200 lumens/watt 120 Watt Light Fixtures

X-PoE Controllers

Total Count: 91

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24 Distributed BITS boxes to support: 32 Ports
1.5 Fully Loaded Powered Headend DC Distribution Racks

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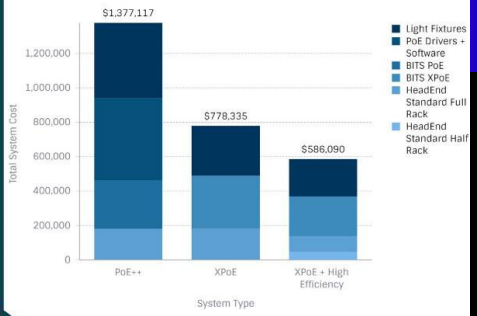
Cost Comparison

Warehouse Case Study: Low Voltage Lighting and Controls



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Improvements

43%

Materials Cost savings in the transition from PoE++ to XPOE

57%

Materials Cost savings in the transition from PoE++ to XPOE with high efficiency LEDs

30%

Estimated Materials/ Labor Savings on System the cabling and installation

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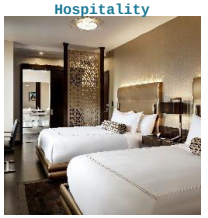
DIGITAL BUILDING SOLUTIONS ARE AVAILABLE FOR:

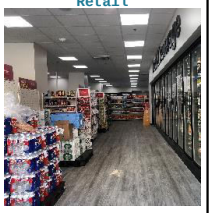
K-12/Education

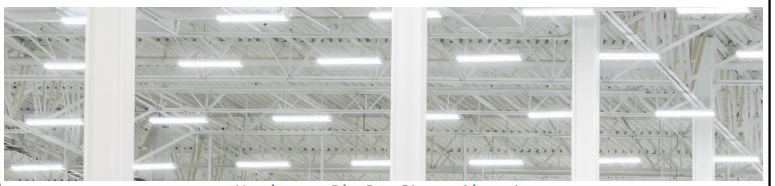
Office

Hospitality



Retail





Warehouse, Big Box Store, Airports

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