

# NECA • BICSI SUMMIT 2023

## DC Microgrids: Enabling Smarter and More Sustainable Buildings



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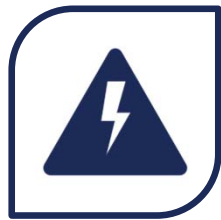
# The Basics

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# Definition of Concepts

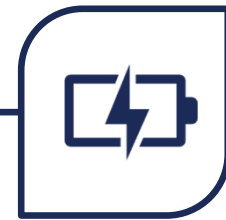
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AC vs DC



Microgrid



Distributed energy  
resources (DERs)

# A Closer Look at Microgrids

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- Distributed Energy Resource
- Power can come from a wide variety of sources
- Can detach from the grid and operate separately as an island
- Solar, wind, and hydropower to drive 35% of new microgrid capacity by 2025
- Record installed in 2019 (546)
- Microgrids are less valuable to utilities, more valuable to customers



# What's driving the adoption of Microgrids?

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- State-driven initiatives
- FERC Order 2022 will accelerate microgrid development
- Resilience in extreme weather conditions
- Relieve pressure / operate outside of peak demand pressures
- Cost of renewables decreasing
- Improved energy efficiency of connected devices and systems





# FERC Order 2022

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Enables DER aggregators to compete in regional organized wholesale electric markets



# Microgrid Goals

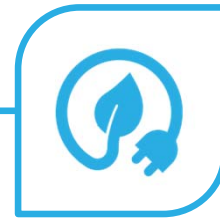
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Energy Security



Resilience

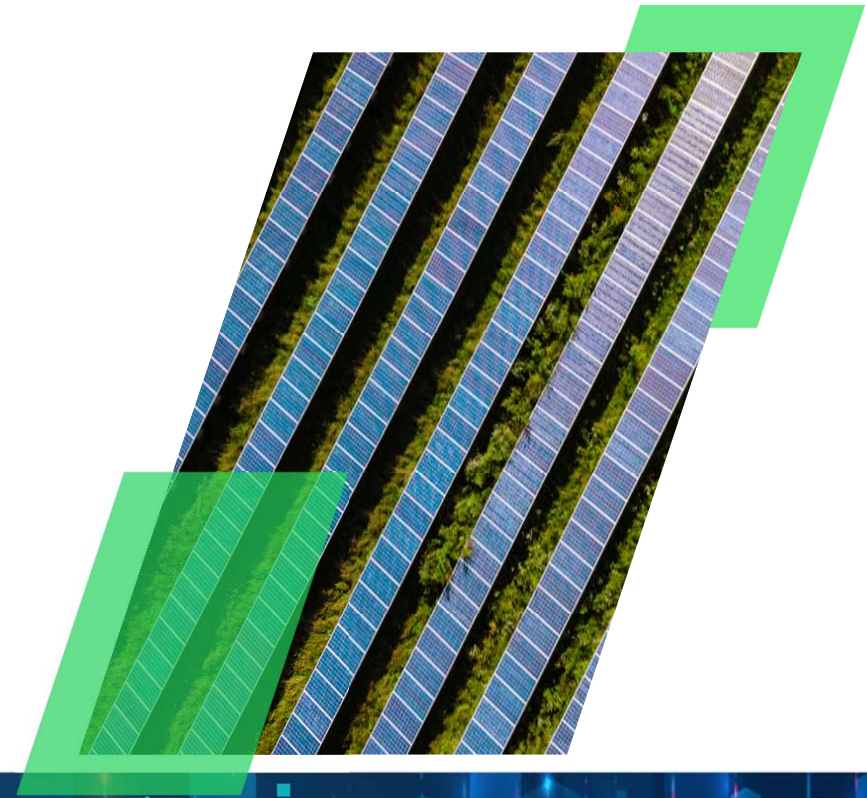


Sustainability

# The Rise of a DC Microgrid

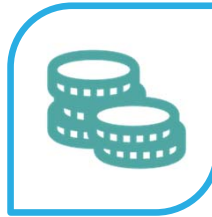
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- Removes the conversions between AC and DC power
- Requires low-voltage devices
- PoE cabling enables the DC microgrid from power source to device
- Ideal for a smart building





## Benefits of bringing systems into the low-voltage world



PoE is easier and cheaper - save money on conduit and installation cost



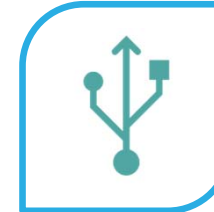
Global solution for advanced connectivity and universal compatibility



PoE enables 2-way communication with each fixture for advanced control and data analytics

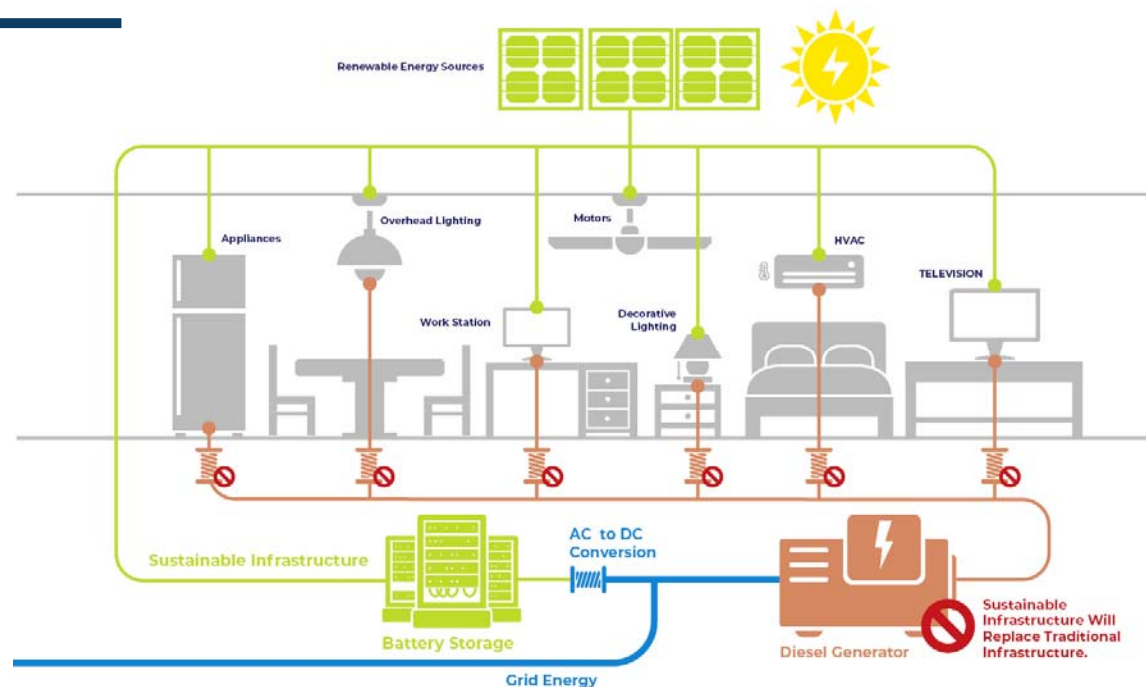


Possible integrations in the future without needing to rewire or retrofit

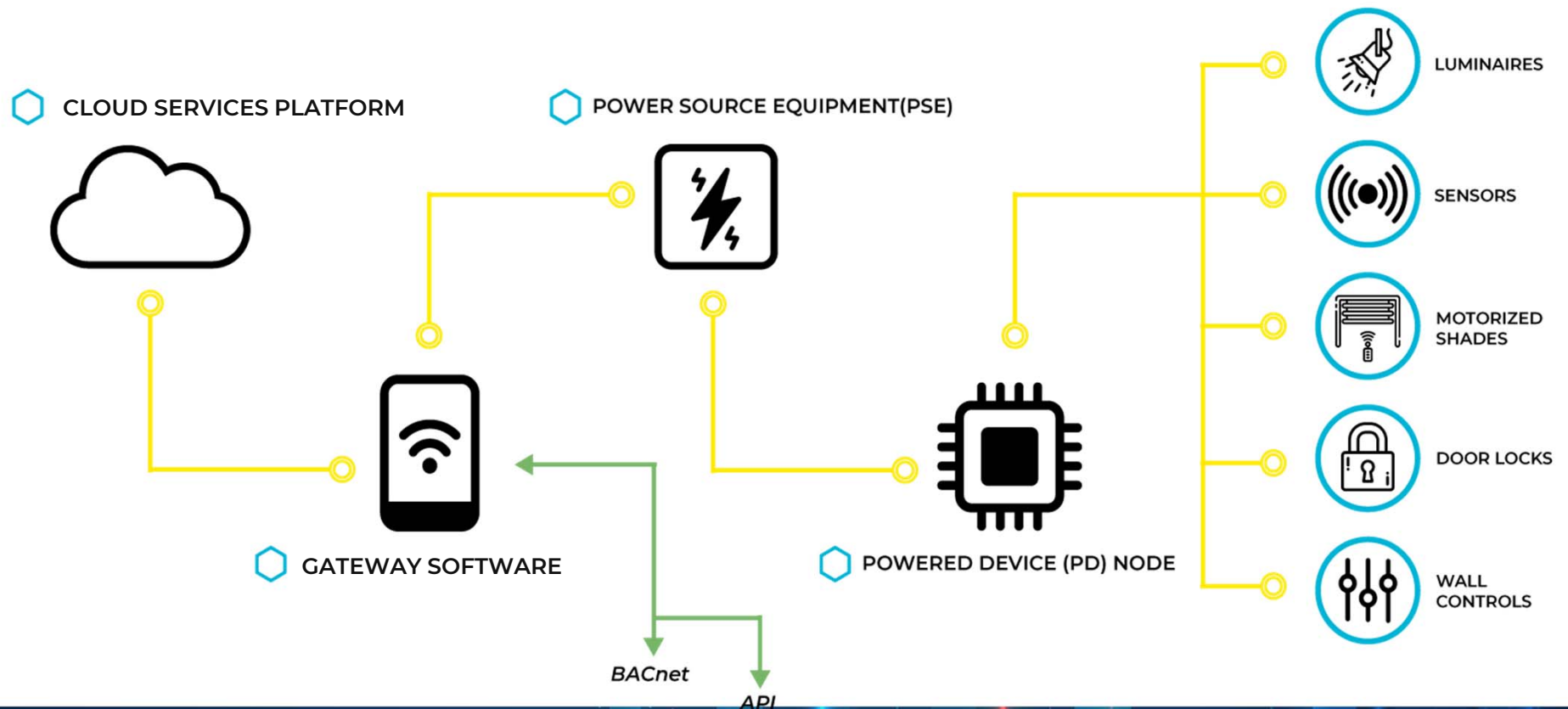


More wattage to integrate more devices and go into more spaces

# How a Smart Building Uses a DC Microgrid

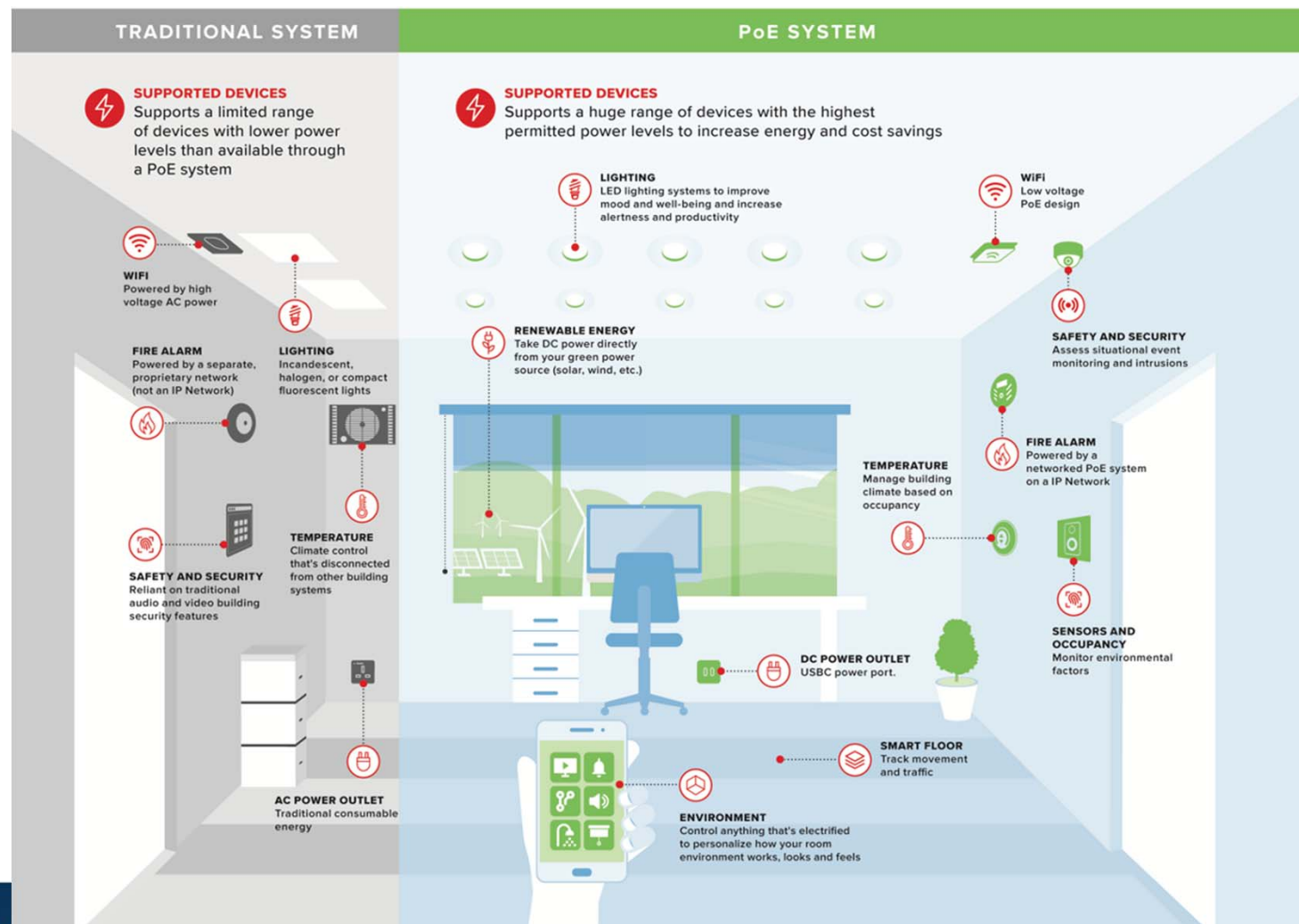


# How to manage everything IoT: Software



# What the occupant sees

A new world of customization





# CASE STUDY:

## Hotel Marcel in New Haven, CT

The World's First Net-Zero Hotel

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### CHALLENGE

Transform a historic building into the world's first "Net Zero" hotel.

### WHY PoE?

Using PoE power with a smart building creates infinite integration and enables the use of DC power from energy generation to end device.

### OUTCOME

Hotel Marcel is slated to achieve LEED Platinum certification and generate all the energy it will consume from its onsite solar panels.



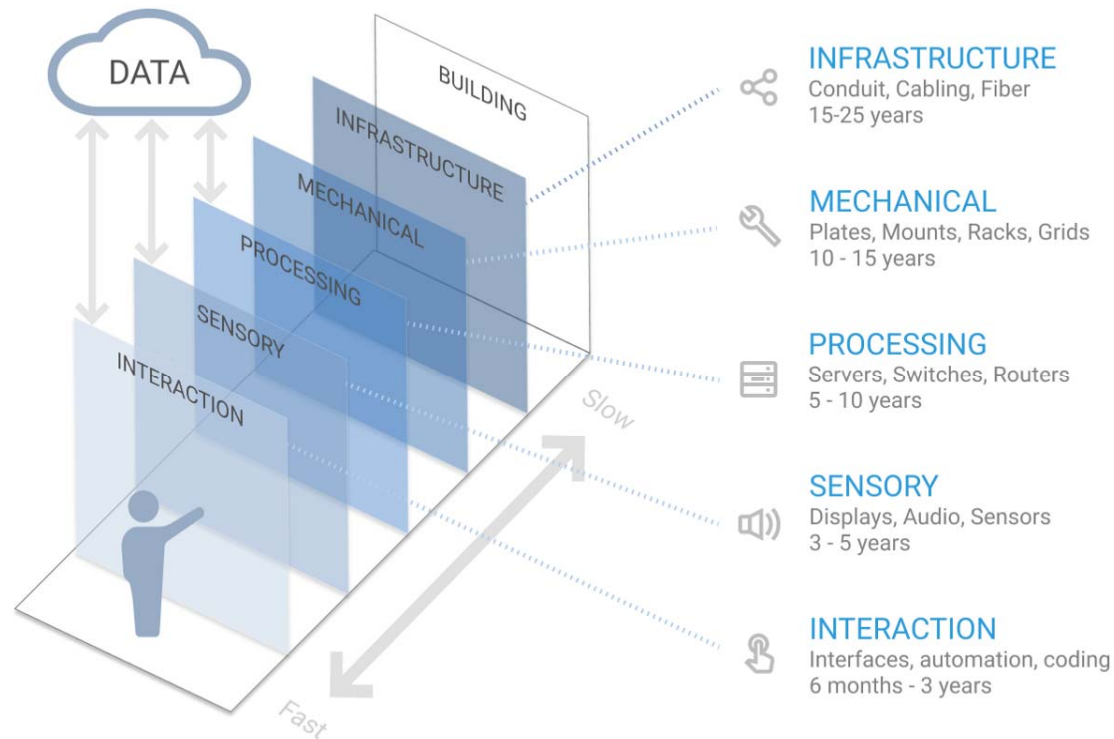


# Smart Building & DC Microgrids

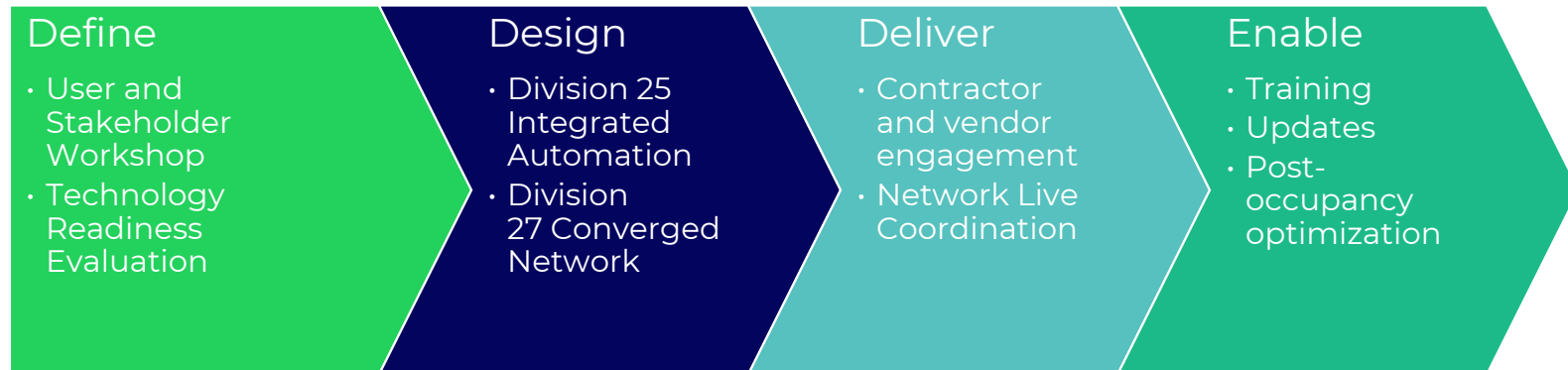
- The Layers of Smart Building
- Smart Building Design Process
- User Stories
- Data Use Cases
- Design and Implementation Enablers
- Technology Readiness and Challenges
- The IoT Desk Case Study



# The Layers of Smart Building



# Smart Building Design Process



# Smart Building + PoE User Stories

## Developer

Cost and space reduction

Streamlined and flexible cabling infrastructure

## Operator

Streamlined network management

Streamlined data management

System security

Maintenance

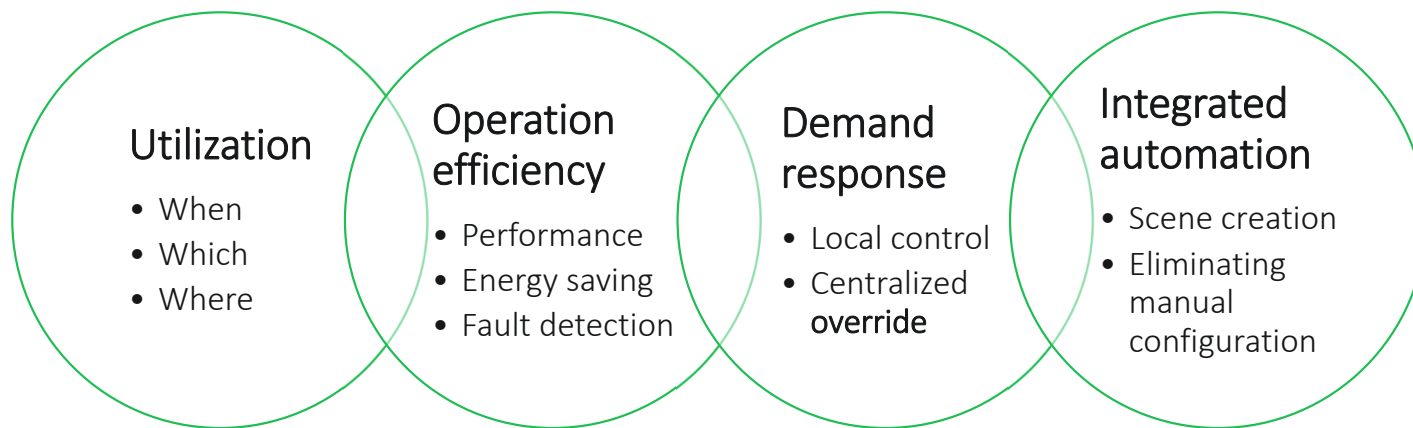
## Occupant

Real time personal control and awareness

Cable management

Connectivity and community

# Smart Building Data Use Cases



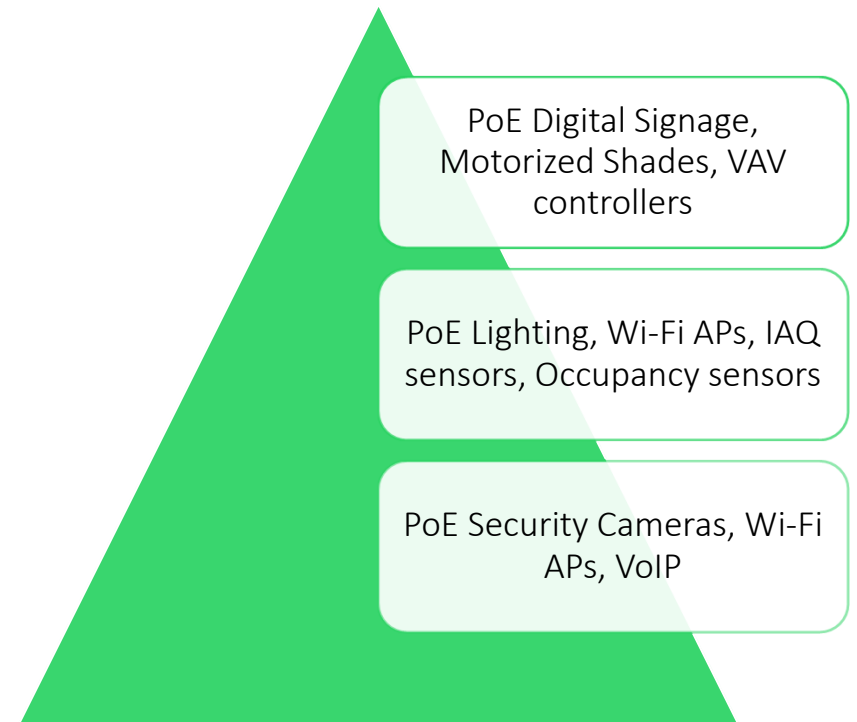


# DC Adoption Readiness

Voltage levels for building applications

Voltage	Application		
≥465V	Direct interconnection with three-phase, 400V AC grid		
380-400V	Standard in the data-centre industry		
350V	Current/OS standard		
325V	Minimum modification required for loads with input rectifier		
230V	Compatibility with pure resistance loads		
120V	Limit for extra low voltage DC, electric shock protection is basic insulation only		
60V	Safe DC. Limit for DC conductors exposed to touch in use		
48V	Standard in telecommunication industry		
25V	Safe AC. Limit for AC conductors exposed to touch in use	Safe AC	Safe DC
24V	Emerge Alliance Occupied Space Standard		
20V	USB type C (implementing USB-PD)		
12V	Standard in automotive industry		
5V	USB legacy		

# DC/PoE Adoption Readiness

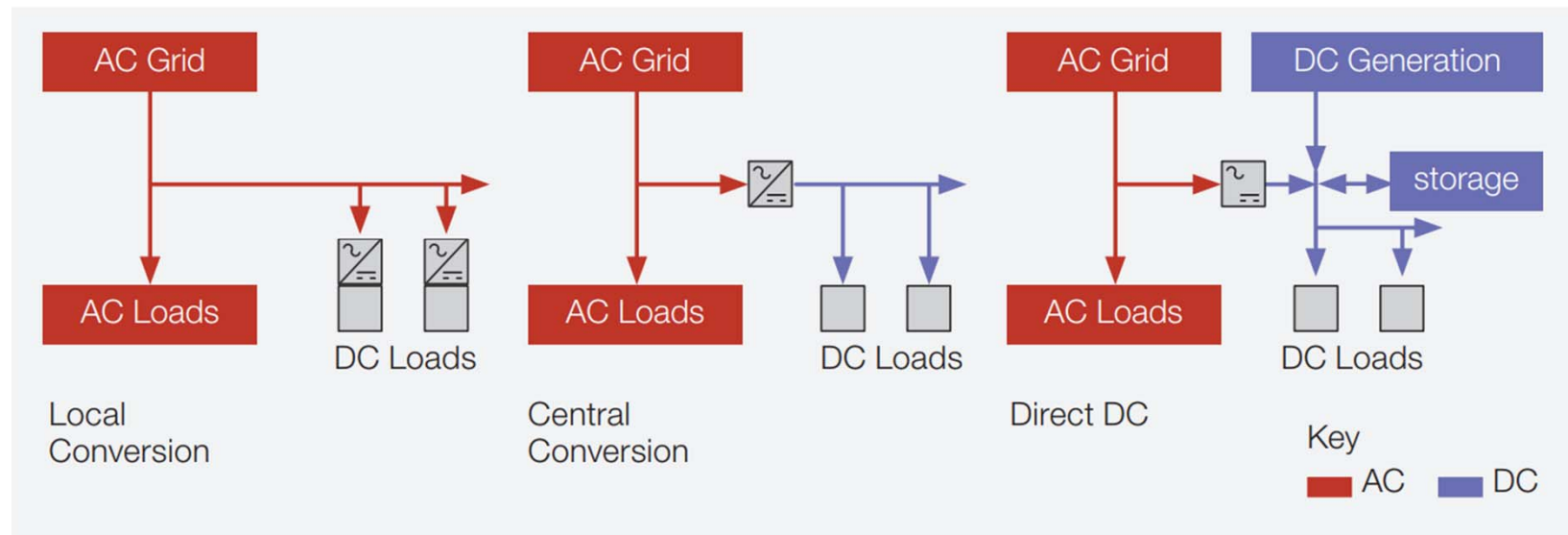


# DC/PoE Challenges

- Business case
- Safety and protection
- Common best practice
- High performance applications
- Grid controllers and network management technology
- Transition/Retrofit

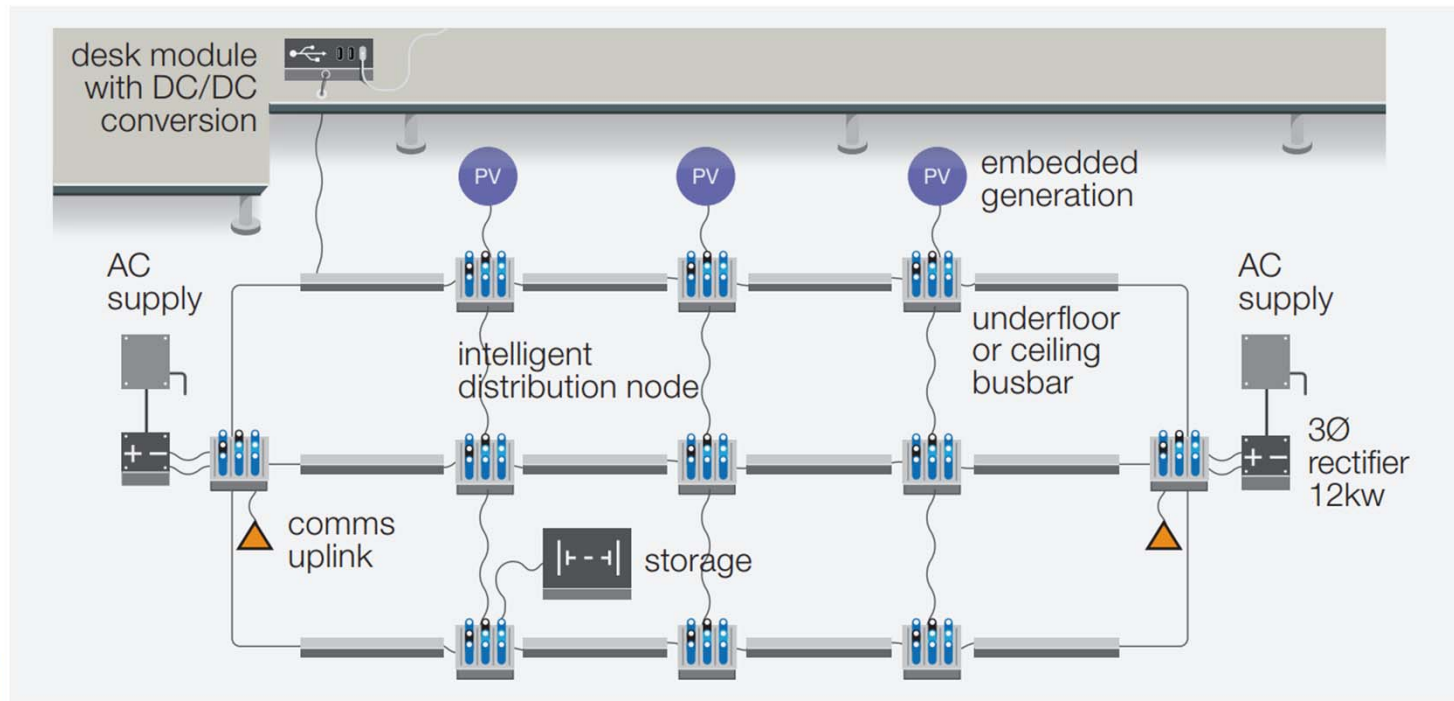
# DC building power distribution approaches

AC/DC grid topologies



# DC building power distribution approaches

Possible design for managed power distribution in offices





# DC Smart Building Design Enablers

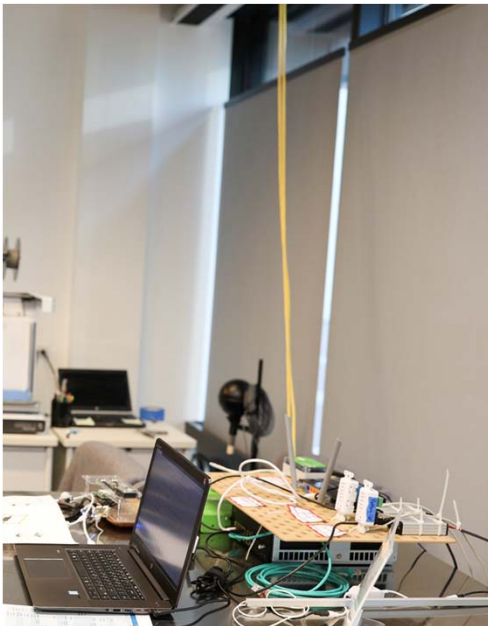
- DC Smart Building Design Considerations
  - PoE at device or gateway
  - PoE Distance to MDF/IDF
  - MDF/IDF rack space and cooling
  - Conduit sizing comparison
  - Furniture cable management
  - Structured cabling design coordination
  - PoE standards and specification for power and network security



# DC Smart Building Implementation Enablers

- Enabling Stakeholders
  - Electrical contractor
  - Structured cabling contractor
  - Equipment vendor
  - Owner's IT/OT group
  - System Integrator

# DC Smart Building IoT Desk Case Study



- PoE motorized shades
- PoE lighting
- USB-powered IoT sensors
- USB-powered Arduino User Interface and Integrated Automation programming
- USB charging for personal electronic devices including laptop and monitors

Determine  
PoE end-  
devices

Mock-up  
installation

Test use  
cases and  
user  
experience

Validate  
and  
customize  
design





NE  
SU



  
**Intelligent AND Sustainable**

# Sustainability Concepts of Smart Buildings



Energy Efficiency

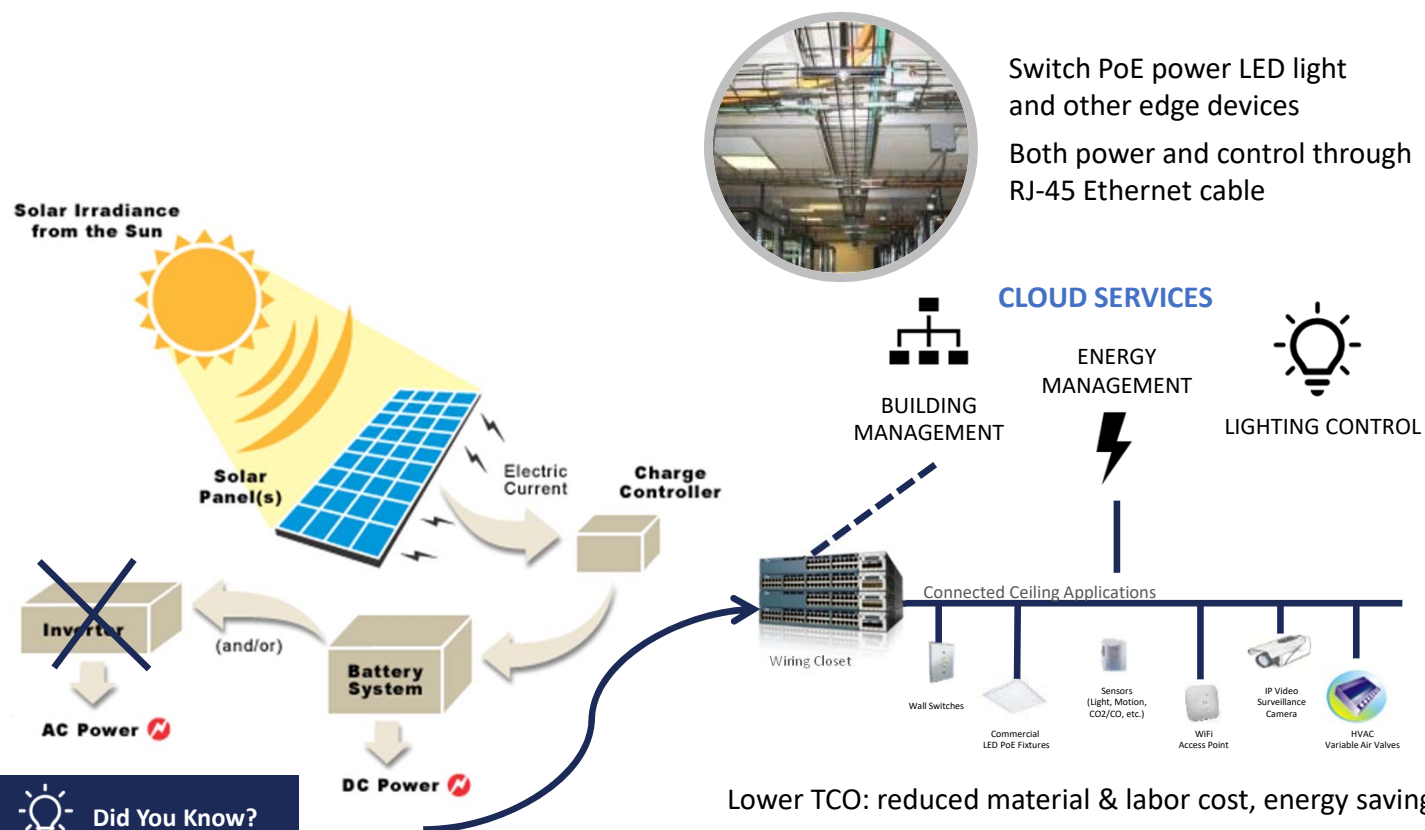
Safety,  
Security &  
Wellbeing

Carbon  
Reduction

Sustainable  
Products



# DC vs. AC POWER



Switch PoE power LED light and other edge devices

Both power and control through RJ-45 Ethernet cable

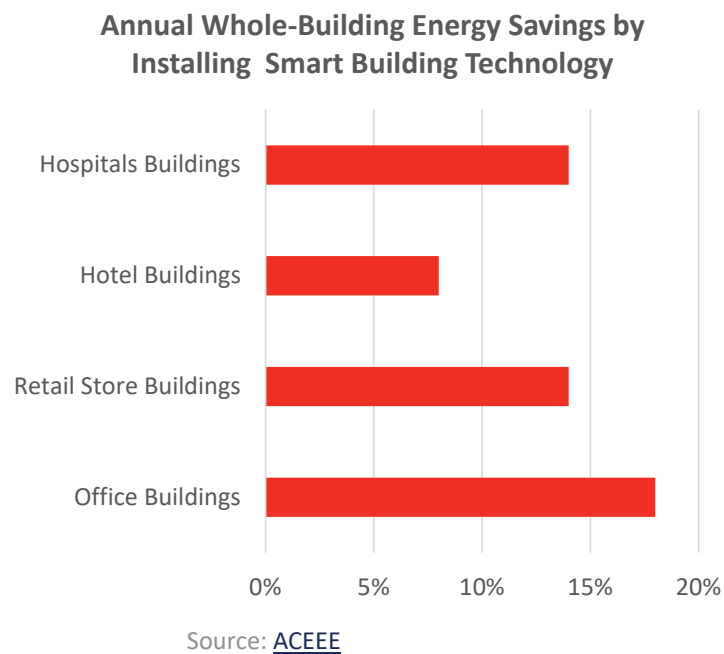
## Did You Know?

PoE systems reduce AC-DC conversion power loss, which could exceed 15% in poorly designed systems (U.S. Department of Energy, 2017).

Lower TCO: reduced material & labor cost, energy savings

Intelligent IP platform, software analytics for broader building automation initiatives

# ENERGY SAVINGS FROM SMART BUILDINGS



Smart building technologies like occupancy sensors, smart thermostats, HVAC and lighting controls can significantly reduce energy consumption in a variety of building types.

# NET ZERO ENERGY DESIGN



**LEED**Zero

**2030**  
DISTRICTS®



**ZERO CARBON  
BUILDING STANDARD**  
Canada Green Building Council®



## Did You Know?

Sustainably designed buildings release 36% fewer CO<sub>2</sub> emissions compared to the national average (U.S. General Services Administration, 2011).

## SMART + GREEN BUILDING CONTRIBUTIONS

- LBC Energy Petal
- LEED Energy and Atmosphere Credits
- WELL Lighting Features



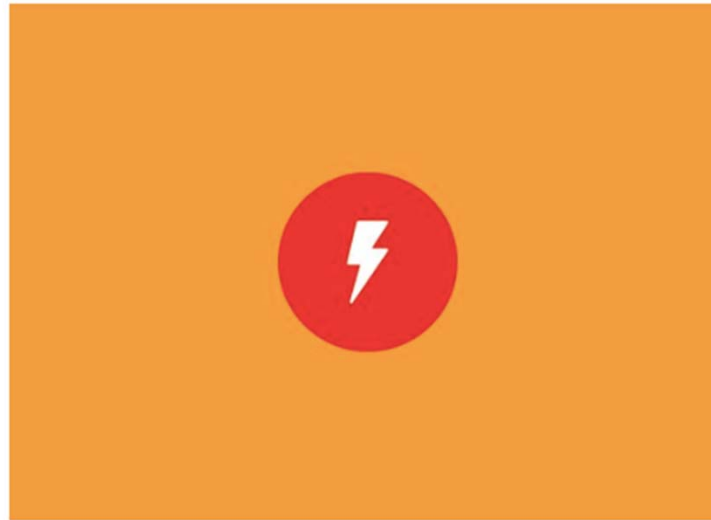
**LIVING  
BUILDING  
CHALLENGE** <sup>SM</sup>



# DC Power LEED PILOT CREDIT

LEED

**New LEED pilot credit  
encourages energy savings  
with DC power systems**



<https://www.usgbc.org/articles/new-leed-pilot-credit-encourages-energy-savings-dc-power-systems>



# Promoting Safety, Security and Well-Being



(15W, 30W, 60W, 90W) @ 24V – 54V DC

Installation

Shot Gun Detection



VOC Sensors

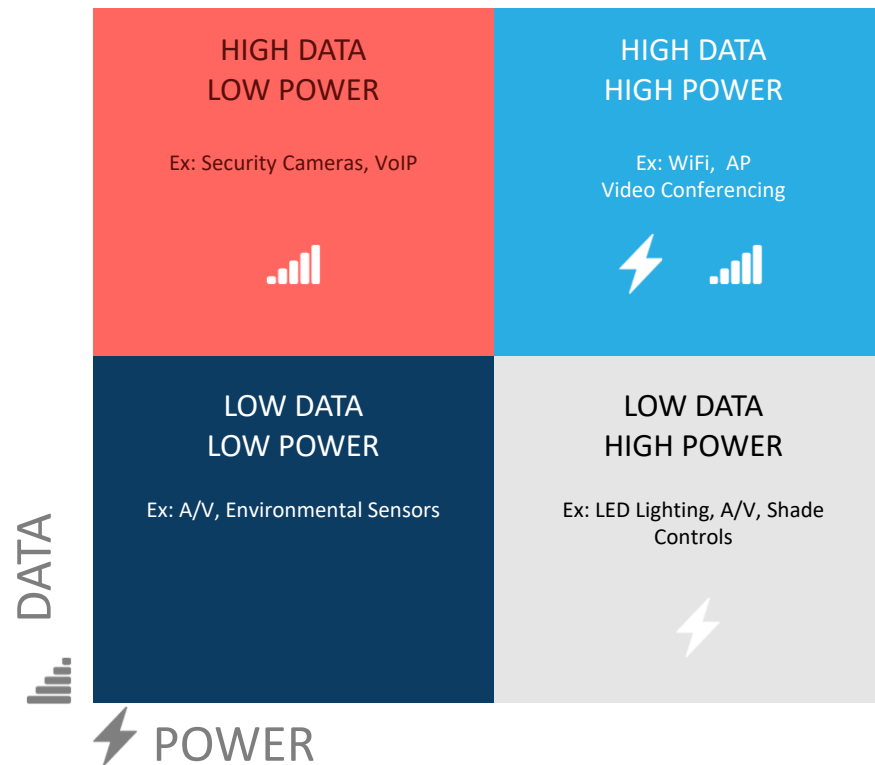


Integrated  
BAS

Applications



# Lets Talk Cable: Not all cable is created equal!



**THE TYPE OF CABLING YOU USE COUNTS!!**



**NOT ALL CABLE IS CREATED EQUAL**





# #what'sbehindyourwalls?



IF ALL ELSE IS EQUAL, WHY NOT CHOOSE SUSTAINABLE?

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## Leading Green Building Standards



# What Types of Projects Are You Working on?



## Did You Know?

U.S. LEED-certified projects command 3.7% more in rent, have 4% higher occupancy rates and 5.6% higher tenant renewal rates than noncertified buildings (Commercial Property Executive).

Current Value Estimate  
\$65,700,000



NON-CERTIFIED

10.2%<sup>CDN</sup> ↑ rental rate premium in LEED certified buildings\*

3.7%<sup>US</sup> ↑

4% ↓ rent concessions in CDN LEED & BOMA BEST certified buildings\*\*

4% ↑ occupancy rate premium in US LEED certified buildings\*

Current Value Estimate  
\$72,300,000



CERTIFIED



# GREEN BUILDING CONTRIBUTIONS & CERTIFICATIONS



1 Living Product  
(2 In Progress)



3 Red List Free  
Declare Labels



Supports achievement of LEED  
Circular Products Pilot Credit



35+ HPDs  
(1,000's of  
SKUs)



55+ EPDs  
(1,000's of  
SKUs)



LEED v4.1  
Compliant  
Action Plans  
covering 35+  
Product  
Families



<https://sustainability.superioressexcommunications.com/sustainable-products/>



# Zero Carbon Program

## You've Got Zero Carbon Building Project Goals We've Got Zero Carbon Cables

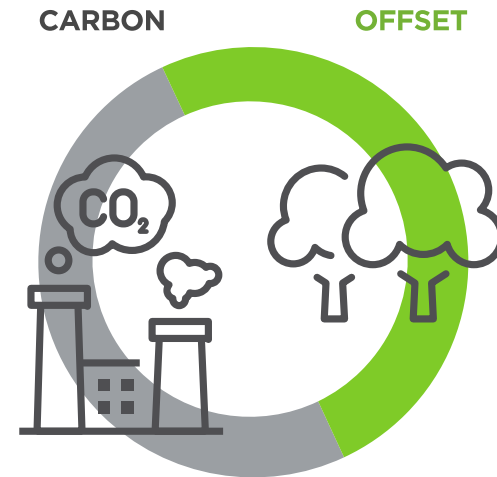
We're proud to launch our **Zero Carbon Program**, a new collaboration opportunity we've created to encourage and enable architects, designers and building owners to take action by specifying our sustainable cables.

In return, **we'll offset 150% of the carbon footprint of the cable you purchase for your projects!** In short, we're not only completely offsetting the carbon impacts of our own cabling products - we're also enabling the offset of an extra 50% to help you counterbalance other products' carbon impacts in your building projects as well!

Plus, this program enables your project team to use the verifiable offsets to achieve zero carbon and carbon neutrality initiatives such as ILFI's Living Building Challenge and Zero Carbon programs, CaGBC's Zero Carbon program and/or LEED Zero.

If you'd like to participate in our Zero Carbon Program, simply email [ZeroCarbon@spsx.com](mailto:ZeroCarbon@spsx.com) to get signed up today.

We look forward to offsetting TONS of carbon with you!



To learn more, visit: [superioressexcommunications.com/sustainability](https://superioressexcommunications.com/sustainability)

*Printed on 100% post-consumer recycled paper*

# WHERE CAN YOU FIND THIS INFORMATION?

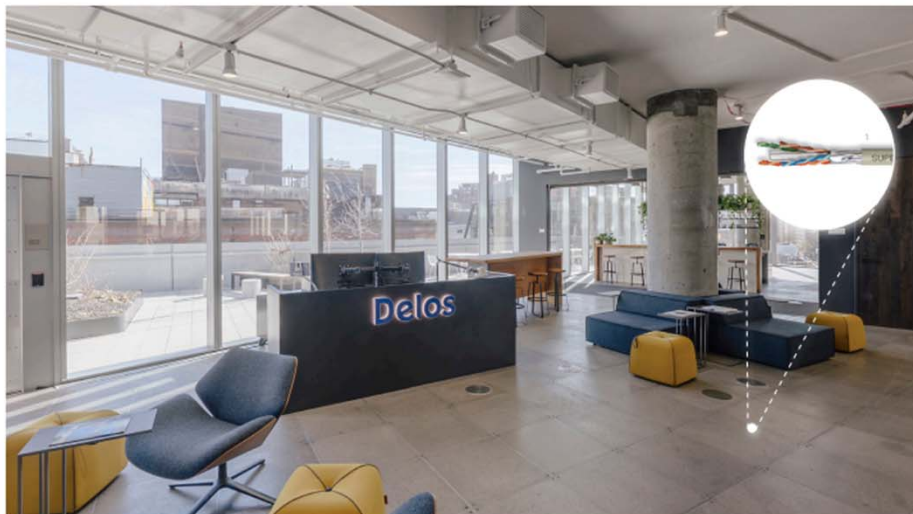


[www.mindfulmaterials.com](http://www.mindfulmaterials.com)



## Case Study: Delos

- LEED Platinum
- WELL Platinum
- LBC Materials Petal Certification



SUPERIOR ESSEX CAT 6 UTP/FTP WITH FEP JACKET



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