

**ConnectivityWeek™**

**twitter**  
**#ConnWeek**

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

**Brian Patterson**  
**Chairman, EMerge Alliance**



# Zero Energy Buildings (ZEB)

Buildings that produce as much energy as they use in a year

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

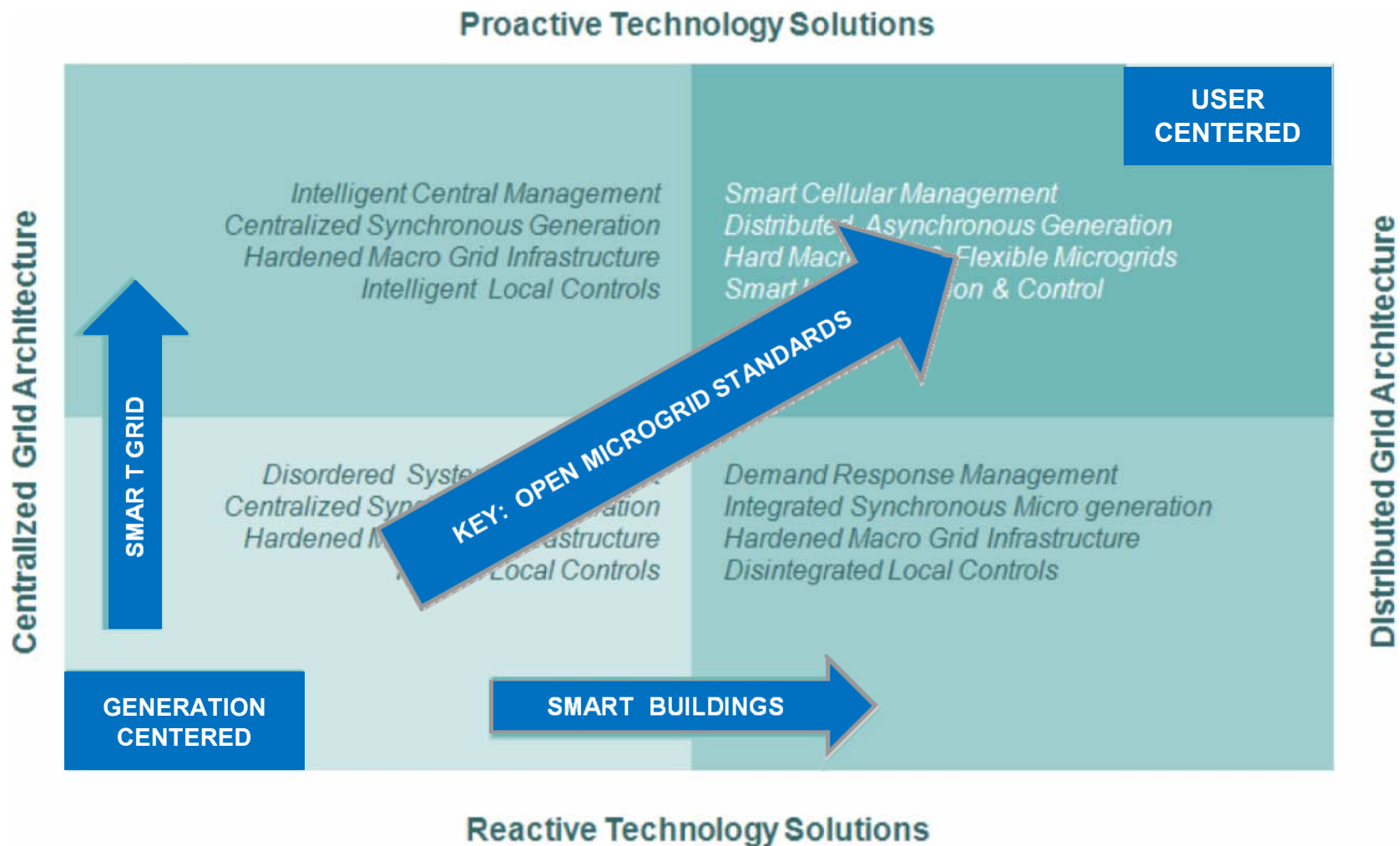
**2040:** 50% of commercial building stock

**2050:** All commercial buildings



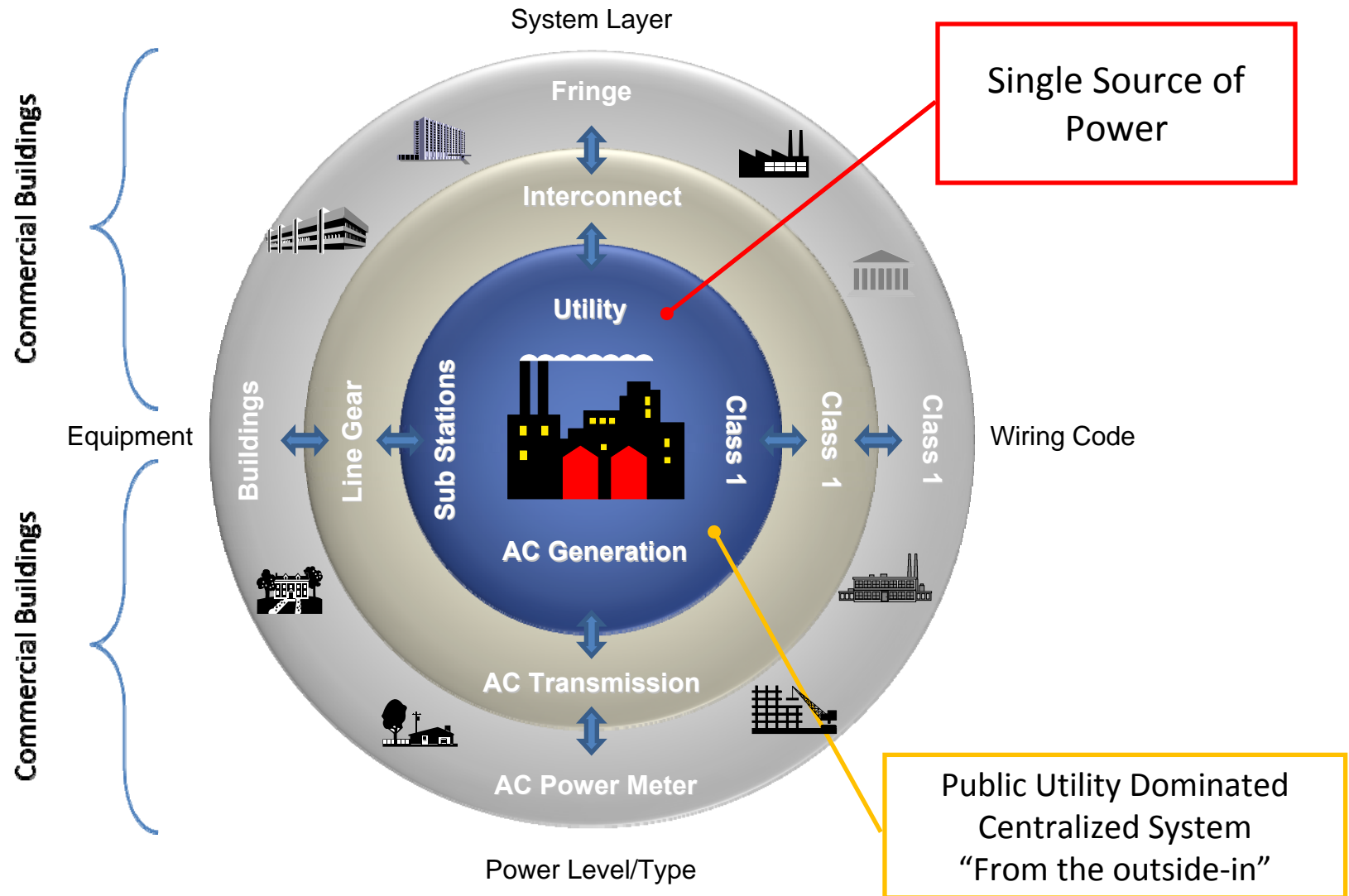
# Zero Energy Buildings (ZEB)

Drive need to create an integrated microgrid energy network



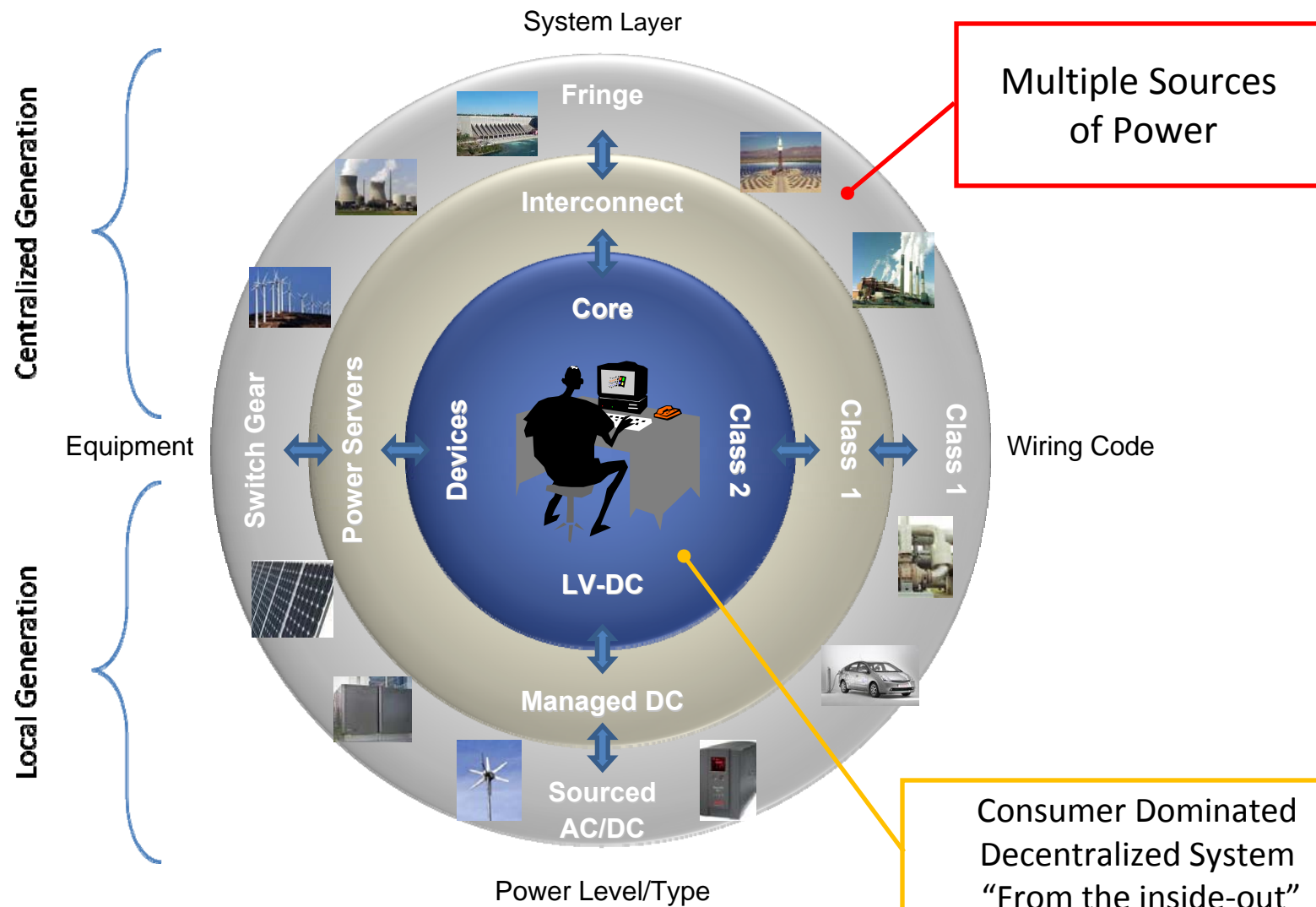
# A Generation Centric View

The existing synchronous power topology



# A User Centric View

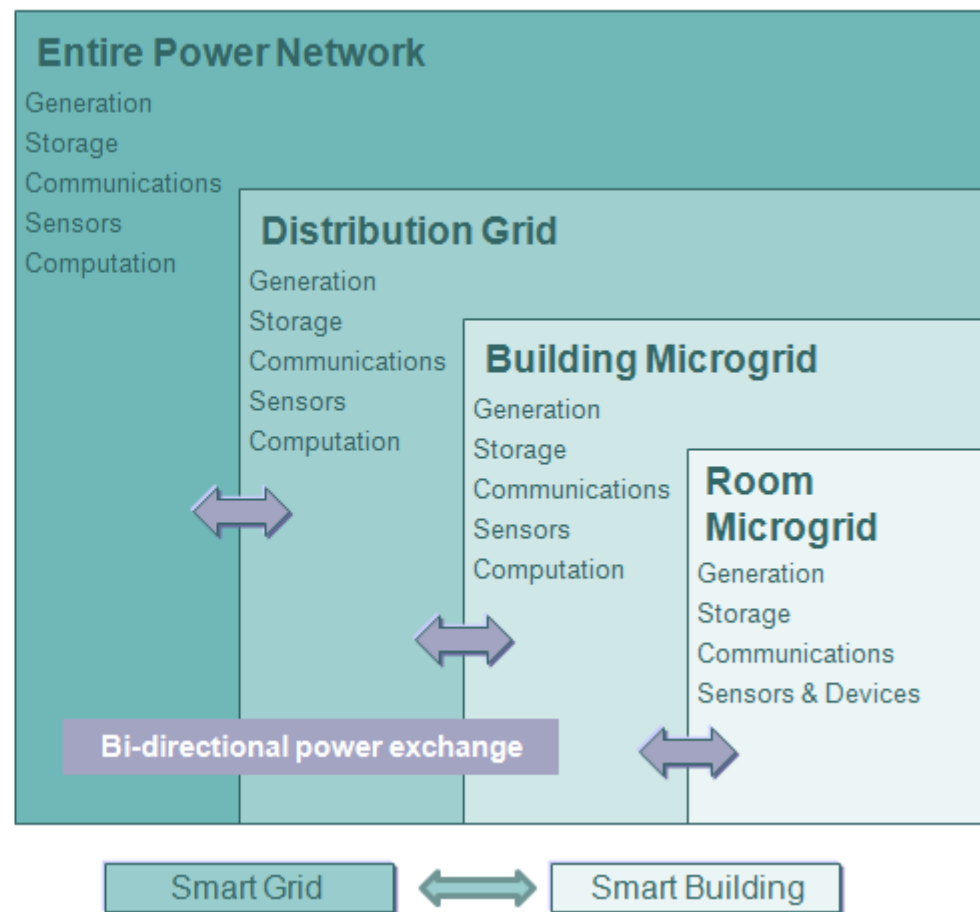
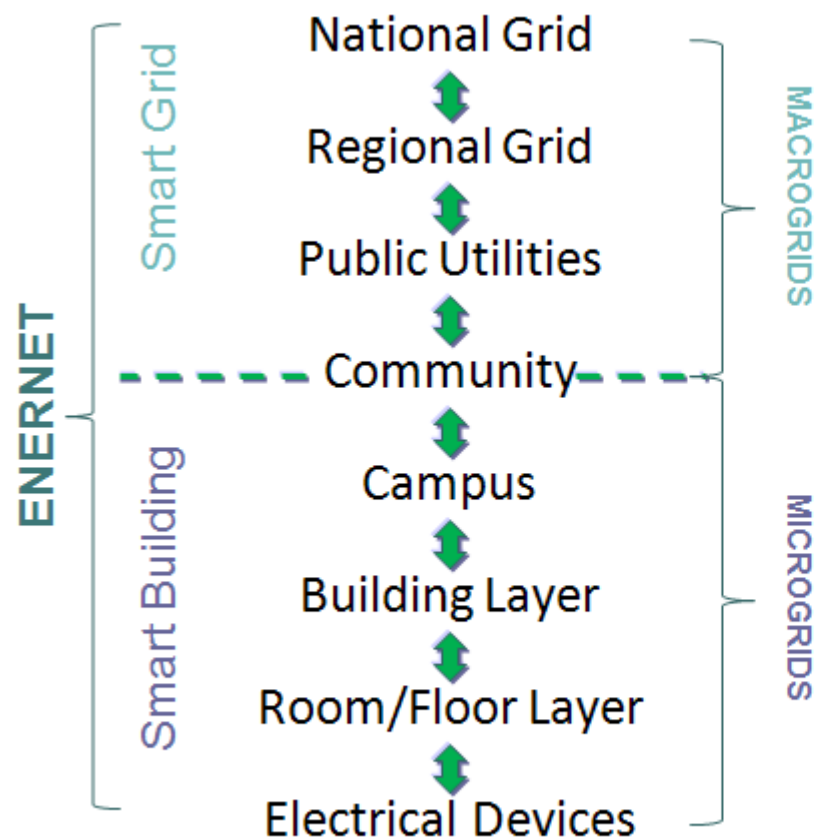
Emergence of an asynchronous "Enernet"





# Zero Energy Buildings (ZEB)

The ZEB driven network will be formed in layers and look much like the Internet

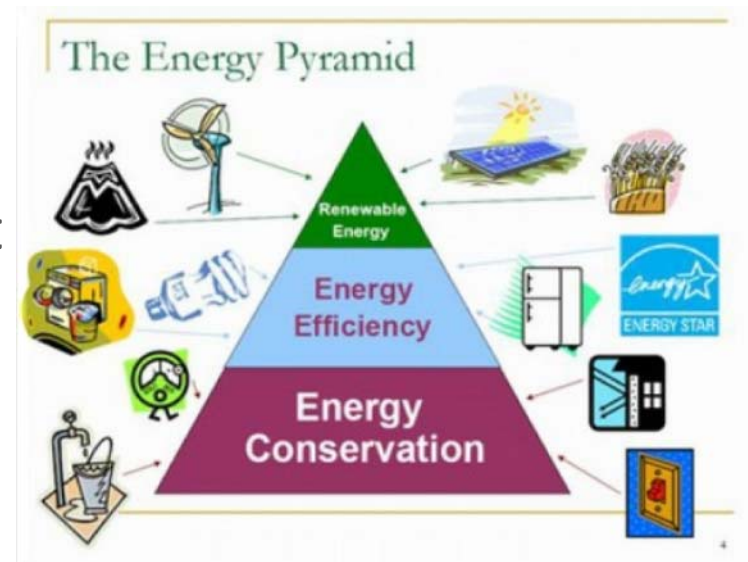


## Building Strategic Plan

Plans often start with basic decisions about energy systems/platform

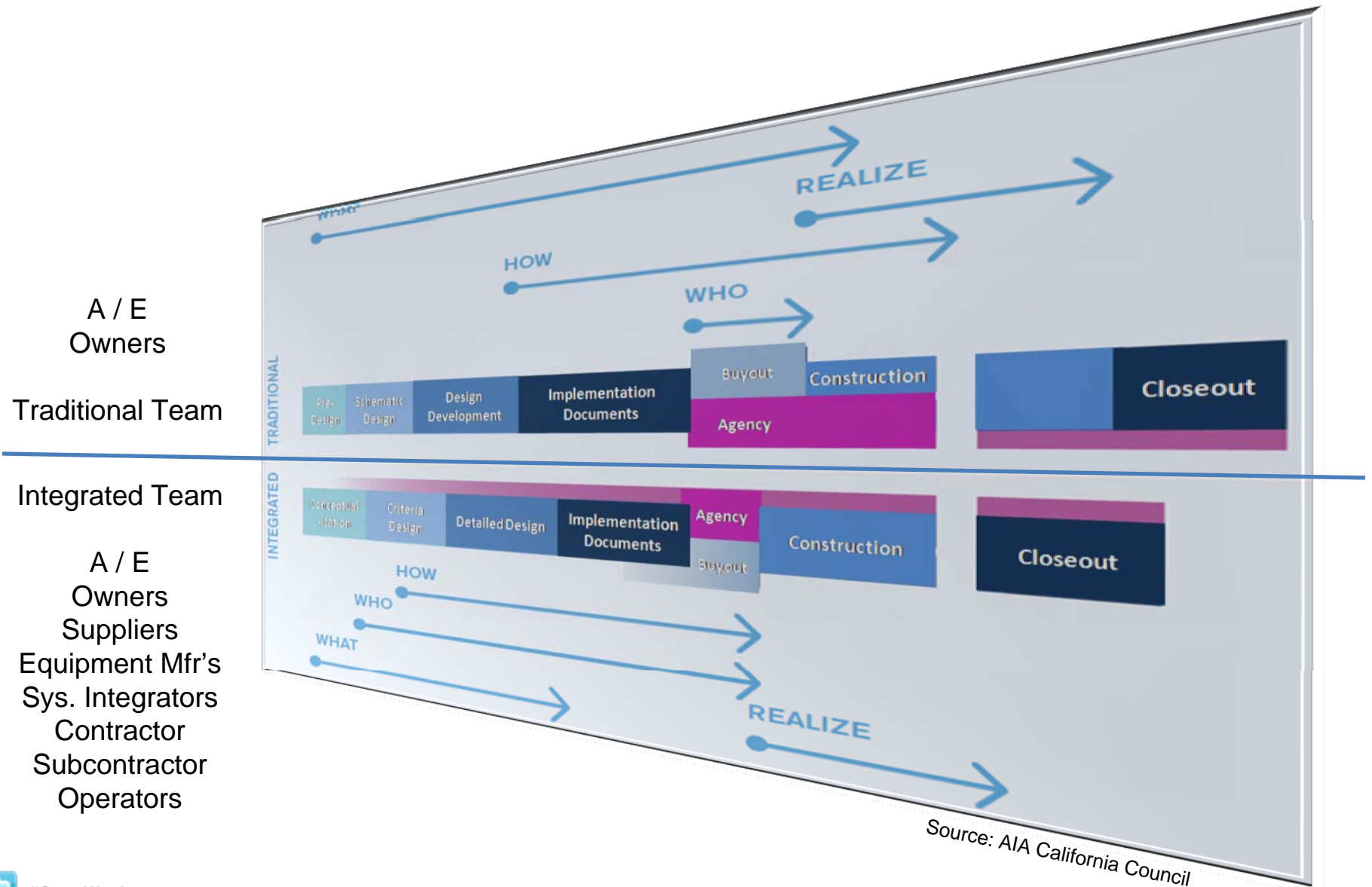
### A paradigm change – a greatly increasing energy focus

- One Megawatt+ renewable energy generation
- Site Generation is part of the architecture
- Demand management
- On Site Electric Hybrid Vehicle Charging
- Energy system/equipment decided early
- Energy players have seat on IPD Team



# Zero Energy Buildings (ZEB)

Broad Integration team is used early in design conceptualization





## Building Information Model

Use of BIM tools is increasing rapidly

### Virtual Modeling reduces complex design time

- Virtual design team collaboration and integration
- Building user group understanding
- Materials take off
- Building sequence
- Clash detection
- Value engineering
- Constructability review
- Progress payments
- Lean construction / sustainability



# Zero Energy Buildings

Producing as much energy as used means utilizing power efficient technologies

## Employing a diverse pallet of energy efficient solutions

- Natural Air Flow
- Solar Shading
- Daylighting
- Chilled Beams - Radiant Cooling
- Site Based Renewable Energy
- Hybrid Microgrid Power Grids
- Highly Articulated Lighting
- Plug Load Control



# Renewable Energy Program

Leaving no stone unturned in possible power sources

## Multimode Site Based Generation

- Solar PV
- Urban wind
- Solar thermal
- Geo thermal
- Fuel Cells

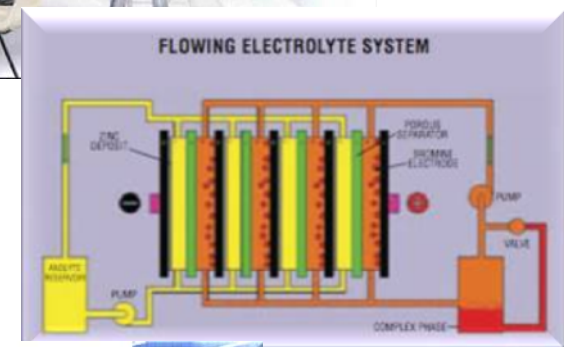


# Renewable Energy Program

Storage is the key to asynchronous “islandable” operations

## Storage becomes essential

- Thermal
- Reversible Fuel cell
- Solid state hydrogen
- Lithium ion battery
- Flow battery
- Ultra Capacitors

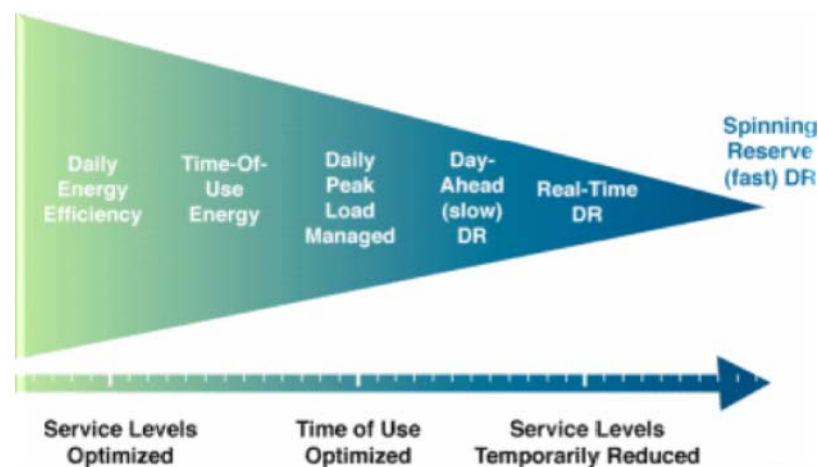


# Demand Management is Essential

On or off the utility grid its still a balancing act

## Internal and external Demand Response drivers

- Retrofit all energy consuming elements
- Install conservation features in all buildings
- Metering and monitoring systems
- Intelligent energy management
- Smart Grid interconnection





## What's Wrong With Fluorescent Lighting?

LEDs really do stand a chance of taking over quickly

### Incremental Gains aren't enough with a "Zero" goal

- Will eventually be less efficient vs. LED/OLED
- Dimming takes its toll on lamp life
- They are breakable, expensive to recycle.
- Contain mercury, which is toxic to humans,
- Flicker as they die out.
- Have a "warm up" time.
- Give off a fair amount of heat.
- Do not work well in severe cold.



# Solid State Lighting Really Starts to Make Sense

Key Opportunities for Improved Power Efficiency

## Solid-state light engines become dominant

- Eliminate high voltage ballasts and relays
- Simplified direct modulation for continuous dimming
- Simple controls for room level devices
- Great platform for primary, task and decorative LED implementations
- Eliminate AC to DC power conversions



# Wireless Controls Really Start to Make Sense

Key Opportunities for Improved Power Efficiency

## Wireless facilitates plug and play flexibility

- Eliminate high voltage switches & relays
- Simplified direct modulation for continuous dimming
- Actuators for room level devices
- Great platform for wireless controls
  - ZigBee, EnOcean
- Eliminate batteries altogether, even in remote locations



# 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 Campus Fuel  
Cells



DC  
Photovoltaic



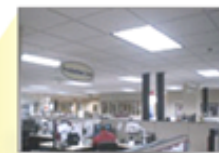
DC Wind  
Power



AC Line  
Power



### ELECTRIC DEVICES – TYPICALLY DC



Electronic  
Lighting



HVAC Actuators



Sensor & Controls



AV/IT Devices



Data & Telecom Centers



Security & Safety

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



## Creating a New Legacy

Adapting to the needs of our ever increasing digital/dc world

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

#### ENERGY SOURCES



AC/DC Site  
Generation



DC Campus Fuel  
Cells



DC  
Photovoltaic



DC Wind  
Power



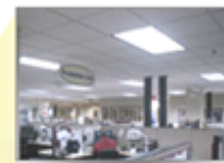
AC Line Power

Coupled  
AC/DC Power  
Sources

▲  
DC Power  
Distribution  
Management

▼  
Wireless  
Controls  
BACnet  
TCP/IP

#### ELECTRO-ACTIVE DEVICES



Electronic  
Lighting



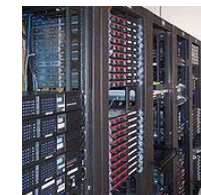
HVAC Actuators



Sensor & Controls



AV/IT Devices



Data & Telecom Centers



Security & Safety

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



#ConnWeek

Source: **EMerge**  
ALLIANCE



# It Takes an Industry to Build a Building

Creating a Vibrant Sustainable Eco-system

## The Alliance Approach

- Simple
- Safe
- Sustainable



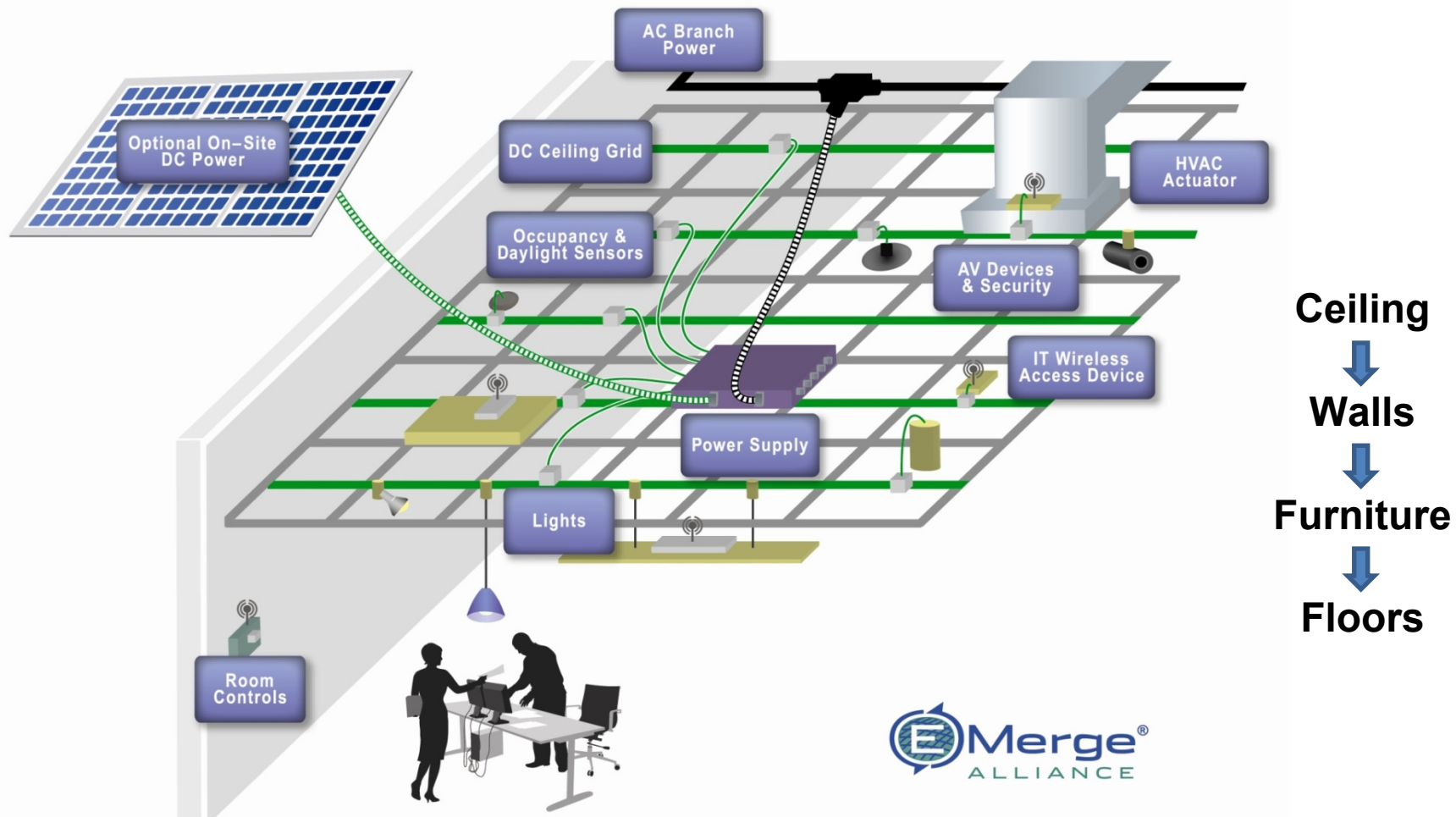
**An open industry association**

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



# Working from the Top-Down

Applies Well to New Construction and Renovation



Copyright ©2009 EMerge Alliance. All rights reserved.

# Current Demonstration Sites

A new Architecture - Scalable from Room to Campus

PNC Financial  
Services Hqtrs.  
Pittsburgh, PA



lauckgroup  
Design Hqtrs.  
Dallas, Texas



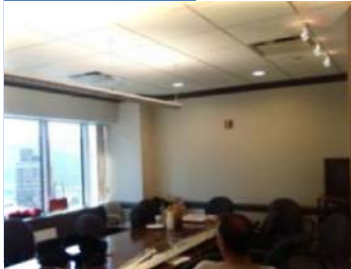
Council HdqtrsUS  
Green Building .  
Washington, DC



Nextek Power  
NextEnergy Hqtrs.  
Detroit, Michigan



UC San Diego  
Sustainability Center  
San Diego, CA



Coming  
To A Building  
Near You...?



Southern Cal Edison  
Customer Center  
Irwindale, CA



Armstrong World Ind.  
Innovation Center  
Lancaster, PA



LACCD  
Trade Tech Campus  
Los Angeles, CA



CLTC  
UC Davis Campus  
Davis, CA





**ConnectivityWeek**

Santa Clara, CA  
May 24-27, 2010

# The EMerge Alliance

Smart Power Standards

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

Please stop by our booth here on the tradeshow floor



Members Area

ABOUT | STANDARD | JOIN | NEWS & EVENTS | RESOURCES  
CONTACT



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

## Flexibility

Do More with Unimaginable Ease...

## Sustainability

Meet Needs for Today and Tomorrow...

## Savings

Reap Rewards for Decades to Come...

## Latest News

03/22/2010  
Let's Talk AC/DC (the currents, not the band)

03/05/2010  
Trends in Wireless Controls

02/02/2010  
EMerge and EPRI make DC Power Progress at  
the 2010 Green Building Power Forum

[View all News](#)

## Upcoming Events

May 12-14, 2010 - Las Vegas  
LightFair International

[View all Events](#)

## Watch our Video

See how EMerge can change your building

## Members



[View all members](#)

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

### Founding Governing Members



### Participating Members



### Liaison Members



### General Members



### Supporting Members



#ConnWeek

**ConnectivityWeek**

Santa Clara, CA  
May 24-27, 2010

## The EMerge Alliance



#ConnWeek