Symposium on the Global Energy Future

Countdown to Zero: Sustainability and Advanced Building Design

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expertise  imagination  partnership  performance
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Presentation Outline

• Building Impact on Energy and Carbon
• Zero Energy Building
• Zero Carbon Building
• Why ‘Zero’
• Path to ‘Zero’
• USGBC, AIA and their Role
• Discussion
Buildings and Carbon

Global CO₂ Emissions by Sector

#1. Buildings
#2. Transportation
#3. Industry

Buildings and Energy

IMPACTS OF U.S. BUILDINGS ON RESOURCES

40% primary energy use*
72% electricity consumption*
39% CO₂ emissions*
13.6% potable water consumption**

Sources:
* Environmental Information Administration (2008): EIA Annual Energy Outlook
Green Buildings Can Reduce...

- **ENERGY USE**: 24%* - 50%**
- **CO₂ EMISSIONS**: 33%*** - 39%**
- **WATER USE**: 40%**
- **SOLID WASTE**: 70%**


CANNONDENVIS
Zero Energy Building

- Building that produce as much energy on-site as it uses on an annual basis
- Trades energy back and forth with the utility company in the form of electricity
- Can go ‘Beyond Net Zero’ by producing more than it uses
Zero Carbon Building

• Building that uses no fossil fuels in its operation, creates no direct greenhouse gases, and does not contribute to global warming

• Energy may be generated on site or from utility but must be from renewable sources like wind, solar or other renewable energy systems

• Zero Carbon and Zero Energy Building produces its own renewable energy each year
Why ‘Zero’

- Social and Economic Impact of Global Warming
- Rising Energy Prices
- Quality of Life Worldwide depends on using energy more efficiently
- Maximum Energy Efficiency would lead to significant CO2 emission reductions
- Healthier, More Comfortable, Less Expensive
- It is an opportunity to improve our life and our responsibility to our future generations
Path to ‘Zero’

• Integrated Design Process
• Establish and Communicate Clear, Aggressive Energy Goals
• Understand the Climate
• Reduce Energy Loads and Use
• Utilize On-Site Renewable Energy Resources for Power Generation
Integrated Design Process

- Commitment:
- Expertise:
- Collaboration:
  - Design Team
  - Contractor
  - Owner
Energy Goals

- Decisions Driven by Energy Use
- Building Size
- Building Materials
- Building Orientation
Understand the Climate

• Comfort in Climatic Extremes?
• Passive Solar
• Natural Ventilation
• Radiant heating/cooling
• Sophisticated Controls
• Equipment Turndown Options
Reduce Energy Loads and Use

• Building Orientation, Massing and Geometry, Glazing Percentage, Insulation and Daylighting

• Efficient Equipment – Computers, Copy Machines, Refrigerators, Microwaves…

• Efficient HVAC Systems

• Efficient Lighting Systems based on Daylighting
Renewable Energy Resources

- Solar
- Wind
- Biomass
- Geothermal
- Hydroelectric
- Green Power
USGBC and its Role

MISSION

Buildings and communities will regenerate and sustain the health and vitality of all life within a generation.
USGBC and its Role

VISION

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy and prosperous environment that improves the quality of life.
USGBC and its Role

- Site Planning
- Water Management
- Energy
- Material Use
- Indoor Environmental Quality

Leadership in Energy and Environmental Design

A leading-edge system for certifying the greenest performing buildings in the world.
USGBC and its Role

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CREDIT CATEGORIES | POINTS
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Sustainable Sites | 14 | 26
Water Efficiency | 5 | 10
Energy & Atmosphere | 17 | 35
Materials & Resources | 13 | 14
Indoor Environmental Quality | 15 | 15
Innovation & Design Process | 5 | 6
Regional Priority Credits | 0 | 4
TOTAL | 69 | 110
USGBC and its Role

Commercial LEED Registered Projects
Total Currently Registered
As of August 2010

35,350
USGBC and its Role

Commercial LEED Certified Projects (cumulative)
As of August 2010

6,602
USGBC and its Role

Square Footage of Commercial LEED Certified Projects (cumulative)

As of August 2010

900 Million
AIA and its Role

• 2030 Challenge
• 60% Reduction in 2010
• 10% Reduction Every Five Years
• Embraced by Organizations and U.S. Conference of Mayors
Recovered Wetland
A protected area that naturally filters storm runoff and supports diverse native vegetation.

Glycol Loop
Heat and energy recovery system transfers thermal conditioning of exhaust air to supply air stream.

Energy Efficient Mechanical System
Cascading air system and variable speed drives allow more efficient energy use and improved indoor air environment.

Hybrid Solar Lighting
Rooftop dishes track the sun to collect solar light which is focused onto optical fibers. The fibers connect to hybrid light fixtures inside the building.

Stormwater Retention Vault
Underground Cistern stores rainwater for site irrigation.

Efficient Building Envelope
High performance glazing, well insulated walls and roof as well as light colored roof that reflects heat.

Pervious Paving
Prevents excess storm runoff and allows water to filter into the subsurface.

Light Shelf
Bounces light deep into building to improve daylighting.

Solar Shading
Shading elements mitigate solar gain reducing energy loads and improving interior light quality.

Siphonic Roof Drain System
Reduces storm water run-off.

Solar Panels
Advanced photovoltaic panels to collect solar energy for a renewable source for electrical power production on site.

Native Plantings
Reduces the need for irrigation and harmful insecticides as well as providing a habitat for local animal species.
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