LEED V3 and Beyond

2010 Concrete Sustainability Conference
April 13, 2010
Tempe, AZ

Mark Wilhelm
Principal, Green Ideas, Inc.
Background

- **LEED Project Management Services**
  - Manage >100 sustainable development and LEED projects (>28 MSF)
  - Certified 35 LEED projects, including 5 LEED Platinum

- **Sustainability Services**
  - Design and implement CSR and EMS programs
  - Facilitate renewable energy and DSM/conservation programs

- **Education Programs**
  - Trained over 20,000 professionals
  - USGBC Education Provider
  - LEED NC, EB, CI and CMR

First Project: 1995 – The APS Environmental Showcase Home
Phoenix, Arizona
Most Americans believe that Cars and Trucks are the leading source of greenhouse gas emissions...

Survey conducted by Lake Research Partners, January 2007, 1,000 registered voters
...where in fact buildings consume the most energy and produce the most GHG emissions of any sector of the U.S. economy

**CO2 Emissions from Fossil Fuel Combustion by End-Use Sector, 2002**

- Buildings: 43%
- Transportation: 32%
- Industry: 25%
Global CO₂ Emissions by Sector

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

So what has happened since the 1973 Oil Embargo?

- **U.S. net oil imports**
  - 28% in 1972
  - 48% in 1997
  - 65% in 2007

- **U.S. energy consumption**
  - 20 quadrillion Btu in 1972
  - 84 quadrillion Btu in 1997
  - 102 quadrillion Btu in 2007

- **U.S. renewable energy consumption**
  - 8.4% of total U.S. energy demand in 1972
  - 7.6% of total U.S. energy demand in 1997
  - 7.0% of total U.S. energy demand in 2007

*Source: Energy Information Administration*
Other countries have implemented change:

Brazil

- 50% of all cars can run on biofuel
- 70% of electricity is produced by hydropower

Source: http://www.worldculturepictorial.com/blog/category/tags/alternative-energy
Other countries have implemented change:

France

- 80% of electricity is produced by nuclear power
- GHG emission per unit of GDP is half that of the U.S.

Source: http://www.treehugger.com/nuclear-power-renaissance.jpg
Other countries have implemented change: **Sweden**

- 2020: 40% GHG reduction, 50% renewables & 20% more efficient
- 2050: sustainable energy supply with no net GHG emissions

Source: [http://www.sweden.gov.se/content/1/c6/12/34/66/1a1aa683.pdf](http://www.sweden.gov.se/content/1/c6/12/34/66/1a1aa683.pdf)
World Population (billions)

- 1 billion in 1800
- 2 billion in 1920
- 4 billion in 1975
- 6.5 billion in 2005

Source: UN Population Division 2004; Lee, 2003; Population Reference Bureau
Source: Keeling and Whorf, 2005.
Current worldwide production of oil is 85 million barrels per day...whereas before the *worldwide recession* demand was firm at 87 million barrels of oil per day.

The total value of Crude Oil Imported into the U.S. from 1972-2008 (in chained 2000 dollars):

$1.8 trillion

This is arguably the largest transfer of wealth between nations in human history

The U.S. ADDICTION to oil negatively affects our ECONOMY, our ENVIRONMENT, our HEALTH and WELL-BEING, and our NATIONAL SECURITY
Curbing CO₂ emissions in the U.S. Electric Sector is a tough challenge...

<table>
<thead>
<tr>
<th>Technology</th>
<th>EA 2007 base case</th>
<th>Prism analysis target*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>Load growth - +1.5%/year</td>
<td>Load growth - +1.1%/year</td>
</tr>
<tr>
<td>Renewables</td>
<td>30 GW by 2010</td>
<td>70 GW by 2030</td>
</tr>
<tr>
<td>Nuclear generation</td>
<td>11.5 GW by 2020</td>
<td>24 GW by 2020</td>
</tr>
<tr>
<td>Advanced coal generation</td>
<td>No existing plant upgrates;</td>
<td>150 GW plant upgrates; 40% new plant efficiency by 2020; 40% in 2030</td>
</tr>
<tr>
<td>Carbon capture and storage</td>
<td>None</td>
<td>Widely available and deployed after 2020</td>
</tr>
<tr>
<td>Plug-in hybrid electric vehicles</td>
<td>None</td>
<td>10% of new vehicle sales by 2017; &lt;2%/year thereafter</td>
</tr>
<tr>
<td>Distributed energy resources (including distributed solar)</td>
<td>&lt;3.1% of peak load in 2030</td>
<td>5% of peak load in 2030</td>
</tr>
</tbody>
</table>

*Prism analysis targets do not reflect economic or potential regulatory and siting constraints.

Source: EPRI
Many believe that it’s not too late to make an impact – though atmospheric CO₂ readings are already higher than ever

- Some believe we can stop CO₂ concentration at 450 ppm by 2040
  - 280 ppm – the average before the Industrial Revolution
  - 387 ppm – today’s average – 29% higher than the highest levels found in the last 650,000 years in Antarctic ice cores

- 25% of needed CO₂ reduction can be derived from improving building energy performance
  - Improving building efficiency offers the best ROI

- The game is on!
  - ASHRAE standards will call for buildings to consume 70% less energy by 2016
  - Zero energy buildings are the next logical step...and we will not get there without renewable energy

Sources: UNEP; McKinsey; Yudelson & Associates; ASHRAE; RMI; IPCC
Why is it that Americans have not embraced the changes needed to transform the market to one in which we design, build and operate more sustainably?
Are we all waiting for a **headline** to announce the beginning of the **Age of Sustainability**?

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**Age of Sustainability Begins**

(New York City) - It was jointly announced today by the United Nations and over 131 of the world's governments that the first day of the Age of Sustainability has dawned - it shall be noted in the history books as October 20, 2009.

President Barack Obama and Ban Ki-moon, the Secretary General of the United Nations held a joint news conference in New York City with over 100 other world leaders to follow up and make the announcement.

"We have been waiting for this date for some time that has arrived. Some of us expected it to dawn 37 years ago with the First Arab Oil Embargo, but its people can be hard to mobilize on a common cause."

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Monday, October 19, 2009

The Future
This is an issue of **MARKET TRANSFORMATION**…

1. Create Awareness
2. Educate
3. Build Demand
Regulation and Market Action will both be Leveraged to Transform the Market
Transforming Society

The vast networks of electrification are the greatest engineering achievement of the 20th century

– U.S. National Academy of Engineering
Context: R&D Expenditures*

*R&D expenditures as % of net sales

Dr. Massoud Amin, University of Minnesota
Declining Public Support for Energy RD&D during the 25-years 1978-2004

- Analyses of DOE data shows that over the 25 years from FY 1978 to FY 2004, US government appropriations for ERD&D fell from $6.4B to $2.75B in constant year-2000 dollars, a nearly 60% reduction.

- The part of these appropriations devoted to applied energy-technology RD&D fell from $6.08B to $1.80B.

Dr. Massoud Amin, University of Minnesota

Gallagher and Sagar, 2004
Private Sector Energy RD&D

An analysis of less complete private-sector data indicates a drop by about a factor of three in the private sector funding for the indicated purposes during the same period.

Dr. Massoud Amin, University of Minnesota
Enabling a Stronger and Smarter Grid:

- Broad range of R&D including end-use and system efficiency, electrification of transportation, stronger and smarter grid with massive storage.

- Sensing, Communications, Controls, Security, Energy Efficiency and Demand Response if architected correctly could assist the development of a smart grid.

- Smart Grid Challenge/Opportunity areas include:
  - Distributed Control
  - Grid Architectures
  - Cyber Security

Dr. Massoud Amin, University of Minnesota
Are the concrete industry RD&D Initiatives significant enough?
GBCI created in 2008

- Develops Education
- Develops LEED Systems
- Establishes Policy

- LEED Certification
- LEED Credentialing
- Administers Policy
GBCI’s Role

• Non-Profit created in January 2008

• Administers exams and credentialing programs (Green Associate, LEED AP, LEED Fellow)

• Now administers the LEED building certification process via true third party verification

  – Uses 10 Different ISO-17021 Accredited Companies to review documentation
The USGBC’s Role

- USGBC still responsible for development and advancement of LEED Rating Systems AND NOW
- They can now provide education, training and exam preparation materials *without a conflict of interest*
How it All Fits Together

Professional accreditation — Building certification — LEED Online — LEED

Reference guides — Rating systems — Education programs
LEED 2009
ADVANCEMENTS TO THE RATING SYSTEM

LEED ONLINE
FASTER, SMATER & A BETTER USER EXPERIENCE

CERTIFICATION MODEL
GBCI & CERTIFICATION BODIES

= LEED V3
HISTORY OF LEED LAUNCHES

NCv1.0 → NCv2.1 → NCv2.2 → EBv1.0 → EBv2.0 → Clv1.0 → Clv2.0 → CSV1.0 → CSV2.0 → Schools → LEED 2009
PREDICTABILITY
AND CONTINUOUS IMPROVEMENT
CREDIT PILOTING
innovation doesn't keep to a schedule
HARMONIZATION
CREDIT ALIGNMENT AND HARMONIZATION

LEED'S MOST EFFECTIVE COMMON DENOMINATOR
WEIGHTINGS
IMPACT CATEGORIES

CLIMATE CHANGE
INDOOR ENVIRONMENTAL QUALITY
RESOURCE DEPLETION
HUMAN HEALTH CRITERIA
WATER INTAKE
HUMAN HEALTH-CANCEROUS
ECOTOXICITY
EUTROPHICATION
HABITAT ALTERATION
HUMAN HEALTH-NONCANCEROUS
SMOG FORMATION
OZONE DEPLETION
ACIDIFICATION

CLIMATE CHANGE
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HUMAN HEALTH-NONCANCEROUS
SMOG FORMATION
OZONE DEPLETION
ACIDIFICATION
<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Impact Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Change</td>
<td>25%</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>15%</td>
</tr>
<tr>
<td>Resource Depletion Fossil Fuel</td>
<td>9%</td>
</tr>
<tr>
<td>Human Health Criteria Pollutants</td>
<td>8%</td>
</tr>
<tr>
<td>Water Intake</td>
<td>7%</td>
</tr>
<tr>
<td>H.H. Cancerous Effects</td>
<td>7%</td>
</tr>
<tr>
<td>Ecological Toxicity</td>
<td>6%</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>5%</td>
</tr>
<tr>
<td>Habitat Alteration</td>
<td>5%</td>
</tr>
<tr>
<td>H.H. Noncancerous Effects</td>
<td>4%</td>
</tr>
<tr>
<td>Smog Formation</td>
<td>4%</td>
</tr>
<tr>
<td>Acidification</td>
<td>3%</td>
</tr>
<tr>
<td>Ozone Depletion</td>
<td>2%</td>
</tr>
</tbody>
</table>
WEIGHTINGS TOOL

Impact Categories

Carbon Footprint 25%
Fossil Fuel Depletion 9%
Water Use 7%
Land Use 5%
Acidification 3%

Impact Category Weighting Relative Importance [%]

Credit Description Impact

Building Systems

SS 7.1 Landscape and exterior design to reduce heat island, non-tool Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
SS 7.2 Landscape and exterior design to reduce heat island, roof Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
SS 8 Light pollution reduction Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 11 Optimize Energy Performance 31.5% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 12 Optimize Energy Performance 31% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 13 Optimize Energy Performance 30.5% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 14 Optimize Energy Performance 29% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 15 Optimize Energy Performance 28.5% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 16 Optimize Energy Performance 28% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4
EA 17 Optimize Energy Performance 27.5% Reduce ELI 1 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4 3.4

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THE POINT VALUE FOR MOST CREDITS HAS CHANGED

THE CREDITS ARE INTACT
100-POINT SCALE

- 40 CERTIFIED
- 50 SILVER
- 60 GOLD
- 80+ PLATINUM
New Reference Standards

- ASHRAE 90.1 – 2007 – Energy
- ASHRAE 62.1 – 2007 – Ventilation
- ASHRAE 55 – 2004 – Thermal Comfort
  - Baselines are now more difficult

- ENERGY STAR – New Space Types
  - Portfolio Manager – EB: O&M
  - Target Finder – Design Tool

- New SMACNA Guidelines for IAQ
- CSI Master Format 2004 for Materials
Minimum Program Requirements

1. **MUST COMPLY WITH ENVIRONMENTAL LAWS**

2. **MUST BE A COMPLETE, PERMANENT BUILDING OR SPACE**

3. **MUST USE A REASONABLE SITE BOUNDARY**

4. **MUST COMPLY WITH MINIMUM FLOOR AREA REQUIREMENTS**

5. **MUST COMPLY WITH MINIMUM OCCUPANCY RATES**

6. **MUST COMMIT TO SHARING WHOLE-BUILDING ENERGY AND WATER USAGE DATA**

7. **MUST COMPLY WITH A MINIMUM BUILDING AREA TO SITE AREA RATIO**
Free Consulting Recipe:

- **Energy Efficiency (EE)**
- **Renewable Energy (RE)**
- **Measurement & Verification (MV)**

High Performance Building

- **ASHRAE 90.1 – 2007** – Energy
- **ASHRAE 62.1 – 2007** – Ventilation
- **ASHRAE 55 – 2004** – Thermal Comfort
  - Address as 1 comprehensive challenge
REGIONAL CREDITS
REGIONALIZATION
LEED-NC v2.2 vs. LEED-NC 2009

The relative contribution to earning LEED points has changed for the LEED Credit Categories
So where did the points go?

<table>
<thead>
<tr>
<th>Credit Category</th>
<th>LEED NC v2.2</th>
<th>2009 LEED-NC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Points</td>
<td>% of Total</td>
</tr>
<tr>
<td>SS</td>
<td>14</td>
<td>22%</td>
</tr>
<tr>
<td>WE</td>
<td>5</td>
<td>8%</td>
</tr>
<tr>
<td>EA</td>
<td>17</td>
<td>27%</td>
</tr>
<tr>
<td>MR</td>
<td>13</td>
<td>20%</td>
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<tr>
<td>IEQ</td>
<td>15</td>
<td>23%</td>
</tr>
<tr>
<td>LP</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>ID</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>LEED AP</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RP</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total Base Points</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Total Points</td>
<td>69</td>
<td></td>
</tr>
</tbody>
</table>
Maricopa County Court Tower – Compare LEED-NC v2.2 & 2009

- 16-story, 32 court rooms
  - Targeting Silver
  - LEED-NC v2.2
    - Tracking 34 points
    - Possible 69 points
    - Silver is 33-38 points
  - LEED-NC 2009
    - Tracking 53 points
    - Possible 110 points
    - Silver is 50-59 points
Rating System

- LEED for New Construction
- LEED for Core & Shell
- LEED for Schools
- LEED for Healthcare*
- LEED for Retail*
- LEED for Commercial Interiors
- LEED for Retail Interiors*
- LEED for Existing Buildings
- LEED for Existing Schools*

Reference Guide

- GREEN BUILDING DESIGN & CONSTRUCTION
  2009 Edition

- GREEN INTERIOR DESIGN
  & CONSTRUCTION
  2009 Edition

- GREEN BUILDING OPERATIONS & MAINTENANCE
  2009 Edition
LEED ONLINE

- NEW user-friendly interface
- RESPONDS to changes in the LEED 2009 rating system
- STREAMLINES reporting between project teams & certification bodies
- IMPROVES efficiency for project management
- DESIGNED to be scalable
- AGGREGATES metrics
New LEED-Online Website
New LEED-Online Website
Smarter Credit Templates

LEED for New Construction: Design
SS CREDIT 4.1: ALTERNATIVE TRANSPORTATION
PUBLIC TRANSPORTATION ACCESS

ALL OPTIONS
Select one of the following:
- **Rail**: The project is located within 1/2-mile walking distance of a commuter rail, light rail or subway station.
- **Bus**: The project is located within 1/4 mile walking distance of one or more stops for two or more public or campus bus lines usable by building occupants.

BUS SERVICE
Table. Bus Service

<table>
<thead>
<tr>
<th>Distance to Bus Stop (miles)</th>
<th>Line Designation/Description of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.08</td>
<td>Valley Metro McDowell Route 35</td>
</tr>
<tr>
<td>0.05</td>
<td>Valley Metro Roosevelt Route 4</td>
</tr>
</tbody>
</table>

A site plan, with scale, showing the walking path from the project building main entrance to the bus/rail stop is required to document credit compliance.

Upload the site plan for the LEED building. Sketches are also acceptable.

Select one of the following:
- The site plan with scale above shows the walking path from the project building main entrance to the bus/rail stop.
- A different site plan is better suited to satisfy this requirement.
Required Signatories
CREDENTIALING

OR

LEED AP

OR

LEED AP
What is Changing?

1. *Now 3 levels of Accreditation*

2. *Eligibility requirements for all 3 levels*

3. *GBCI requires continuing education to maintain credentials, and a small fee*
3 Levels of Accreditation:
A DIVERSE INDUSTRY HAS DIVERSE NEEDS

USGBC EDUCATION PROVIDER PROGRAM

LEED CORE CURRICULUM

300 Level Implementation
Tier II: LEED AP+

- Green Home Design & Construction
- Green Neighborhood Planning & Development
- Green Building Operations & Maintenance

200 Level Understanding
Tier I: LEED Green Associate

- LEED Core Concepts & Strategies

100 Level Awareness

- Green Building Basics & LEED
- Green Building Design & Construction
So all of the trends are clear…but what should the concrete industry do now to take advantage of the situation?
The Future
Embrace sustainability, innovate, and forge a new business model to thrive in the 21st Century
• “Sustainability isn’t the burden on bottom lines that many executives believe it to be. In fact, becoming environment-friendly can lower your costs and increase your revenues. That’s why sustainability should be a touchstone for all innovation.”

• “In the future, only companies that make sustainability a goal will achieve competitive advantage. That means rethinking business models as well as products, technologies, and processes.”
• Stage 1:
  – View Compliance as an Opportunity

• Stage 2:
  – Make Value Chains Sustainable

• Stage 3:
  – Design Sustainable Products and Services

• Stage 4:
  – Develop New Business Models

• Stage 5:
  – Create Next-Practice Platforms
Transform your Organization to a Sustainability-Focused Enterprise

- Leadership
- Goals
- Culture
- Focus
- Passion

Total Commitment to Sustainability

- Executive/Leadership Drives Organization
- Products and/or Services
- Marketing / Stakeholder Perception
- Asset Management / Internal Operations
- Employee, Customer & Supplier Education
- Manufacturing or Development Program
- Partnerships
- Continuous Improvement M&V
<table>
<thead>
<tr>
<th>Green</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Detail focused</td>
<td>• Whole systems focus</td>
</tr>
<tr>
<td>• Tactical</td>
<td>• Strategic</td>
</tr>
<tr>
<td>• Ecological</td>
<td>• Triple bottom line</td>
</tr>
<tr>
<td>• Focus on being less “bad”</td>
<td>• Focus on aligning with nature’s cyclical processes</td>
</tr>
<tr>
<td>• Lacks common definition of success</td>
<td>• Capable of defining success</td>
</tr>
</tbody>
</table>
Path to Restoration

- Code
- LEED
- Living Building Challenge
- Sustainability
- Restoration
The list of green building and sustainability tools will expand...

- Natural Step
- Triple Bottom Line
- Cradle-to-cradle
- Natural Capitalism
- Precautionary principle
- Zero Waste
- Factor X
- Eco-footprint
- Life Cycle Assessment
- EMS (ISO 14001, etc.)

- Carbon footprint
- ENERGY STAR certification
- LEED certification
- Green Globes certification
- Living Building Challenge
- ASHRAE 179.1P
- ICC, ASHRAE, USGBC and IES Model Codes
There are important steps to take for the concrete industry

- Stay involved with the USGBC, GBCI and LEED
- Strengthen your sustainability actions and focus
- Increase RD&D – partner with other industries
- Leverage your sustainability/durability strengths
- Develop alternative solutions
- Expand demonstrations of new products and technology
- Foster market transformation
  - Create awareness, educate, build demand…