

Hybrid Power for Green Buildings

DC Devices Powered from On-Site Solar

California Higher Education Sustainability Conference
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Marketing Chair, EMerge Alliance

Context: Zero Net Energy Buildings

What's likely to change in the approach to design/build?

1. **Integrated design** and operations planning
2. **Site renewable energy** strategies get maxed out
3. **Energy Storage technology** will allow Grid independence breakthroughs
4. **System Intelligence** - More control, monitoring, verification of everything

2030: All new commercial buildings

2040: 50% of commercial building stock

2050: All commercial buildings



Zero Net Energy Buildings

Drive need to create an integrated MICROGRID energy network

Proactive Technology Solutions

Centralized Grid Architecture

Distributed Grid Architecture

USER
CENTERED

*Intelligent Central Management
Centralized Synchronous Generation
Hardened Macro Grid Infrastructure
Intelligent Local Controls*

*Smart Cellular Management
Distributed Asynchronous Generation
Hard Macro Grid & Flexible Microgrids
Smart Interconnection & Control*

SMART GRID

*Disordered System Management
Centralized Synchronous Generation
Hardened Macro Grid Infrastructure
Manual Local Controls*

*Demand Response Management
Integrated Synchronous Micro generation
Hardened Macro Grid Infrastructure
Disintegrated Local Controls*

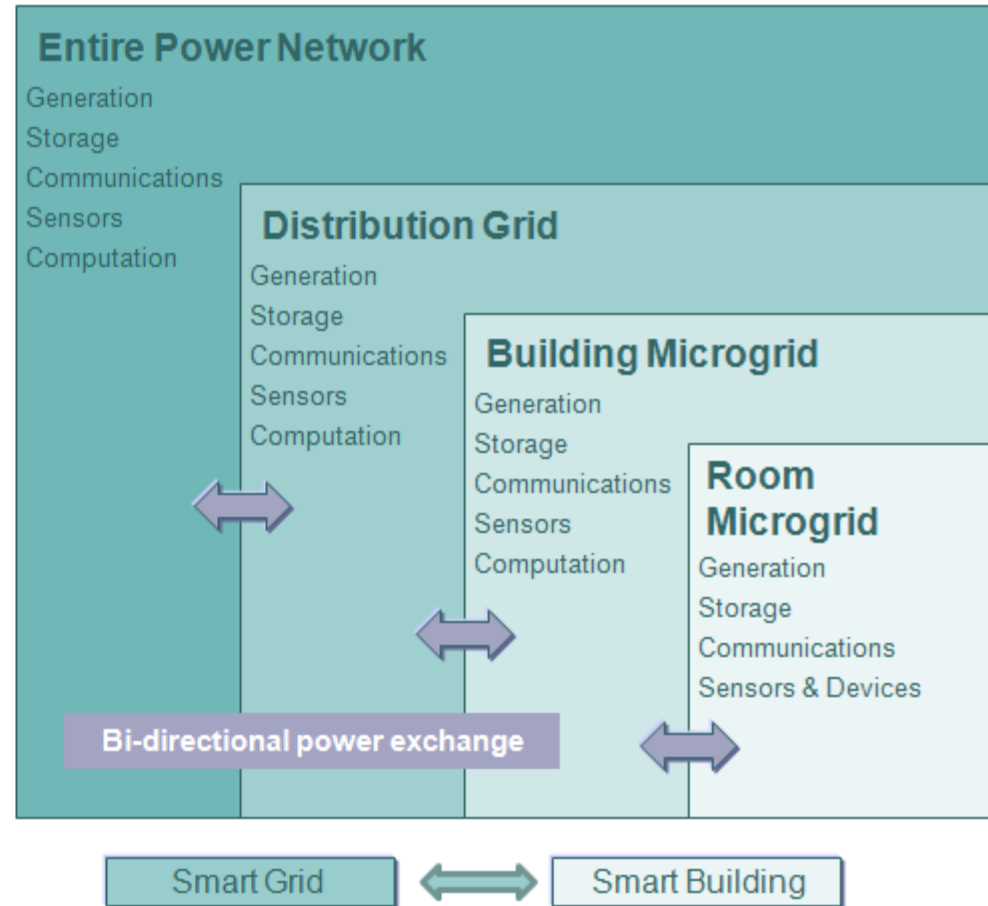
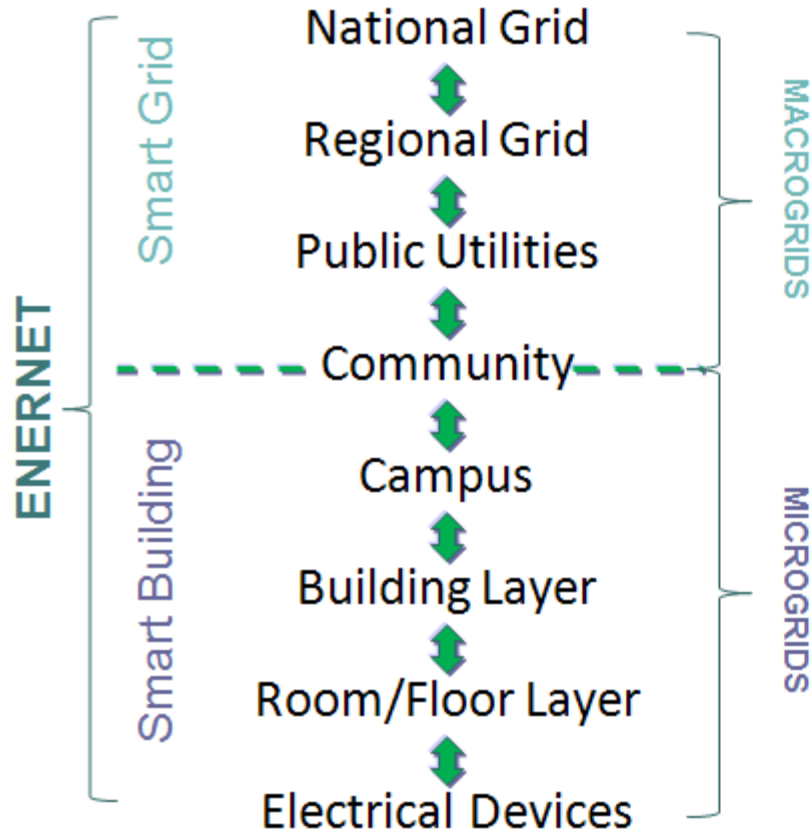
GENERATION
CENTERED

SMART BUILDINGS

Reactive Technology Solutions

Zero Net Energy Buildings

A ZEB driven network will look much like the Internet – a new ENERGY NETWORK



Constrained by a Legacy

Dealing with a century-old power architecture

PROBLEM: MISMATCHED AC & DC POWER REQUIREMENTS

ENERGY SOURCES – MIXED AC & DC



AC/DC Site
Generation



DC Fuel Cells



DC
Photovoltaic



DC Wind
Power



AC Line Power



ELECTRIC DEVICES – TYPICALLY DC



Electronic
Lighting



HVAC Actuators



Sensor & Controls



AV/IT Devices



Data & Telecom Centers



Security & Safety

Creating a New Legacy

Adapting to the needs of our ever increasing digital world

SOLUTION: A SIMPLIFIED AC/DC HYBRID COUPLED POWER NETWORK

ENERGY SOURCES



AC/DC Site
Generation



DC Fuel Cells



DC
Photovoltaic



DC Wind
Power



AC Line Power

Coupled
AC/DC Power
Sources

▲
DC Power
Distribution
Management

▼
Wireless
Controls
BACnet
TCP/IP

ELECTRO-ACTIVE DEVICES



Electronic
Lighting



HVAC Actuators



Sensor & Controls



AV/IT Devices



Data & Telecom Centers



Security & Safety

OPPORTUNITY: LESS ENERGY, LESS CAPITAL, HIGHER RELIABILITY



Smart Power
Standards

It Takes an Industry to Build a Building

Creating a Vibrant Sustainable Eco-system

The Alliance Approach

- Simple
- Safe
- Sustainable

60+ Members and Growing

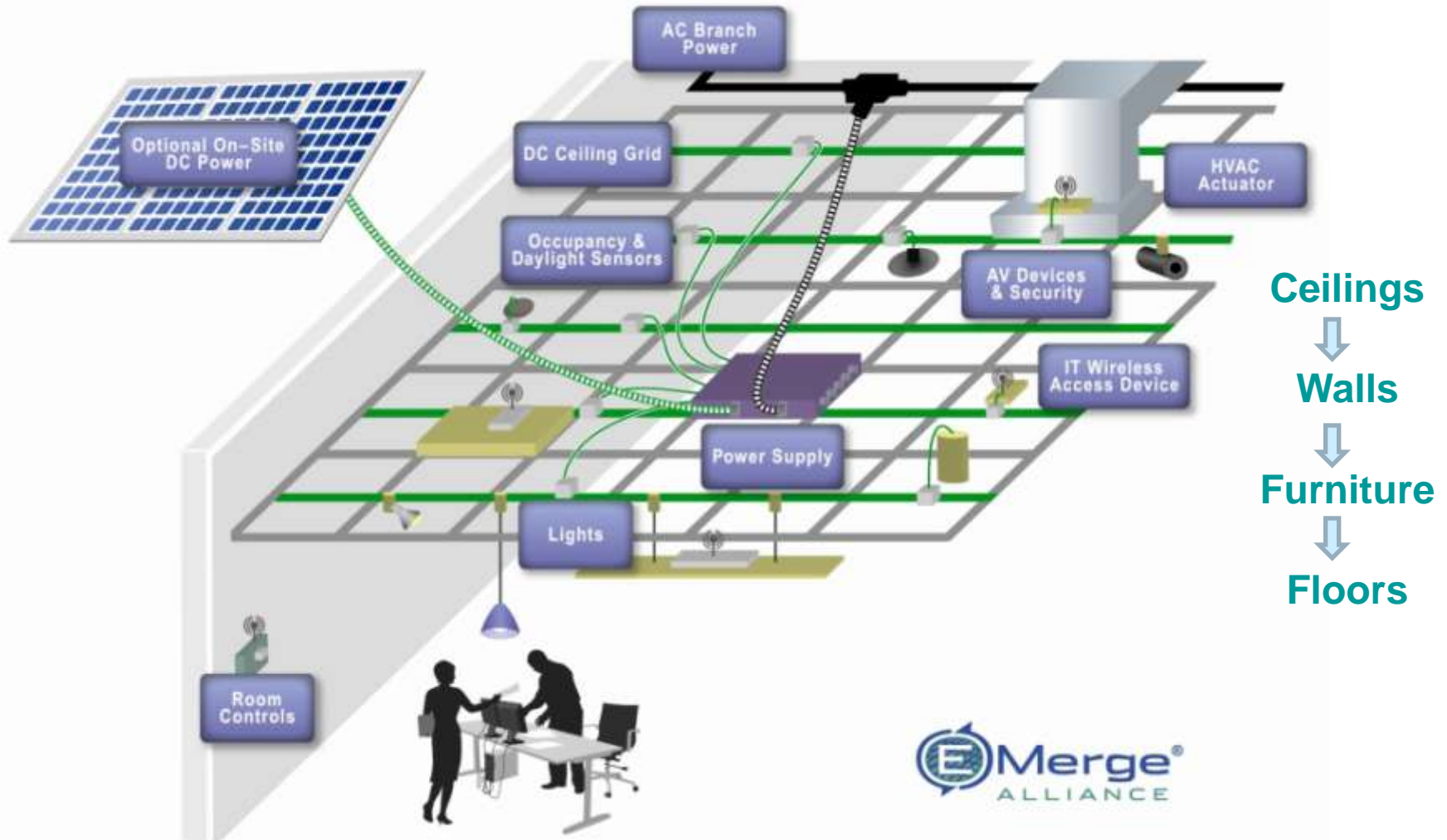


An open industry association

promoting the rapid adoption of safe, low voltage DC power distribution and use in commercial building interiors.

Working from the Top-Down in Buildings

DC Microgrids Distribute DC Power Directly for DC Uses via Open Platforms



Demonstration Sites – Education & Beyond

A new Architecture - Scalable from Room to Campus

PNC Financial
Services HQ
Pittsburgh, PA



lauckgroup
Architectural Office
Dallas, TX



US Green Building
Council HQ
Washington, DC



Nextek Power
NextEnergy Center
Detroit, MI



UC San Diego
Sustainability Center
San Diego, CA



Southern Cal Edison
Design & Eng/SCLTC
Irwindale, CA



Armstrong World Ind.
Innovation Center
Lancaster, PA



Optima Engineering
MEP Firm
Charlotte, NC



LACCD
Trade Tech Campus
Los Angeles, CA



CLTC
UC Davis Campus
Davis, CA



Los Angeles Trade Technical College

First DC Microgrid Application at Calif Higher Ed Institution





Smart Power
Standards

Los Angeles Trade Technical College

First DC Microgrid Application at Calif Higher Ed Institution

INDUSTRY PARTNERS

Armstrong
Ceilings

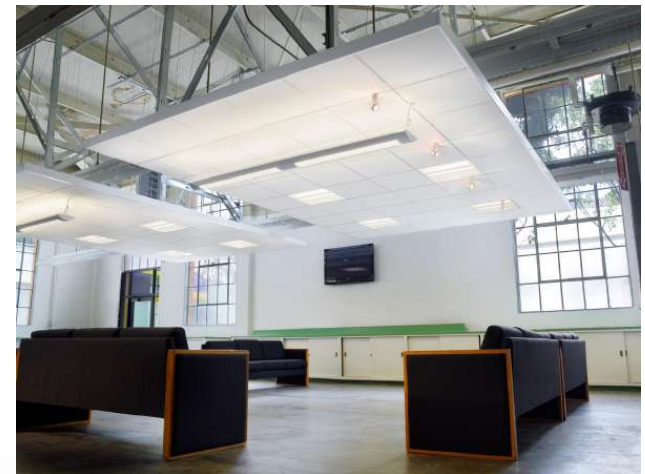
Crestron
Electronics

Finelite
Lighting

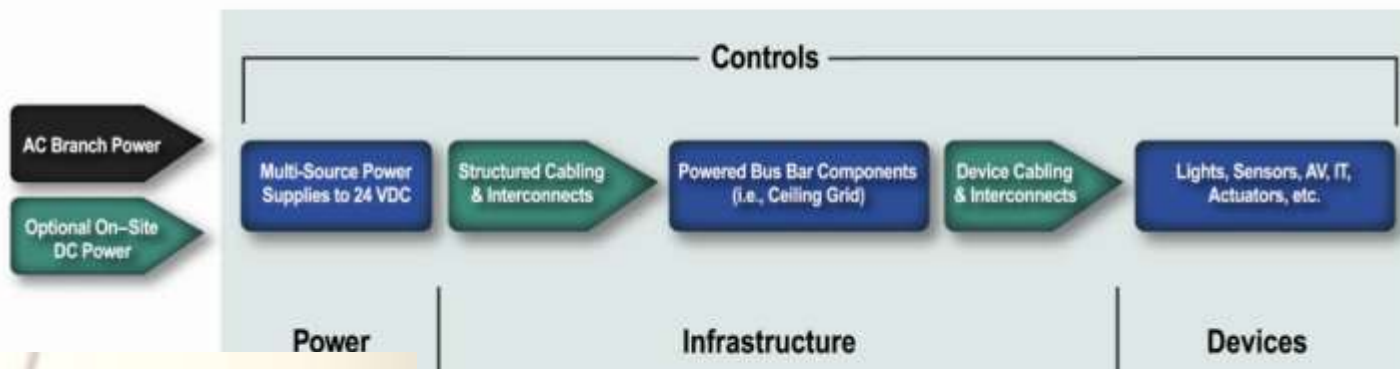
Nextek
Power
Systems

Tyco
Electronics





Room Level Power Distribution Standard



UC San Diego – Sustainability Resource Center

Interior Renovation Focused on Sustainability, Efficiency & Innovation



UC San Diego – Sustainability Resource Center

First Direct Solar Application to Interior DC Microgrid

DC Source: Dedicated Solar Array



DC Loads: Lighting & Controls



Sustainability Resource Center
Equity-Environment-Economy



UC San Diego
Local Impact, National Influence, Global Reach

UC San Diego – Sustainability Resource Center

Interior Renovation Focused on Sustainability, Efficiency & Innovation

INDUSTRY PARTNERS

Armstrong
Ceilings

Finelite
Lighting

Nextek
Power
Systems

Tyco
Electronics

Watt
Stopper



Sustainability Resource Center
Equity-Environment-Economy

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Local Impact, National Influence, Global Reach

Energy Savings By Going DC Direct

- No AC Inversion: More KW of Solar Used
- Digital devices get power they need
 - AC-DC conversion upstream, not at device level
 - DC ballasted lighting, sensors without power packs...
 - For LED lights, efficiency gains are significant
- Flexibility and ease of upgrade
 - Low voltage wiring, embedded in infrastructure
 - Go to more efficient technologies – no rewiring

LED Lighting Pushes Efficiency Higher

First Direct Solar Application to LEDs & Controls (in Commercial Setting)



More Efficient Use of Solar,
No Inversion to AC



More Efficient Use of LED Lights
(Spot & Recessed) –
LEDs also DC-based digital devices



Smart Power
Standards

LED Lighting Pushes Efficiency Higher

First Direct Solar Application to LEDs & Controls in Commercial Setting



Armstrong – Lithonia - Nextek Power - Sensor Switch - Tyco Electronics

Replicating for Scale – Registering Products

Next Step in Deploying Room Level DC Power Distribution Standard



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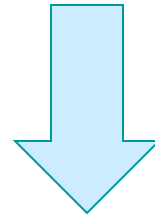
Smart Power
Standards

Expanding to DC Powered Buildings

Solar and Renewables Used for More than Room-Level Devices
Bigger DC Loads




DC Power Partners



Data Centers & Telecom

Higher Voltage DC Buses



Thank you for your time!
Q?

www.EMergeAlliance.org