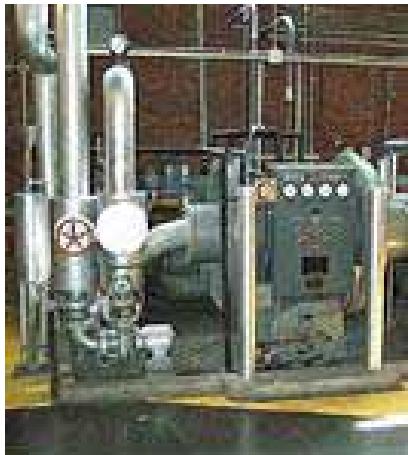




Green Building for Healthcare Facilities – Impacts and Implications



Spring 2005 Pollution Prevention Workshop for Healthcare

St. Joseph's Hospital and Medical Center

April 28, 2005

Mark D. Wilhelm
Vice Chairman
USGBC-AZ Chapter

Principal
Green Ideas, Inc.



Outline

- LEED Market Impact Update
- Overview of LEED Products
- Future Plans for LEED
- Overview of Program Options for Labs and Healthcare Facilities
- How to Ensure Best Possible Results for a LEED Project



Why Green Building? Because U.S. buildings have a significant negative impact on the environment...

- There are over 76 million residential and 5 million commercial buildings in the U.S.
 - Collectively, these buildings consume:
 - ***65% of electricity and 37% of primary energy***
 - ***25% of all water supplies and 30% of all wood & materials***
 - Collectively, these buildings generate:
 - ***35% of solid waste***
 - ***36% of CO₂ and 46% of SO₂ emissions***
 - ***19% of NO_x and 10% of fine particulate emissions***

Sustainable buildings consume less resources, generate less waste, cost less to operate, and provide healthier living and working environments than traditional buildings.



Key Issues of Concern – and a Call for Green Building

- On average, people spend 90% of their time indoors
- U.S. EPA states that air pollution is one of the top five environmental risks to public health
- Studies show that exposure to air pollutants can commonly be 2-5X – and occasionally up to 100 X – higher than outdoor levels
- Poor air quality can produce health effects ranging from headaches and dry eyes to nausea, dizziness and fatigue
- A majority of cancers are environmentally induced



Why Green Hospitals? Because building materials and design have a significant impact on health...

Cause → ***Effect*** → ***Result***

- Fossil fuels
- Engineered wood
- Carpets
- Insulation
- Resilient flooring
- Paints
- Cleaning solutions
- Poor IAQ

- CO₂, SO_x, NO_x, CO
- Particulates
- VOCs
- Phthalates
- Formaldehyde
- Mercury
- Dioxin

- Cancer
- Birth defects
- Asthma
- Nosocomial diseases
- Endocrine disruption
- Bronchial problems

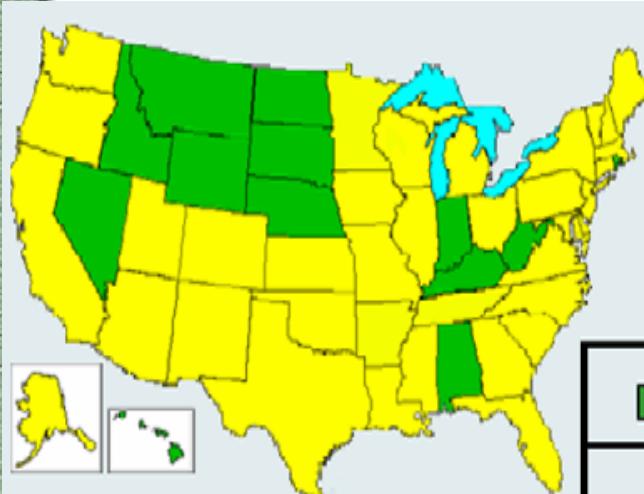


Family of LEED Products – Status of New Standards

Product	Status
New Construction	Available
Existing Buildings	Available
Commercial Interiors	Available
Core & Shell	Pilot
Homes	Development
Neighborhood Developments	Development



LEED Project Summary – 12/04

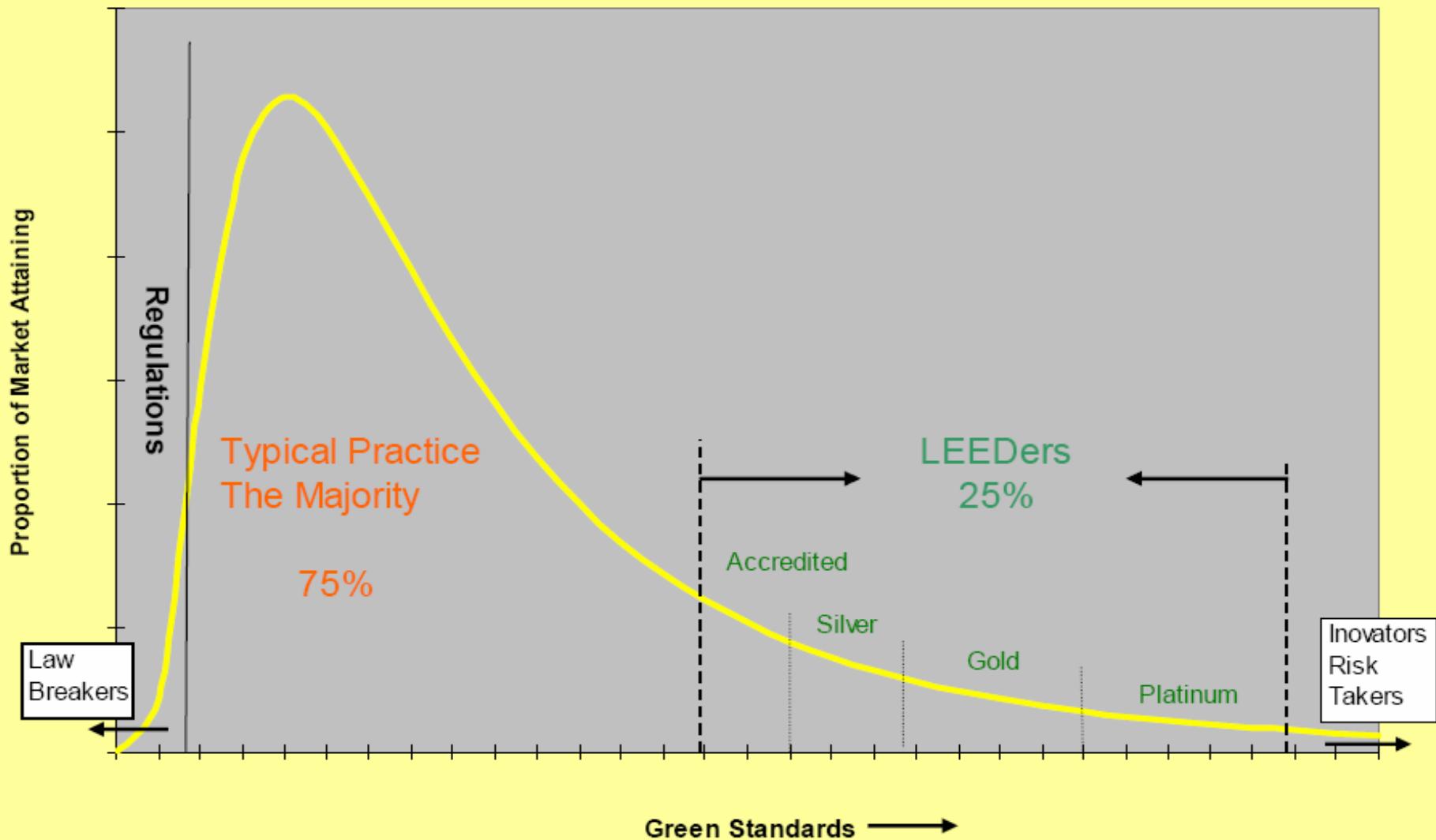


	■ Registered	■ Certified
	Number	Number
LEED-NC	1706	157
LEED-EB	102	14
LEED-CI	102	17
LEED-CS Pilot	22	0
TOTAL	1932	188



Market Transformation

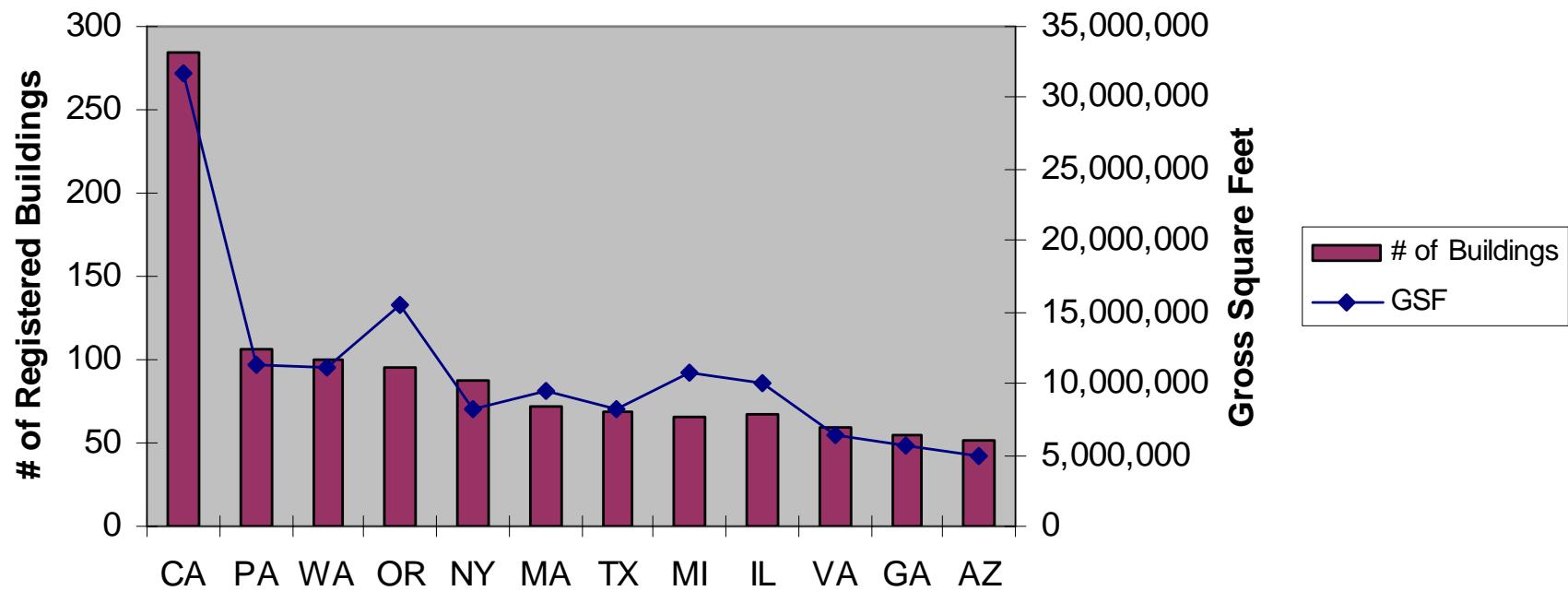
Green Building Markets





LEED-NC Market Transformation

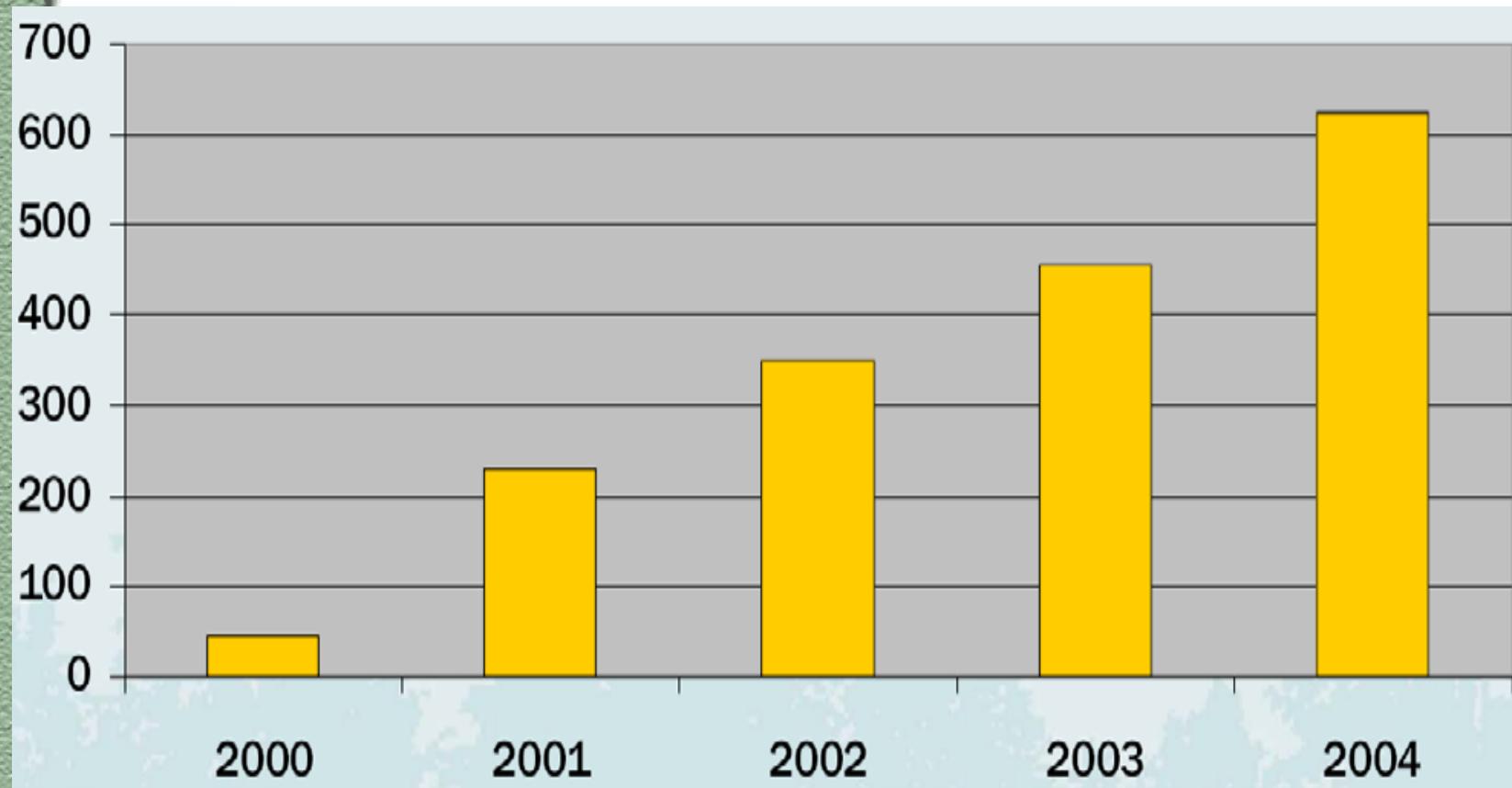
Registered LEED-NC Projects: Top 12 States



As of January 23, 2005

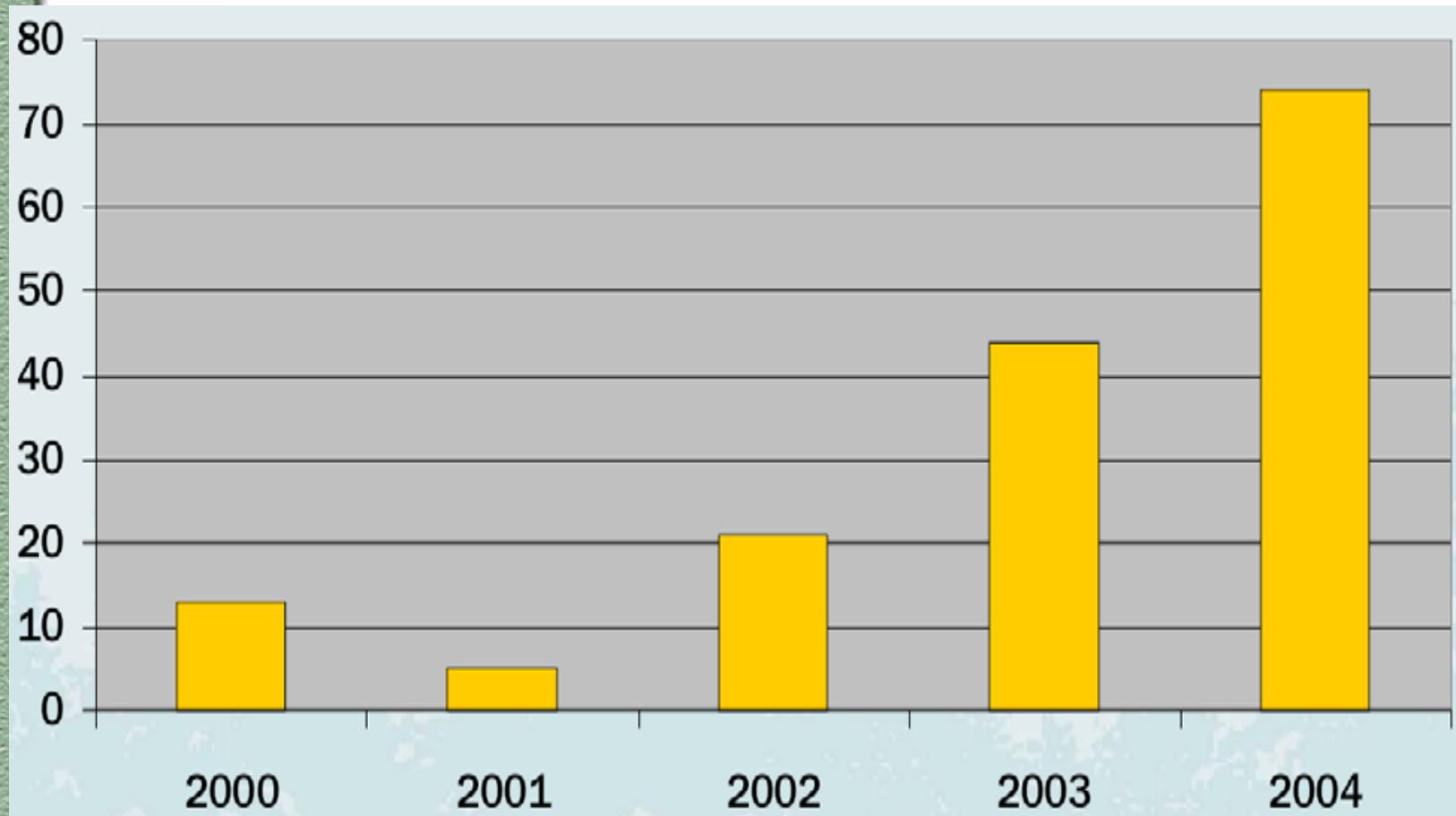


LEED-NC Project Registration



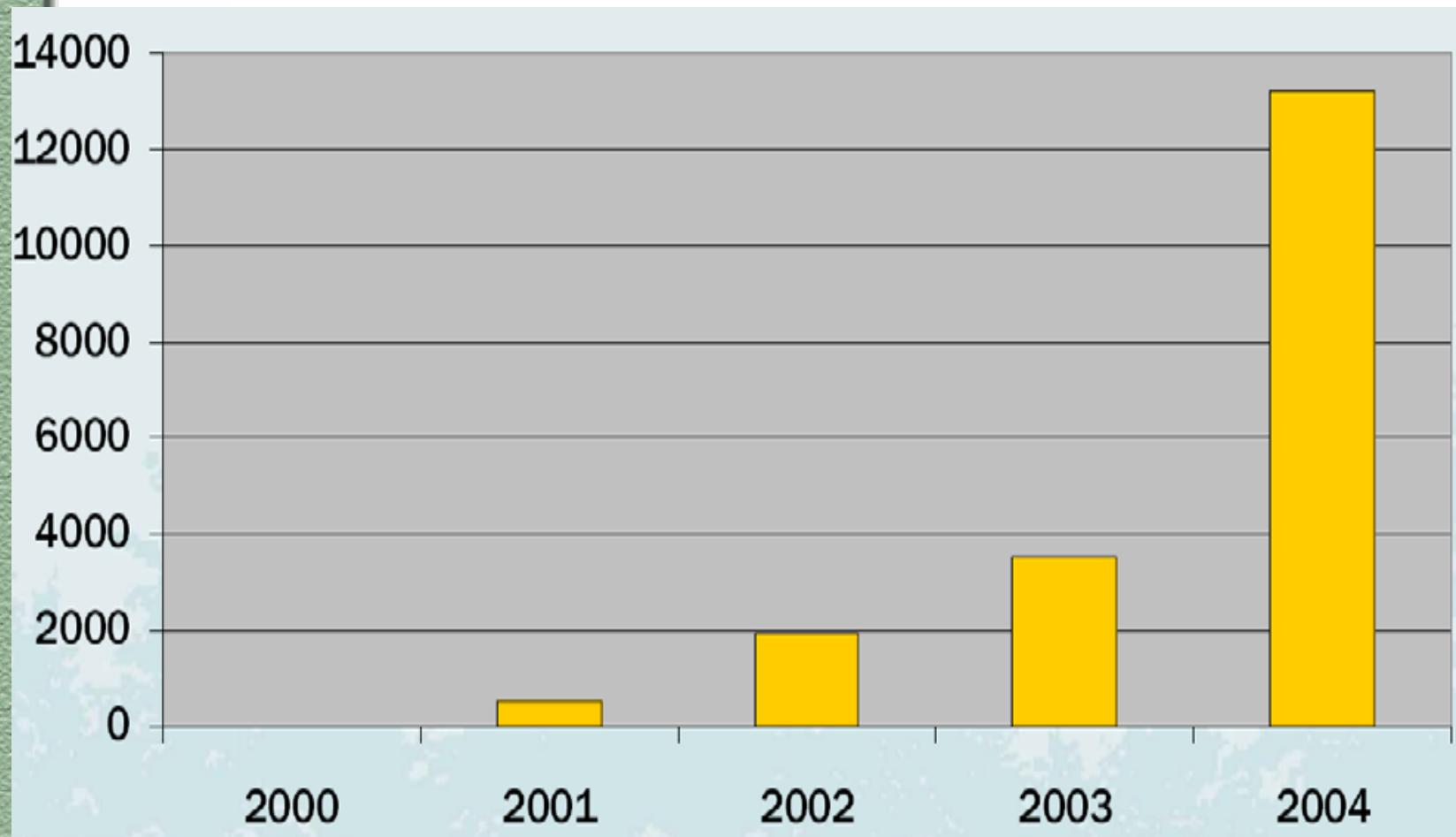


LEED-NC Project Certification



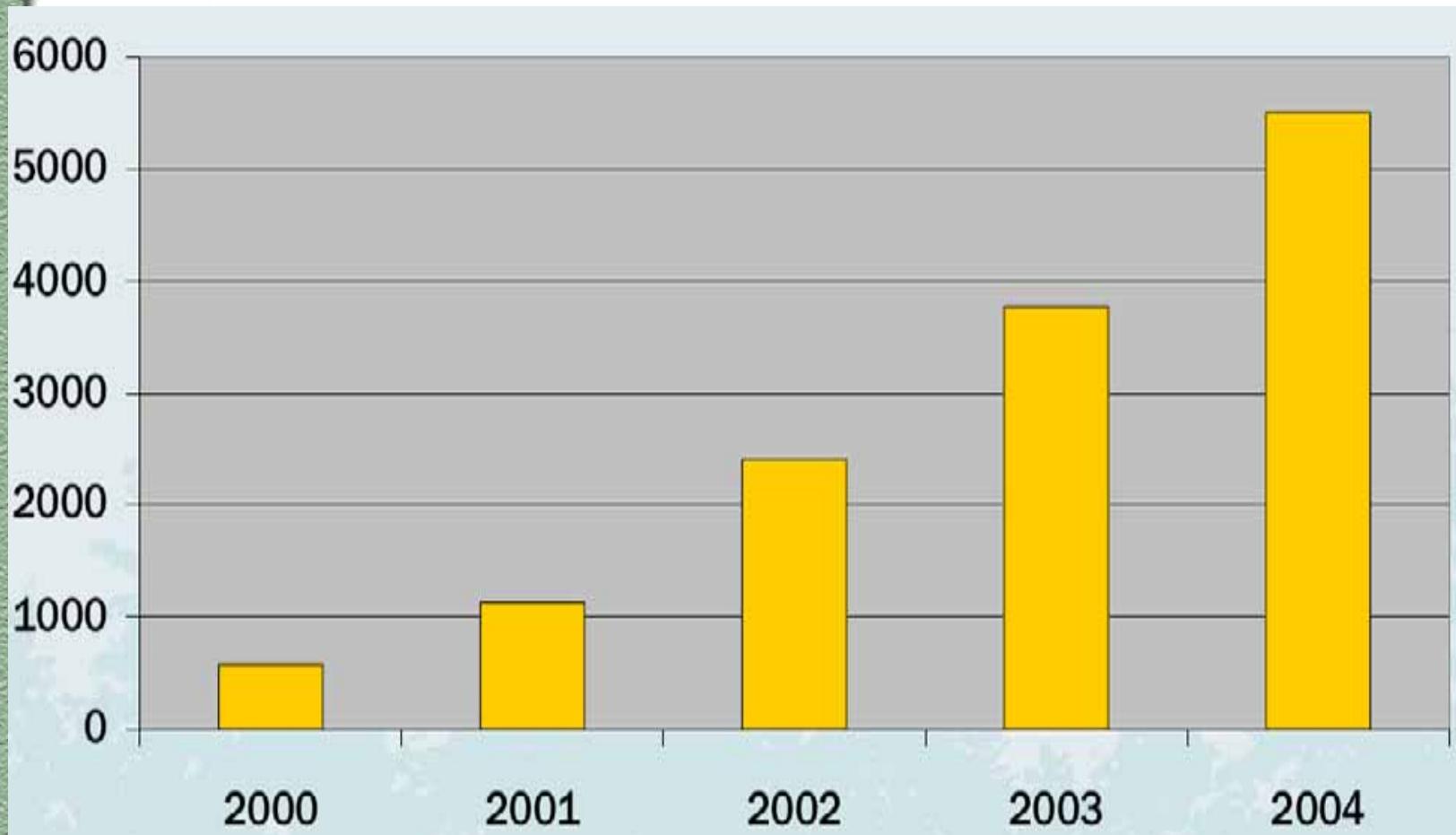


LEED Professional Accreditation



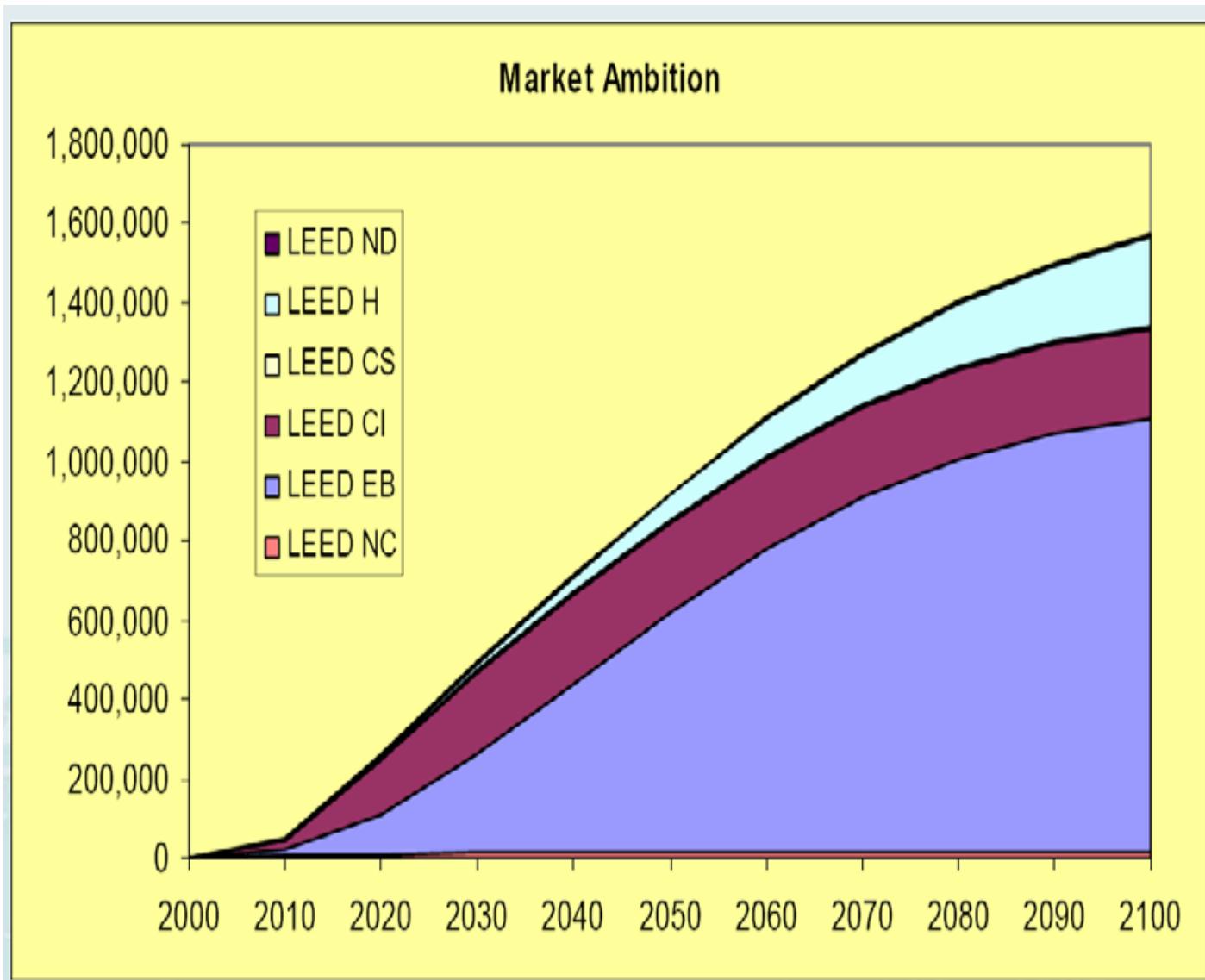


USGBC Membership



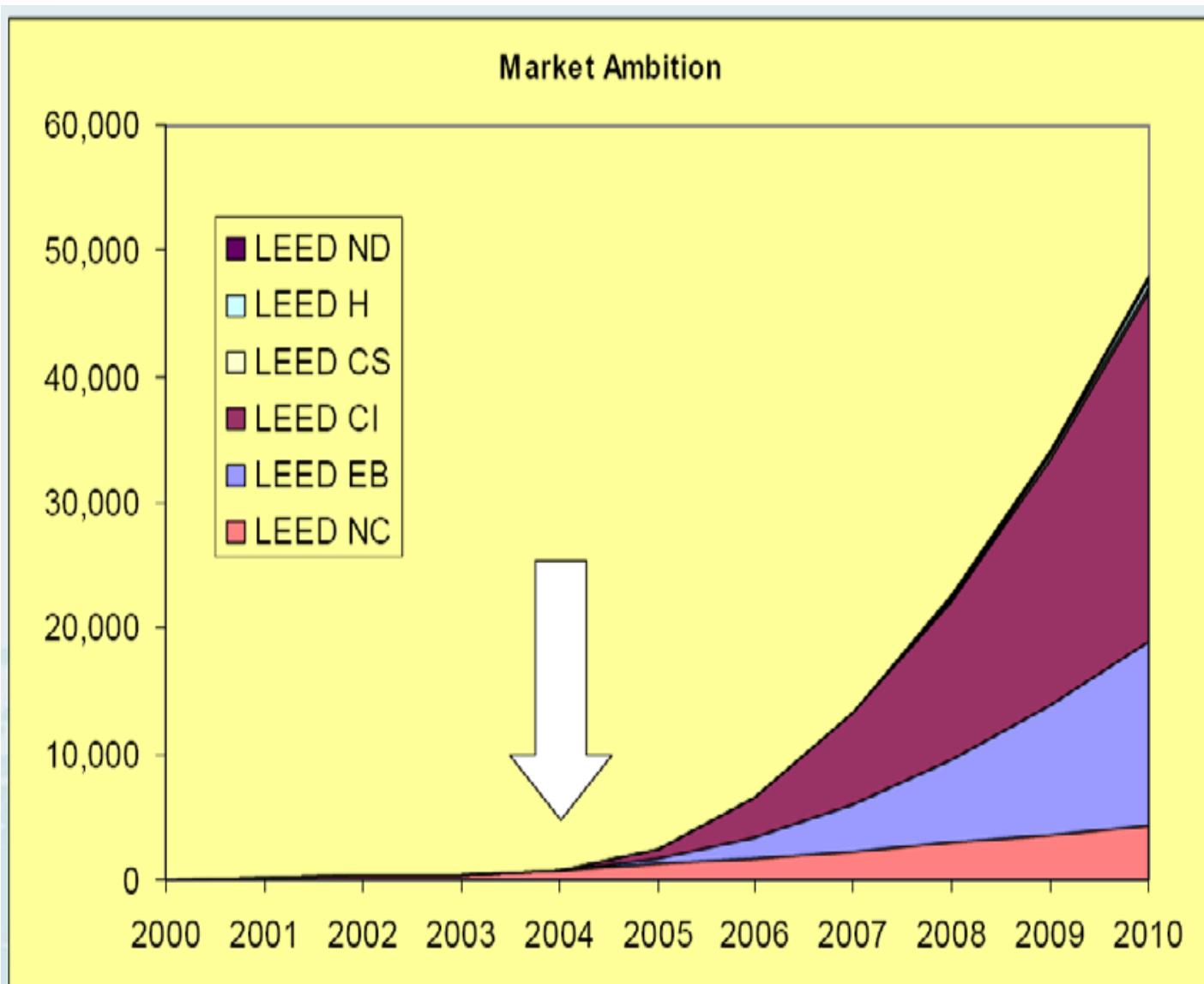


The S-Curve of Market Ambition





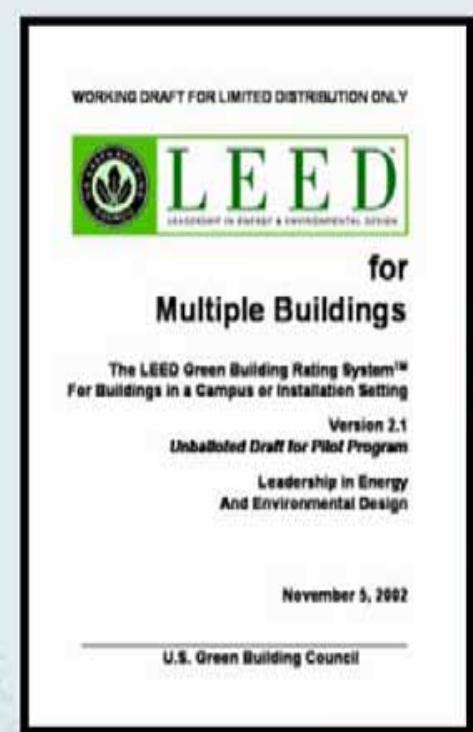
The S-Curve of Market Ambition





LEED Application Guides

- Lodging
- Multiple Buildings/Campus
- Retail
- Healthcare
- Laboratories
- Schools
- Volume Build





Status of New LEED Application Guides

Application Guide	Status
Lodging	Available
Campus/Multiple Buildings	Pending Approval
Retail	Development
Healthcare	Development
Laboratories	Development
Schools	Development



Results Tallied from the First 148 LEED-NC v2 Certified Projects

- **> 50%** exceeded the ASHRAE 90.1-1999 Building Energy Standard by > 30%
- **53%** included plumbing fixtures that consumed >30% less water than EPAct1992 requirements
- **65%** used no potable water for landscaping
- **34%** installed alternate fuel refueling stations
- **9%** installed RE systems that met 20% of the projected annual electricity consumption
- **36%** entered into 2-year contracts to purchase green power (Renewable Energy Certificates) equivalent to 50% of the projected annual electricity consumption



2001 ASHE Green Healthcare Construction Guidance Statement

1. Protect the immediate health of building occupants
2. Protect the health of the surrounding local community
3. Protect the health of the global community and natural resources



Case Study: Boulder Community Foothills Hospital

First LEED hospital: awarded LEED v2.0 Silver Certification on 12/16/2003

- 60 bed, 200,000 SF project includes:
 - 24 hour emergency department
 - ICU
 - Surgery
 - Radiology
 - Laboratory Services
 - Maternity
 - Pediatrics Care
- LEED characteristics:
 - Waste management plan (diverted 64%)
 - Construction IAQ Management Plan
 - Exemplary Alternate Transportation plans:
 - *Bus stops*
 - *Bicycle storage*
 - *Reduced parking*
 - *Carpooling*



What Does Green Building Mean for Hospitals?

"In practice, a LEED hospital doesn't function or appear different than other construction in any remarkable way, nor should it. If it were a big maintenance headache few would choose to get involved with the program."

Joe Howard, Facilities Director, Boulder Community Foothills Hospital

Boulder Community Foothills Hospital has received 8 design awards since its completion and has become noted as an international model for healthcare facilities that seek to incorporate sustainability into their design

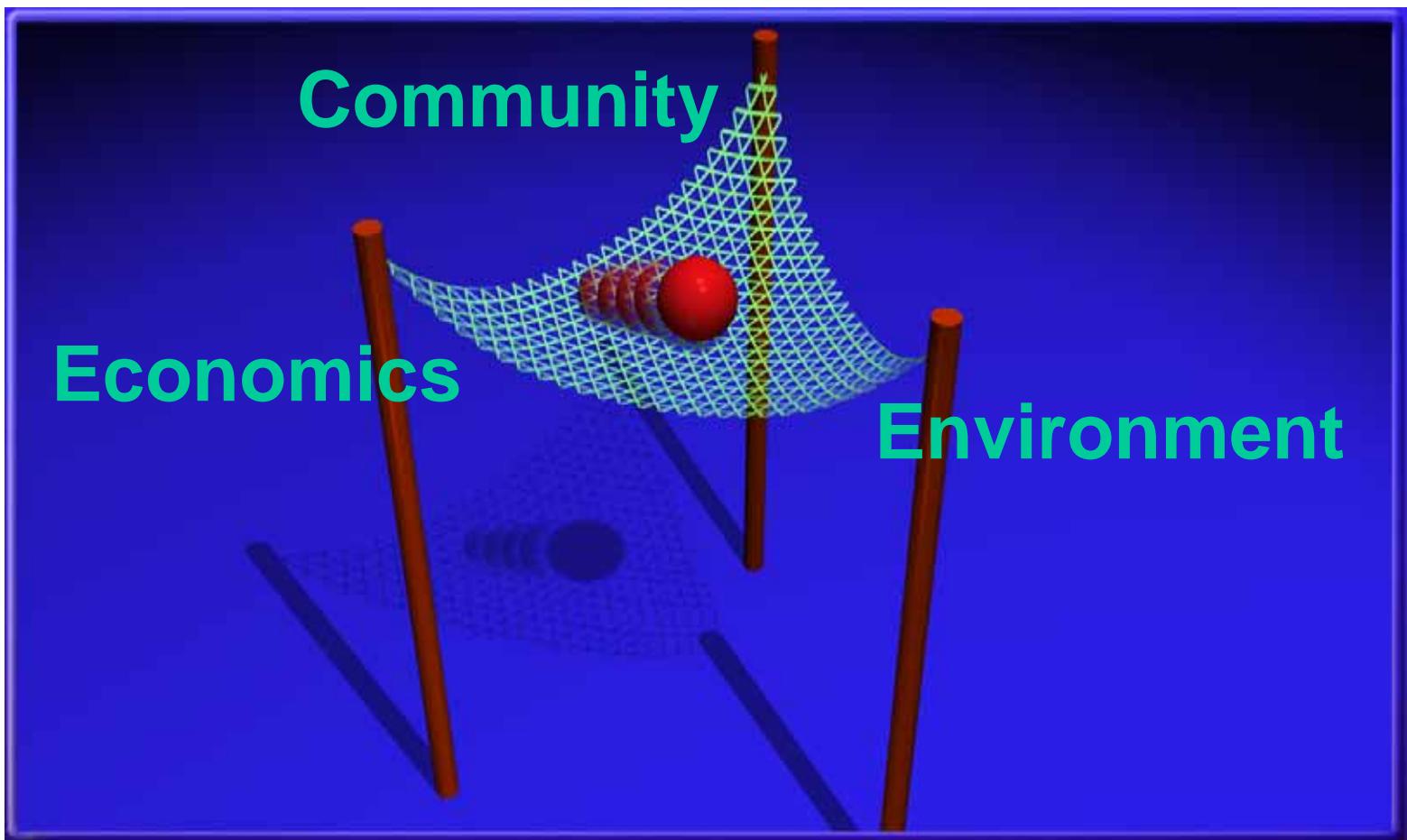


The Concept of Sustainability





Sustainable Development Sits at the Saddle Point of a Continuing Trilemma of Balance...





LEED Application Guide for Healthcare Facilities (LEED-AGHF)

- 12-member committee
- Chair – Gail Vittori, The Center for Maximum Potential Building Systems (www.cmpbs.org)
- USGBC members can join correspondence committee
- Committee will develop draft standard, conduct pilot test, and then refine the requirements for the LEED-AGHF
- The ASHE-sponsored “*Green Guidelines for Healthcare Construction*” (www.gghc.org) will serve as seed document
 - Developed over 1 year
 - Draft version 2.0 now available
- GGHC will facilitate and expedite development process



GGHC Reference Documents

- ***Green Healthcare Construction Guidance Statement***, ASHE
(www.healthybuilding.net/healthcare/ASHE_Green_Healthcare_2002.pdf)
- ***LEED-NC Green Building Rating System***, USGBC
(www.usgbc.org/leed)
- ***LEED-EB Green Building Rating System for Existing Buildings***, USGBC
- ***Labs 21 Environmental Performance Criteria (EPC)***, Laboratories for the 21st Century, US EPA (<http://labs21.lbl.gov/epc.html>)
- ***Green Star***, Green Building Council of Australia
(www.gbcaus.org/greenstar)
- ***High Performance Building Guidelines***, NYC Dept. of Design and Construction, Office of Sustainable Design
(www.ci.nyc.ny.us/html/ddc/html/ddcgreen/)
- ***2003 Savings by Design Healthcare Modeling Procedures***, Pacific Gas & Electric www.gghc.org/Documents/PGEModelPRoc.pdf)



Further Reference: Health and Productivity

- *Over 1,000 studies and reports* link green building attributes such as air quality and thermal comfort to human health and productivity
 - National Science and Technology Council project entitled *Indoor Health & Productivity* developed a data base containing over 900 papers from more than 100 journals and conferences. The entire database is searchable
<http://www.dc.lbl.gov/IHP/>
 - Center for Building Performance at Carnegie Mellon University – Building Investment Decision Support (BIDS) program has reviewed over 1,000 studies that relate technical characteristics of buildings to tenant responses.
http://www.eere.energy.gov/femp/aboutfemp/pdfs/nov01_femac_loftness.pdf



What is the Green Guide for Health Care?

- A voluntary, self-certifying system
- Modeled after the US Green Building Council's LEED rating system
- Contains 96 design and construction points and 72 operations points
- Unique features of the Green Guide:
 - Addresses the unique structural, usage and regulatory challenges of health care buildings
 - Considers health issues as an element of each credit
 - Incorporates design elements that enhance the healing process



Examples of Best Practices in the Green Guide for Health Care

- Incorporating indoor healing gardens, outdoor walking spaces, staff break rooms with views
- Using innovative technologies that address health care's significant energy and water consumption
- Eliminating materials that contain or produce persistent, bioaccumulative, toxic (PBT) chemicals
- Implementing green housekeeping and landscaping protocols



Benefits of Green Hospitals: Health Benefits

- Kaiser Permanente, an early adopter of GGHC, is choosing building materials that are free of hazardous chemicals in an effort to improve IAQ and protect the health of patients and staff.
- Kaiser Permanente is
 - Specifying sustainable materials for millions of square feet in new construction to be built over the next decade
 - Seeking alternatives across the board for products containing formaldehyde, mercury and PVC (vinyl)
 - Working with manufacturers to develop a new durable, low emission, PVC-free carpet product with backing made from 95% post-consumer recycled plastic.



Benefits of Green Hospitals: Financial Benefits

- Financial benefits over the life of the building can well exceed the initial investment to design and construct a green facility
 - “Patients with views of nature went home 3/4 of a day sooner, had a \$500 lower cost per case, used fewer heavy medications and exhibited better emotional well being.” (Ulrich, R. 1984. Science 224 (647): 420-21.)



Benefits of Green Hospitals: Other Benefits

- Attract and retain staff
- Improve worker safety and productivity
- Increase philanthropic donations
- Develop community goodwill
- Enhance positive positioning



Why aren't there more Green/LEED hospitals right now? Lack of knowledge, fear of unknown, costs, regulations, etc...

- "When I think of LEED compliance, I think of making **compromises** around **air handlers** or the **electrical distribution**. The fear for me is cost, both initial and ongoing...If you would have asked me two years ago to consider sustainable building design, I would have said 'no' because I equated it to spending money unnecessarily. **The Green Guide provides a wonderful incentive to pick up the green challenge.**"
 - *Arthur Mombourquette, vice president of support services at Brigham and Women's Hospital in Boston*

Healthcare users of LEED & GGHC are finding significant benefits through experience...



Possible Points – Evaluation of GGHC – Construction & Operations

Section	GGHC - Const	GGHC - Ops	Section
Prerequisites	11	10	Prerequisites
Sustainable Sites	18	5	Integrated Operations
Water Efficiency	7	3	Transportation Operations
Energy & Atmosphere	19	18	Energy Efficiency
Materials & Resource	24	8	Water Conservation
Environmental Quality	24	5	Chemical Management
Innovation in Design	4	6	Waste Management
Integrated Design (prerequisites)		9	Environmental Services
		11	EPP
		7	Innovation in Operations
Total	72	96	Total

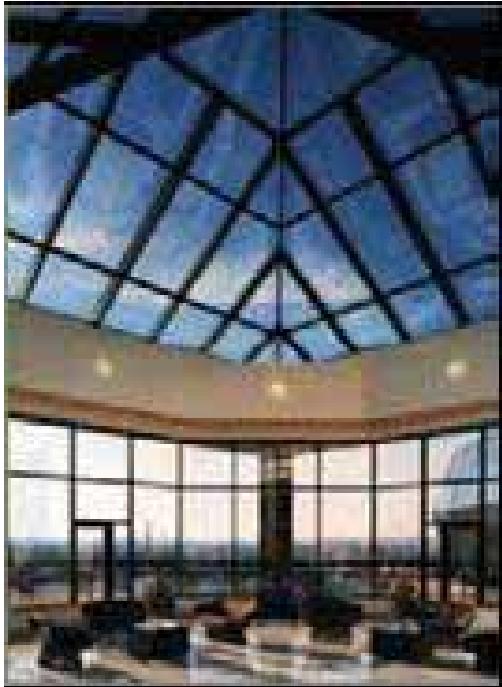


Integrated Design and Operations Prereq 1: Integrated Design Process

- Use cross discipline decision making starting early in the design process & continuing throughout to maximize interrelationships between systems
 - Involve all key players
 - Architects, engineers, *interior designers*, contractors
 - Facility managers, medical staff, administrators, patients
 - Purchasing agents, industrial hygienists, support services



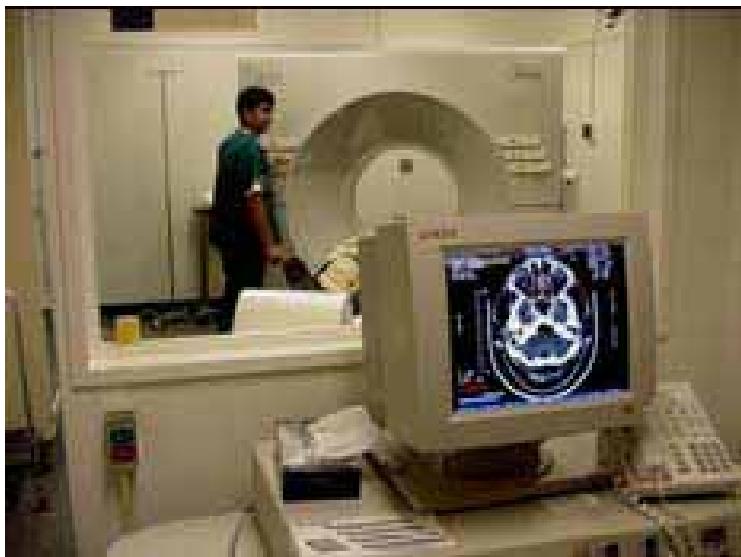
Sustainable Sites Credit 9: Connection to the Natural World



- Establish 5% of the building program as programmed places of respite easily accessible to patients, visitors, and staff.
- Provide at least one place of respite dedicated to staff and separate from patients and visitors.



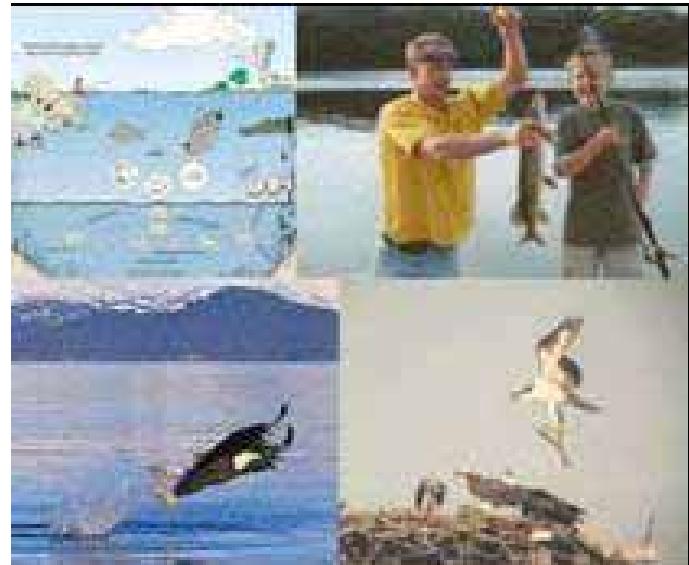
Energy & Atmosphere Credit 8: Medical Equipment



- Use Energy Star® qualified products or equipment in the top 25th percentile for at least 75% of new equipment that is not building systems related, and at least 30% of all such equipment.



Materials & Resources Prereq 2: Mercury Elimination



- Switches, thermostats, gauges
- Low-mercury lamps
- Medical devices
- Dental amalgam separators
- Demolition protocol



Materials & Resources Credit 8.1: PBT Elimination – Dioxin (1)



- Reduce Persistent Bioaccumulative Toxins (PBTs) associated with building materials
 - PVC is a major source of dioxins
 - Avoid cement from kilns fired with hazardous waste



Materials & Resources Credit 9.1: Medical Waste Reduction (1)



- Reduce solid waste disposal in landfills and incinerators
 - Reduce total waste volume by 33% below 1998 volumes.
 - Utilize alternative waste treatment technologies to reduce reliance on incineration.
 - *Develop a waste management plan*
 - *Recycle*
 - *Reduce the use of disposables*
 - *Reduce packaging*



Indoor Environmental Quality Credit 3: Construction IAQ Management Plan (2)



- During construction and before occupancy
 - 3.1 During construction: IAQ management plan
 - 3.2 After construction: 2-week minimum flush out – OR – Baseline IAQ testing procedure
 - *JCAHO outline for IAQ Management Plans*
 - *ICRA protocols*



Indoor Environmental Quality Credit 8: Daylight and Views (2)

- Provide occupants with connection between indoor spaces and the outdoors
 - 8.1 2% daylight factor
 - *In 75% of Nursing units*
 - *In Surgical units (excluding ORS)*
 - *In D&T areas*
 - 8.2 Views in all the the above



Environmental Services Credits: Green Cleaning



- Up to 5 points are available for green cleaning
 - Environmentally preferable cleaning policy
 - Sustainable cleaning products and materials
 - Environmentally preferable janitorial equipment



Environmentally Preferable Purchasing: 6 Credits / 11 Points



- Food
 - Organic or sustainable; Antibiotics; Local production/food security
- Janitorial paper & other disposable products
- Electronics purchasing and take back
- Toxic reduction
 - Mercury; DEHP; Natural rubber latex
- Furniture & medical furnishings
- IAQ compliant products
 - 45% - 90% of annual purchases



Some Key Differences between GGHC and LEED-NC

- SS: Connection to Natural World
- SS: Safety and Risk Management
 - Protect community from airborne contaminants
 - Prevent release of hazardous chemicals
- SS: Least Toxic Grounds Management
- WE: Potable Water for Equipment Cooling
- WE: Process Water Efficiency – 20-50%
- WE: Chemical Waste Minimization Plan
- WE: Pharmaceutical Waste Discharge



Some Key Differences between GGHC and LEED-NC

- EA: Energy Supply Efficiency
- EA: Medical Equipment Efficiency
- MR: Mercury Elimination
- MR: Construction Practices
 - Energy and Resource Efficiency
 - Alt Fuels and Transport and Low-Emitting Equip
- MR: PBT Elimination – Dioxin, Mercury, Lead, Cadmium
- MR: Copper Reduction
- MR: Environmentally Preferable Purchasing



Some Key Differences between GGHC and LEED-NC

- EQ: Asbestos Removal or Encapsulation
- EQ: Low-Emitting Materials
 - Asthma Triggers, Formaldehyde, Phthalates & Natural Rubber Latex
 - Furniture and Furnishings
 - Roofing and Solvent-Based Products
- EQ: Permanent Monitoring System
- EQ: Daylight & Views: Lighting and Circadian Rhythm
- EQ: Acoustic Environment



Potential Benefits from Improved IEQ

Source of Productivity Gain	Potential Annual Health Benefits in US	Potential U.S. Annual Savings or Productivity Gain (1996 \$U.S.)
Reduced respiratory disease	16 to 37 million avoided illnesses	\$6 - \$14 billion \$23 - \$54 per person
Reduced allergies and asthma	8% to 25% decrease in symptoms in 53 million allergy sufferers and 16 million asthmatics	\$1 - \$4 billion \$20 - \$80 per person with allergies
Reduced sick building syndrome symptoms	20% to 50% reduction in symptoms experienced frequently by ~ 15 million workers	\$10 - \$30 billion ~\$300 per office worker

- Potential savings from improved IEQ have been estimated at \$40-250 billion in the U.S.

Sources: LBNL; ASHRAE; EPRI; Carnegie Mellon University



Results of a Recent Survey Conducted by Turner Construction Company

- Turner solicited the views of > 700 U.S. executives involved with buildings either as an owner of rental buildings, owner-occupant, developer, designer, consultant or builder
 - 75% said their green buildings had lower operating costs
 - 91% reported greater health and well-being among occupants
 - 84% believe that building green yields higher building values
 - 75% said they generated a higher ROI than traditional buildings
 - 51% expected the number of green buildings in their organization to increase substantially over the next three years



Owners who are considering a green building project should expect to confront the following:

- Fear of the unknown
 - Questions about costs, results, team members, impacts on budget & timeline, etc.
 - Seek insight from experienced professionals
- Fear of change
 - Remember – change is the only constant!
 - We only control the rate of change and what we change to...
- Naysayers
 - Don't rely solely on the counsel of business associates and contacts who have little or no experience with green building or the LEED program



To Get Different Results We Need to Do Things Differently! Strategies to Ensure the Best Green Building Results:

1. Start early!
2. Get educated about:
 - Green building
 - GGHC, LEED and process
 - The costs & benefits of building green
3. Identify environmental goals and strategies up front
4. Use an integrated design process
5. Hire experienced team members who understand GGHC/LEED and process



To Get Different Results We Need to Do Things Differently! Strategies to Ensure the Best Green Building Results:

6. Register the project early at the USGBC website
7. Start energy modeling as soon as possible in the design process to maximize investment
8. Hire a commissioning authority with LEED project experience
9. Assign specific GGHC/LEED credit responsibilities to individual Project Team members



To Get Different Results We Need to Do Things Differently! Strategies to Ensure the Best Green Building Results:

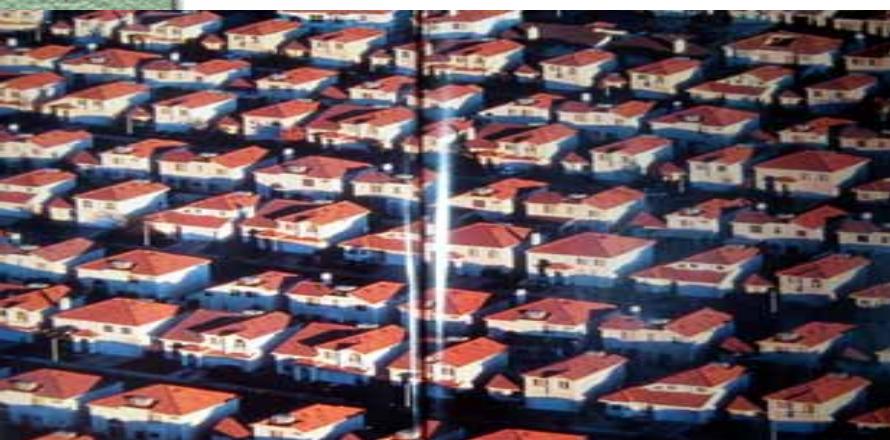
10. Utilize Life Cycle Cost Analysis (LCCA) to identify the best green building strategies
11. Hold regular GGHC/LEED meetings to track progress and begin collecting documentation early on
12. Hire a knowledgeable green building consultant to join the team and drive the green aspects
13. Maintain sense of respect, purpose and humor among project team members



Choose to make a difference! Have impact – use your influence to spur your organization to build and operate green...

“Make no little plans...they have no magic to stir (the) blood and probably themselves will not be realized.”

Daniel H. Burnham





Now That We Know, There Really Isn't an Option to Green Building Design and Operations...

“Insanity has been described as doing the same thing over and over and expecting a different outcome.

Negligence is defined as doing the same thing over and over even though you know its dangerous, stupid or wrong.

Now that we know, it's time for a change. Negligence starts tomorrow.”

William McDonough



Questions?



Mark D Wilhelm
Green Ideas, Inc.
Environmental Building Consultants
Mark@egreenideas.com (602) 512-0558

