Supercharging the Role of Low Voltage: FMP and advanced low voltage deployment use cases for Building Infrastructure

Luis Suau
Chief Business Officer | **Sinclair Digital**

ICT SUMMIT
CONFERENCIA & EXHIBICION
MÉXICO 2025

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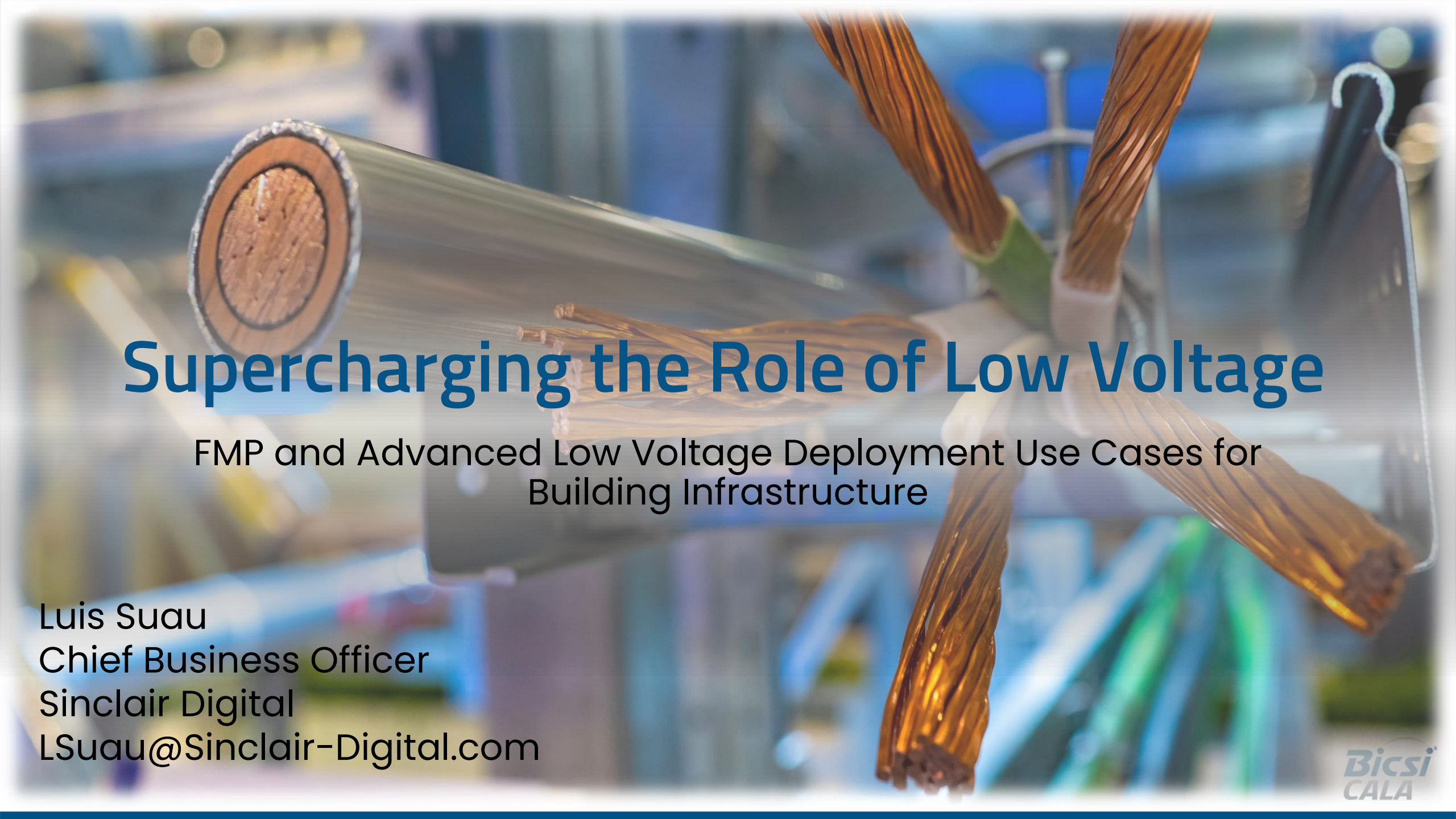


Supercharging the Role of Low Voltage

FMP and Advanced Low Voltage Deployment Use Cases for Building Infrastructure

Luis Suau
Chief Business Officer
Sinclair Digital
LSuau@Sinclair-Digital.com

Change and Disruption

Agenda

- The Big Picture
- FMP and Building Low Voltage Applications
- Use Cases
  - The Sinclair Hotel (2020)
  - The Marcel Hotel (2022)
  - Mouser Advanced Distribution Center (2024)
  - Applications in Process
    - Large Office Building
    - Schools
- Future Architectures for converged Infrastructure

2025

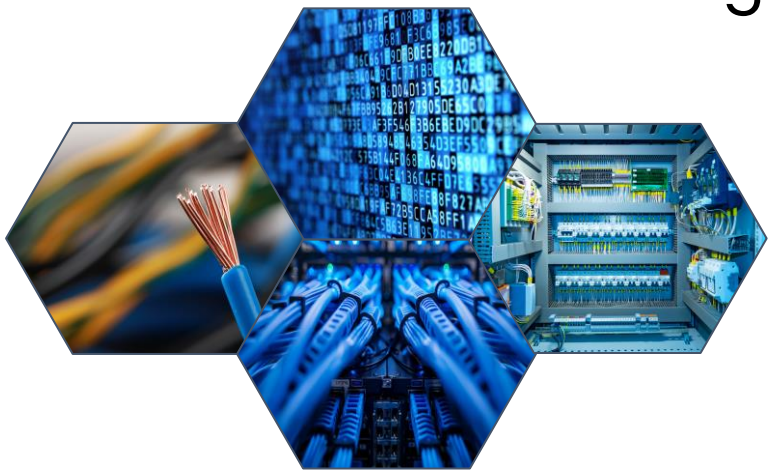
Modern Problems

- Buildings use too much energy
- Electrification increases the stressed electrical grid demand
- The addition of more electric creates more pressure on buildings to lower their demand

Electrification Will Drive Building Infrastructure Consolidation

Software and Artificial Intelligence

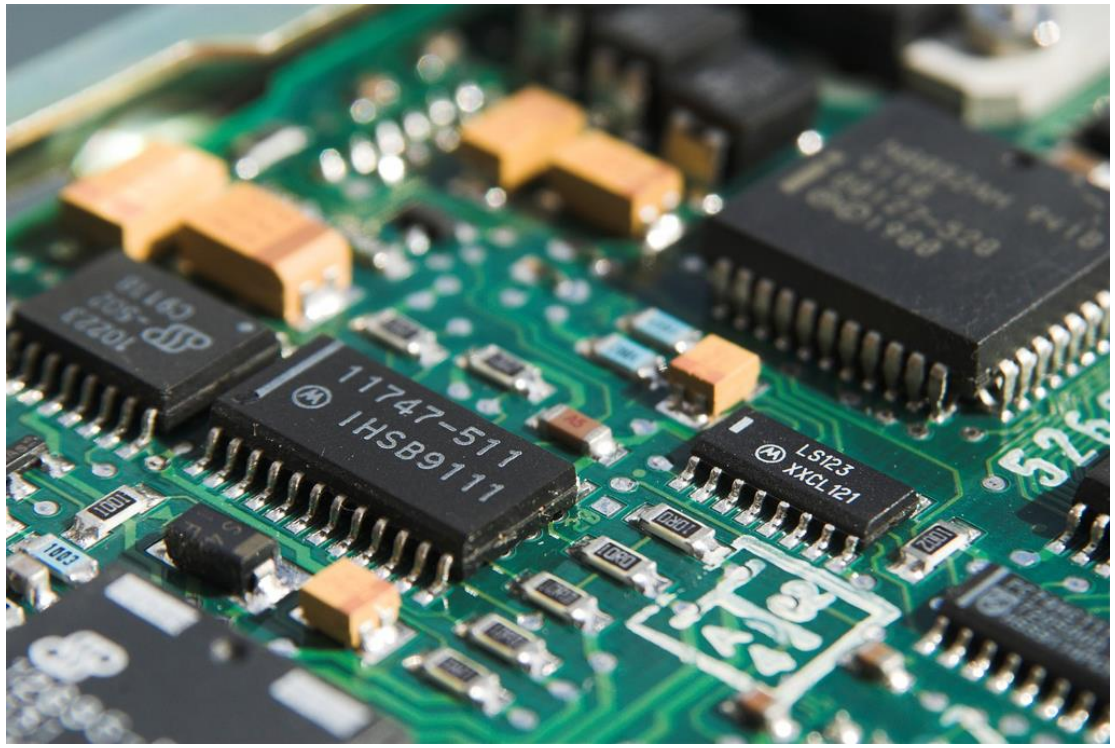
Power Distribution



Controls & Automation

IT & Communications Technology

Electrical vs Electronic: The Subtle Difference

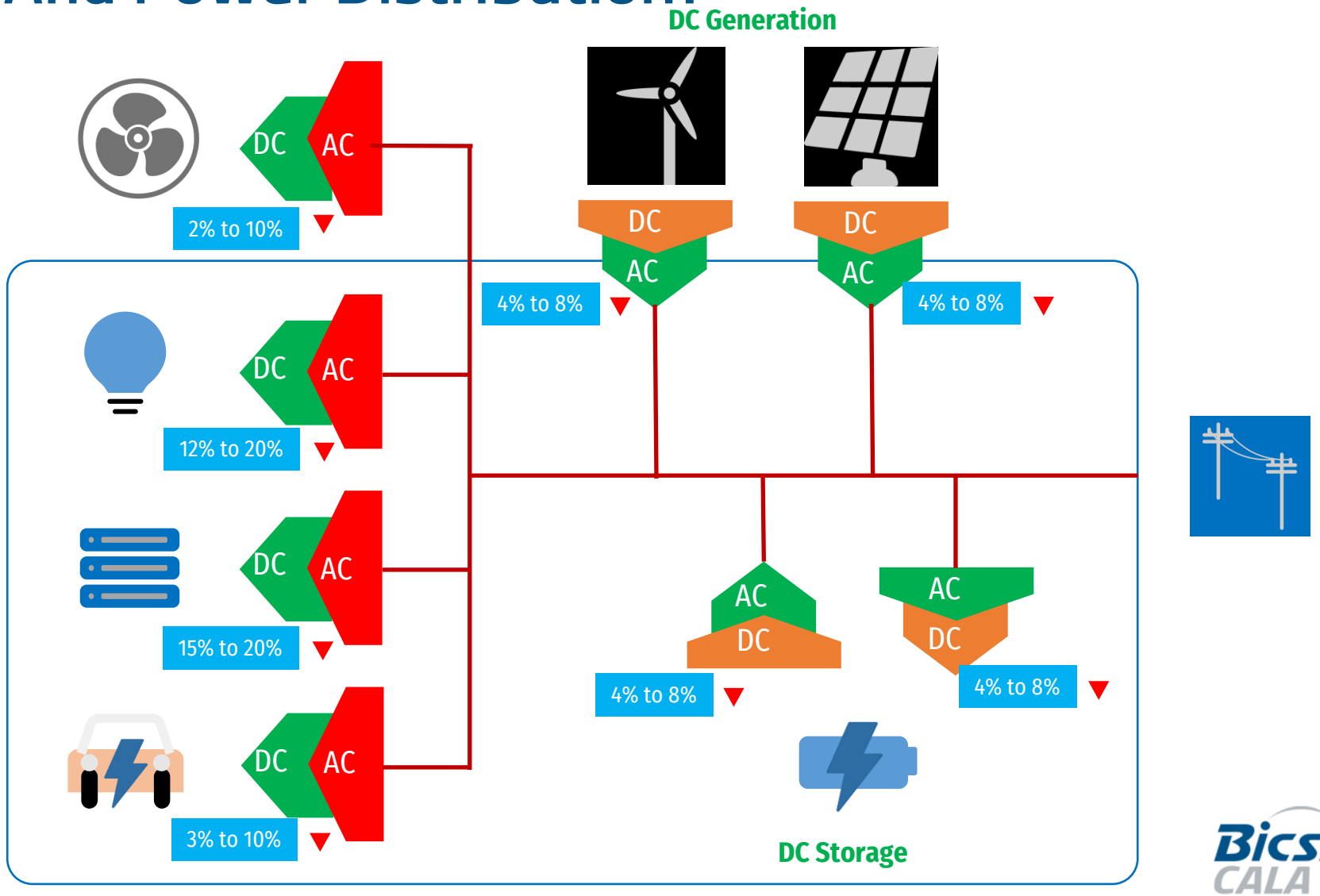


Is it time to rethink Building Infrastructure Power? And Power Distribution?

Up to

20%

of power wasted in conversion loss

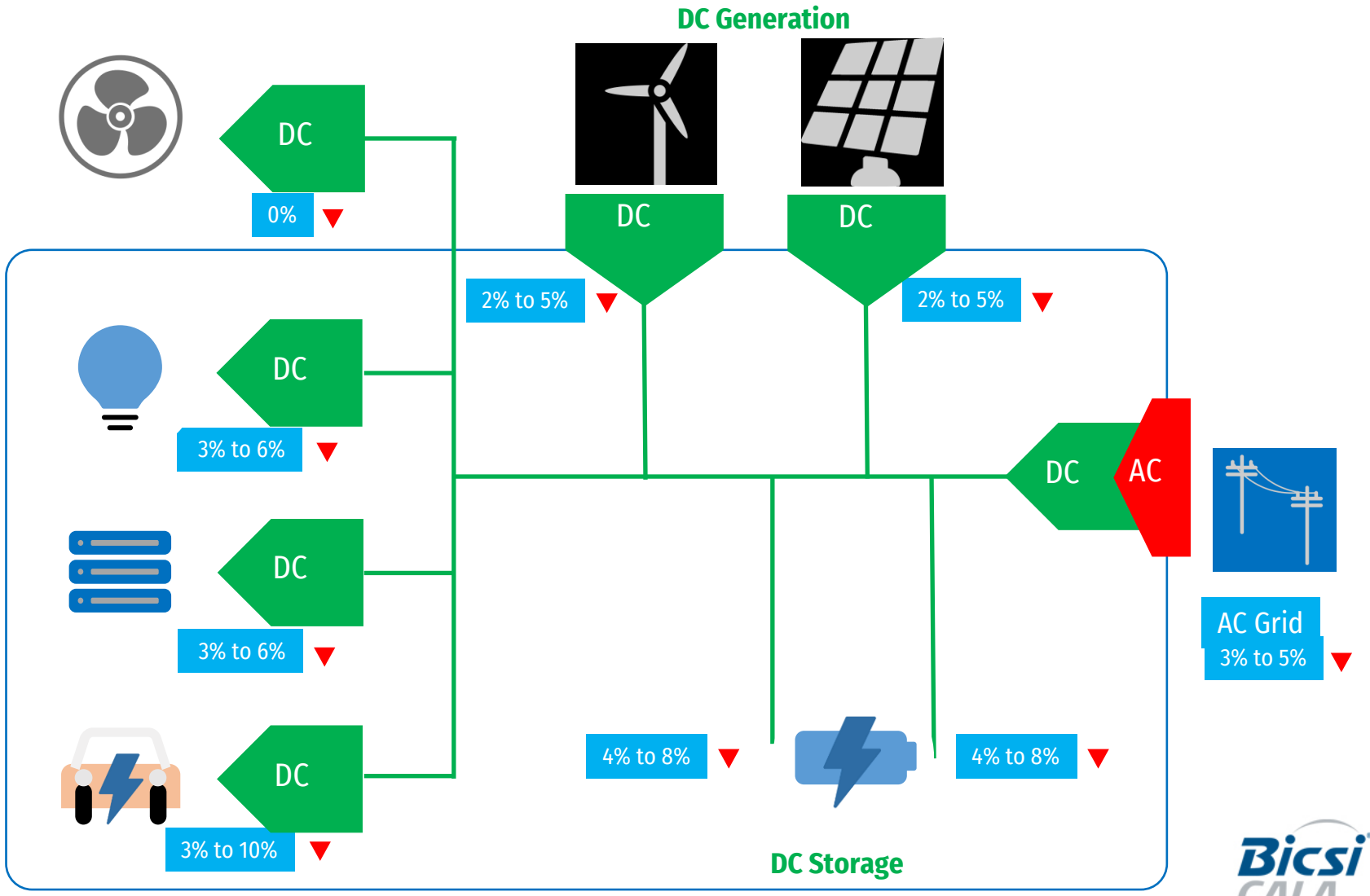


Source: CSA Group

Smart Buildings save energy, cost less to operate

45%+

Reduction in energy waste by using DC power



Source: CSA Group

The Tesla moment for Buildings

CAR INDUSTRY

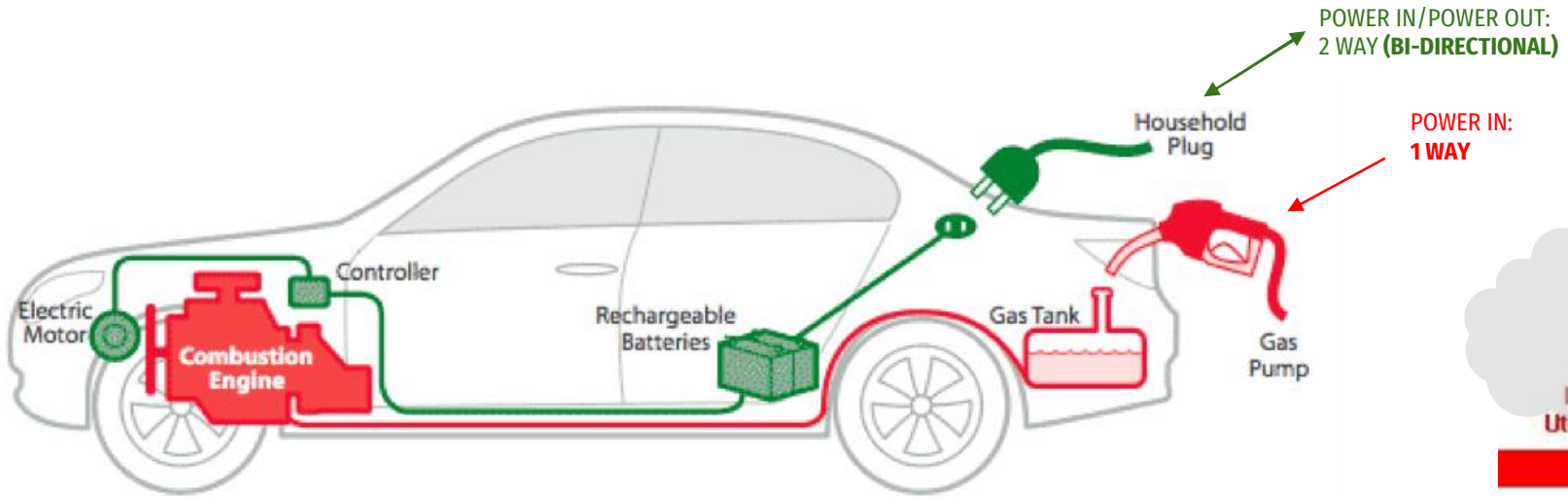
ELECTRIC VS GASOLINE

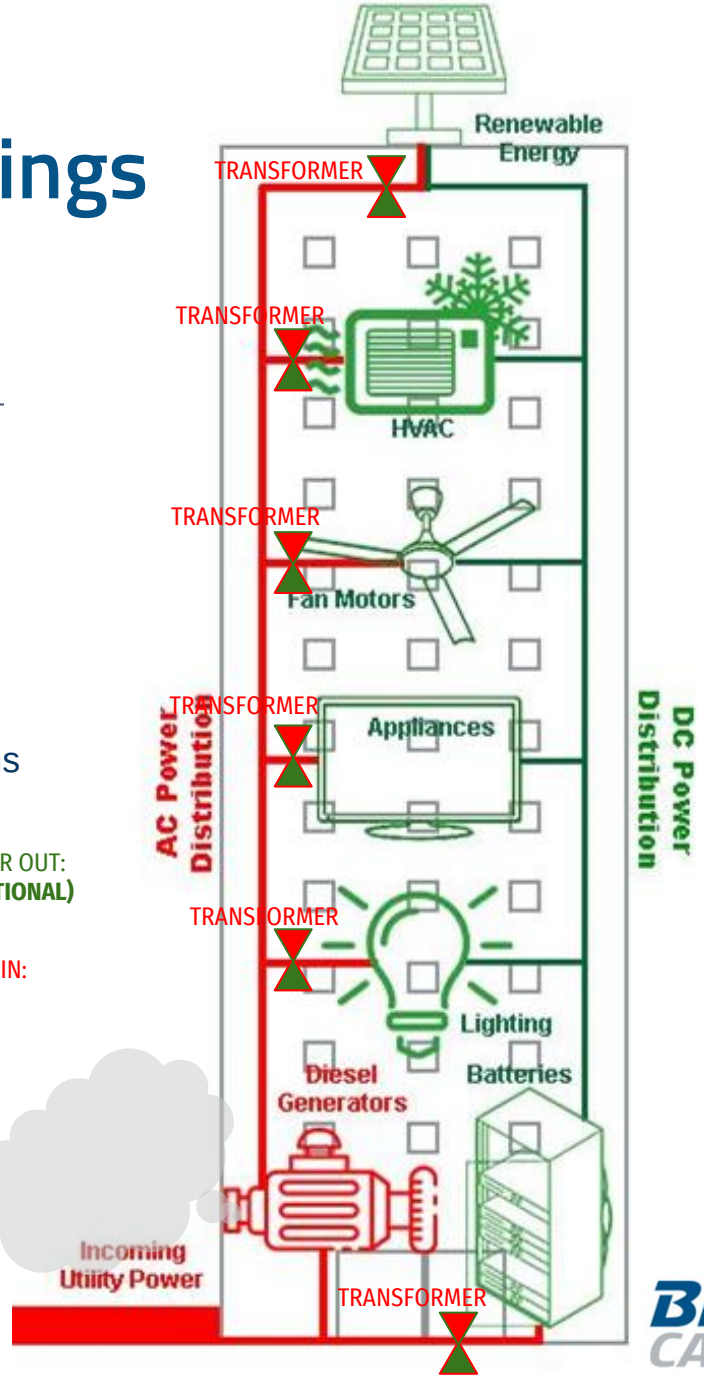
- Entirely new vehicle power plant
- Propelled by regulation
- Software plus batteries
- Vehicles are simpler & require less maintenance
- No emissions means healthier people

BUILDING INDUSTRY

DC VS AC

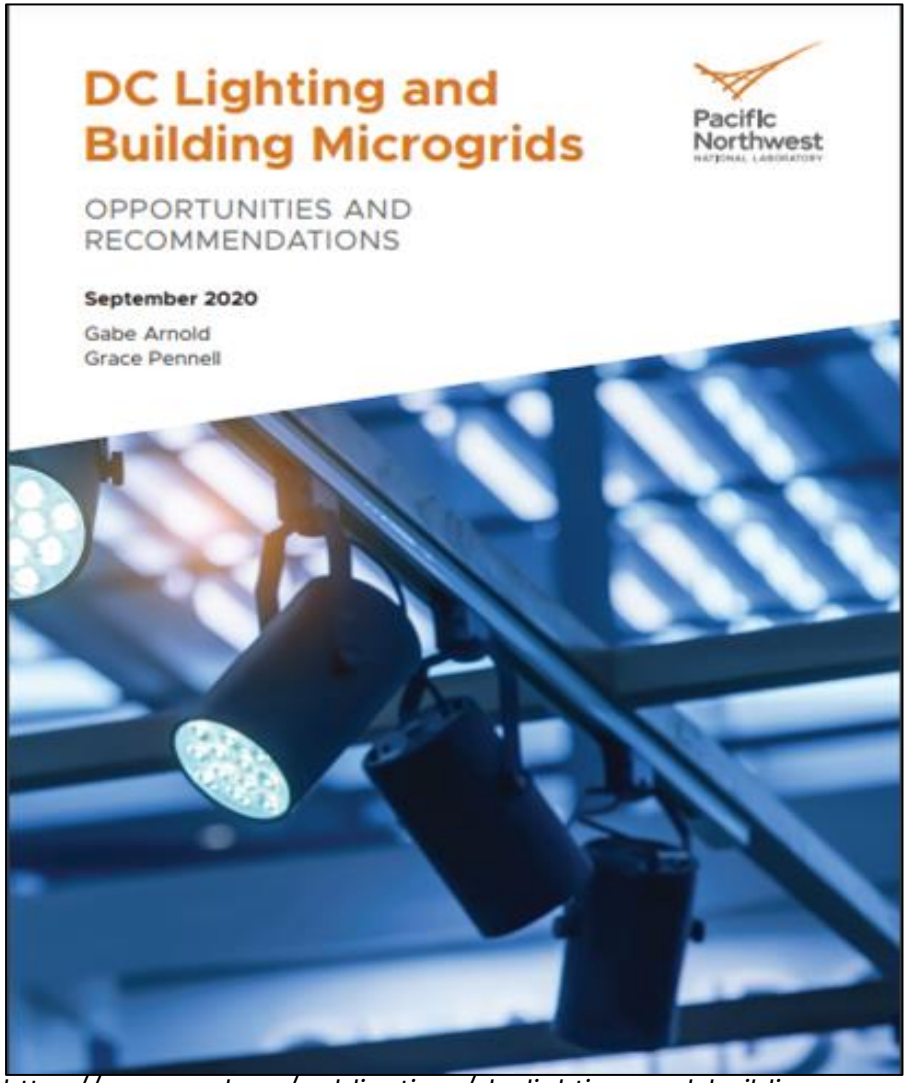
- New building power system
- Propelled by new regulations
- Software plus batteries & renewables
- Simpler to build, simpler to maintain means less embodied carbon
- Less (soon to be no) emissions means no climate change





Energy Efficiency drives Digital Infrastructure

https://www.iec.ch/technologyreport/lvdc/



https://www.pnnl.gov/publications/dc-lighting-and-building-microgrids

Three Technologies Driving Digital Infrastructure Convergence

PoE

IEEE: 802.3bt

- Globally Harmonized Standard
- Low Voltage Power
- Facilitates adds, moves, changes
- HS Data Delivery (Infrastructure devices)

USB-C

USB-IF: Std 3.1

- Globally Harmonized Standard
- Low Voltage Power
- Facilitates adds, moves, changes
- Data delivery for PC & accessories

FMPS

No Std : NEC 2023 Article 726

- Class 4 power, Safety Driven
- High Voltage, Pulsed DC
- Safety Data Only
- UL 1400-1 Equipment
- UL 1400-2 Cable

Bicsi CALA

VOLTSERVER FMPS – DIGITAL ELECTRICITY™ (LPS)

SOLUTION: 5S's

- ✓ Significant Power: 600W/pair
- ✓ Significant Distance: 2km
- ✓ Skinny Conductors: 18-14 AWG
- ✓ Safe to touch
- ✓ Speed To Deploy

DIGITAL ELECTRICITY™

DELIVERING POWER:

- ✓ Where it is needed
- ✓ In the format it is needed
- ✓ With lower cost & resiliency
- ✓ *Faster Installation & Revenue!*

INPUT
AC or 48VDC
CLASS1

Transmitter

1000's of feet

Receiver(s)

OUTPUT
Power Limited
CLASS1

Load(s)

Digital Electricity™ is a Limited Power Source per IEC 62368-1 which allows installation using standard multi-conductor cabling, typically without conduit, while conforming to the NEC and CEC Code standards for building installation

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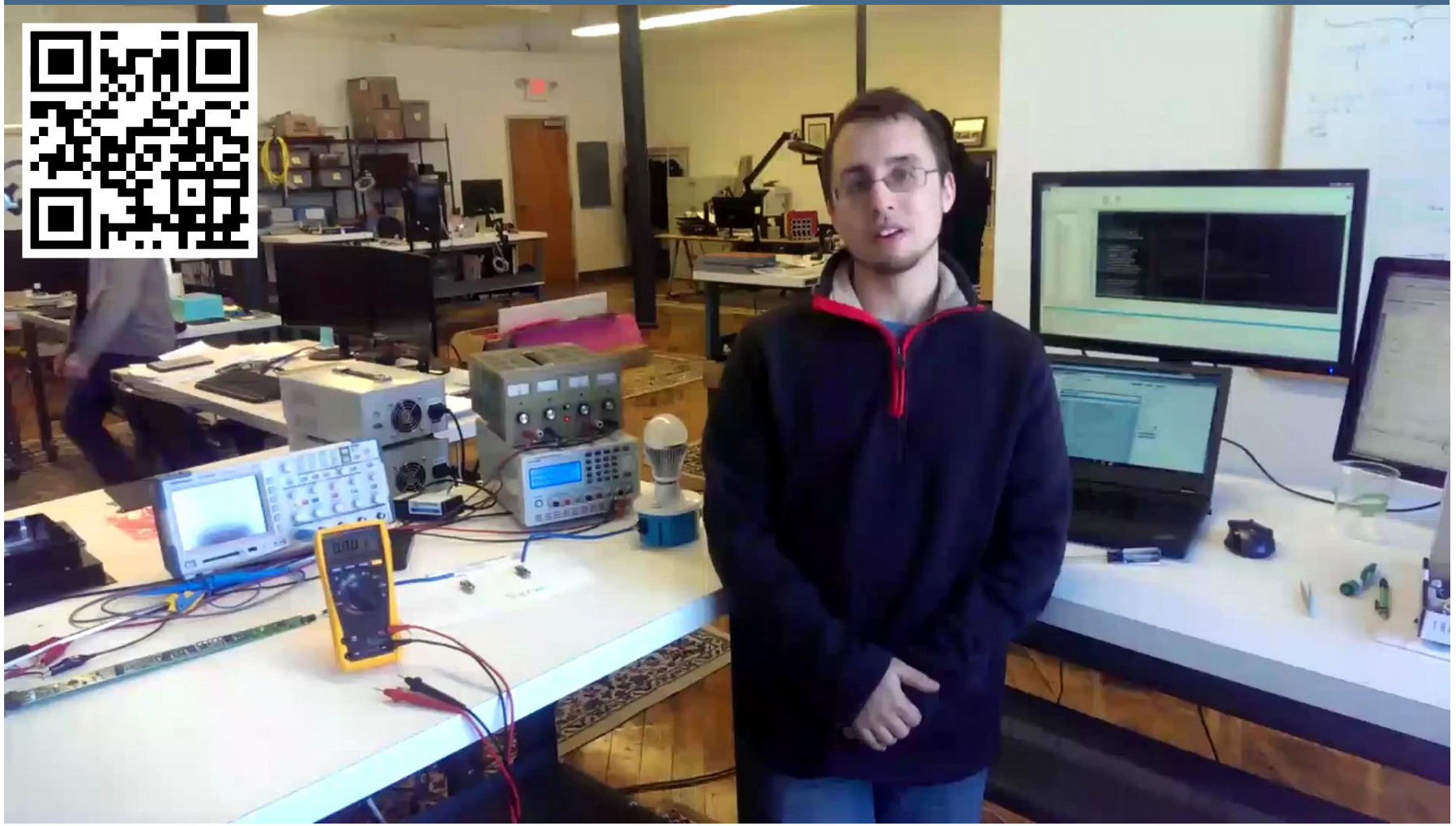
Safety Demonstration of Digital Electricity

2016 Demonstration

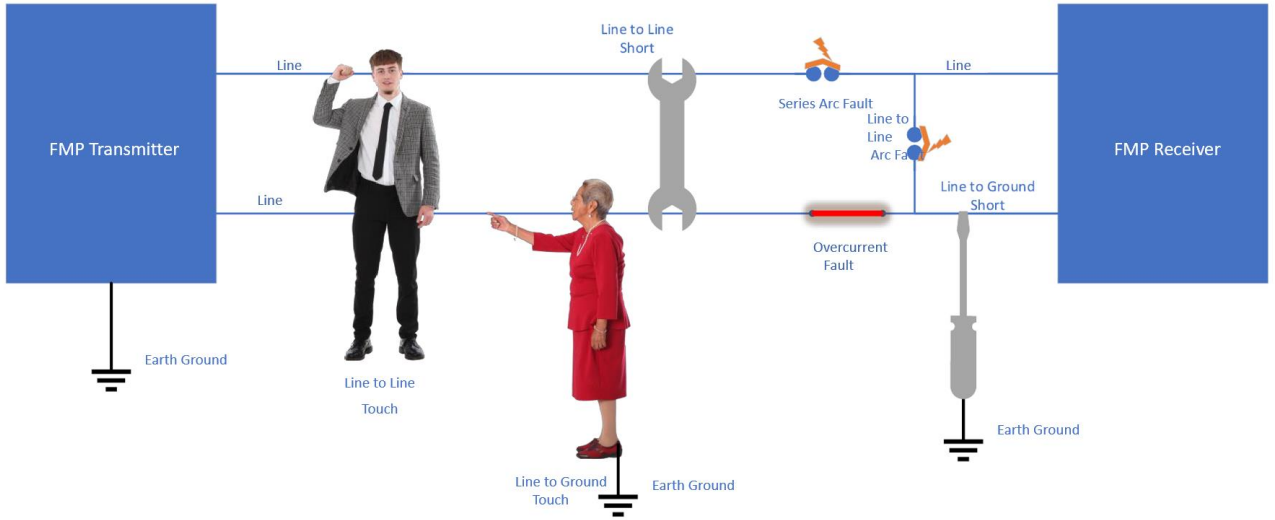


https://www.youtube.com/watch?v=GoSIAj4rSzQ

FMP Systems (FMPS)

US NEC 2023 Article 726:

- Provides quick fault detection and handling
- Class 4 systems provide high voltage power safely (up to 450V)
- Can be AC, DC and **must provide manage faults quickly enough to prevent hazardous shock or fire**
- Requires a transmitter (TX) and receiver (RX) **working together.**
- No interoperability standards exist so TX and RX are certified as a system from the same manufacturer and must be designed to work together
- Cabling requirements are similar to Class 2 and can share pathways; providing both line to ground and line to line personnel protection, as well as fire protection.
- Two UL listing standards exist for Class 4: 1400-1 for equipment and 1400-2 for cable



VOLTSERVER FMPS – DIGITAL ELECTRICITY™ (CLASS4)

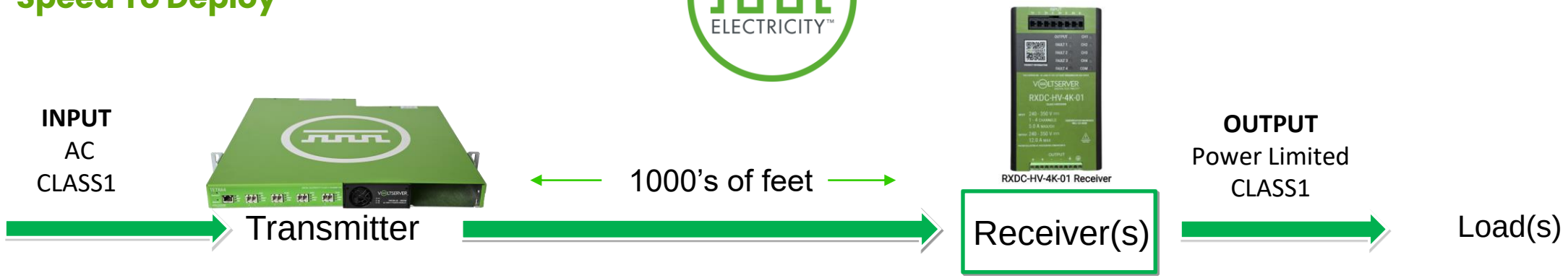
SOLUTION: 5S's

- ✓ Significant Power: 1500W/pair
- ✓ Significant Distance: 2km
- ✓ Skinny Conductors: 18-14 AWG
- ✓ Safe to touch
- ✓ Speed To Deploy

DELIVERING POWER:

- ✓ Where it is needed
- ✓ In the format it is needed
- ✓ With lower cost & resiliency
- ✓ *Faster Installation & Revenue!*

DIGITAL ELECTRICITY™



The Tetra, certified Class 4 solution combines the power capabilities of an AC circuit with the safety, monitoring and control benefits of a software-defined power digital power platform.

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Safety aspects of PoE

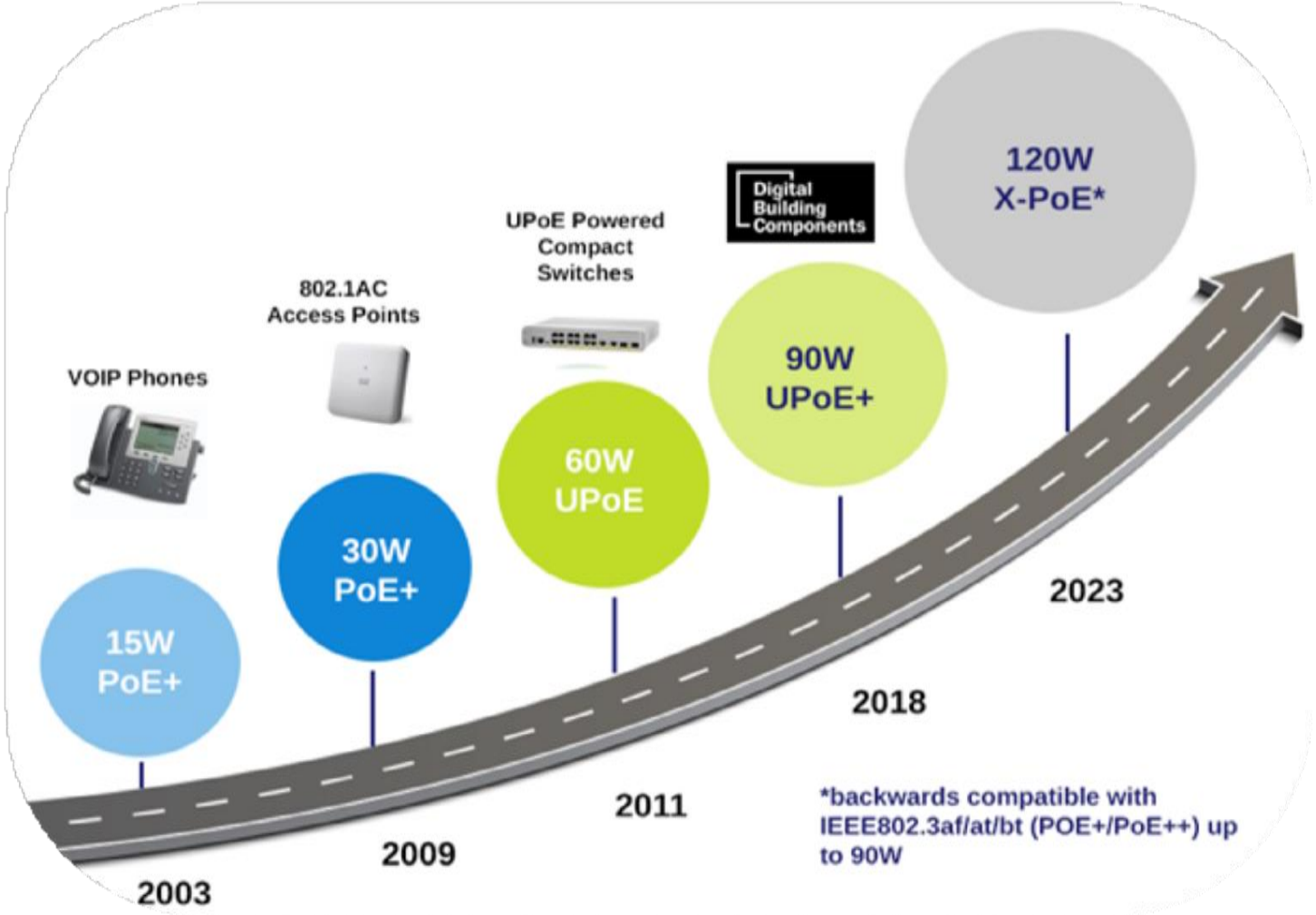
2021 Demonstration

Extending Structured Wiring for Lighting

PoE a Historical Perspective

Early on in PoE, it was mainly lower power devices such as phones and wireless access points. This has evolved over time to deliver higher Power over Ethernet cable.

With the availability of higher power, lighting, air conditioning, televisions and more are now feasible. The move to PoE for DC objects will continue to grow.



Use Cases

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The Sinclair Hotel, Fort Worth

a Marriott Autograph Collection Hotel

2020

Implementation:

Sinclair Hotel inspired and featured these products for the first time:

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

Building Details:

- 110,000 Sq Ft
- 300 Tons of LG VRF HVAC
- **Average Monthly Power Bill ~$7K**
- **Building Constructed: 1929**

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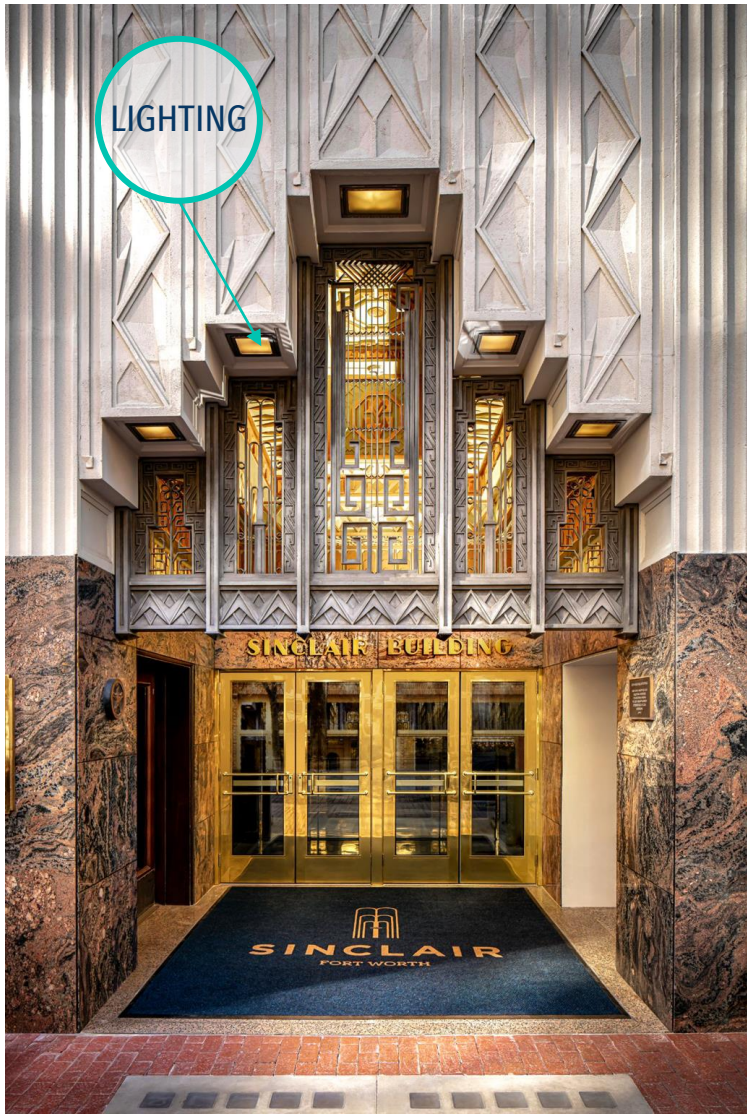
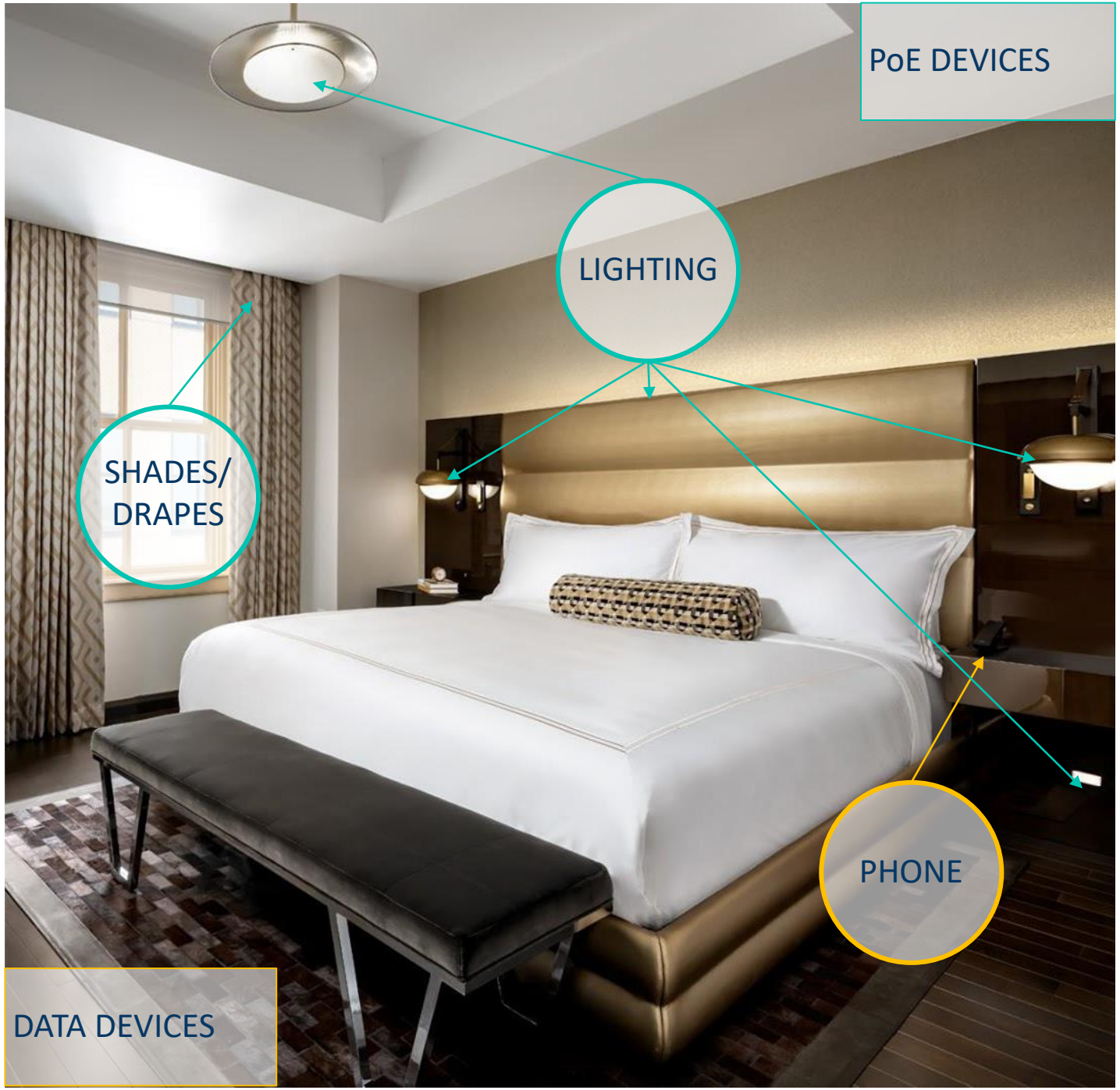
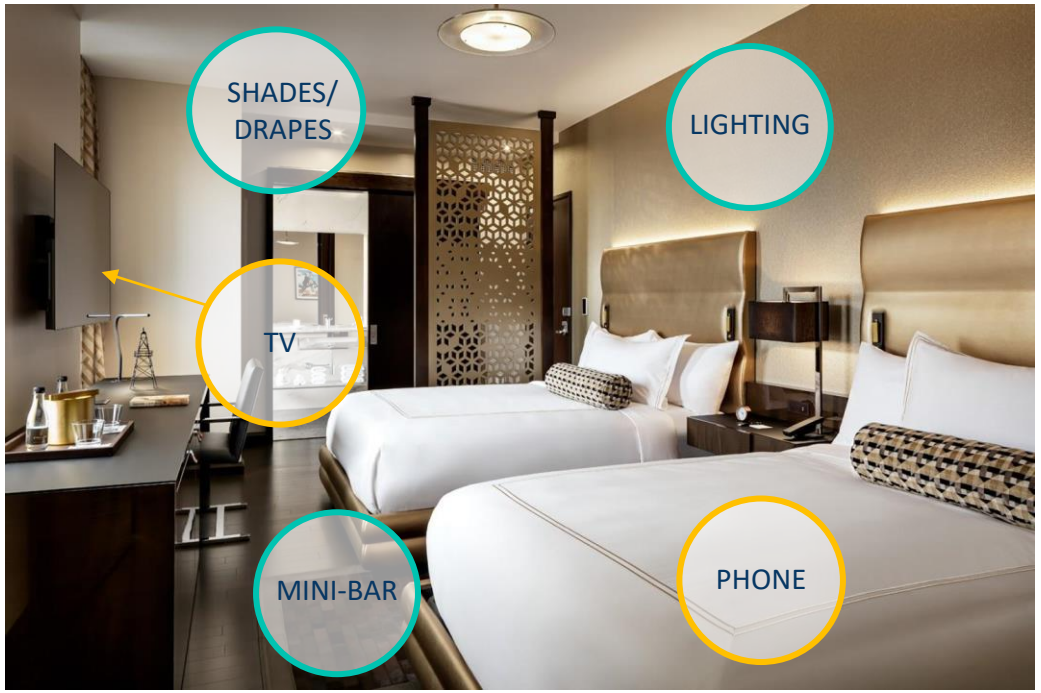
NBC TODAY SHOW VIDEO


lighting
WIFI
wireless charging
cameras

The Sinclair Hotel, Fort Worth



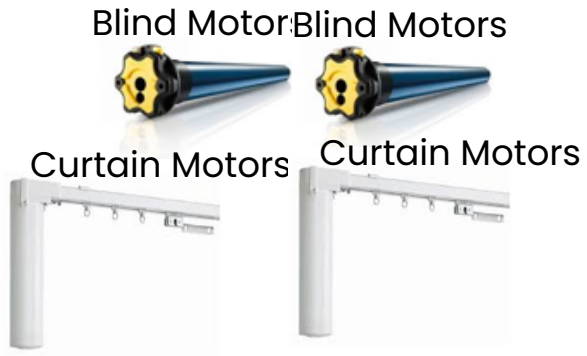

PoE DEVICES
LIGHTING
SHADES/
DRAPES
PHONE
DATA DEVICES


SHADES/
DRAPES
LIGHTING
TV
MINI-BAR
PHONE


MIRROR
LIGHTING
TV

Typical Guest Room Switch Loads

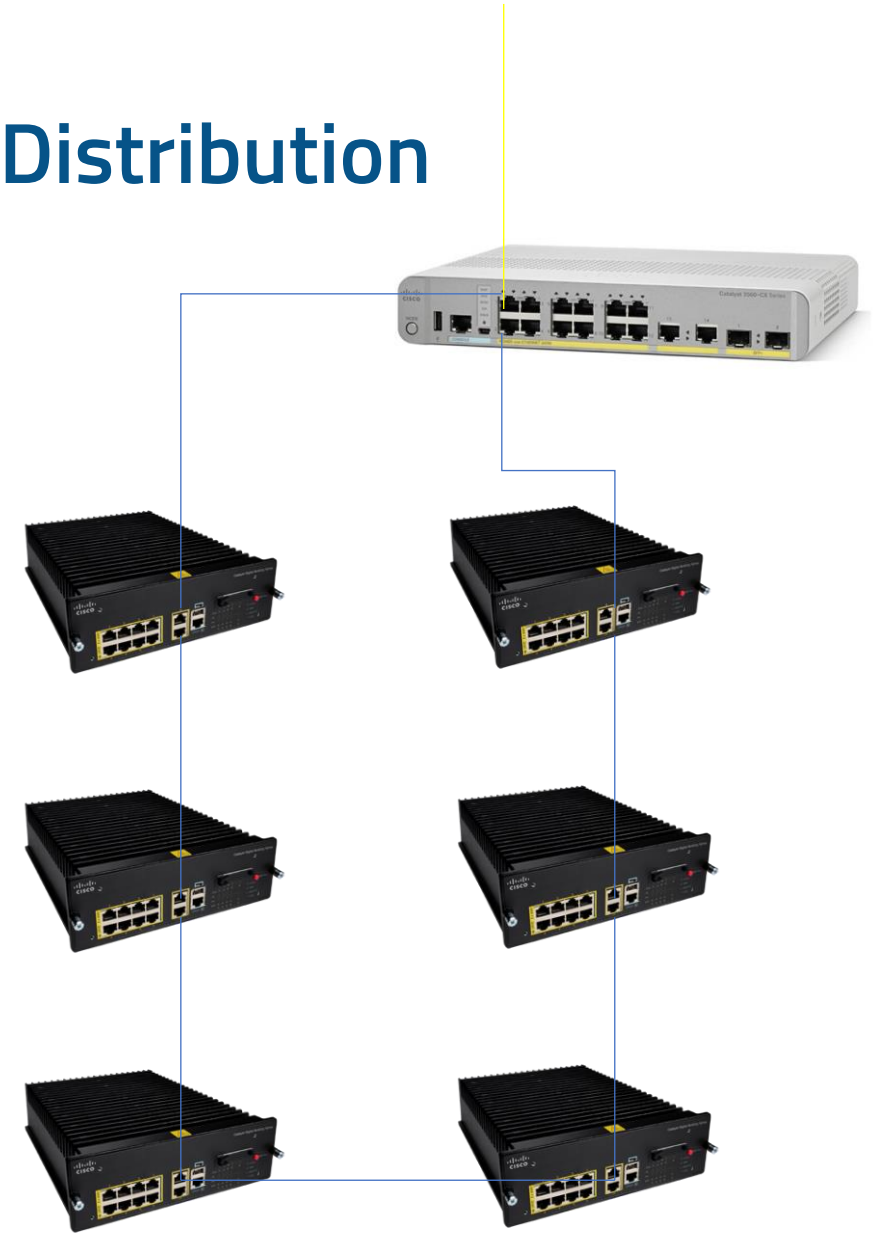
- Port 1 POE Lighting
- Port 2 POE Lighting
- Port 3 POE Lighting (RGB)
- Port 4 Blind Motors
- Port 5 Curtain Motors
- Port 6 TV or Set Top Box
- Port 7 ONT Power
- Port 8 Electric Mirror
- VoIP connected & powered from Access Point connected to ONT



- Each Room is a clone of each other
  - Installation consistency and serviceability
- Each room is a subnet
  - Devices respond to broadcast commands

Sinclair Floor Network Distribution

- 1 Cisco WS-C3560CX-12PD-S used as Distribution switch per floor, terminations in riser every other floor
- 6 Cisco CDB UPOE switches per lobe
- 6 lobes per switch Distribution switch
- Fiber 10G uplinks to floor distribution switch
- Cisco 3850-24U-L Core Switches in Lobby, Back Office Network Rack



Marcel Hotel Use Case, New Haven, CT

2022

a Hilton Tapestry Edition Hotel

First Net-Zero Hotel in the USA

- Passive House design
- Dual 500 KWHr Energy Storage Systems
- Solid State Transfer switch

Sinclair Digital Implemented:

Sinclair Hotel inspired digital building DC Microgrid:

- Fault Managed Power (Digital Electricity) for Lighting POE Systems
- POE for Lighting, Window Treatments, HVAC Integration
- Integration of HVAC controls in touchscreens

POE Details:

- 48 Transition SM24TBT2DPA 24 port 802.3bt 60/90W port switches (Lighting & Shading)
- 800+ PowerShade POE Shade Motors
- 800+ POE Lighting Drivers
- 50+ Cameras
- 180 Meraki AP’s
- 180 VoIP Phones

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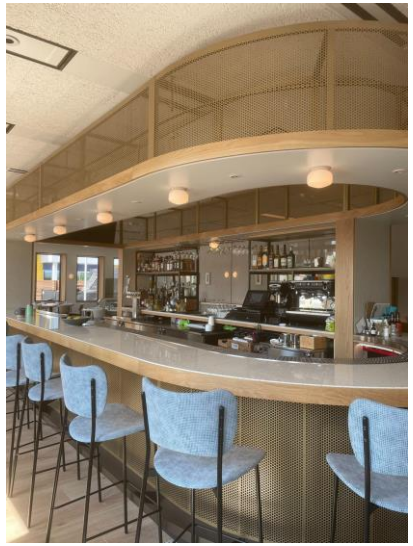
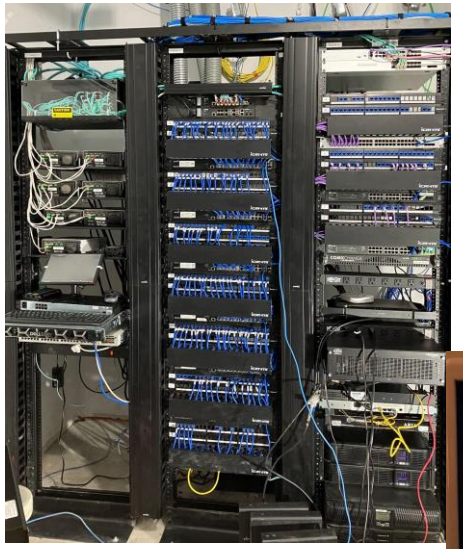
Marcel Hotel Photos





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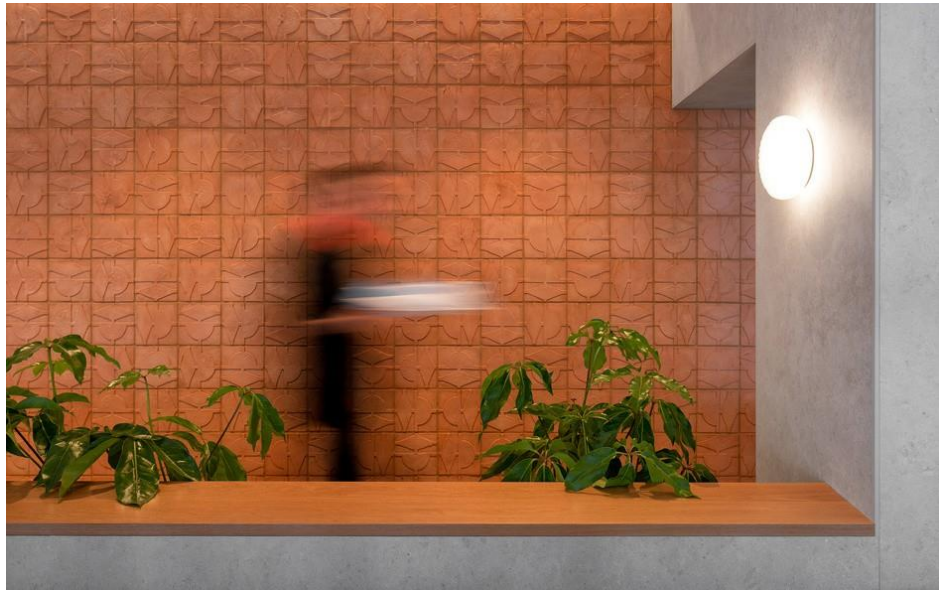
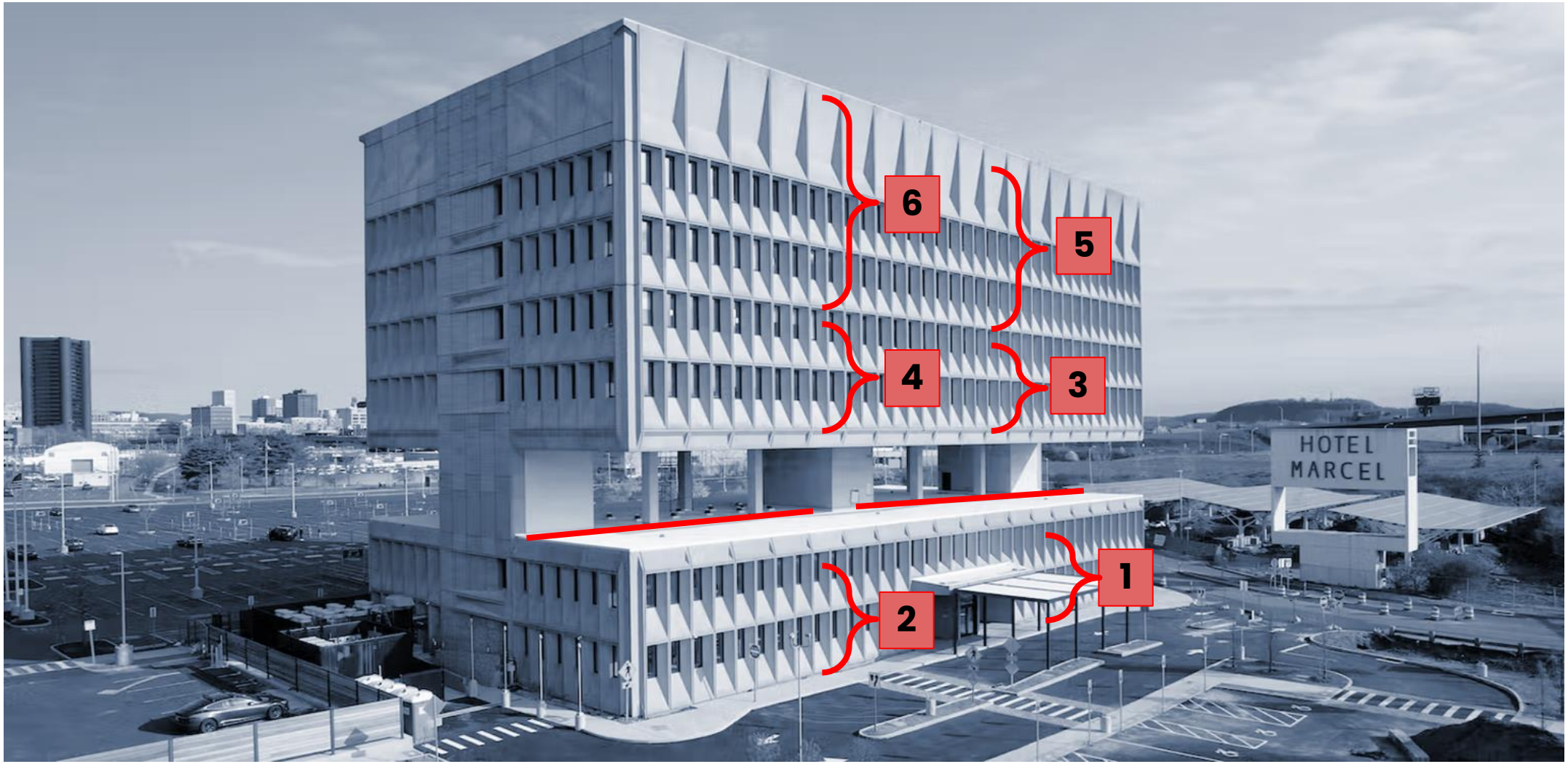
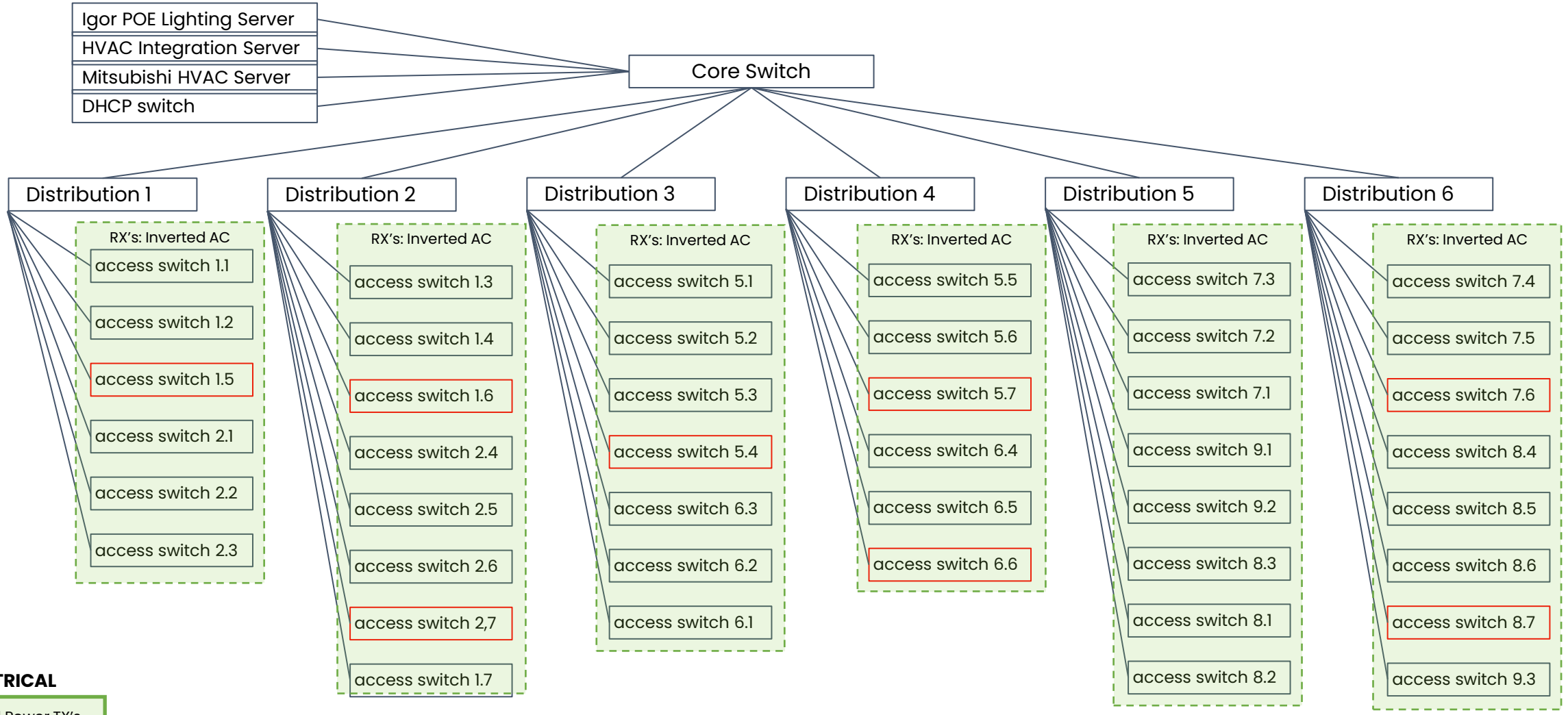
Marcel Hotel Photos



Marcel Hotel, IDF Layout



Marcel Hotel High Level Network Topology



ELECTRICAL

Grid Fed Power TX's

Emergency Power TX's

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Marcel Hotel 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

Mouser Electronics Distribution Center

Mansfield, Texas

400,000 sqft warehouse distribution center building in Mansfield, Texas. PoE lighting on a Fault Managed Power Backbone.

The Details:

- 2 Headends, 16 guage Hybrid Copper+Fiber
- 38 Voltserver FMP-LPS Transmitters
- 61 Distributed AGILE-CORE™ Edge BITS IDFs
- 120 24-Port Lantronix POE++ switches
- 1678 Linear High Bay Light Fixtures
- 2218 Mezzanine Linear Light Fixtures
- 2557 MHT Technologies PoE++ Nodes
- All smart occupancy sensor enabled, 40’ High Ceilings

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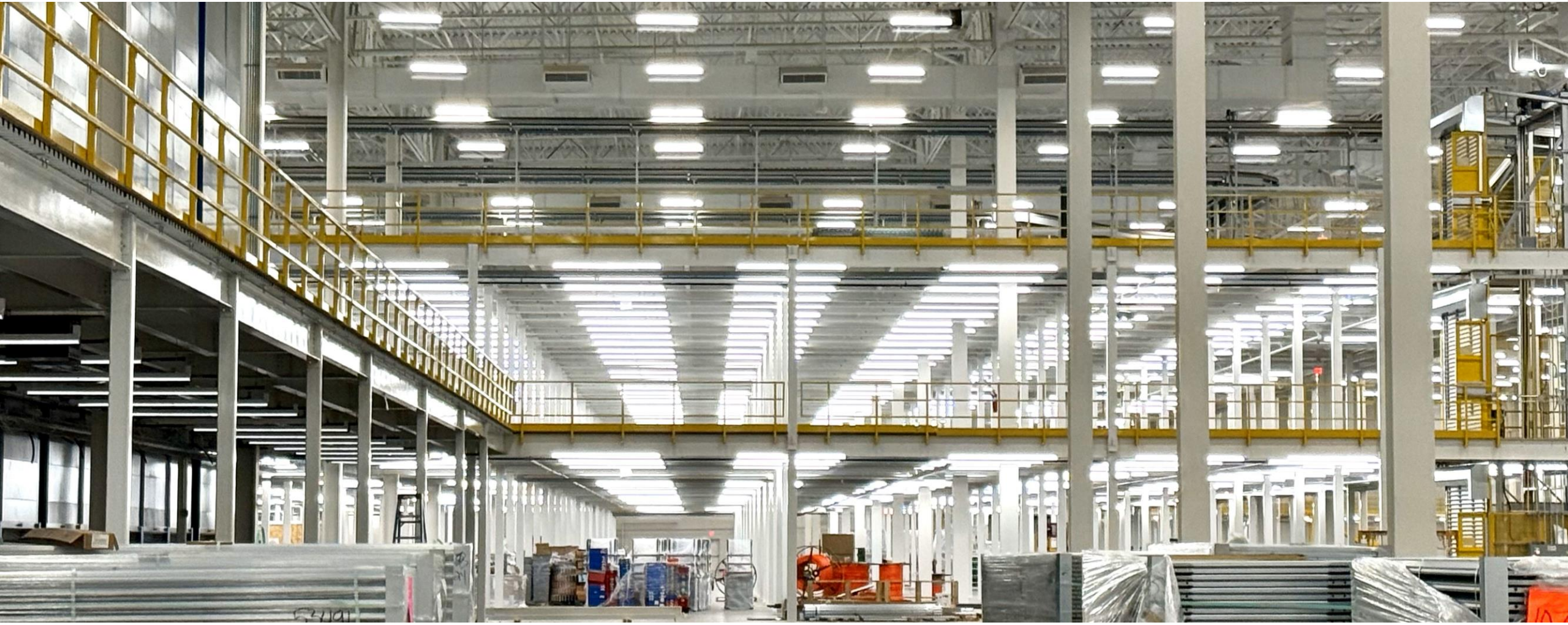
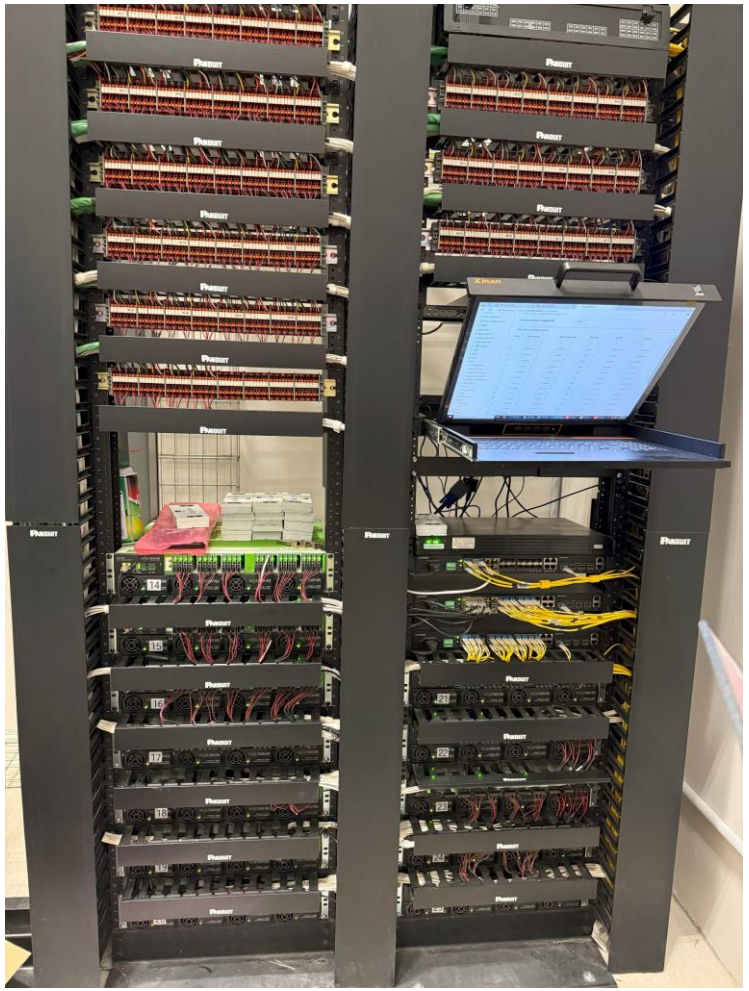
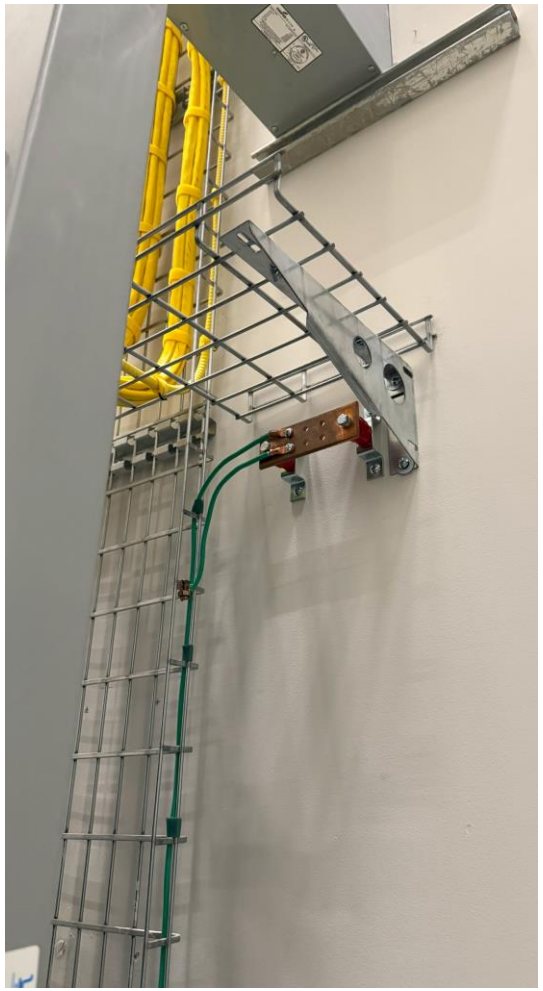
Mouser Electronics Distribution Center

BIG POE LIGHTING INSTALLATION (~1M sq ft)

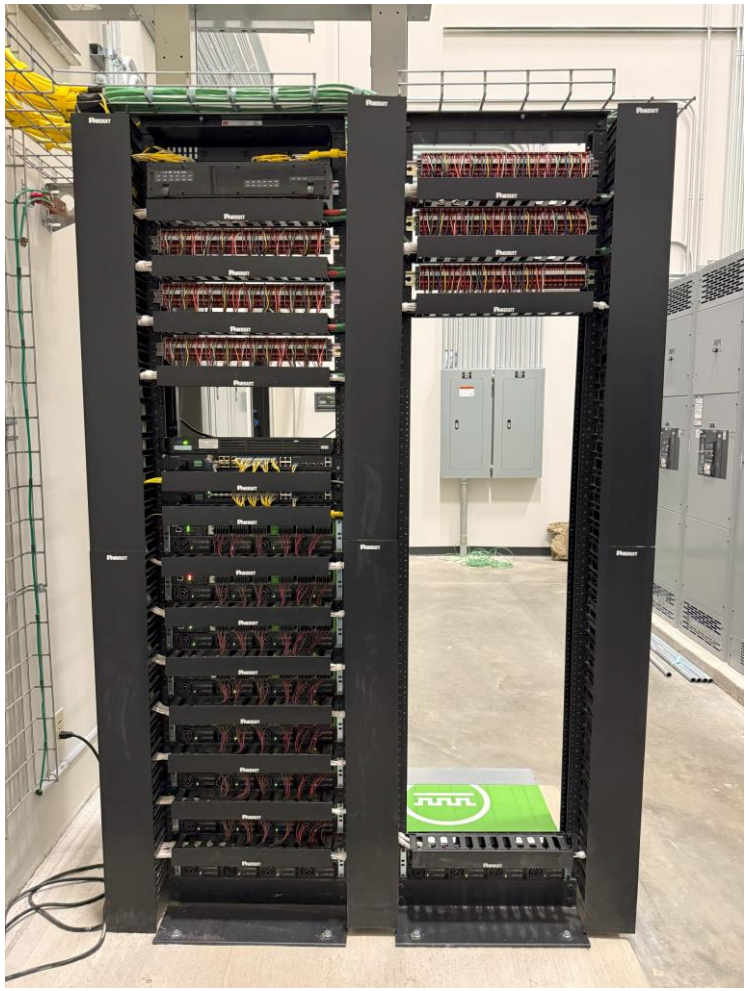


FMP Headends





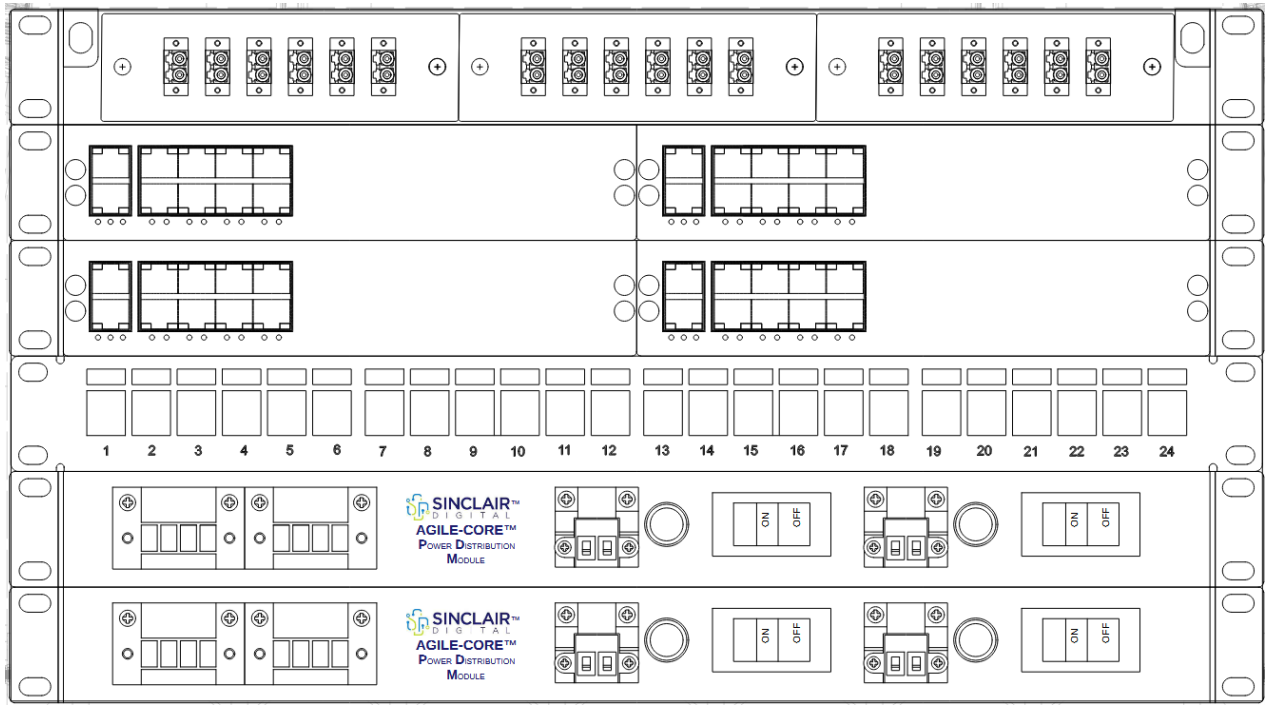
Primary NE Headend



Secondary SW Headend

If we were to do this Project Again!

For Highbay applications use X-PoE
Next Generation 4KW X-PoE BITS™



Use a combination of PoE and X-PoE where granular lighting and controls are required

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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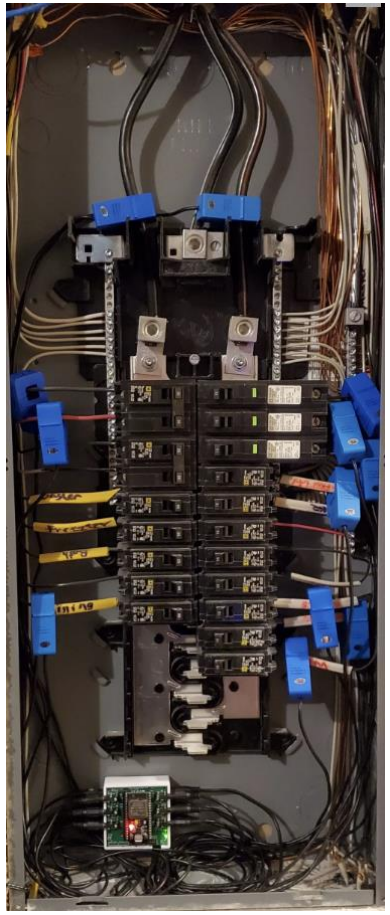
Closing Observations

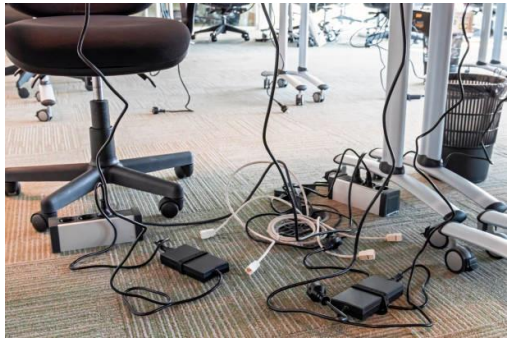
Traditional Energy Metering is Still a Challenge

Callout: Metering is inherent with FMP and POE



Traditional Building Plug Loads Continue to be a Mess

Callout: Code (as planned) vs end-user electronic needs safety, convenience



Tech is able to significantly eliminate vampire loads for Building Lighting

Practical Applications of Emerging DC/LV Technologies

- Low Voltage has been disappearing from Div 26 for years
- FMP, POE, USB-C and other LV Infrastructure enable the trend
- Standards, Codes, and the need for greater Energy Efficiency will accelerate the trend

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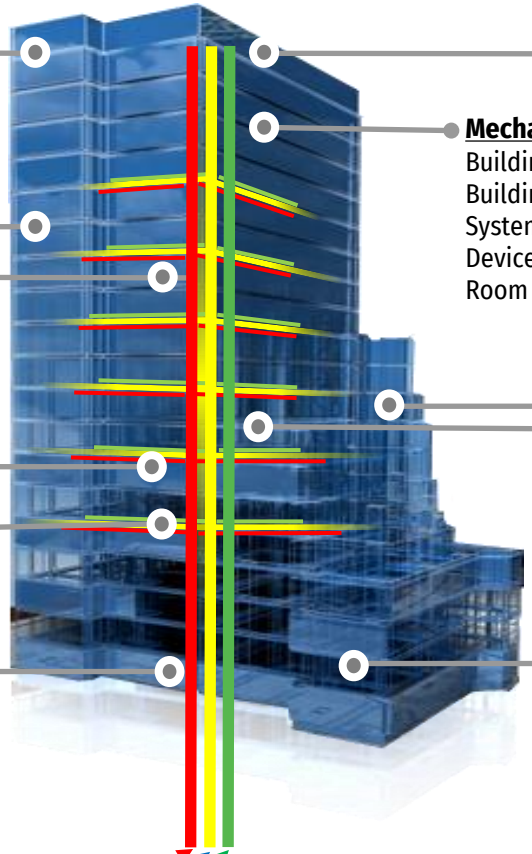
Isolated Building Systems Design Limits Energy Efficiency Gains



Physical Security
Close Circuit TV
Access Control
Intruder Detection
Key Management

Sustainability / Wellness
Electrical Monitoring
Water Monitoring
Gas Monitoring
Demand Response
Productivity Monitoring
Air Quality

Communications
Base Building Telephone
Public Address / Intercom
Base Building Wi-Fi
Digital Antenna Systems

Fire / Life Safety
Emergency Warning and Intercommunication System
BMS Integration
Security System Integration
Very Early Smoke Detection Apparatus (VESDA)
Emergency Signage
Emergency Lighting

Building Services
Bathroom Services
Data Access for Services
Visitor Management

Building Envelope
Steel
Concrete
Glass (Capacitive)
Insulation

Mechanical
Building Management System **(BMS)**
Building Energy Management Systems **(BEMS)**
Device Supervisory Control
Room Control

Electrical
Low Voltage Control
Load Shedding
Standby Power Systems
High Voltage SCADA
Combined Cooling/Heat/Power (CCHP)
Lighting Control
Micro Grid (DC) Monitoring
Plug Load Monitoring
Power Generation

Hydraulic
Water Recycling System
Leak Detection
Flow Control / Monitoring
Toilet / Sink Flow

Vertical Transportation
Elevator Management
Elevator Display System
Elevator Security Integration
Elevator Communications
Escalator Management

Parking Systems
Parking Management
Parking Assistance
Car Charging Systems

Tenant Improvements
Window Shades
Digital Signage
Projectors
White Noise Systems
Meeting Room Automation
Audio / Visual System

Power
Enterprise Data "IT"
OT & Telecomm

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Network Architectures will mimic building power distribution

Centralized POE deployment must address NEC 726 Cable Heat Rise

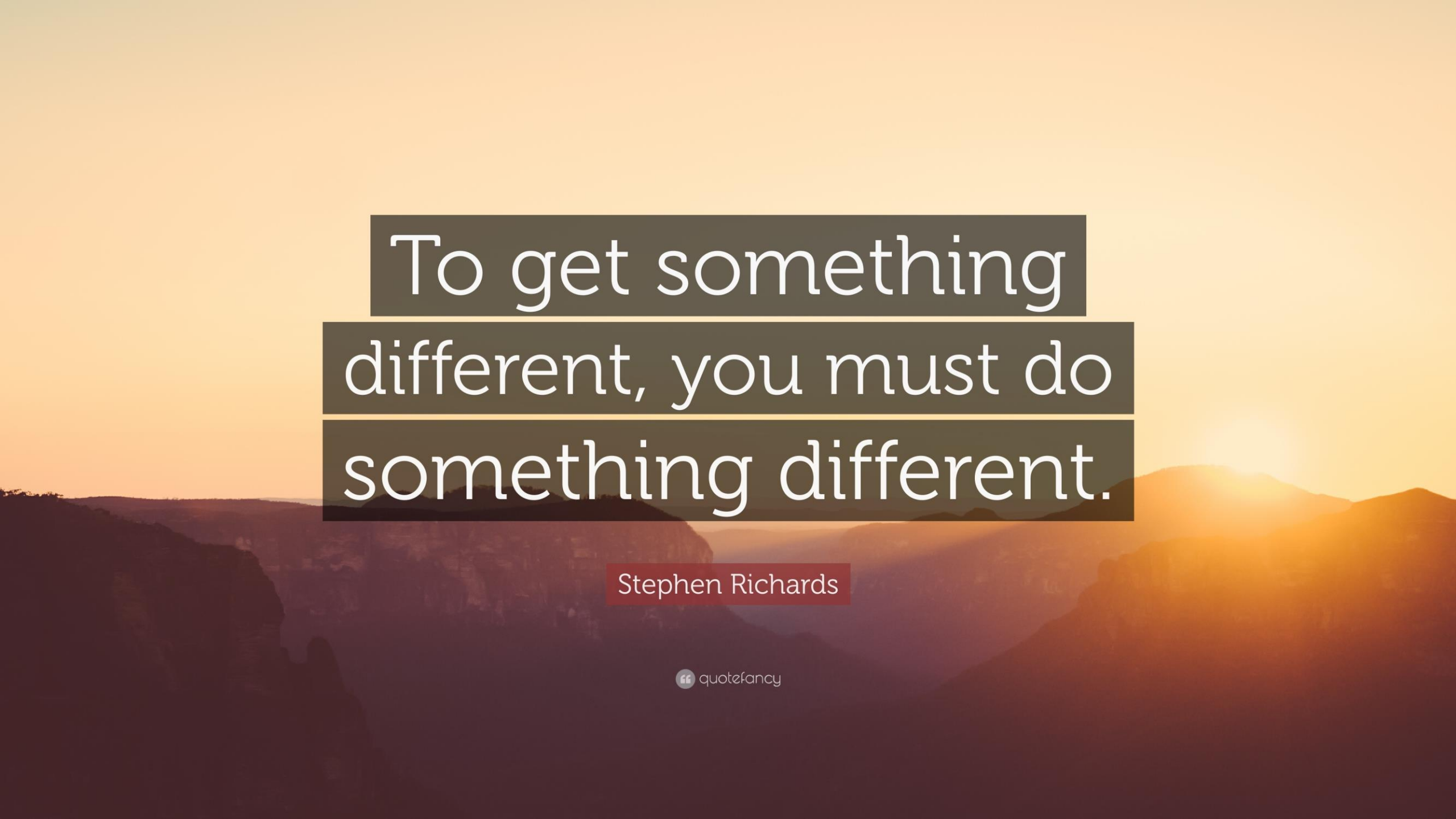
- More Cabling Required
- Controlled Access in IDF
- Greater IDF Cooling Requirements
- Power needed in IDF

- Less Cabling, patch cables to endpoints
- Allows for ring and daisy chain topologies
- Ceiling may be less secure, service requires ladder
- Less Cooling in IDF, lower cost switches
- Distributed Power required in ceiling

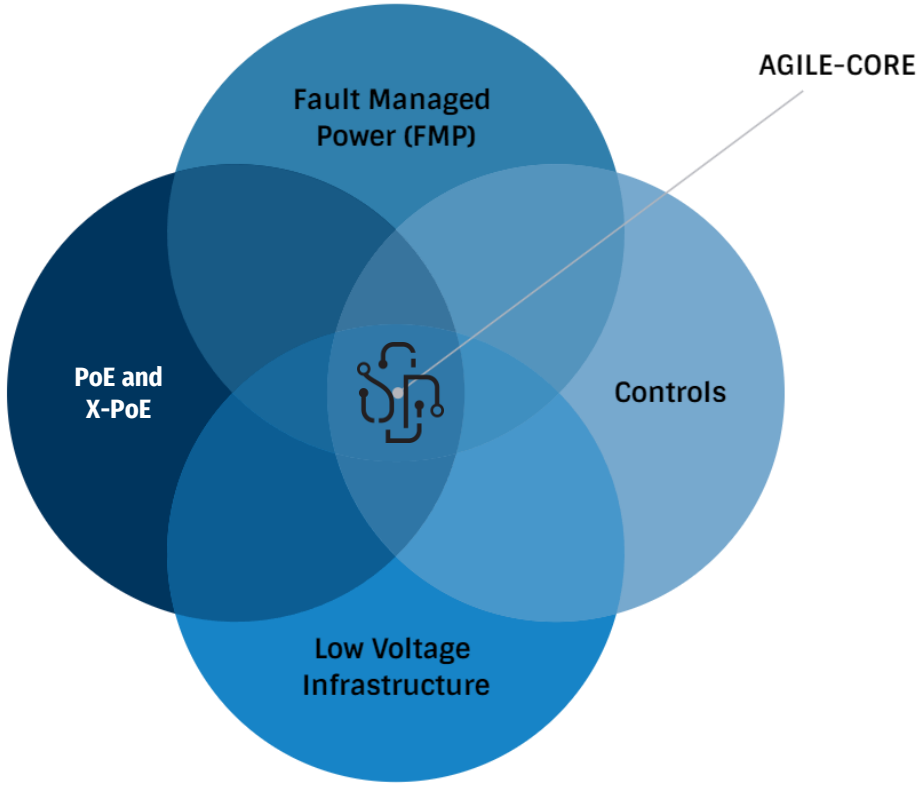
Small network switches mimic J-boxes

Future Energy Technology Trends for Buildings

Technology	Standards Org	Logo	Power Delivery	Data Delivery	Usage
Fault Managed Power	NFPA/NEC	NFPA National Fire Protection Association; nec	Bulk Power Kilowatts	Safety and Management Data Only	Powers DAS and Network Today
Single-Pair PoE	Ethernet Alliance / IEEE 802.3	ethernet alliance; IEEE	Up to 52W	Up to 10 GB/s	Future cable convergence
DC Microgrids	eMerge Alliance and others	eMerge ALLIANCE; IEEE; IEC International Electrotechnical Commission	TBD Expect up to 90W	No	Eliminates Energy Double Conversion
Distributed Power Sources	TBD others	?	Varies on the source	TBD	Perimeter & in building power generation
Extended POE (X-PoE)	? ? Ethernet Alliance / IEEE 802.3	ethernet alliance; IEEE	TBD Expect up to 90W	Up to 1 GB/s	Bi-directional power transport
Bi-directional PoE (BPoE)	?? Ethernet Alliance / IEEE 802.3	ethernet alliance; IEEE	TBD Expect up to 90W	Up to 1 GB/s	Bi-directional power transport


To get something different, you must do something different.
Stephen Richards
quotefancy

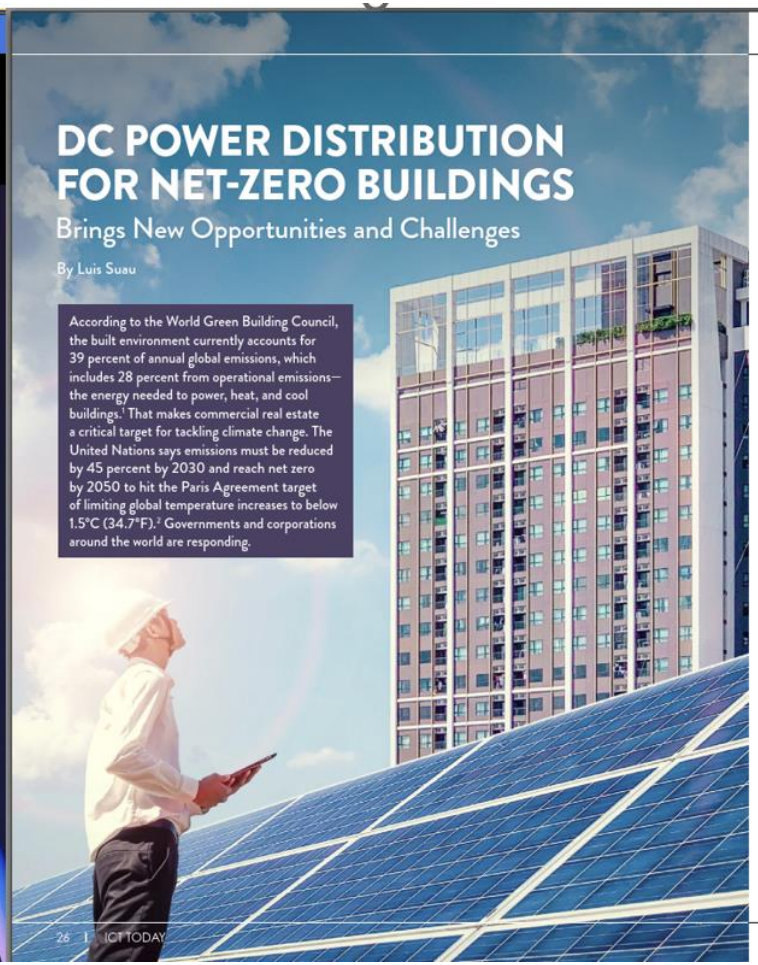
AGILE-CORE: A Reference Architecture



Taking the cost and complexity out of DC Buildings

Use a combination of different "DC" and low voltage products and solutions taken from different markets and industries.

Additional Reference
2024 Q2 Edition of ICT Today



The Biden Administration's Executive Order 14057 establishes an ambitious plan to make all federal facilities net zero by 2045, which the U.S. Department of Energy defines as a building that produces enough renewable energy to meet its annual energy consumption requirements. New York City Local Law 97, which goes into effect in 2024, establishes strict limits on emissions for buildings over 25,000 square feet, requiring a 40 percent reduction in emissions by 2030 and an 80 percent reduction by 2050. Dozens of other states and jurisdictions have executive orders and statutes requiring net-zero or near-net-zero buildings by 2050, with several requiring a significant carbon emissions reduction by 2030. Across the pond, the U.K. Climate Change Act requires a 100 percent reduction of greenhouse gas emissions from 1990 levels by 2050. The EU Energy Performance of Buildings Directive (EPBD) requires a minimum energy performance rating for commercial buildings by 2030 and climate neutrality by 2050.[3] Many of these regulations carry hefty financial penalties and carbon-based taxes for facilities that do not comply.

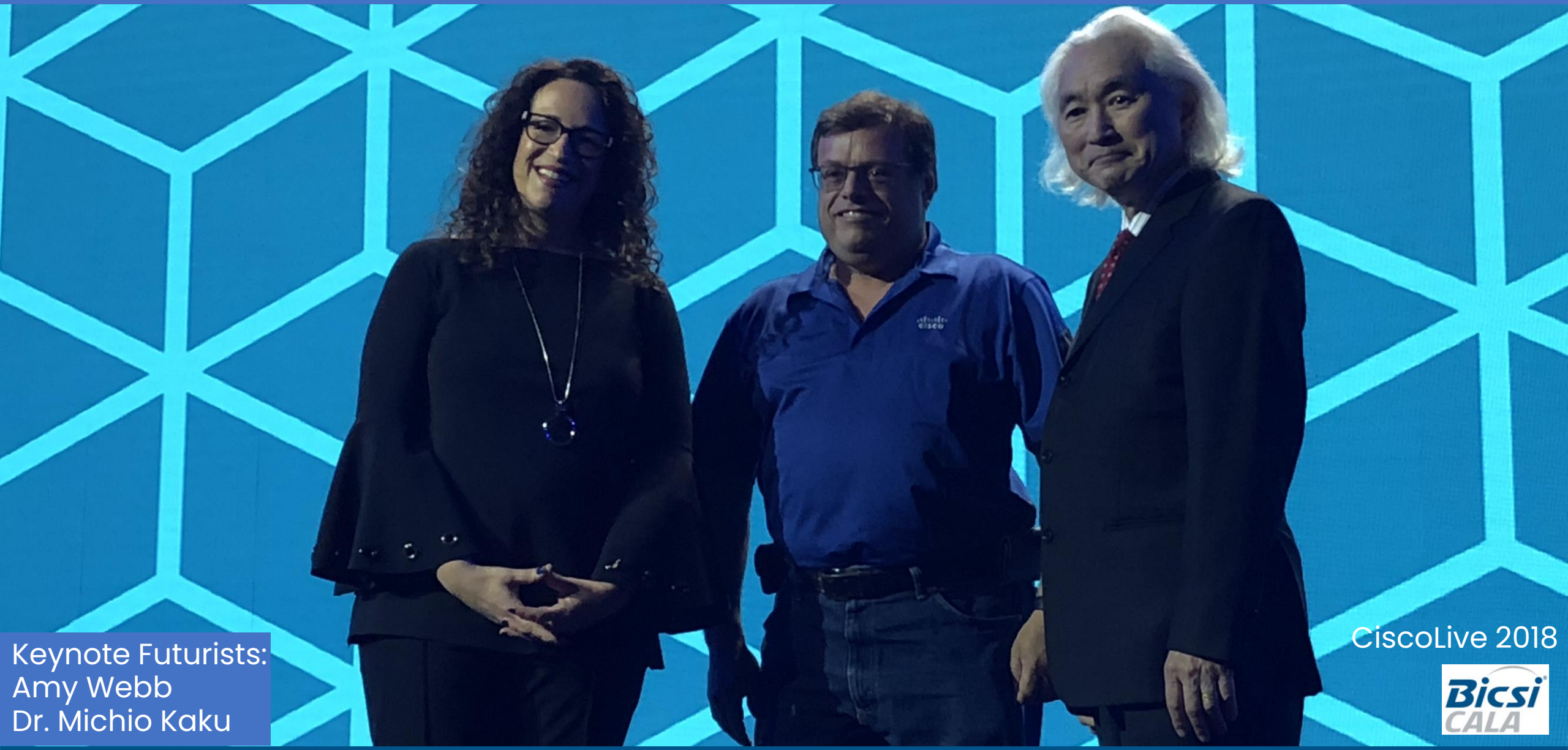
While investment in environmental, social, and governance (ESG) fell in 2023 due to the economic downturn and regulatory tightening to combat the issue of greenwashing (i.e., misleading information that makes a company's policies, products, or services appear more sustainable than they actually are), many corporations are still committing to strict emissions targets to comply with regulations and meet the demands of corporate stakeholders and evolving building occupant expectations. In response to new regulations governing environmental claims, such as the European Commission's proposed Green Claims Directive, more companies are ensuring transparency and ensuring that their environmental claims are independently verified by third-party assessment bodies such as the Science-Based Targets initiative (SBTi). According to SBTi, the number of companies setting and verifying science-based targets continues to grow, now representing over a third (34 percent) of the global economy.[4] The New Building Institute (NBI) says North America's number of verified and emerging net-zero buildings increased by 42 percent between 2018 and 2020, and they predict the number of net-zero buildings will increase by as much as 50 percent every two years.[5]

Onsite microgrids comprised of renewable energy sources (e.g., wind, solar, hydro) and battery energy storage systems (ESS) are becoming an increasingly attractive solution for many commercial buildings to achieve net-zero status. The global microgrid market is projected to more than double in value by 2028 at a rate of more than 20 percent, and the U.S. microgrid market experienced a 47 percent increase in solar and storage capacity between 2017 and 2022.[6] While a building can reach net-zero status by generating enough renewable energy via an onsite microgrid, a DC power infrastructure that distributes DC power from an onsite microgrid throughout a building makes it easier—all while improving building resiliency, reducing operating costs, driving innovation, and expanding opportunities in the ICT industry. But, as with any significant paradigm shift, there are some considerations.

DELIVERING EFFICIENCY, SAVINGS, AND MORE

Since the beginning of the 19th century, the electric power grid has used AC to distribute power to cities, neighborhoods, and buildings due to its ability to deliver higher voltages over long distances from centralized power plants. However, over the past few decades, there has been an unacknowledged, subtle transition from equipment and devices with electric components to those with electronic components. Electronic components feature printed circuit boards with diodes, resistors, microprocessors, capacitors, and even motors that operate via DC power. For example, all IT and audiovisual equipment, LED lighting, electrical vehicle (EV) chargers, variable speed HVAC systems, and energy-efficient motors within other building system appliances and equipment (e.g., variable speed motors, fans, blowers, pumps, and compressors) operate via DC power. Yet, building electrical infrastructure has not changed and continues to rely on AC power.

I’m no Futurist… But It’s a Logical Evolution



Keynote Futurists:
Amy Webb
Dr. Michio Kaku

CiscoLive 2018

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Thank You

Luis Suau
Chief Business Officer
Sinclair Digital
LSuau@Sinclair-Digital.com