

# Carbon Neutral Construction Basics

Paul R Bertram, Jr.  
FCSI, CDT, LEED AP  
Director, Environment and Sustainability

**NAIMA**  
NORTH AMERICAN INSULATION  
MANUFACTURERS ASSOCIATION  
[pbertram@naima.org](mailto:pbertram@naima.org)







# Learning Objectives

**Upon completing this program, the participant should know:**

- 1. Potential Climate Change Influences**
- 2. Confirmation on the confusion about what are green/climate neutral buildings & product**
- 3. Understanding carbon strategies**
- 4. Net Zero Energy concepts**
- 5. LCA and carbon analysis**
- 6. Carbon neutral strategies**



# New considerations impacting evaluation and specifying products

- Green Rating Systems
- Climate Change
  - GHG Reduction in the Building Sector
  - Energy Efficiency Goals above Code
  - IAQ
- Government Green Building & GHG Mandates
  - Federal, Regional, State, Local
- Climate Neutral Products
- Life Cycle Assessment
- Sustainability, Environmental & GHG Standards Development
- NGO Green Building ANSI Approved Standards



# Average impacts of a 150,000 sf commercial office building:

## Consumes Per Year:

- 12,750,000,000 BTUs
- 54,750,000 gallons of H<sub>2</sub>O

## Generates Per Year:

- 19,200,000 lbs of CO<sub>2</sub>
- 375,000 lbs of waste



# **“Energy efficiency is the world’s most valuable resource”**

- Jim Rogers, CEO of Duke Energy stated at EE Global 2007 that energy efficiency is the world’s most valuable resource.
- He also echoed his message before congress where he called energy efficiency the 5th fuel

(See: [www.google.com/search?hl=en&q=jim+rogers+duke+energy+testimony+congress](http://www.google.com/search?hl=en&q=jim+rogers+duke+energy+testimony+congress))



# Energy Efficiency to Drive GHG Reduction in the Building Sector

- According to DOE, modest increases in energy efficiency, including insulation, would **eliminate the need for 600 new power plants.**
- Power generation accounts for about one-quarter of total emissions of CO<sub>2</sub>, and is a significant factor in global warming (ScienceDaily (Mar. 21, 2007))



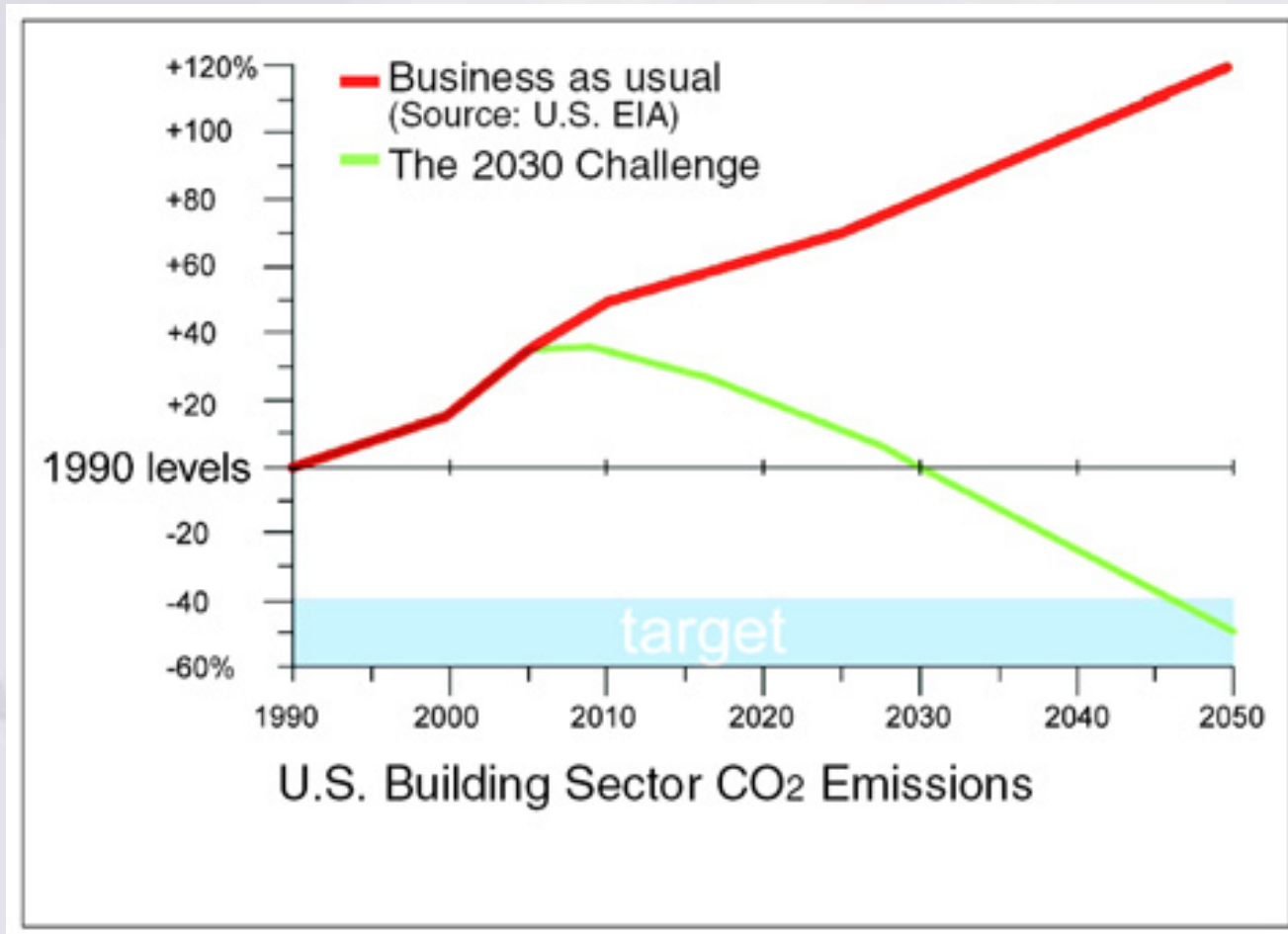


# Energy Efficiency to Drive GHG Reduction in the Building Sector

- Americans spend \$1 million dollars on energy every minute Based on information from the Energy Information Agency (EIA)
- It is also reported that over the next 20 years, U.S. natural gas consumption will rise by well over 50 percent
- Demand for electricity will increase by 45 percent ( US DOE National Energy Policy).
- **To meet projected energy demand, the United States must have in place between 1,300 -1,900 new electric plants by 2020.**
- That is the equivalent of 60 – 90 power plants per year. (US Department of Energy National Policy, Report of the National Energy Policy Development Group, May 2001).



# Architecture 2030

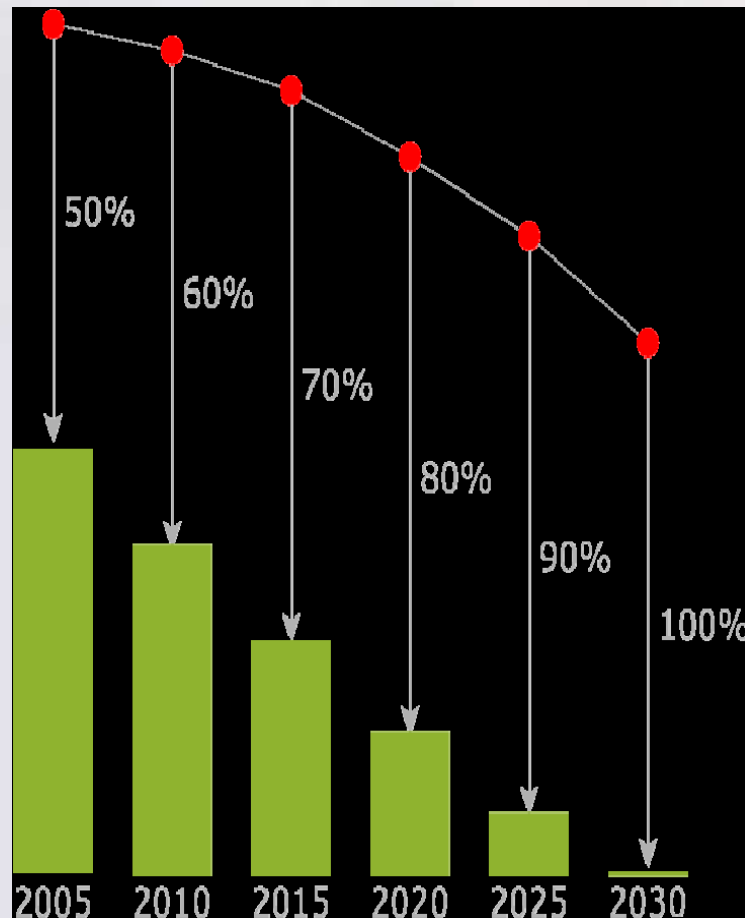




# 2030 Challenge Target Goals

Challenge to  
Reduce Fossil  
Fuel Energy of  
Construction and  
Operations

All new Fuel Energy  
construction  
and an equal  
amount of  
existing building  
area to be  
remodeled

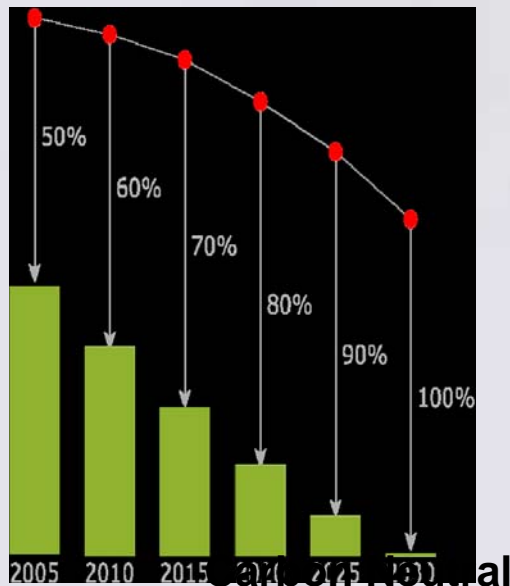


Targets based  
on Country  
Average for that  
Building Type in  
Commercial  
Building Energy  
Consumption  
Survey (CBECS).

Increasing  
Reduction in Fossil  
All new Fuel Energy  
**Carbon Neutral**



# BARACK OBAMA'S PLAN TO MAKE AMERICA A GLOBAL ENERGY LEADER



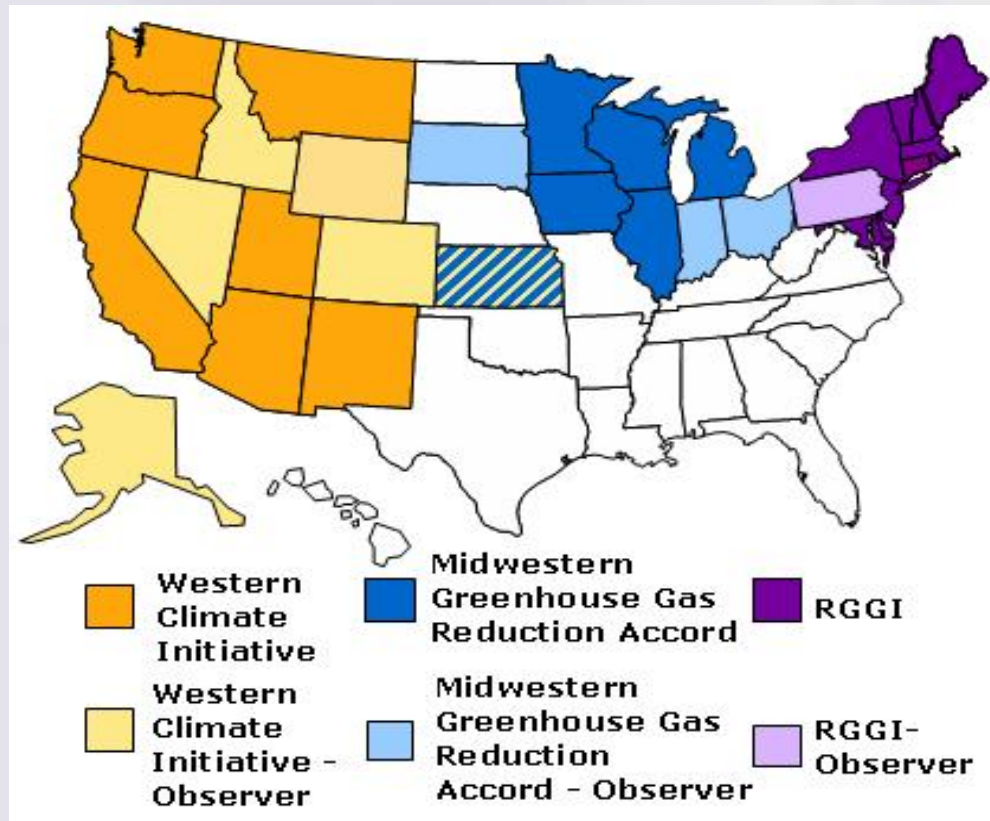
**2030 Challenge  
Target Goals**

Set Building Efficiency Goals: Barack Obama will establish a goal of making all new buildings carbon neutral, or produce zero emissions, by 2030.

He'll also establish a national goal of improving new building efficiency by 50 percent and existing building efficiency by 25 percent over the next decade to help us meet the 2030 goal.



# U.S. State Climate Action Plans



Trading at approximately \$80/ton

## New England Region Northeastern Governors Climate Action Plan:

### Goals

- Reduce emissions to 1990 levels by 2010
- Reduce emissions 10% below 1990 by 2020
- Long term reduction of 75-85%

## Regional Greenhouse Gas Initiative (RGGI)

- Develop Northeast regional GHG reduction policy
- Step toward a regional cap and trade system



# 21 US cities will measure and disclose their CO2 emissions

<http://www.iclei-usa.org/programs/climate/ghg-protocol>

- The cities will resort to a measuring system for CO2 and other greenhouse gases already in used by some 1,300 companies worldwide who voluntarily disclose their emissions.
- "Over 70 percent of total global emissions are generated from cities, and if you don't measure these emissions, you cannot manage them," Carbon Disclosure Project (CDP) CEO Paul Dickinson told AFP.





# Carbon Neutral Incentive Programs

**scgov.net** Sunday, March 25, 2007 Search

**Sarasota County Government** FLORIDA, USA

**Conduct Business**

- 911 Dispatch Reporting
- Backflow Prevention Program
- Board Meetings, Agendas, Minutes and Videos
- Comprehensive Plan
- Cone Zone
- County Jobs
- Flood Information
- Maps
- Neighborhood Services
- Pay Your Water Bill
- Penny Surtax Projects
- Permitting / Permit Status
- Property Records
- Property Tax
- Recreation and Parks Online
- SCAT Bus System
- TV19 Schedule

**City Governments**

- Longboat Key
- North Port
- Sarasota
- Venice

**County Government**

**Employee Article**

**County adopts '2030 Challenge' to reduce fossil-fuel emissions**

**SARASOTA COUNTY** (THURSDAY, JULY 20, 2006) - The Sarasota County Commission has approved a resolution to drastically reduce its fossil-fuel emissions over the next two decades. By adopting the "2030 Challenge," the county has committed to design all new construction and building renovations to use one-half the fossil fuel energy currently permitted by the U.S. Department of Energy. The fossil fuel reduction standard for all new buildings will be increased to 60 percent in 2010, 70 percent in 2015, 80 percent in 2020 and 90 percent in 2025. The ultimate goal is to design all new buildings to be carbon-neutral by the year 2030.

Carbon-neutral buildings use no fossil fuel energy and produce no greenhouse gases. The concept of carbon neutrality has been gaining strength since the United Nations Intergovernmental Panel on Climate Change, an international community of scientists, determined in 2001 that climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming and pollution.

According to the U.S. Department of Energy (DOE), buildings use 68 percent of the country's electricity and nearly 40 percent of the country's natural gas, making them a major contributor to greenhouse gas emissions. "If we are truly serious about conserving energy and being environmental stewards, we must accept the challenge," says Sarasota County Energy Coordinator Gary Patton. "This is a monumental commitment by our commissioners to preserve our environment and protect the health of our citizens."

Sarasota County is the first county in the nation to adopt the 2030 Challenge, which is being championed by the American Institute of Architects and was endorsed by the U.S. Conference of Mayors in June 2006. The resolution that was adopted at the county commission's July 11 meeting establishes a policy of carbon-neutrality in everything from procurement procedures to water treatment facilities, public transit and utilization of renewable energy technologies.

"With this resolution, the county has continued an aggressive approach to sustainability," says Commissioner Shannon Staub. "The goal of being carbon neutral by 2030 is one that I believe county government can reach. The next step is for each of us in our personal lives to strive for that same goal."

Sustainable Sarasota Manager Jodi John cites the new photovoltaic park that the county is partnering on with Florida Power & Light, the county's plan to increase the number of hybrid vehicles into its fleet, and a number of other energy-efficiency measures as just a few of the ways that Sarasota County is demonstrating its commitment to a sustainable energy future.

"Sarasota County has already used energy-efficient design for two county buildings that have been awarded Gold LEED designations from the U.S. Green Building Council," says John. The LEED designation recognizes buildings based on their energy conservation and environmental operations. "The county is also actively pursuing technology to utilize landfill gas for energy or other productive purposes in the future."

In June, Sarasota County, in conjunction with the Department of Energy's National Renewable Energy Laboratory, announced the first Renewable Community demonstration project in the nation. A renewable community integrates renewable energy systems for both housing and transportation. Zero or near-zero energy homes and plug-in hybrid electric vehicles are key components of this integrated system. NREL is partnering with Sarasota County on a demonstration project



Sustainable, Green and High Performance  
Solutions for the Built Environment

***It will take the collaborative work of many to solve  
global climate change problems***



# Climate neutral construction

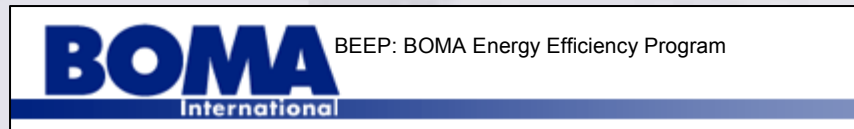
- While the solution to significant carbon dioxide emission reductions, energy efficiency, and energy independence are still years beyond our reach in terms of technology and government policy, certain measures to reduce the environmental impact of our buildings are currently available.
- From a structural engineering standpoint, a reduction in material demand, selection of methods geared toward shortening construction schedules, and reducing building volume without compromising architectural expression are all proven measures that contribute to happy clients and end users.

Close collaboration between all design team members is also key in creating green buildings. Both structural engineer and architect play a vital role in striking a balance between layout efficiency and aesthetics. As such, structural engineers will need to become much more involved in the early conceptualization of any proposed building to ensure that this balance is met.

**Martin Maingot, P.E.**, has been a project manager with Cary Kopczynski & Company since 2005 and was recently promoted to associate of the Bellevue, Wash.-based structural engineering firm. He can be reached at [martinm@ckcps.com](mailto:martinm@ckcps.com) or 425-455-2144.



# Green Rating Systems & Programs

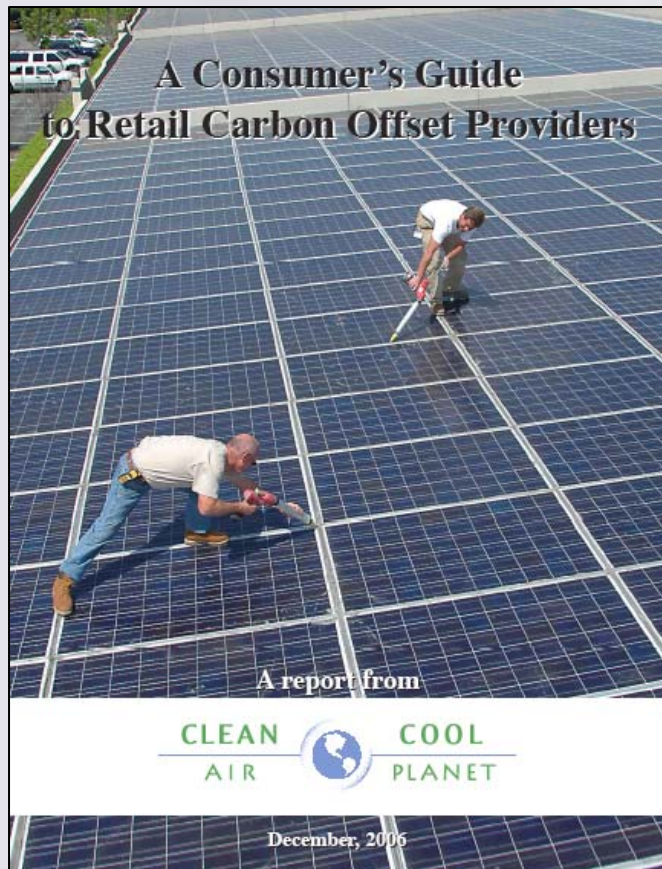


*It will take the collaborative work of many to solve global climate change problems*



# Climate Neutral Products and LEED

REC's (Renewable Energy Credits) must be certified by Green-e, Environmental Resources Trust or proven equivalent. Carbon offset programs must be in the top 8



AgCert/Drive Green (Ireland)

AtmosFair (Germany)

Carbon Neutral Company (UK)

Climate Care (UK)

Climate Trust (US)

CO2 Balance (UK)

Native Energy (US)

Sustainable Travel/My Climate (US)

[www.cleanair-coolplanet.org/ConsumersGuidetoCarbonOffsets.pdf](http://www.cleanair-coolplanet.org/ConsumersGuidetoCarbonOffsets.pdf)



# the dictionary of sustainable management

# A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

About

Credits

## CLIMATE NEUTRAL

The process of offsetting carbon-producing activities with those that either reduce or capture carbon, thus credibly neutralizing the net amount of carbon released in the atmosphere from a particular activity.

See Also: [carbon trading](#)

### COMMENTS

### POST A COMMENT

If you have a TypeKey identity, you can [sign in](#) to use it here.

Name:

Paul bertram

Email Address:

paul@prbconnect.com

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Remember Me? ☒ Yes ☐ No

Comments: (you may use HTML tags for style)

a project of:



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SCHOOL OF MANAGEMENT

### SEARCH

go

C:

Carbon Footprint  
Community Choice Aggregation (CCA)  
Clarkson Principles  
Collective Intelligence  
Cogeneration  
Clear Cutting  
Cheater Capitalism  
Caux Round Table Principles  
Carbon Disclosure Project  
Corporation  
Corporate Reporting  
Corporate Citizenship  
Compliance  
Customization  
Customer Experience  
CSR (Corporate Social Responsibility)  
Cradle-to-Cradle  
Core Competencies  
Coopetition  
Cooperation  
Consumer  
Competitiveness  
Competitive Advantage  
Competition

- **Climate Neutral** - The process of offsetting carbon-producing activities with those that either reduce or capture carbon, thus credibly neutralizing the net amount of carbon released in the atmosphere from a particular activity.
- **Climate Neutral Products** - Products where CO2 emissions have been measured and reductions identified by a recognized 3rd party verification, and remaining emissions offset through established carbon trading in accordance with a verifier's stated protocol.



# What is a climate neutral product?

- Climate neutral refers to products, services and enterprises that have little or no effect on the Earth's climate.
  - This is achieved by reducing and offsetting global warming gases associated with the production and delivery of products, services or total operations emissions for an enterprise to achieve a net zero impact on the Earth's climate.



# Defining Carbon Neutral Buildings

- Generally understood to be those that require no GHG-emitting energy to operate.
- Accomplished by combining on and off-site renewable energy generation with ultra-efficient building materials and equipment.



# The Vision: Zero Net Energy for Buildings – EEB

*(Energy Efficiency in Buildings (EEB) project, World Business Council for Sustainable Development (WBCSD)*

- Climate Neutral is defined as the process of offsetting carbon-producing activities with those that either reduce or capture carbon,
- Neutralizing the net amount of carbon released in the atmosphere from a particular activity.
- Implementation of Climate Neutral Buildings may include Carbon Trading strategies.

See: [www.wbcsd.org/templates/TemplateWBCSD5/layout.asp?type=p&MenuId=MTA5NA](http://www.wbcsd.org/templates/TemplateWBCSD5/layout.asp?type=p&MenuId=MTA5NA))





# Cap-and-trade program

- **Key Elements of a Well-Designed Cap-and-Trade Program**
  - Stringently capping emissions, with firm near-term goals
  - Including all major heat-trapping gas emissions. Those include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF<sub>6</sub>).



# Defining Cap & trade

- Cap-and-trade systems, also known as allowance trading, can be best summed up as "**pollution credits.**"
- What happens is that overall air quality goals are set for an area (such as the entire nation) and specific sources of air pollution (such as power plants, waste incineration facilities, etc.) are given a certain number of allowances, which represent the amount of various pollutants that the organization or facility is allowed to emit.
- Facilities that come in under that allowable limit because of air pollution control systems can then **sell** their leftover allowances to other facilities and organizations on the open market.
- This allows the facilities that **buy** up such allowances (pollution credits) to pollute more, because other facilities are polluting less.



# What is a carbon offset?

- An emission reduction **credit** from another organization's project that results in less carbon dioxide or other greenhouse gases in the atmosphere than would otherwise occur.
- Carbon offsets are typically measured in tons of CO<sub>2</sub>-equivalents (or 'CO<sub>2</sub>e') and are **bought and sold through a number of international brokers, online retailers, and trading platforms.**





# Making Sense of the Voluntary Carbon Market - A Comparison of Carbon Offset Standards

Anja Kollmuss (SEI-US), Helge Zink (Tricorona), Clifford Polycarp (SEI-US)

- Clean Development Mechanism (CDM)
- Gold Standard (GS)
- Voluntary Carbon Standard 2007 (VCS 2007)
- VER+
- The Voluntary Offset Standard (VOS)
- Chicago Climate Exchange (CCX)
- The Climate, Community & Biodiversity Standards (CCBS)
- Plan Vivo System
- ISO 14064-2
- GHG Protocol for Project Accounting



# Standards for Carbon Offsets

- A number of standards exist for carbon offsets, including the VCS, Green-e, and The Gold Standard
- More standards are being announced regularly.
  - Each of these standards differs in key ways, with some being more rigorous than others.



# GHG Climate Registry

## The Climate Registry

**<http://www.theclimateregistry.org/>**



- [About The Registry](#)
- [Voluntary Reporting](#)
- [Mandatory Reporting](#)
- [Public Stakeholders](#)
- [Tools](#)
- [Calendar](#)

Questions about the Registry?  
[info@theclimateregistry.org](mailto:info@theclimateregistry.org)

THE CLIMATE REGISTRY is a nonprofit partnership developing an accurate, complete, consistent and transparent greenhouse gas emissions measurement protocol that is capable of supporting voluntary and mandatory greenhouse gas emission reporting policies for its Members and Reporters. It will provide a verified set of greenhouse gas emissions data from its Reporters supported by a robust accounting and verification infrastructure.

## Member States, Provinces, and Tribes



## Spotlight

### Request For Proposals (RFP)

The Registry is currently accepting proposals for the development of its first industry-specific protocol, which will target the electric power generation industry. See below for the full RFP.

[Electric Power Generation,  
Transmission & Distribution  
RFP](#)

Proposals must be submitted on **June 13, 2008**.

## What's New

### The Registry Finalizes General Reporting Protocol



The Registry has finalized its [General Reporting Protocol](#), which gives guidance on how to inventory

greenhouse gas emissions for participation in the Registry. When organizations become Reporters, they agree to register their greenhouse gas emissions for all operations in the U.S., Canada

***It will take the collaborative work of many to solve global climate change problems***



# Emerging GHG Reporting requirements

## ISO 14064 GHG Standards

for assessing and supporting greenhouse gas reduction and emissions trading



International  
Organization for  
Standardization

ISO is becoming less optional for US manufacturers because of international business opportunities requirements in many foreign markets

- **ISO 14064-1:2006**,  
Greenhouse gases – Part 1:  
**reporting of greenhouse gas emissions and removals.**
- **ISO 14064-2:2006**,  
Greenhouse gases – Part 2:  
**reporting of greenhouse gas emission reductions and removal enhancements.**
- **ISO 14064-3:2006**,  
Greenhouse gases – Part 3:  
**validation and verification of greenhouse gas assertions.**





# ASTM GHG Standards

- Work Item Summary Copyright 2008 ASTM International. All rights reserved.
- WK15321 New Practice for Practice for Carbon Neutral and Greenhouse Carbon Dioxide emitted from Stationary Emissions Sources
- 1. Scope

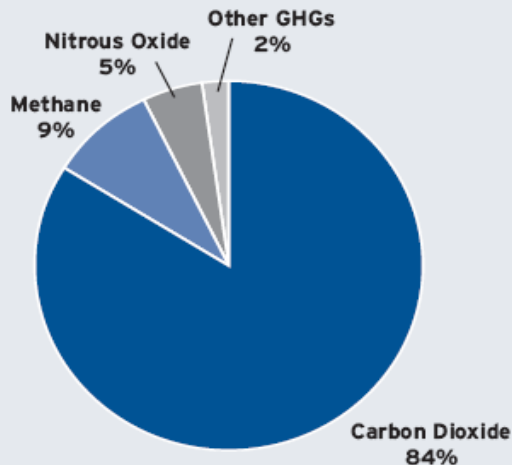
This practice covers specific procedures applicable to collection of gas **samples from stationary emission sources for measurement in accordance with Standard D 6866 (applicable to the identification of, and determination of relative proportions of CO<sub>2</sub> derived from renewable resources and CO<sub>2</sub> derived from fossil fuels within bulk air emissions).** This Practice is needed to satisfy the immediate interests of regulatory, industrial, and financial markets acting upon greenhouse gas initiatives. The Supreme Court has just ruled in favor of States demanding the EPA monitor and control CO<sub>2</sub> emissions per requirement designated in the Clean Air Act. California has passed law AB 32 requiring all greenhouse gas emissions to be monitored, reported, and reduced to 1990s levels within the next decade. Renewable Portfolio Standards within almost all of the States require that at least 5% of the states energy production be derived from renewable resources within the next decade. The Regional Greenhouse Gas Initiative within the NE States are collectively working to reduce their greenhouse gas emissions, with their sites on alternative energy production as a means to achieve their goals.



# ***Shrinking the nation's carbon footprint while allowing for population and economic growth requires a strategic focus on reducing the energy intensity of the U.S. economy and reducing the carbon intensity of the energy we consume.***

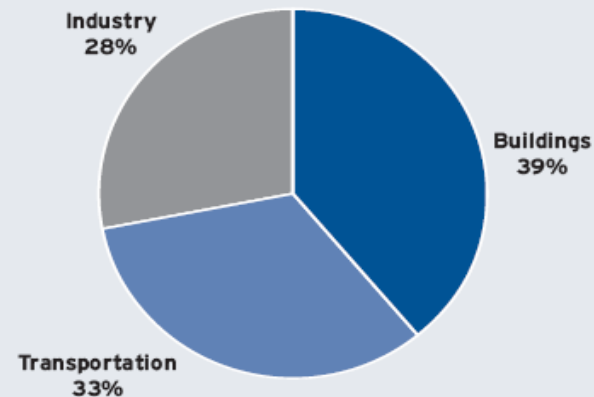
***Carbon dioxide is the most prevalent greenhouse gas (GHG) emitted in the United States and it primarily comes from the energy used in buildings and transportation***

**U.S. GHG Emissions (2005)**



Source: Environmental Protection Agency

**U.S. CO<sub>2</sub> Emissions by Sector (2005)**



Source: Energy Information Administration



# Carbon Neutral Design Technologies

- Potential Carbon Reductions
  - Energy Efficiency
    - Building envelope thermal efficiency
      - Air sealing
      - Low E Windows
    - Energy efficient lighting and automated controls
    - Right sizing HVAC systems
  - Renewables
    - Solar
    - Wind Biofuels
    - Biomass
    - Geothermal



# Climate Neutral Design Strategies

For New Buildings:

- *Determine performance goals, use integrated design approach with state-of-the-art smart systems, construct and commission, operate to meet targets*

For Existing Buildings:

- The ***“benchmark your energy use and set goals, actively monitor end use and indoor environmental quality, diagnose and fix problems as they arise -> take operational and/or investment actions to meet goals, and actively monitor feedback, re-evaluate benchmarks in light of costs...”***

Program interaction

Build these programs around a single shared “life-cycle” Building Information Model (BIM)

Stephen Selkowitz Department Head, Building Technologies Department Lawrence Berkeley National Laboratory

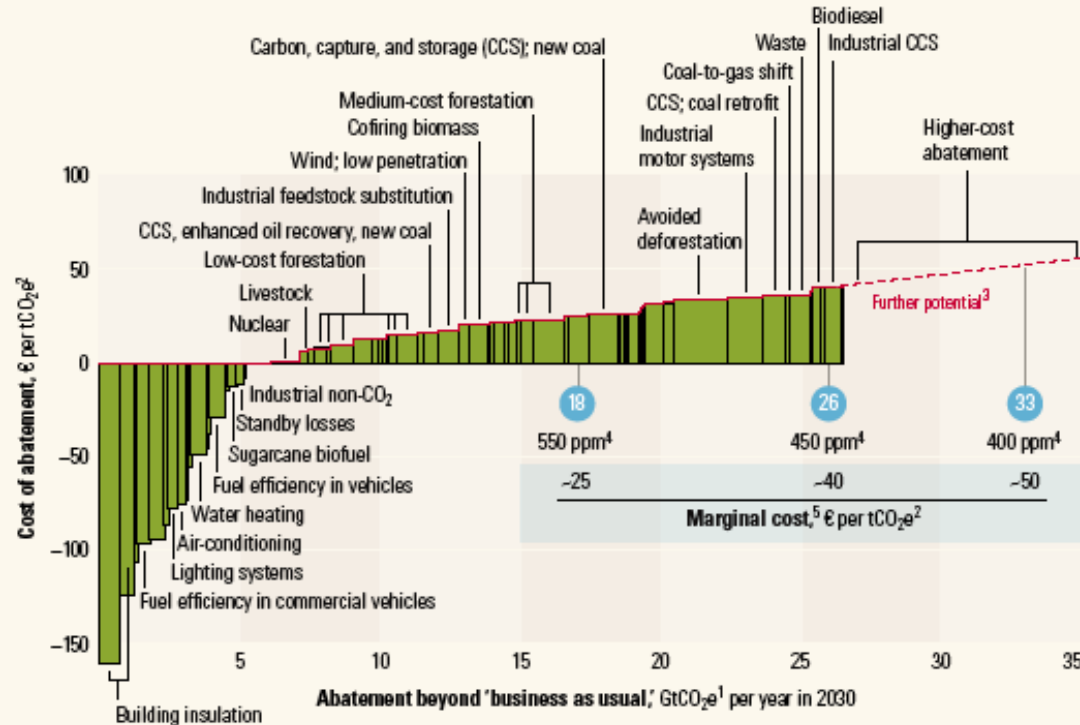


# Carbon Abatement Strategies

## What might it cost?

Global cost curve for greenhouse-gas abatement measures beyond 'business as usual'; greenhouse gases measured in GtCO<sub>2</sub>e<sup>1</sup>

- Approximate abatement required beyond 'business as usual,' 2030



<sup>1</sup>GtCO<sub>2</sub>e = gigaton of carbon dioxide equivalent; "business as usual" based on emissions growth driven mainly by increasing demand for energy and transport around the world and by tropical deforestation.

<sup>2</sup>tCO<sub>2</sub>e = ton of carbon dioxide equivalent.

<sup>3</sup>Measures costing more than €40 a ton were not the focus of this study.

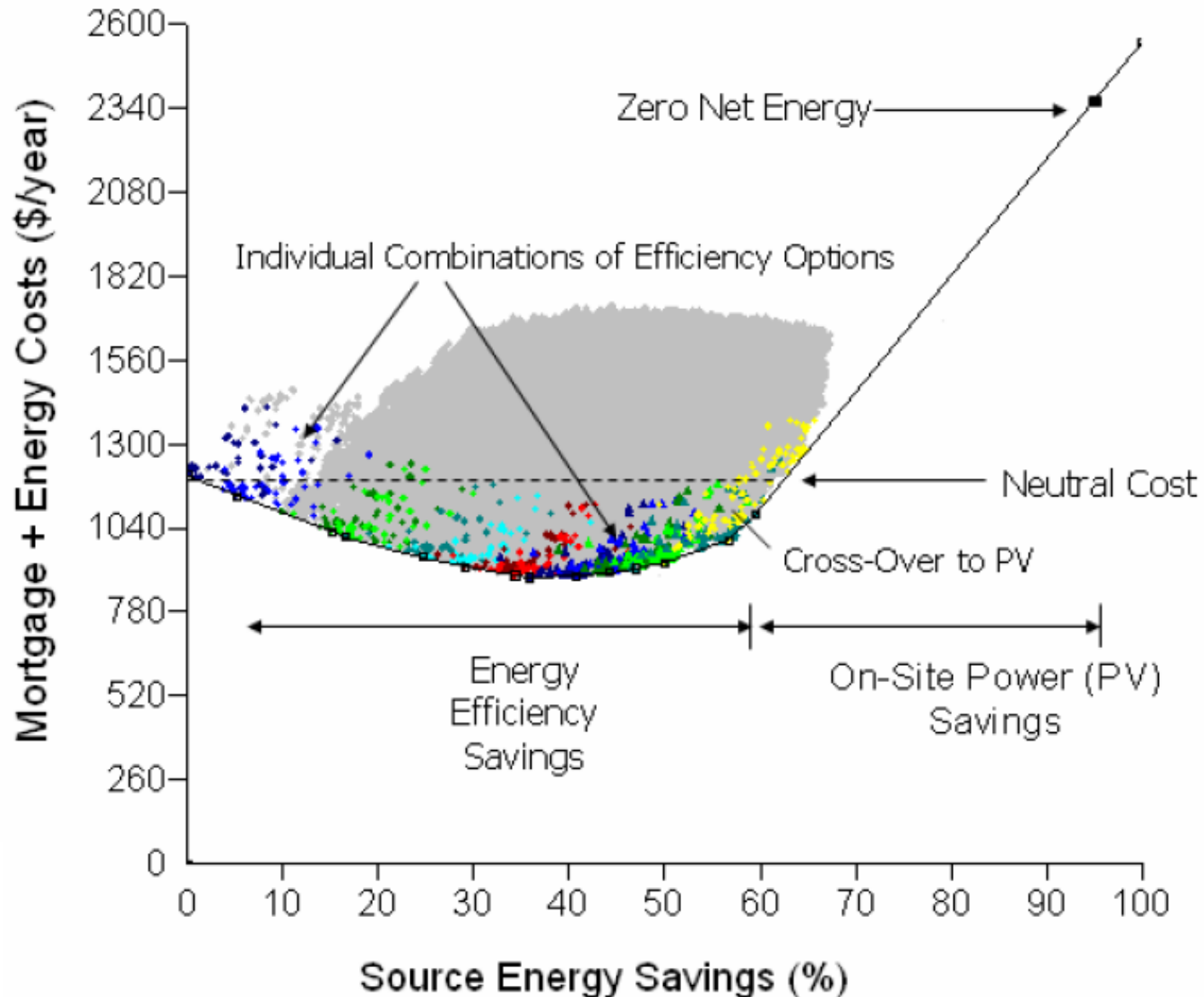
<sup>4</sup>Atmospheric concentration of all greenhouse gases recalculated into CO<sub>2</sub> equivalents; ppm = parts per million.

<sup>5</sup>Marginal cost of avoiding emissions of 1 ton of CO<sub>2</sub> equivalents in each abatement demand scenario.

Source: "A cost curve for greenhouse gas reduction" by Anders Enkvist, Tomas Nauclér, Jerker Rosander  
Copyright © 2007 McKinsey & Company



# Example Results: Costs and Energy Savings of All Possible Combinations of Options





# Net Zero Energy **READY** Buildings

The next generation of residential and commercial building design concepts

- Progressive Energy Efficiency Goals
- **Ultimate Target** is Net Zero Energy  
or Net Zero Energy **PLUS**

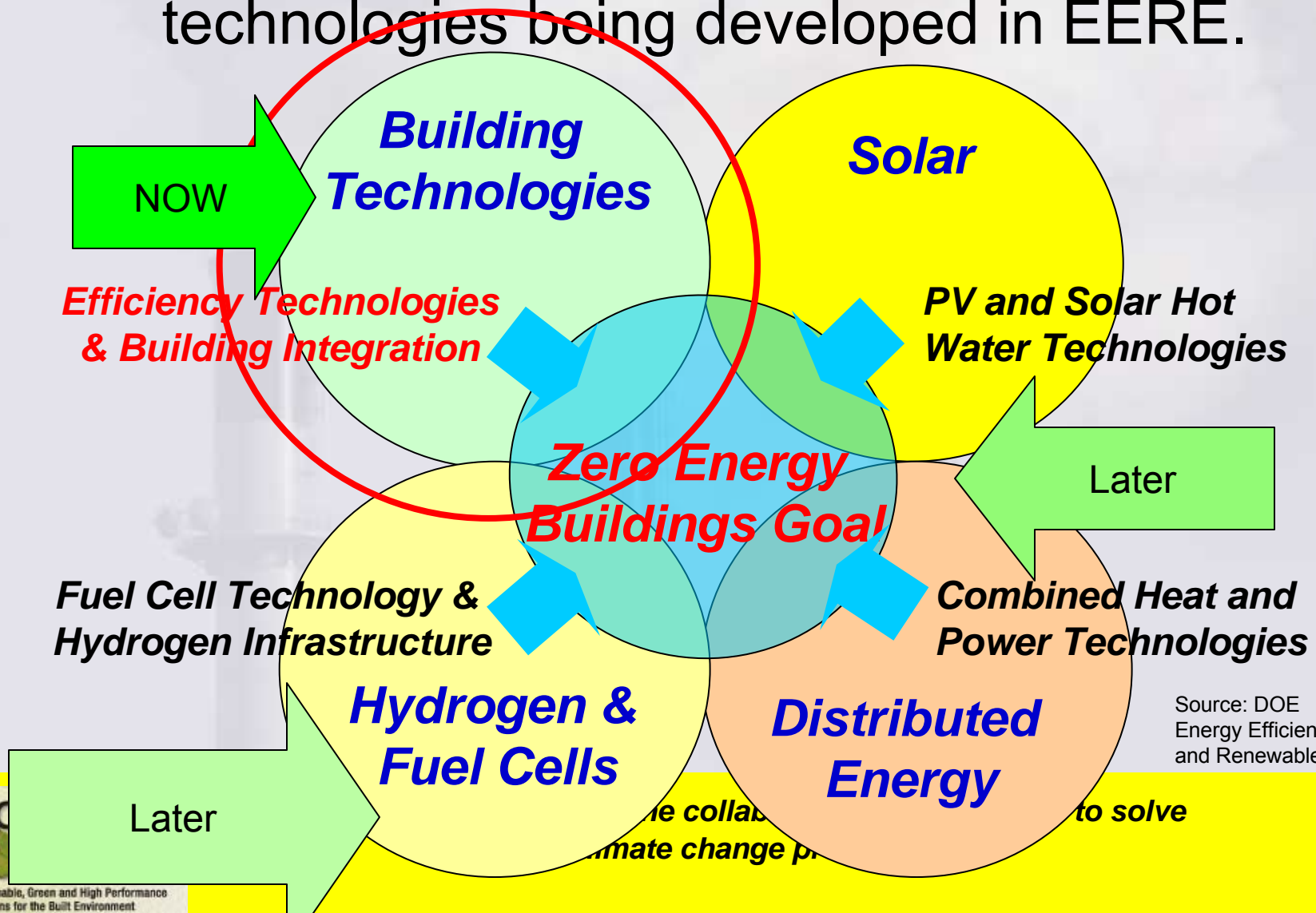
30 ⇒ **50** ⇒ NZER  
(Ready)

*An energy efficiency goal we can meet today!*



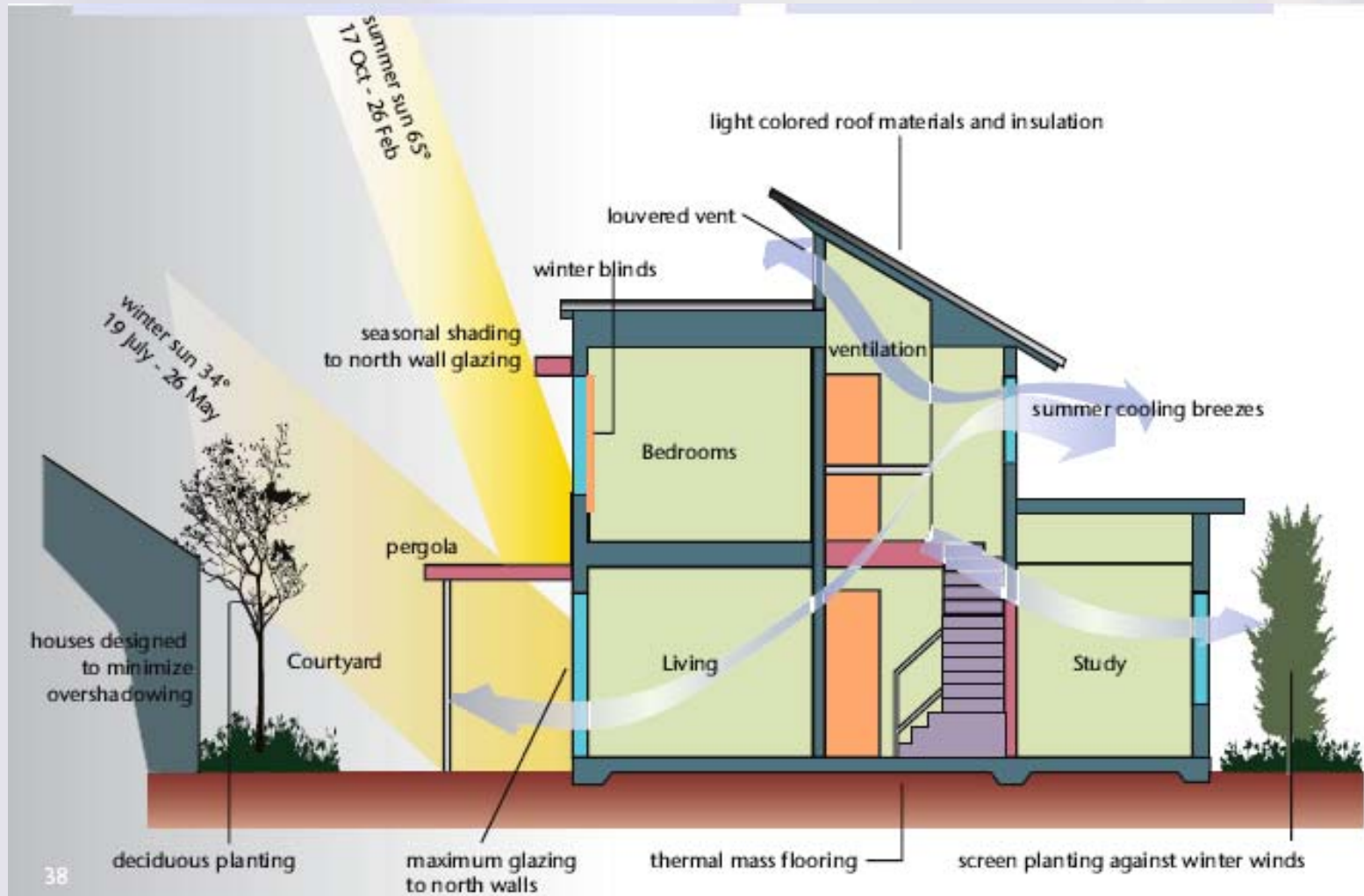
# Buildings as the Integrator

Buildings represents a key market for many technologies being developed in EERE.





# Specifying innovative building design and materials use





# Zero-Energy Buildings: Boundary Definitions and Energy Flows

- At the heart of the ZEB concept is the idea that buildings can meet all their energy requirements from low-cost, locally available, nonpolluting, renewable sources
- At the strictest level, a ZEB generates enough renewable energy on site to equal or exceed its annual energy use

Source: NREL Zero Energy Buildings: A Critical Look at the Definition



# Net Zero Energy Definitions

- **Net Zero Site Energy:** A site ZEB produces at least as much energy as it uses in a year, when accounted for at the site.
  - **Net Zero Source Energy:** A source ZEB produces at least as much energy as it uses in a year
    - when accounted for at the source. Source energy refers to the primary energy used to generate and deliver the energy to the site.
    - To calculate a building's total source energy, imported and exported energy is multiplied by the appropriate site-to-source conversion multipliers.
  - **Net Zero Energy Costs:** In a cost ZEB, the amount of money the utility pays the building owner for the energy the building exports to the grid is at least equal to the amount the owner pays the utility for the energy services and energy used over the year.
  - **Net Zero Energy Emissions:** A net-zero emissions building produces at least as much emissions-free renewable energy as it uses from emissions-producing energy sources.

Source: NREL Zero Energy Buildings: A Critical Look at the Definition



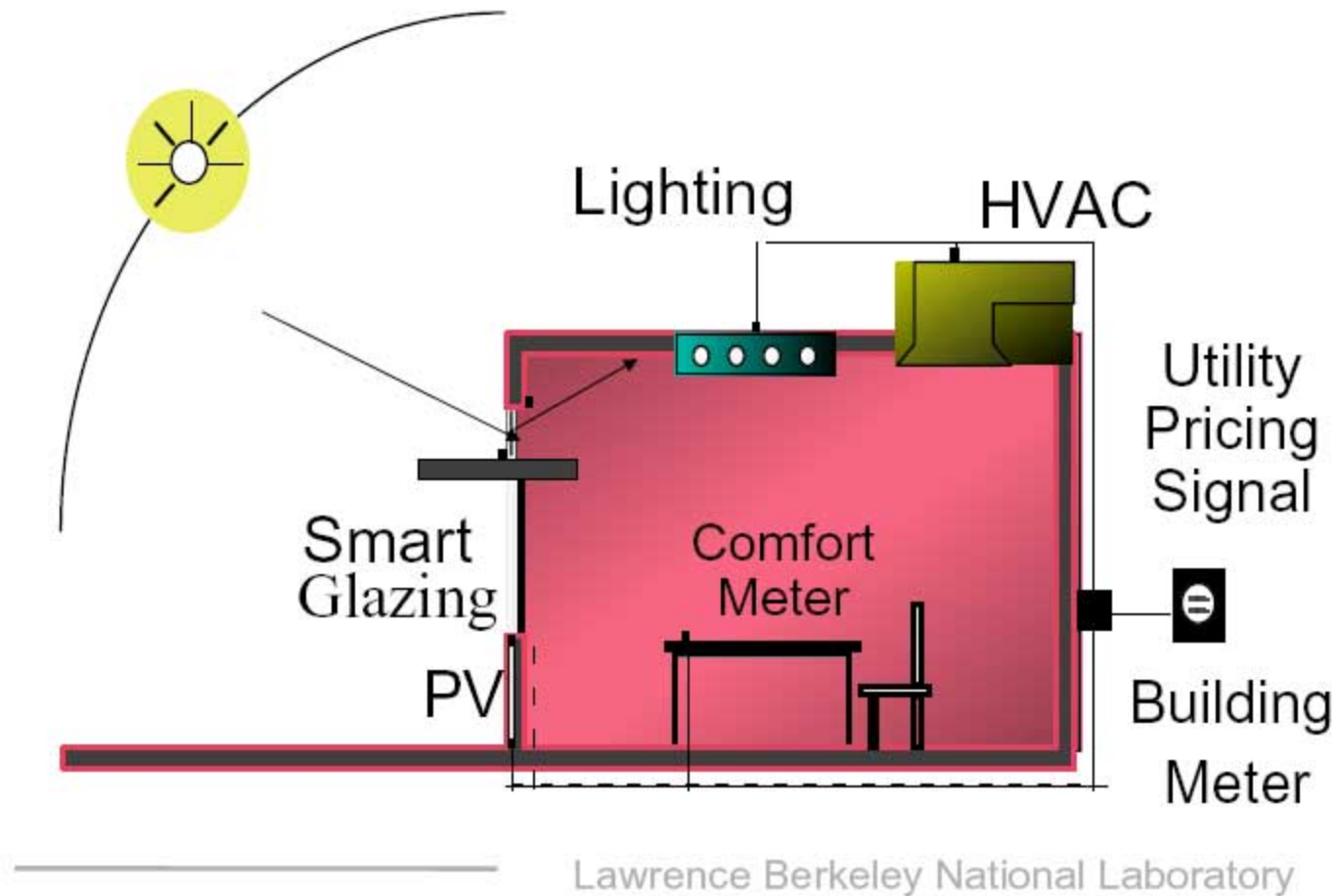
# Grid Connection Is Allowed and Necessary for ZEB Energy Balances

- A ZEB typically uses traditional energy sources such as the electric and natural gas utilities when on-site generation does not meet the loads
- When the on-site generation is greater than the building's loads, excess electricity is exported to the utility grid
- By using the grid to account for the energy balance, excess production can offset later energy use

Source: NREL Zero Energy Buildings: A Critical Look at the Definition



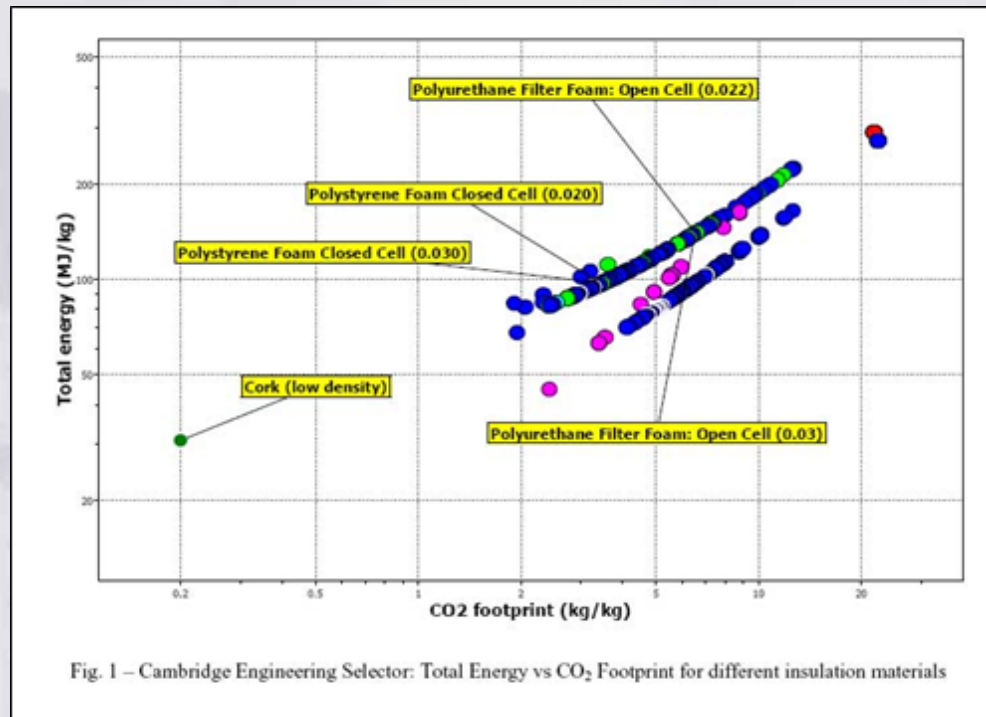
# Conceptual Design for a Carbon-Neutral Office using an Integrated Building Facade Systems





# From Materials to *ECO-MATERIALS*

- Increasing use of “Bio” and “Eco” prefixes are used to market sustainable attributes, but typically are not supported with *quantifying* data within a sustainable life-cycle approach
- Determining what a green building product has brought LCA (Life Cycle Assessment) into forefront as possible solution to reduce confusion







# How far will GHG reporting go?

## Calculating Carbon Footprint of a Cheeseburger



**6.3 to 6.8 pounds**  
(2.85 to 3.1 kg) of carbon  
emissions per burger.

- **Jamais Cascio, former managing editor over at Worldchanging and current proprietor of Open the Future, recently got to wondering: what do everyday, common items contribute to Global Warming**
- **The cheeseburger,**
  - 6.3 to 6.8 pounds (2.85 to 3.1 kg) of carbon emissions per burger.**
    - **This includes:**
      - Growing the feed for the cattle for the beef and cheese,
      - Growing the produce, storing and transporting the components
      - Cooking them all
- **The article says if all Americans eat the average amount of burgers, it will equal 7500-15000 SUV's**



# Companies Measure the Carbon Footprint of Consumer Products

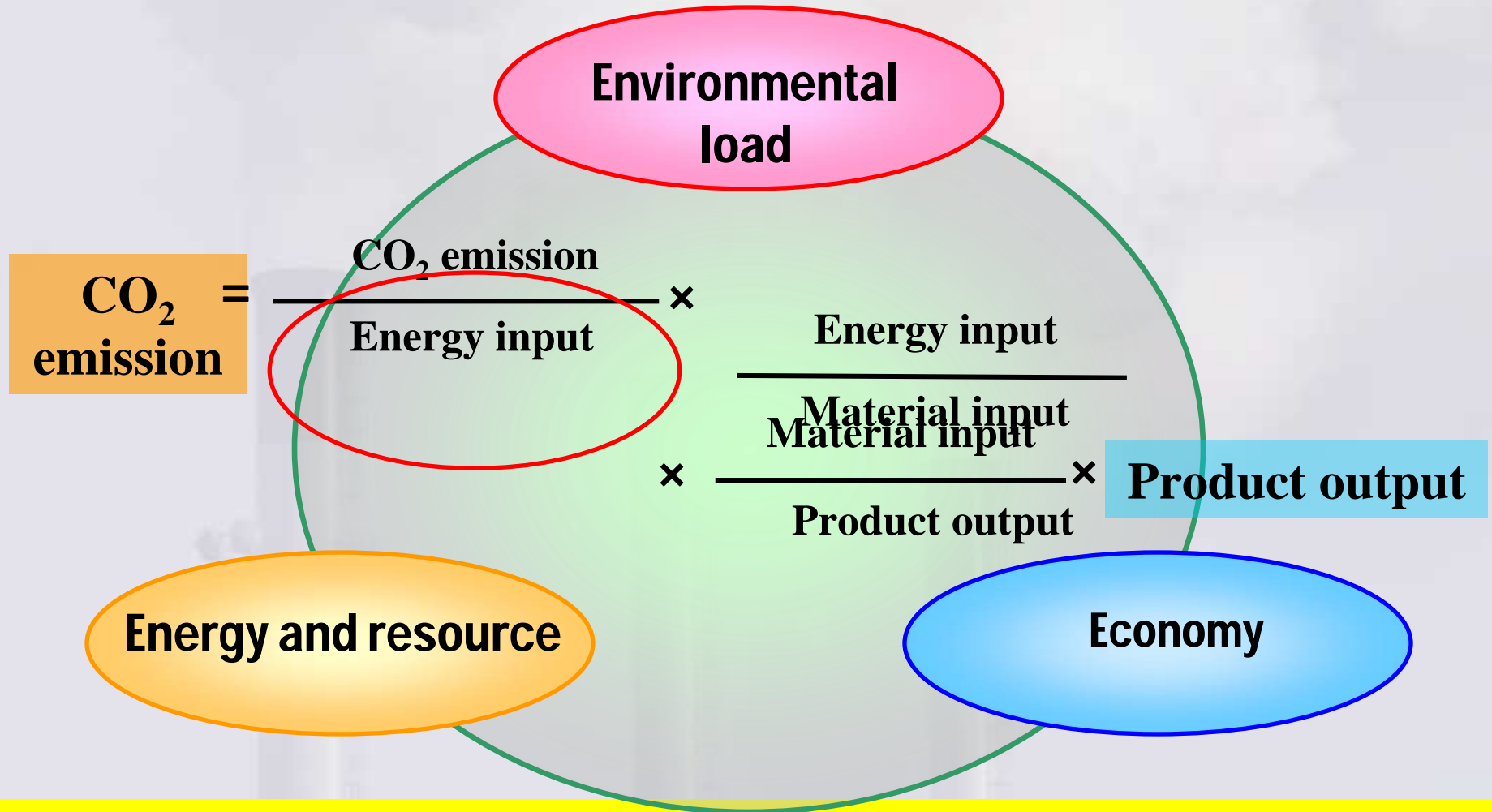


Consumer products are beginning to display details about their environmental impacts. Source: <http://www.timberland.com/shop/ad4.jsp>



# Sustainability in energy and material flow


... considering trilemma between environment, energy and economy





# EcoCalculator

[http://www.athenasmi.ca/signon/login.php?referer=/tools/ecoCalculator/downloadEcoCalculator.php&src=access\\_page](http://www.athenasmi.ca/signon/login.php?referer=/tools/ecoCalculator/downloadEcoCalculator.php&src=access_page)

	A	B	C	D	E	F	G	H	I	J
	 <b>ATHENA®</b> EcoCalculator for assemblies		<b>TOTAL IMPACTS BY BUILDING COMPONENT</b>		Primary Energy (MMBtu) TOTAL	GWP (tons) TOTAL	Weighted Resource Use (tons) TOTAL	Air Pollution Index TOTAL	H2O Pollution Index TOTAL	
1			COLUMNS & BEAMS	0	0	0	0	0.00		
2			INTERMEDIATE FLOORS	0	0	0	0	0.00		
3			EXTERIOR WALLS	0	0	0	0	0.00		
4			WINDOWS	0	0	0	0	0.00		
5			INTERIOR WALLS	39	1	8	499	0.13		
6			ROOF	0	0	0	0	0.00		
7			<b>WHOLE BUILDING</b>	<b>39</b>	<b>1</b>	<b>8</b>	<b>499</b>	<b>0.13</b>		
8										
9	<b>E. INTERIOR WALLS</b>									
10	<b>ATHENA ASSEMBLY EVALUATION TOOL v2.3—Southern USA low-rise building</b>									
11	IN THE YELLOW CELLS BELOW, ENTER THE QUANTITY OF EACH ASSEMBLY USED IN YOUR BUILDING									
		ASSEMBLY NAME	Square footage	Percentage of total	Primary Energy per SF (MMBtu)	GWP per SF (lbs)	Weighted Resource Use per SF (lbs)	Air Pollution Index per SF	H2O Pollution Index per SF	
12										
13	<b>Average:</b>									
14	1	Wood stud (16" OC) gypsum board + latex paint each side	1200	100.00%	0.03	2.49	12.90	0.42	0.0001	
15	2	Wood stud (24" OC) gypsum board + latex paint each side	0		0.03	2.42	11.72	0.41	0.0001	
16	3	Wood stud (24" OC) gypsum board x2 + latex paint each side	0		0.05	4.08	18.28	0.70	0.0001	
17	4	Steel stud (16" OC) gypsum board + latex paint each side	0		0.03	3.51	10.57	0.47	0.0034	
18	5	Steel stud (24" OC) gypsum board + latex paint each side	0		0.03	3.17	9.86	0.45	0.0026	
19	6	Steel stud (24" OC) gypsum board x2 + latex paint each side	0		0.05	4.84	16.42	0.74	0.0026	
20	7	6" Concrete block; gypsum board + latex paint each side	0		0.11	15.89	31.30	1.55	0.0015	
21	8	6" Concrete block; latex paint each side	0		0.09	14.22	24.74	1.25	0.0000	
22	9	Clay brick (4") unpainted	0		0.11	13.37	23.00	1.84	0.0001	
23	<b>TOTAL SQUARE FOOTAGE</b>		<b>1200.00</b>							
24										
25										
26										
	WELCOME & HOW-TO / COLUMNS AND BEAMS / INTERMEDIATE FLOORS / EXTERIOR WALLS / WINDOWS / <b>INTERIOR WALLS</b> / ROOFS /									



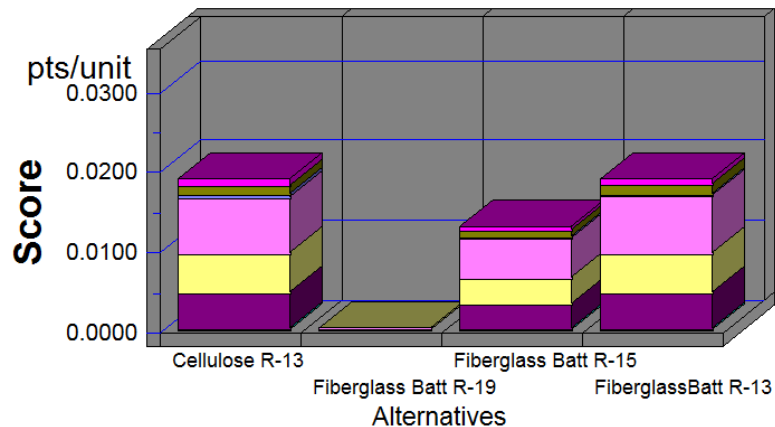
# NIST - BEES LCA

## *Building for Environmental and Economic Sustainability*

From new Bees 4.0 LCA software (Boston, MA Heated with Gas)

### Environmental Performance

Acidification
Crit. Air Pollutants
Ecological Toxicity
Eutrophication
Fossil Fuel Depletion
Global Warming
Habitat Alteration
Human Health
Indoor Air
Ozone Depletion
Smog
Water Intake

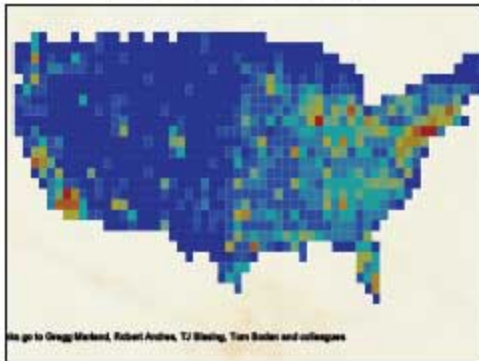


Category	Cellulose13	Fibergls19	Fibergls15	Fibergls13
Acidification--3%	0.0000	0.0000	0.0000	0.0000
Crit. Air Pollutants--9%	0.0007	0.0000	0.0005	0.0007
Ecolog. Toxicity--7%	0.0011	0.0000	0.0008	0.0011
Eutrophication--6%	0.0003	0.0000	0.0002	0.0003
Fossil Fuel Depl.--10%	0.0071	0.0001	0.0048	0.0071
Global Warming--29%	0.0049	0.0001	0.0034	0.0050
Habitat Alteration--6%	0.0000	0.0000	0.0000	0.0000



# Emerging Tools

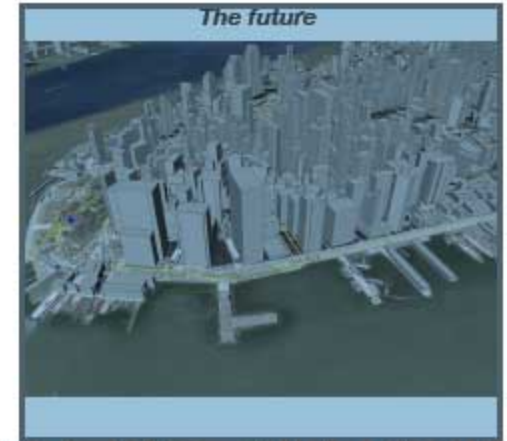
*What have we been using?*



*Results from "Vulcan"*



*The future*



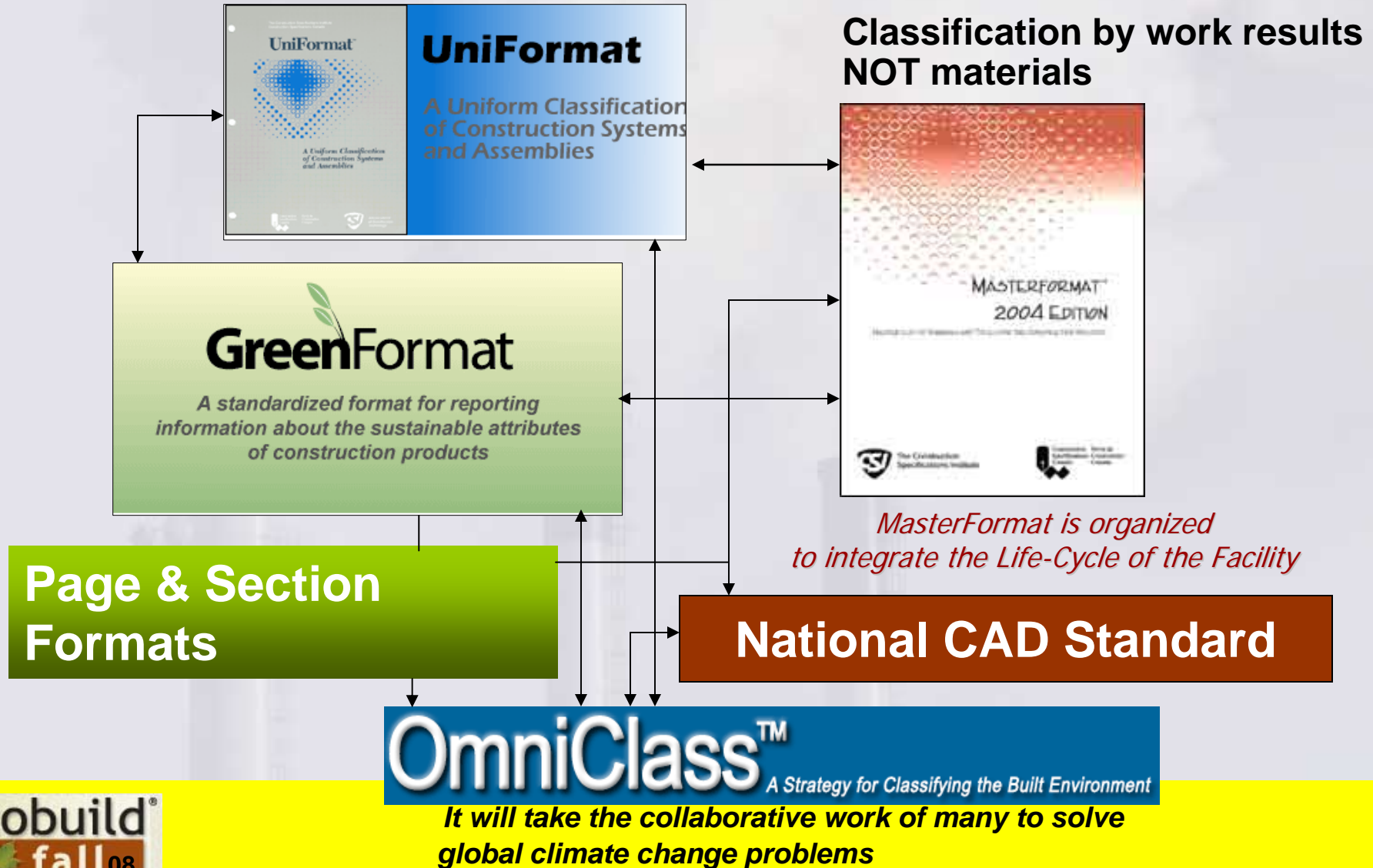
HESTIA: QUANTIFYING PLANETARY FOSSIL FUEL CO<sub>2</sub> EMISSIONS





# Organizational Sustainable Classification Views

Upfront costing & Environmental LCA





# Building Team Climate Neutral Design Requirements in Division 01 Sections

- Section 01 11 00 - Summary of Work
  - ✓ **Include Owner's Goals For Climate Neutral**
- Section 01 25 00 - Substitution Procedures
  - ✓ Include Specific Requirements for Green Products
- Section 01 33 00 - Submittal Procedures
  - ✓ **Include Climate Neutral Requirements**
- Section 01 33 29 - Sustainable Design Reporting
  - ✓ New Section MasterFormat 2004
- Section 01 35 20 – Green Rating System Requirements
  - ✓ **Includes Specific Requirements for Green Rating System**
- Section 01 44 50 - Testing for IAQ, Baseline IAQ, & Materials
- Section 01 57 30 - Indoor Environmental Control
  - ✓ Coordinate with Green Rating System and Climate Neutral

*This is an example in part...*





### Why GreenFormat?

GreenFormat, a product of the Construction Specifications Institute, is the very first online reference source of its kind, offering the building industry an easily accessible database of green building product and manufacturers.

### Who uses GreenFormat?

Architects, engineers, building professionals and others in residential and commercial design can use GreenFormat to search for and review data on green building products to determine ecological friendliness and sustainability.

### FIND A PRODUCT

To find a product, please enter the product's name, category or manufacturer. Example: wood glue or Weldwood. Alternatively, MasterFormat users may enter an existing MasterFormat number to find corresponding products. If your search yields no results, try broadening your search by using keywords or product categories.

S.

### LIST A PRODUCT

Manufacturers: To list a product, enter the product's name and click "start". GreenFormat.com will search the database for duplicates before beginning the product registration process. If a duplicate record is found, please review it for accuracy or changes. If you need help, please consult the FAQs or help center pages.

#### Questions?

(800) 689-2900  
(703) 684-0300  
greenformat@csinet.org

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# Climate Neutral Products and Project Documentation

*LEED AP provides guidelines in delivering LEED*

51,452(plus)LEED AP's




CSI certifications will equip the building team for an integrated design approach for success



- **CDT** - Construction Documents Technologist Certificate
  - *Prerequisite for certification programs*
- **CCS** - Certified Construction Specifier
- **CCCA** - Certified Construction Contract Administrator
- **CCPR** - Certified Construction Product Representative
- **CSI CEU Education Provider Program**




# What You Can Do to Become Climate Neutral



HomePortfolioProductsProcessBlogAboutContact

**We're out to save the planet.**



As of June 30, 2006 we have avoided:

**90496**

pounds of carbon dioxide

Which is the equivalent of

planting **3770** trees or  
removing **12** cars from the road for a year.

### How We Became Climate Neutral

Creating a climate neutral work place was inexpensive and simple. We started by switching our electricity over to wind power. We now receive 90% of our electricity directly from this renewable source of energy. Please see our blog posting for more on our [switch to wind power](#) or visit the [Green Power Network](#) page for a listing of utility programs by state.

Next, we needed to calculate the amount of carbon we produced through commuting, business travel and other sources. By adding up the carbon we produce, we looked at ways to offset it. We planted a few trees and then purchased credits for the carbon production that remained. You can learn more about how we calculated and [offset our carbon production](#) on our blog.

### What You Can Do to Become Climate Neutral

1. The simplest thing you can do is to check with your local power company to see what programs they have available. Many power companies have renewable energy programs, you can make the switch with a simple phone call.
2. Calculating your carbon production is a bit more complicated, but a number of websites can help.

The website for the movie [An Inconvient Truth](#) has an excellent [carbon calculator](#), one that we used to calculate most of our carbon production.



# Elements of Commercial Climate Neutral Program

Define Performance Benchmarks at building system level

- Metrics: energy, demand, cost, carbon.... Stock vs Code....
- Develop a range of design strategies and costs to meet benchmarks
  - by building type and climate
- Create key climate-sensitive, integrated building systems solutions
  - Envelope cooling load control, Daylighting, Low Energy Cooling HVAC,...
  - On-site power generation and integration
  - Provide training, tools, support for “integrated systems”
- Demonstrate strategies and solutions that work
- Create construction, commissioning, operations processes to achieve goals
- Provide Real-time feedback, performance monitoring to assure continued compliance with operating goals
- Make building performance visible to occupants, public
  - Energy Performance of Buildings Directive in Europe a single shared “life-cycle” Building Information Model (BIM)

Stephen Selkowitz Department Head, Building Technologies Department Lawrence Berkeley National Laboratory



# In Summary

- It is pretty much accepted that there are Climate Change impacts from carbon emissions in the building sector.
- Many energy efficiency/ carbon reduction programs are being initiated by global, Federal, State, local agencies and NGO's.
- Most of the energy efficiency initiatives include carbon and/or GHG reduction targets tied to the **Architecture 2030 goals of Net Zero by the year 2030.**





# Challenges

- Establish carbon-neutral buildings by the year 2030
- Design buildings that use substantially less energy, reduce greenhouse gas emissions and create spaces that are healthy and comfortable
- Many high-performance buildings exist today that exceed minimum energy requirements by over 50 percent – yet aggressive research and development needed to achieve feasible, cost-effect net-zero-energy buildings





# How Will We Do It?

- Standards
- Research
- Advanced Energy Design Guides
- Education Programs
- Modeling/BIM delivery
- Mandates and voluntary benchmarks
- Market incentives



# Specifying Climate Neutral /Carbon Neutral Products and Projects

**Thank You!**

This concludes the program.  
Any Questions?

Paul R Bertram, Jr.  
FCSI, CDT, LEED AP

Director, Environment and Sustainability



[pbertram@naima.org](mailto:pbertram@naima.org)