

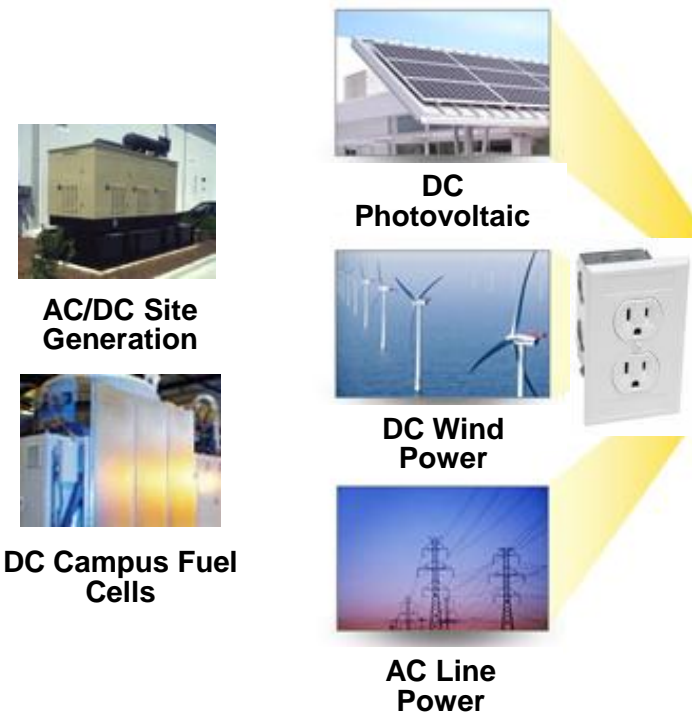


# EMerge Alliance Standards for Hybrid AC/DC Power Distribution in Commercial Buildings

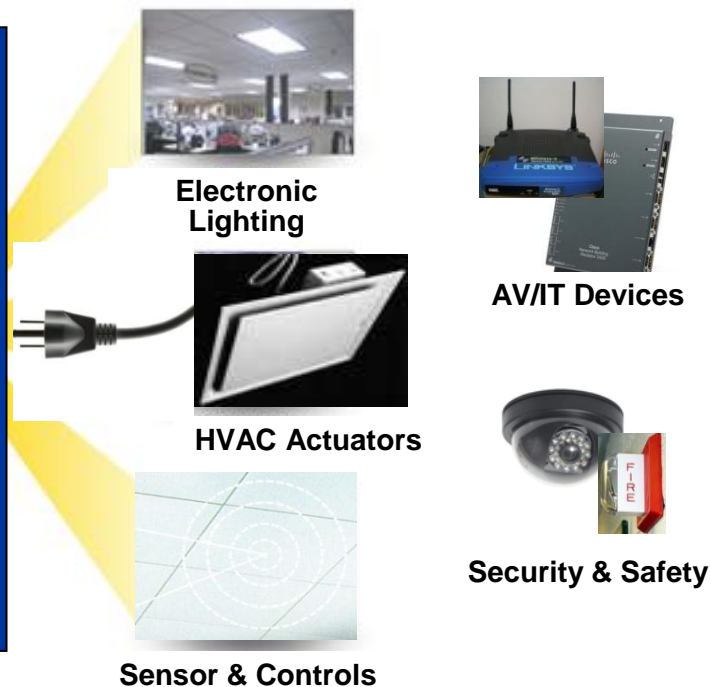
Brian Patterson  
Chairman, EMerge Alliance

## PROBLEM: **MISMATCHED AC & DC POWER REQUIREMENTS**

### ENERGY SOURCES – MIXED AC & DC



### ELECTRIC DEVICES – TYPICALLY DC



**RESULT: LOST OPPORTUNITY TO REDUCE ENERGY UP TO 30%**

Source: **Armstrong**<sup>®</sup>

## **SOLUTION: A SIMPLIFIED AC/DC HYBRID COUPLED POWER NETWORK**

### **ENERGY SOURCES**



**AC/DC Site  
Generation**



**DC Campus Fuel  
Cells**



**DC  
Photovoltaic**



**DC Wind  
Power**



**AC Line Power**



### **ELECTRO-ACTIVE DEVICES**



**Electronic  
Lighting**



**HVAC Actuators**



**Sensor & Controls**



**AV/IT Devices**

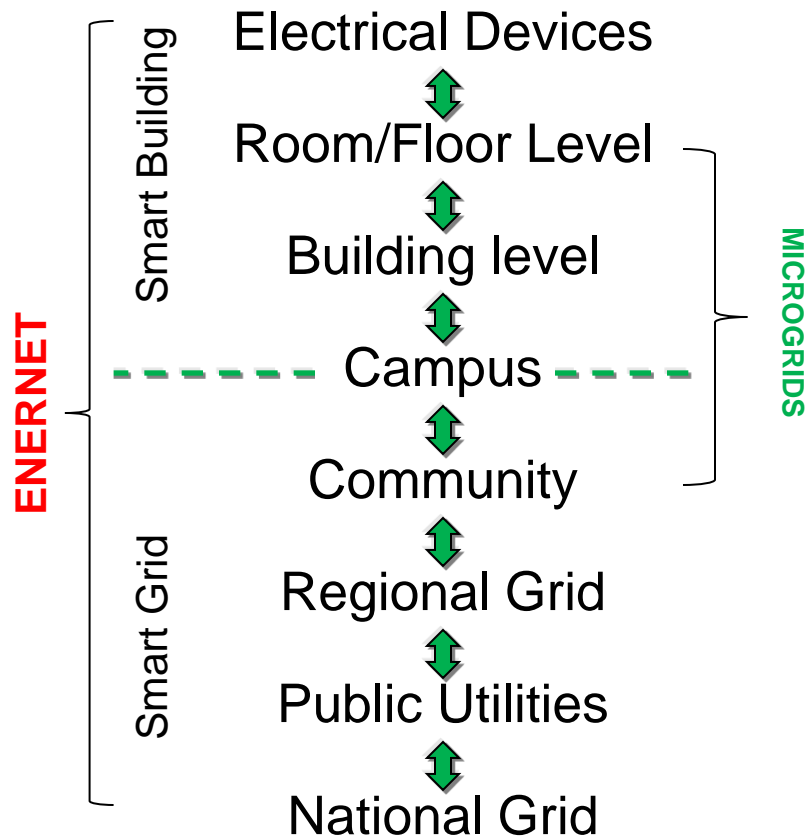


**Security & Safety**

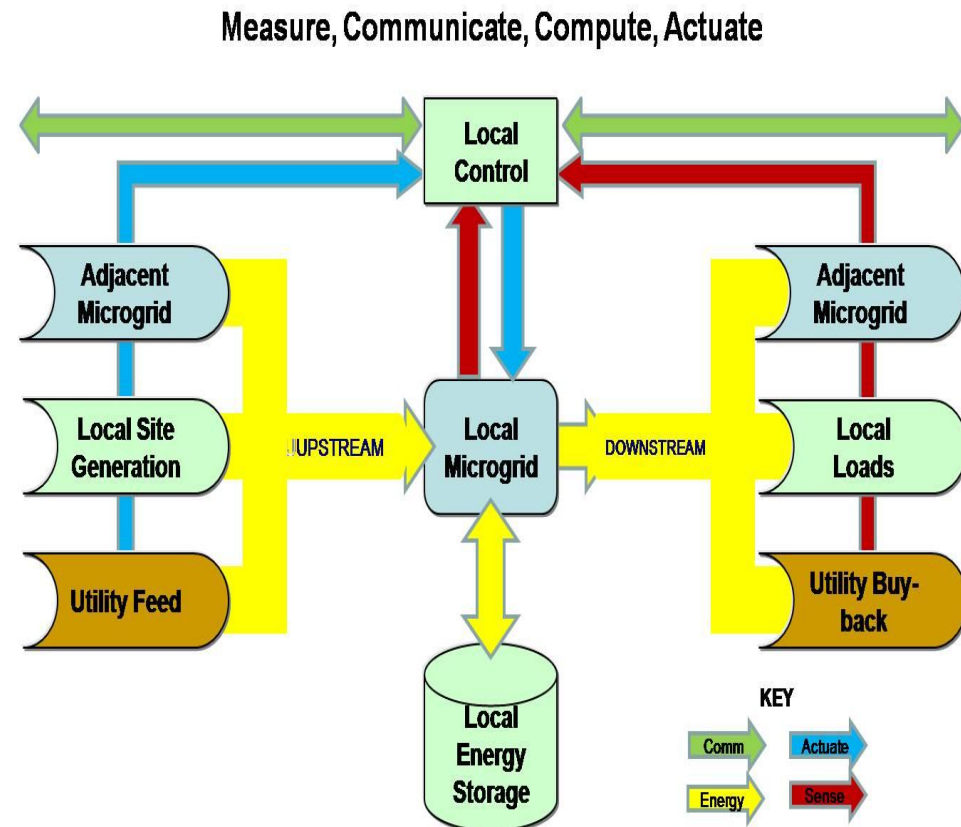
**OPPORTUNITY: 30% LESS ENERGY, 15% LESS CAPITAL, 200% MORE RELIABLE**

# The Building as part of a Power Network

## Power Network Layers:



## Typical Microgrid Node:



## The Alliance Approach

# It Takes an Industry to Build a Building

- Simple
- Safe
- Sustainable



# Who is EMerge?

Over 60 (and growing)  
organizations participating  
in 6 member levels.

## Advisory Council Members

Los Angeles Community College District  
California Institute of Energy & Environment  
Turner Construction  
Naomi Miller Lighting Design  
Paladino and Company  
The PNC Financial Services Group, Inc.  
Darnell Group  
Southern California Edison

Members —Partial list, visit [EMergeAlliance.org](http://EMergeAlliance.org)

### Founding Governing Members



### Participating Members



### Liaison Members



### General Members



### Supporting Members



# What is EMerge about?

A DC power platform for commercial interiors.

- Promoting a new, open standard for room-level Direct Current (DC) power distribution in commercial buildings
- Safe, low voltage DC power at room level complements AC infrastructure of buildings
  - Creating a “hybrid power layer” at the load level
- Enabling plug-and-play device flexibility
- Increased energy savings from more efficient use of lighting, controls and other electrical devices
- Facilitating optional use of direct integration with renewable energy sources

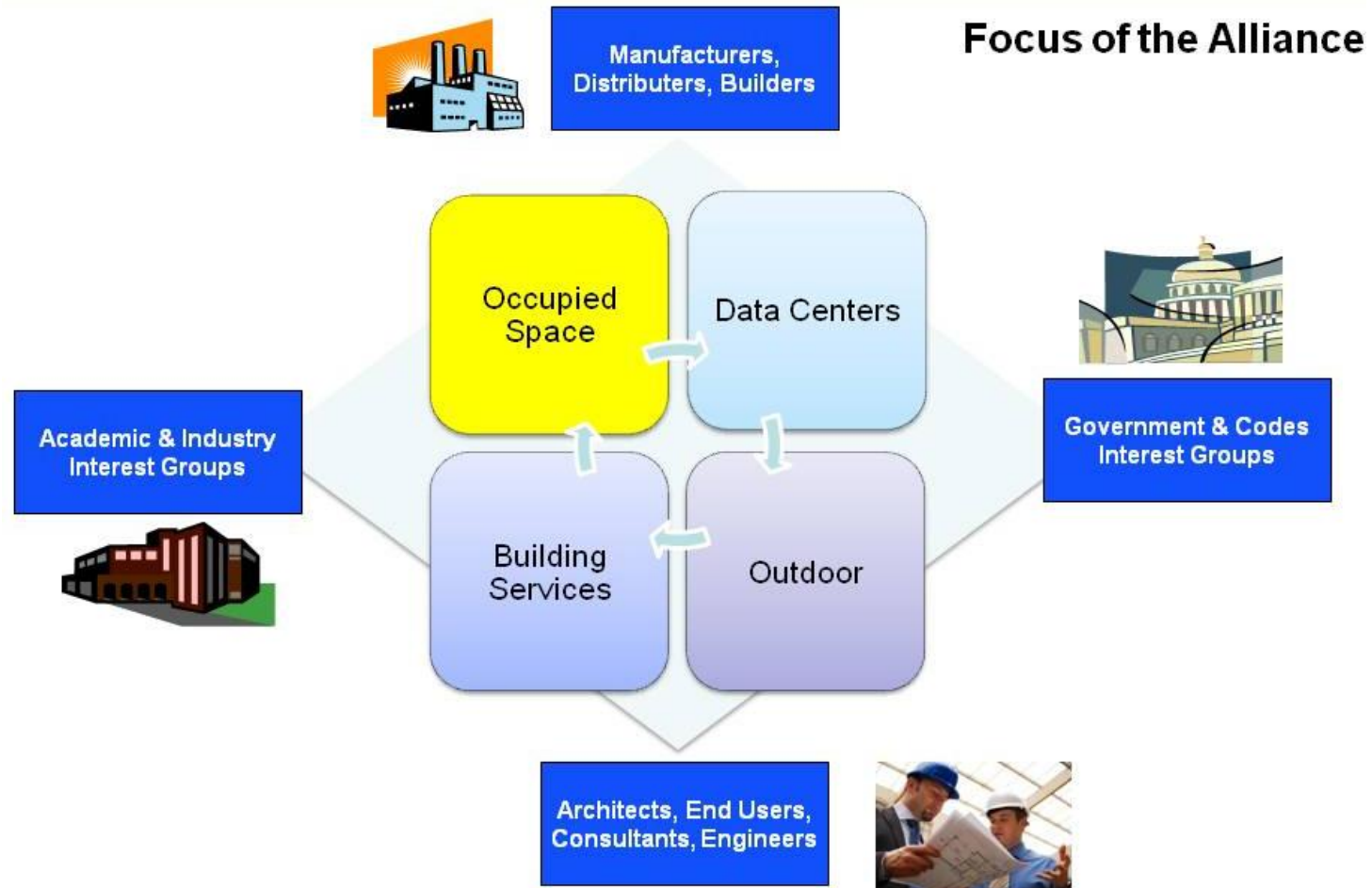
## Focused on Safety, Flexibility, Sustainability, Cost

- » Reduce complexity
- » Reduce installation time
- » First-cost competitive
- » Simple and flexible reconfiguration
- » Plug & play capability
- » NEC recognized Class 2 power levels – under 30 Volts
- » Reduce system energy
- » Create interoperable interconnect and device controls
- » Simplify integration of solar panels, wind, fuel cell, and batteries



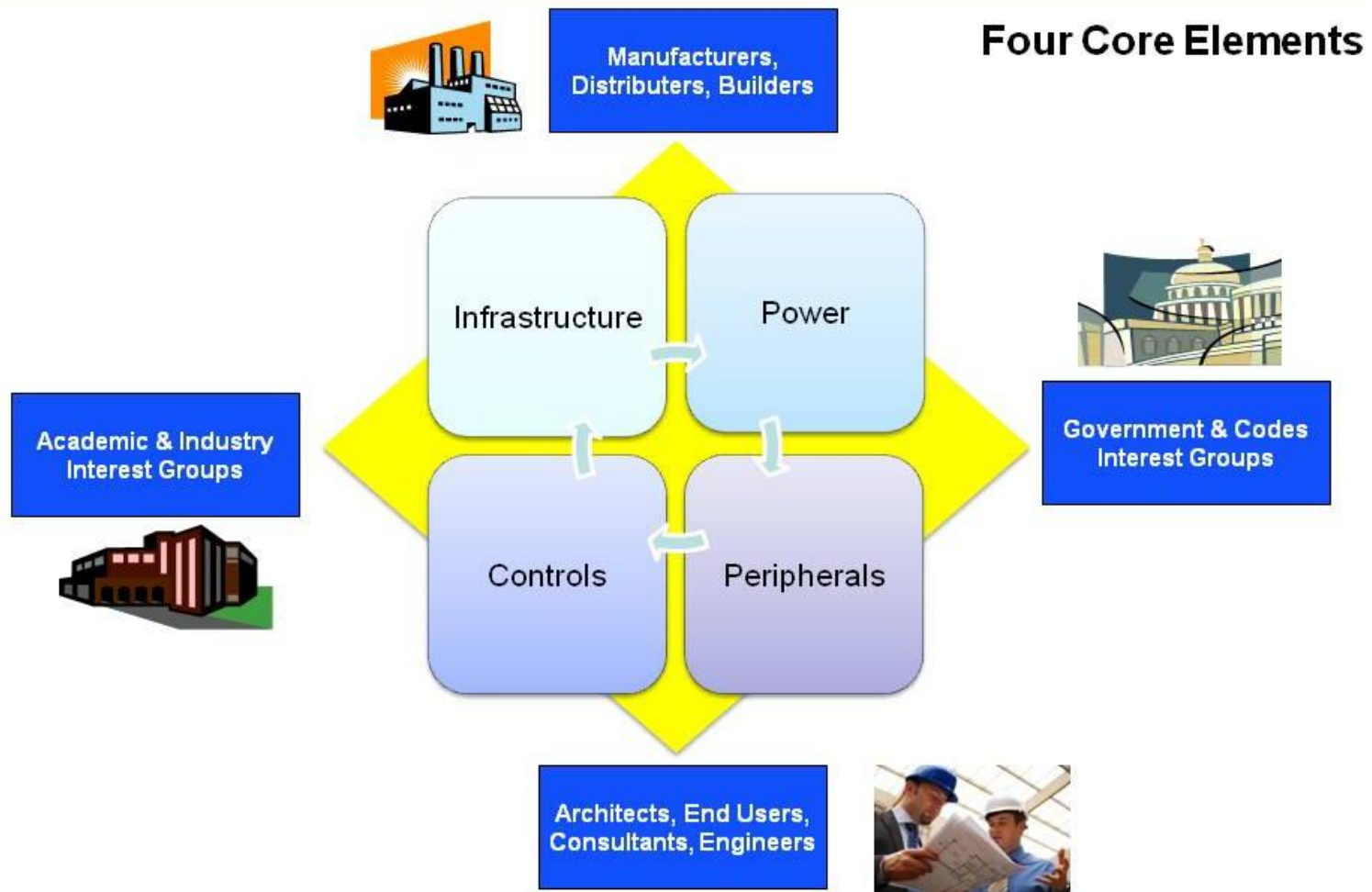
## Scope of Work

# Initial Focus on the Occupied Space



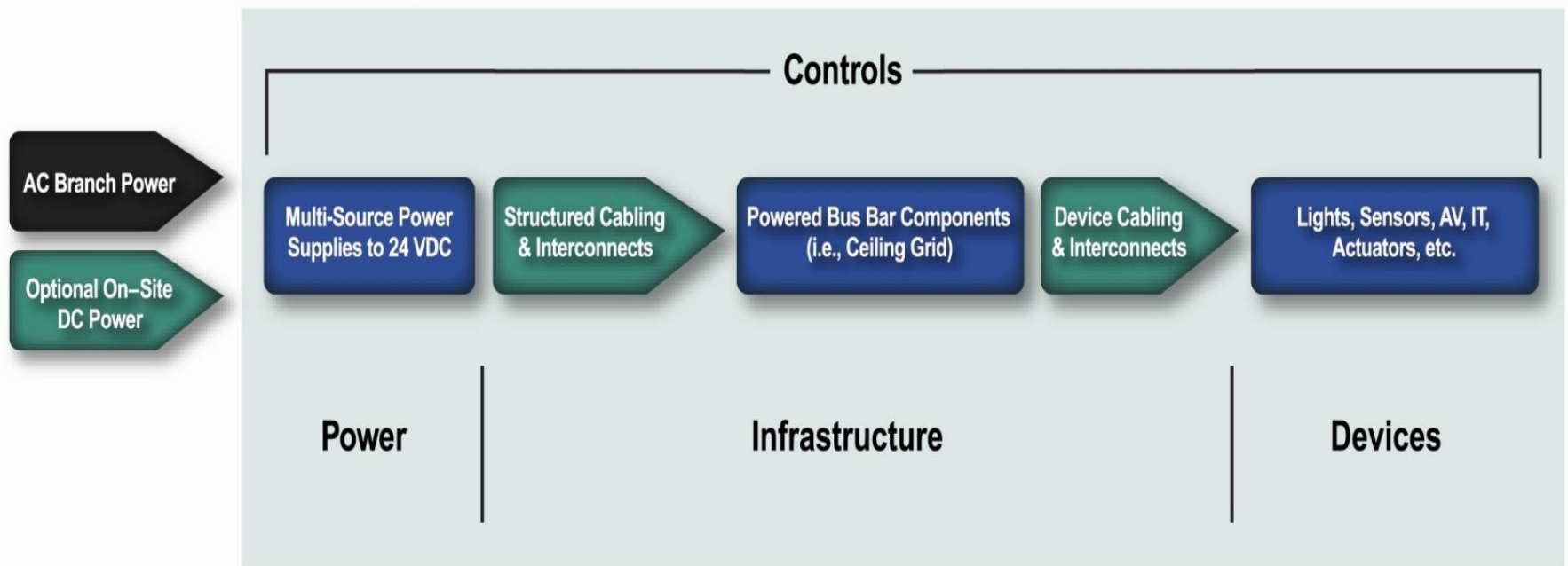
## Content of the Work

# Focused on Essential System Elements



**1<sup>st</sup> Standard Completed**

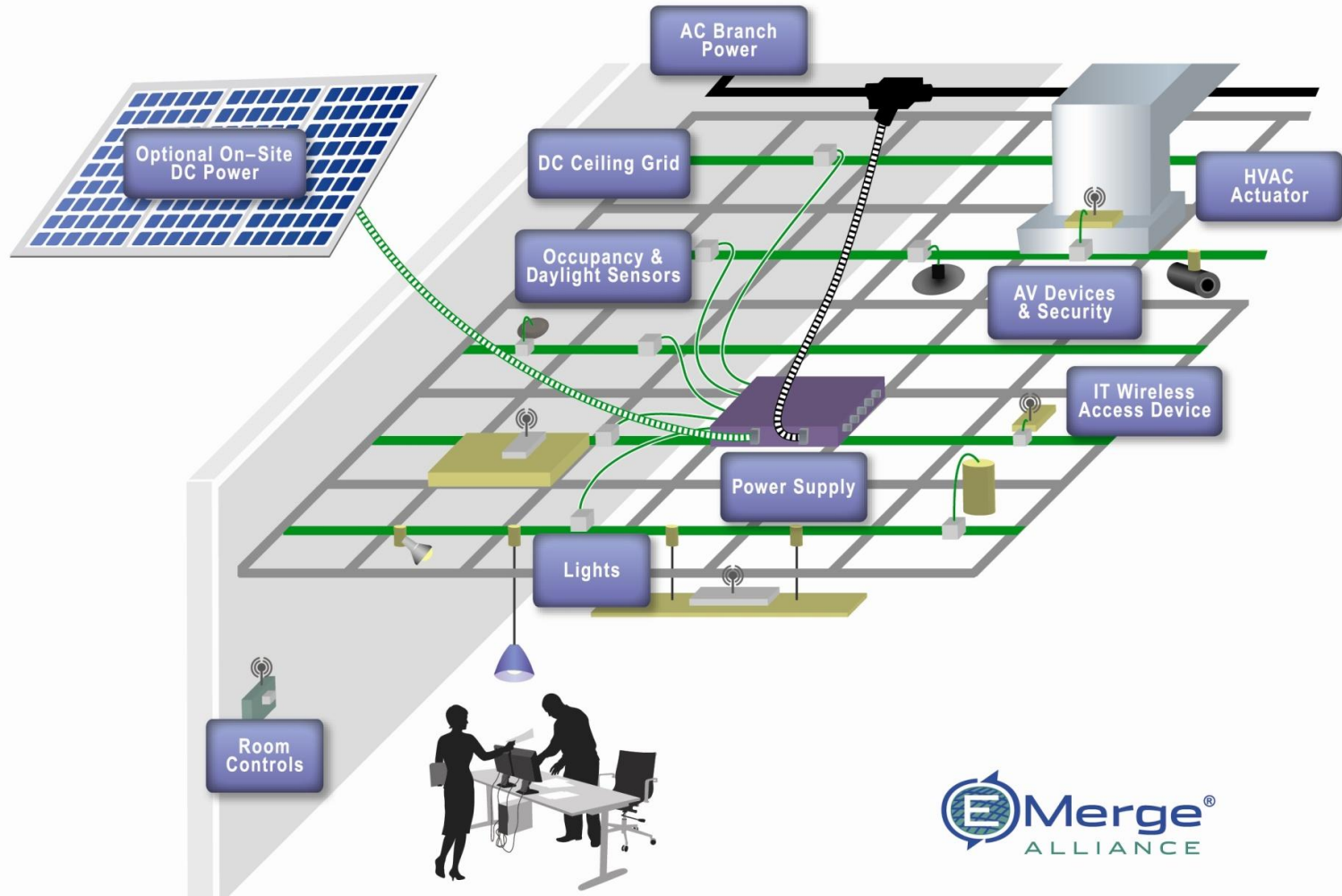
## Room Level Power Distribution Platform



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## Typical Configurations

### Working from the Top-Down

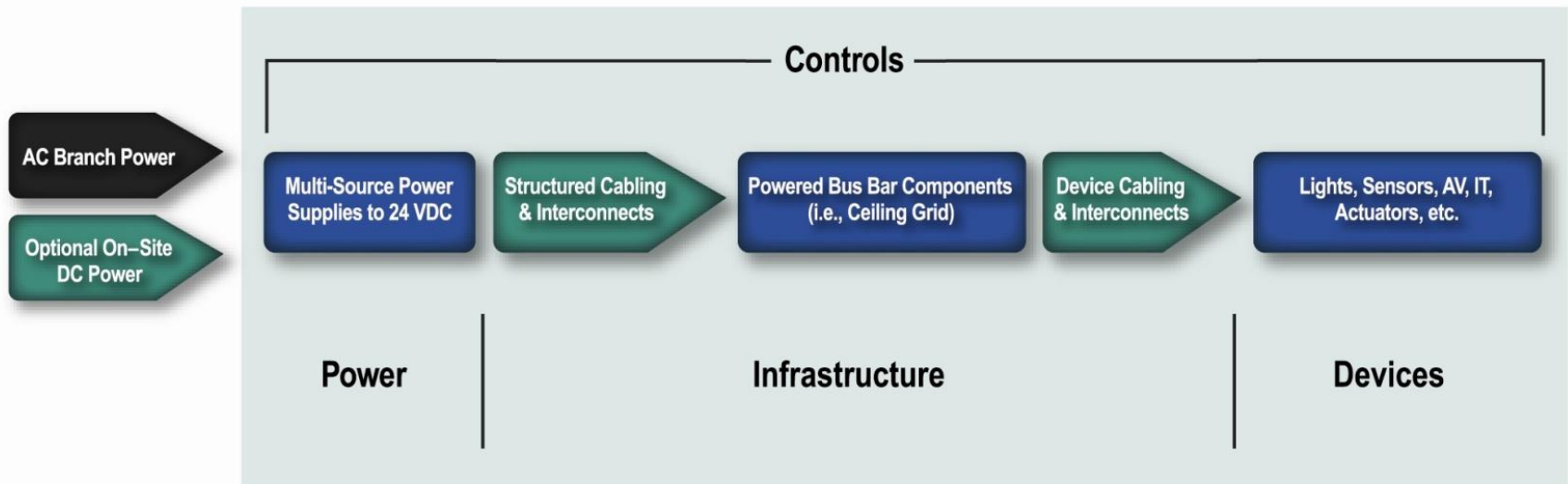


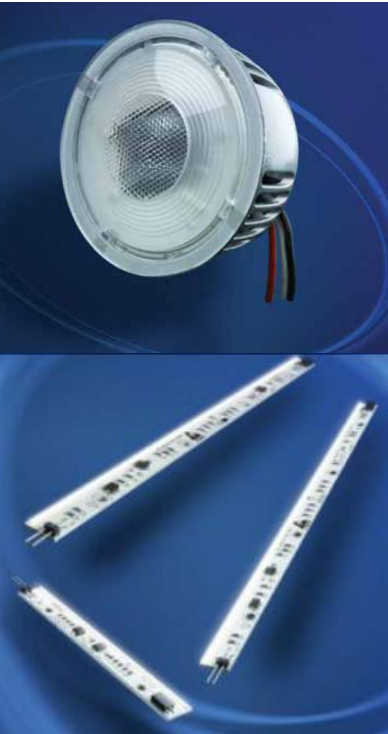
## DEMONSTRATION OF THE STANDARD

AC power → LV DC Power → Infrastructure → Devices  
(Converter) (Ceiling Grid & Cable Assemblies) (LED lights)



### Room Level Power Distribution Standard





## Benefit: Accelerating use of LEDs

LEDs are inherent users of DC power

- Eliminate 120V AC to 24V DC power conversion
  - No need for power supplies & enclosures
  - Higher reliability
- Achieve better design
  - Lighter weight, lower profile fixtures
  - Fewer finished components
- Higher efficacy (light output per watt)
  - Internal AC-DC conversion results in losses
  - LEDs driven by DC up to 10-15% more efficient



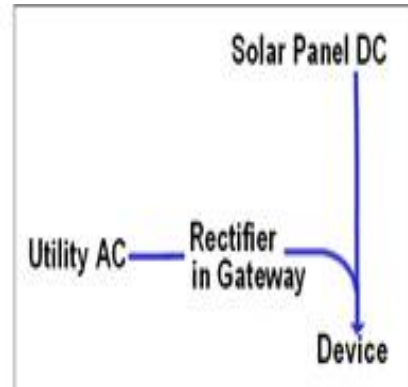
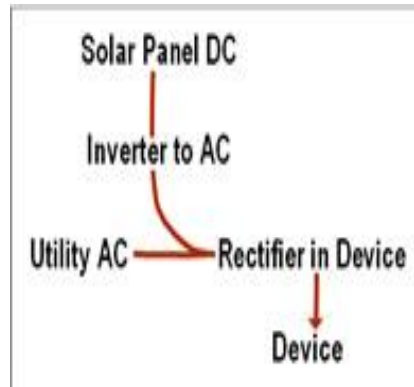
## Benefit: Faster returns on renewables

Use less energy going DC direct, ie with Solar

- Improve power utilization
- Eliminate DC to AC conversion
- Maximize efficiency
- Back up with battery or tie back to AC grid

Typical Solar  
Power  
System:

~89%  
efficiency,  
solar panel to  
device.

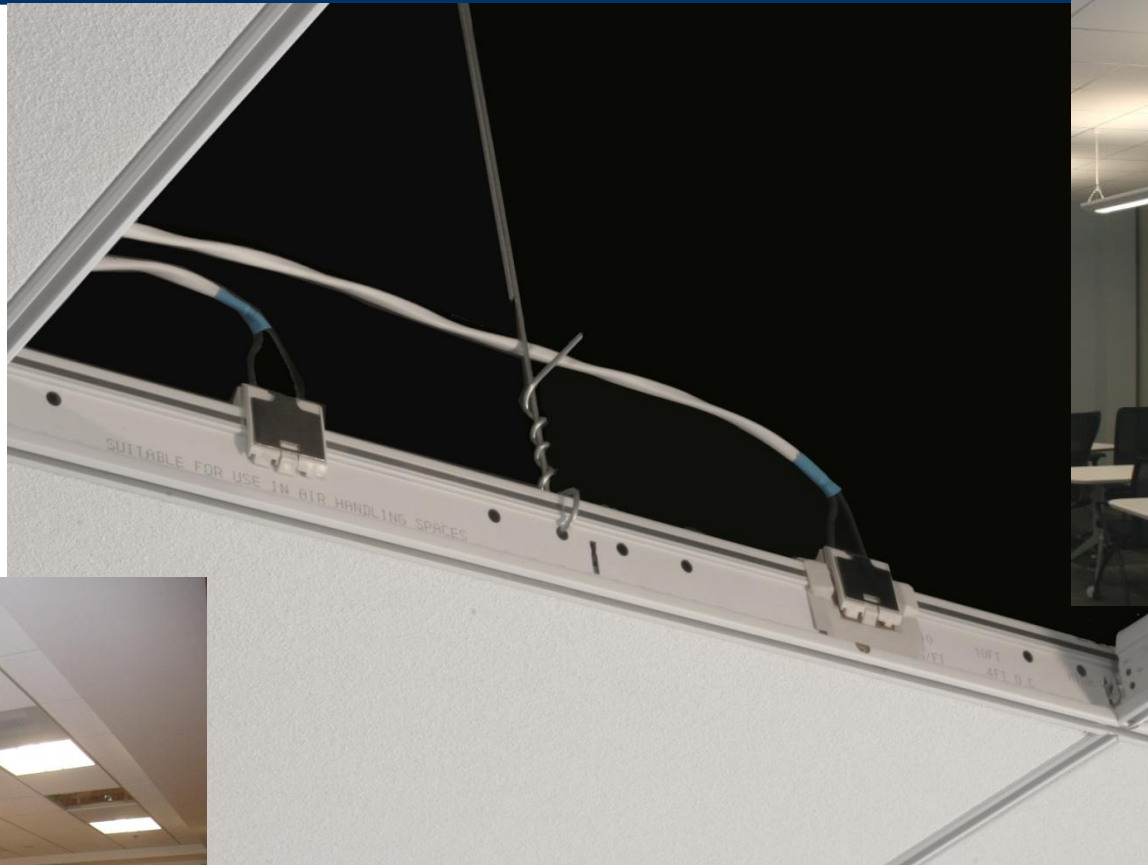


Direct Coupling<sup>®</sup>  
System:

~99% efficiency,  
solar panel to device

Sample topology shown ©Nextek Power Systems





**Where are EMerge  
Demonstrations and Installations?**



# US Green Building Council Headquarters

- » Continuous high light reflectivity acoustical ceilings
- » DC multi-channel power servers – utility AC Primary
  - » Solar supplemental planned for later
- » Fluorescent light fixtures – with DC ballasts
- » Wired controls, touch-panel interface
- » Daylight, occupancy and dimming functions
- » LEED Platinum for Commercial Interiors



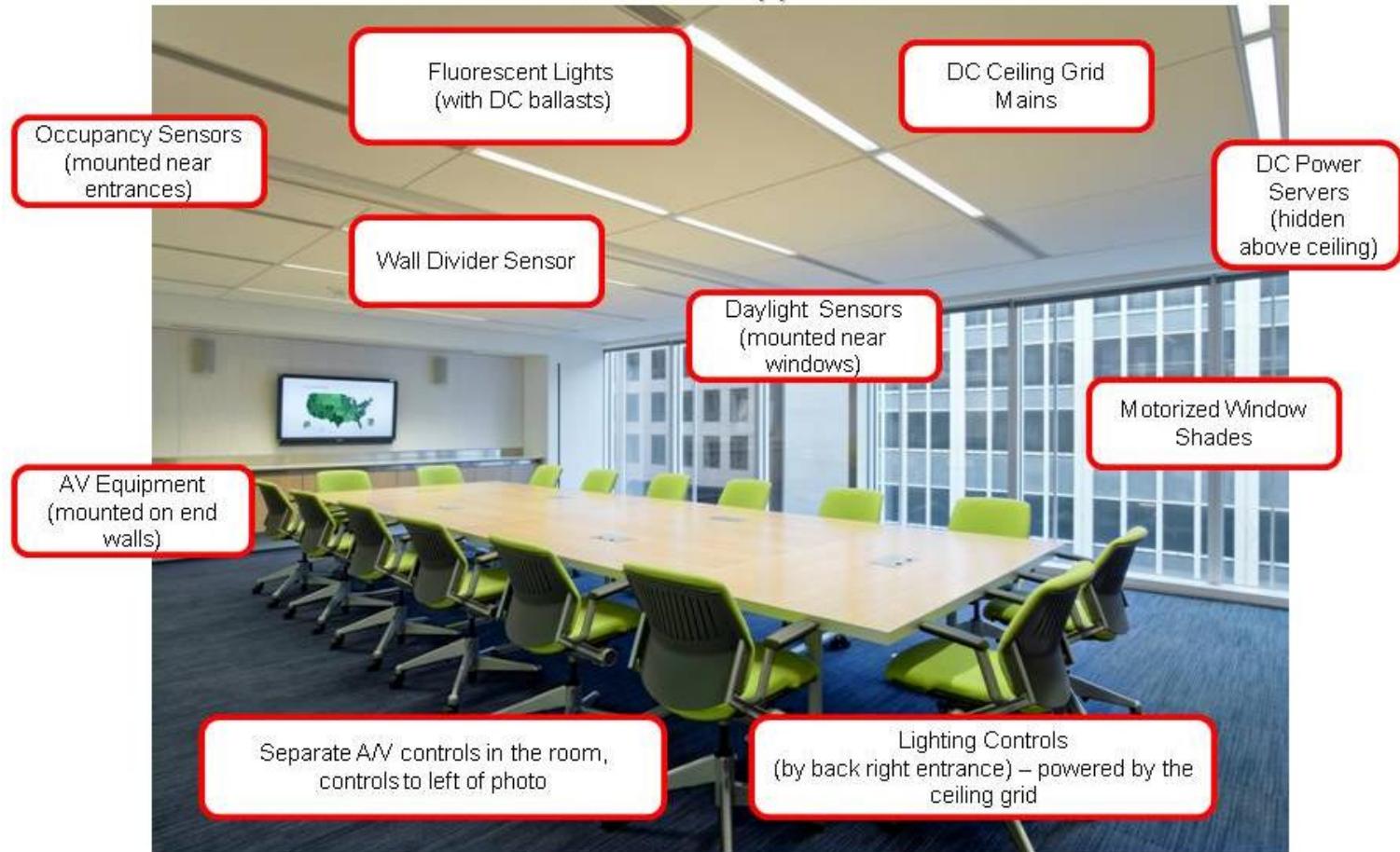
Solar Ready Conference Rooms – Washington, DC

Architect Rod Letonja of Envision Design:

“The infrastructure is in place for USGBC to add solar... Solar panels will be able power all the lights in the conference rooms with DC energy distributed through the ceiling grid.”

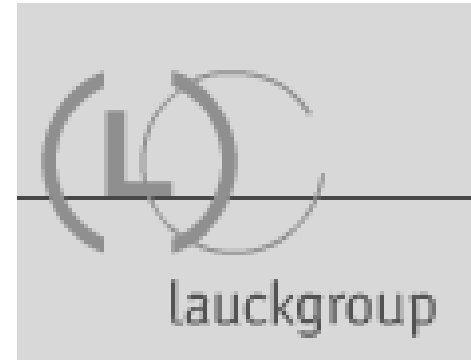
# USGBC Headquarters

## Plug & Play on a LVDC Bus Structure



## lauckgroup

- » Interior architecture firm with sustainability focus
- » Continuous high light reflectivity acoustical ceilings
- » DC multi-channel power server – utility AC Primary
- » Recessed LED light fixtures – driven by 24VDC
- » Wired on/off wall controls and occupancy sensors



LED lighting in Dallas, TX

**Brigette Preston, Managing Principal, lauckgroup:**

“The lighting has been a huge hit with everyone... We’ve had all the building management people down to see it...Our design team loves it, too.”



## PNC Financial Services

- » Downtown Hi-rise commercial office building
- » Non-seismic – union contractors installation
- » Continuous – high light reflectivity acoustical ceiling
- » DC multi-channel power servers – utility AC input
- » Fluorescent & incandescent lighting fixtures – with DC ballasts
- » Wireless (ZigBee) controls - touch panel interface – IP addressable
- » Daylight, occupancy and dimming functions
- » A/V DC powered speakers



**“Smart Ceiling” in place – Case Study / Private Demo in Pittsburgh, PA**

## Nextek Power Systems

- » One-story mixed use commercial office/lab/factory building
- » Non-seismic – non-union contractors installation
- » Continuous – High light reflectivity acoustical ceiling
- » DC multi-channel power servers – utility AC with Solar (PV) planned
- » Fluorescent lighting fixtures – with DC ballasts
- » Wired bus/branch controls – traditional wall switch interface
- » Daylight, occupancy and dimming function



Nextek Power Systems

**“Smart Ceiling” in place – Case Study / Public Demo in Detroit, MI**



# UC San Diego – Sustainability Resource Center

- » Mixed use facility on campus – home of UCSD's Sustainability 2.0 initiative- pursuing LEED-CI Platinum certification
- » Sophisticated direct DC Microgrid energy systems, generating 80 percent its electricity needs including 1 megawatt of solar
- » Continuous – high light reflectivity acoustical ceiling
- » DC multi-channel power servers – solar (PV) primary with AC alternate
- » Fluorescent lighting fixtures – dimmable DC ballasts
- » Wired controls – standard wall switch interfaces
- » Daylight, occupancy and dimming functions



**“Smart Ceiling” in place – Case Study / Public Demo in San Diego, CA**

## Southern California Edison

- » Single story commercial office
- » Promotes energy savings programs with commercial customers – studies lighting & control systems
- » DC multi-channel power servers – utility AC primary
- » Fluorescent lighting fixtures – with DC ballasts
- » Daylight, occupancy and dimming functions
- » Solar (PV) direct to DC loads planned in next phase



Targeted 'Net Zero Energy Ceiling' – Irwindale, CA

## Armstrong World Industries

- » Two-story mixed use commercial office/classroom/factory building
- » Non-seismic – non-union contractors installation
- » Continuous – high light reflectivity acoustical ceiling
- » DC multi-channel power servers – solar (PV) primary power with utility AC back-up
- » Fluorescent lighting fixtures – with DC ballasts
- » Wired bus/branch controls – touch panel interface
- » Daylight, occupancy and dimming function

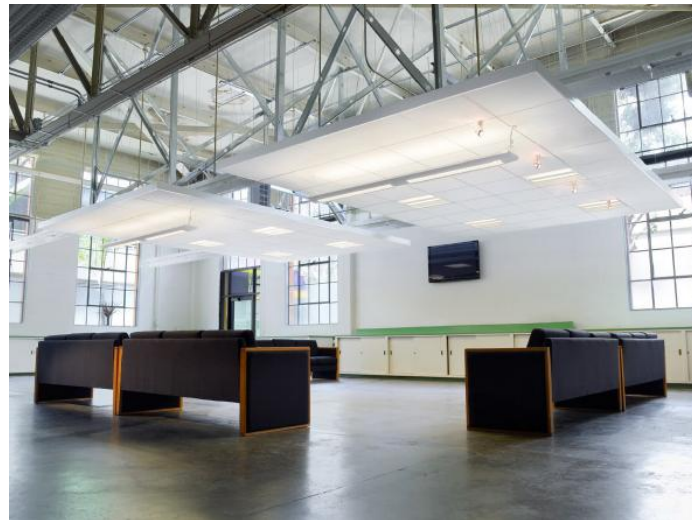


**“Smart Ceiling” in place – Case Study / Public Demo in Lancaster, Pa**



# Los Angeles Community College District

- » Trade & Technology College – home of architectural, electrical & renewable energy depts.
- » Re-purposed single story hi-bay multi-use building
- » Clouds of high light reflectivity acoustical ceilings
- » DC multi-channel power servers – utility AC primary, solar desired for future
- » Fluorescent lighting fixtures – dimmable DC ballasts
- » Wired controls – touch panel interface
- » Daylight, occupancy and dimming functions

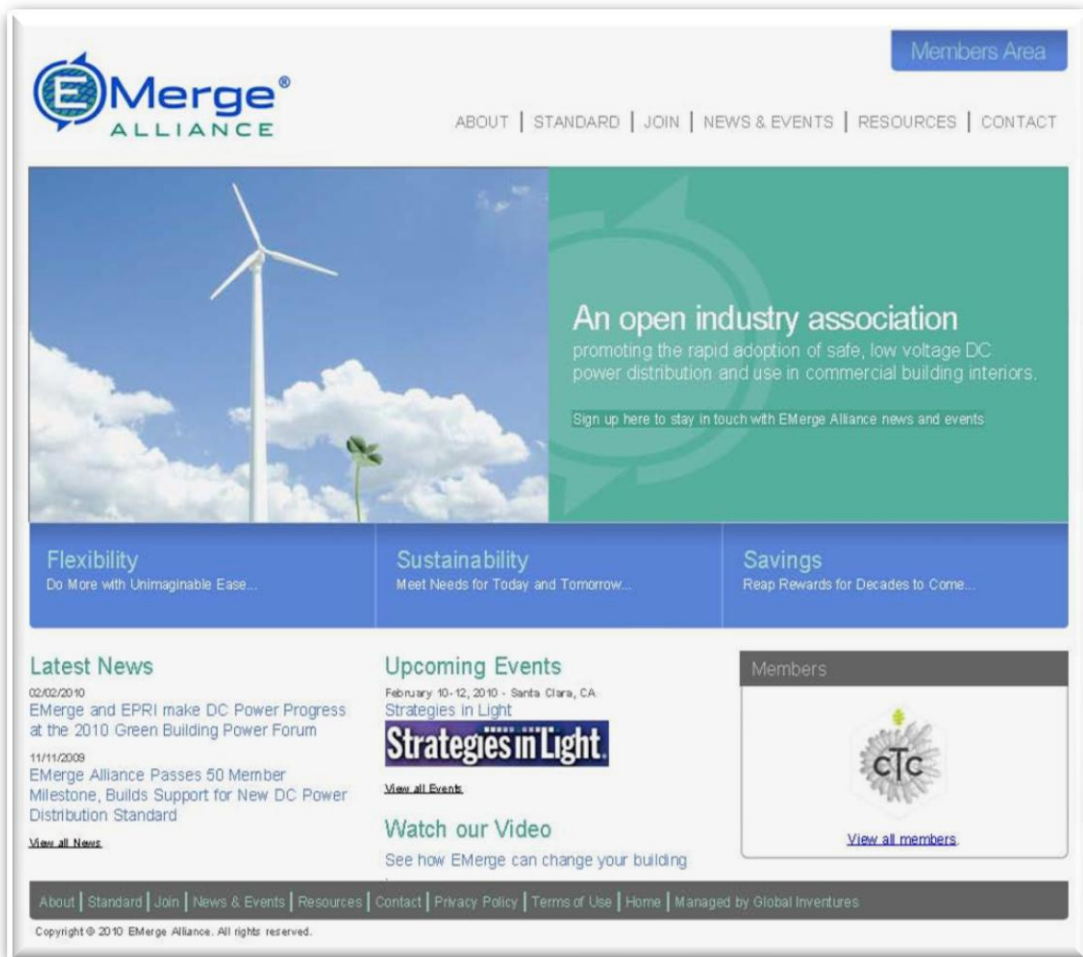


Smart Ceiling – Los Angeles, CA



## Learn More About Us

Visit Our Website @ [www.emergealliance.org](http://www.emergealliance.org)

A screenshot of the EMerge Alliance website. The header includes the EMerge Alliance logo, a 'Members Area' button, and navigation links: ABOUT | STANDARD | JOIN | NEWS & EVENTS | RESOURCES | CONTACT. The main banner features a wind turbine and a small plant, with the text: 'An open industry association promoting the rapid adoption of safe, low voltage DC power distribution and use in commercial building interiors. Sign up here to stay in touch with EMerge Alliance news and events'. Below the banner are three columns: 'Flexibility: Do More with Unimaginable Ease...', 'Sustainability: Meet Needs for Today and Tomorrow...', and 'Savings: Reap Rewards for Decades to Come...'. The footer contains 'Latest News' (dated 02/02/2010 and 11/11/2009), 'Upcoming Events' (February 10-12, 2010 - Santa Clara, CA, 'Strategies in Light'), 'Watch our Video', and a 'Members' section with a 'cTc' logo. The bottom navigation bar includes links: About | Standard | Join | News & Events | Resources | Contact | Privacy Policy | Terms of Use | Home | Managed by Global Inventions. Copyright © 2010 EMerge Alliance. All rights reserved.A graphic with the EMerge Alliance logo at the top, followed by the text: 'Public Overview of the EMERGE ALLIANCE STANDARD'.

## Alliance FAQs

1. [What is the EMerge Alliance?](#)
2. [What is the EMerge Alliance Standard?](#)
3. [Where is EMerge focused?](#)
4. [How can I obtain a copy of the EMerge Alliance Standard?](#)
5. [I have questions about the EMerge Alliance Standard, where can I learn more?](#)
6. [Who is part of the EMerge Alliance?](#)
7. [When can the market expect to see EMerge products and services?](#)
8. [Who should join the EMerge Alliance?](#)
9. [How can I get involved?](#)
10. [How can I stay in touch with EMerge news and information?](#)