Going Green
LEED Certification for Data Centers

Leadership in Energy and Environmental Design

Presented by:

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LEED is more then just Energy Efficiency

- Not just Energy Efficiency
- Not just PUE
- Not just DCiE
- Not just CUPS/W

U.S. Green Building Council

Inception in 1993

11,000 members

- Project Certification
- Professional Accreditation
- Training
- Online Resources

The Built Environment

- 30% of total energy
- 60% of electrical consumption
- 36% of greenhouse gas emissions
- 30% of raw materials
- 30% of waste output
- 12% of potable water consumption

Data Centers Power Consumption:

- Consume 1.25% of 2005 electricity sales (1)
- Doubled from 2000 to 2005
- Predicted to rise to 2.5% by 2011

(1) Jonathan G. Koomey, PHD
Lawrence Berkeley National Lab

LEED Credit Categories

Sustainable Sites	14
Water Efficiency	5
Energy & Atmosphere	17
Materials & Resources	13
Indoor Environmental Quality	15
Innovation and Design	5

Four Levels of Certification

Certified	26-32 points	40%
Silver	33-38 points	50%
Gold	39-51 points	60%
Platinum	52-69 points	80%

If you receive Platinum Certification on a Data Center Project you have done something wrong

Sustainable Sites

Prerequisite 1: Construction Activity Pollution Prevention

- 2003 EPA construction General Permit

Credit 1: Site Selection

Avoid:

- Prime Farmland
- Land lower than 5ft above the 100 yr flood
- Habitat for threatened or endangered species
- Within 100ft of any wetlands
- Within 50ft of a water body
- Public parkland

Credit 2: Development Density & Community Connectivity

Option 1:

- Previously developed site
- minimum of 60,000 sq ft / acre

Option 2:

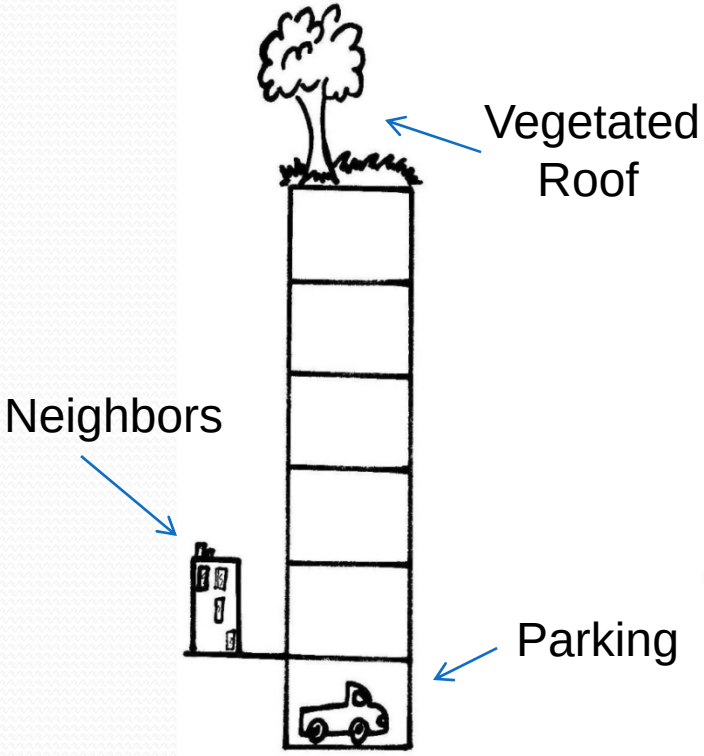
- Previously developed site
- within ½ mile of residential area with average density of 10 units / acre
- within ½ mile of 10 Basic Services
- Pedestrian access

Credit 2: Development Density & Community Connectivity

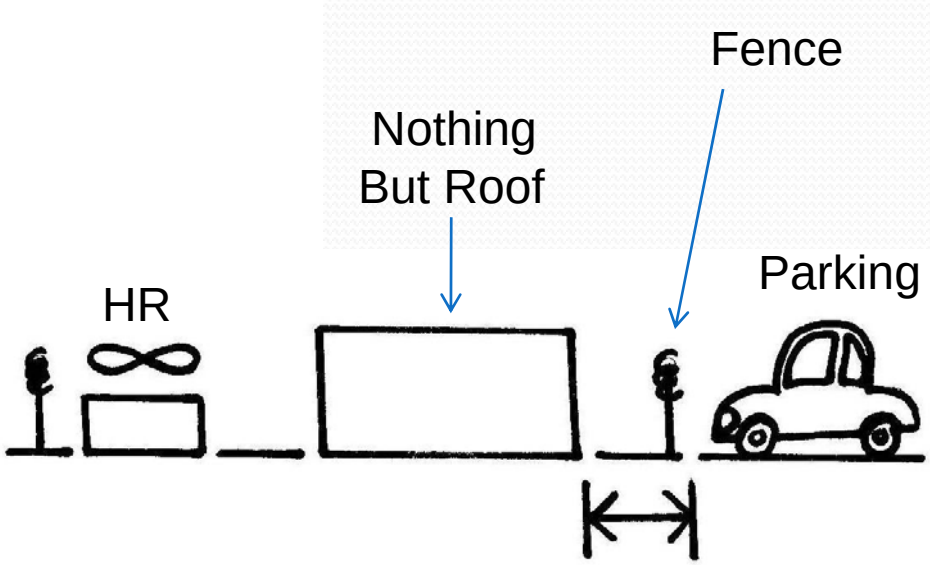
Conflicts with TECH SITE: Site Selection Criteria

"Buffer Zones"

LEED



Data Center



Credit 3: Brownfield Redevelopment

May Conflict with TECH SITE: Site Selection Criteria

“Man Made Hazards”

Credit 4.1: Alternative Transportation
Public Transportation Access

- Locate within ½ mile of commuter rail or subway

OR

- Locate within ¼ mile of one or more stops for two or more public bus lines

May conflict with TECH SITE: Site Selection Criteria: “Buffer Zones”

Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

Commercial or Institutional Buildings

- Provide racks and/or storage within 200 yards of the entrance for 5% of all building users

AND

- Provide shower and changing facilities for 0.5% of FTE occupants

- **Credit 4.3: Alternate Transportation**
  - Low-Emission & Fuel-Efficient Vehicles
  - Provide preferred parking for low-emitting and fuel-efficient vehicles
- **Credit 4.4: Alternative Transportation**
  - Parking Capacity
  - Capacity not to exceed minimum zoning

- **Credit 5.1: Site Development**
  - Protect or Restore Habitat
  - Limit site distance to 40 ft beyond the building perimeter
  - For previously developed sites, restore a minimum of 50% of the site area
- **Credit 5.2: Site Development**
  - Maximize Open Space
  - Exceed zoning by 25%

- **Credit 6.1: Stormwater Design**
  - Quantity Control
  - Prevent an increase in the peak discharge rate
- **Credit 6.2: Stormwater Design**
  - Quality Control
  - Treat the stormwater runoff from 90% of the average annual rainfall

Credit 7.1: Heat Island Effect Non-Roof

- Provide Shade or
- Place a minimum of 50% of parkingspaces undercover / underbuilding
- Conflicts with TIA 942 for parking
  - TIER 3 & 4
  - Physical separation by Wall or Fence
  - 30ft Tier 3
  - 60ft Tier 4

Credit 7.1: Heat Island Effect Roof

Use roofing material w/SRI greater than 78

OR

Use a vegetated roof for 50% of the roof

Side note:
Data Center roof best practices (TIA 942 and Uptime Institute):

- No penetrations
- No interior roof drains
- No mechanically attached systems
- No exhaust fans
- Nothing on the roof including heat rejection

- Use scuppers & down spouts
- Use concrete deck
- Use double redundant
- ½ inch per foot minimum slope
- Comply with FM uplift resistance

Credit 8: Light Pollution Reduction

- Do not exceed 80% of the lighting power densities for exterior areas per ASHRAE 90.1

Water Efficiency

- **Credit 1.1: Water Efficient Landscaping**
  - Reduce by 50 %
- **Credit 1.2: Water Efficient Landscaping**
  - No potable water use for irrigation
- **Credit 2: Innovative Wastewater Technology**
- **Credit 3.1: 20% Water Use Reduction**
- **Credit 3.2: 30% Water Use Reduction**

Captured rainwater used for landscape irrigation toilet and urinal flushing, custodial purposes

TIA 942: Tier 2,3,4; Dual Sources of water for water-cooled heat rejection, or one source + on-site storage

Energy and Atmosphere

Prerequisite 1: Fundamental Commissioning of the Building Energy Systems

- Designate an individual as the Commissioning Authority (CxA)
- Systems to Include:
  - HVAC
  - Lighting and Day Lighting Controls
  - Domestic Hot Water
  - Renewable Energy
- Every Data Center Project should be commissioned

- Prerequisite 2: Minimum Energy Performance
  - Comply with ASHRAE 90.1
- Prerequisite 3: Fundamental Refrigerant Management
- Also includes fire suppression – Halon 1301

Credit 1: Optimize Energy Performance

- 1-10 points
- Demonstrate a percentage improvement compared to baseline
- Strategies
  - Reduce Demand
  - Harvest Free Energy
  - Increase Efficiency
  - Recover Waste Energy

Credit 2: On-Site Renewable Energy

- 1-3 points
- Solar, wind, geothermal, low-impact hydro, biomas.
  - 2.5% 1 pt
  - 7.5% 2 pts
  - 12.5% 3 pts

Credit 3: Enhanced Commissioning

- In addition to Prerequisite 1

- Conduct commissioning design review
- Review contractor submittals
- Develop a system manual
- Verify that the requirements for training are complete
- Review building operation within 10 months

All DC Projects should meet these requirements

Credit 4: Enhanced Refrigerant Management

- Select refrigerants that minimize GWP and ODP
- Do not install fire suppression containing CFCs, HCFCs, or Halons

- FM – 200
  - Zero ODP
  - HFC

- Credit 5: Measurement & Verification
  - Verify system performance
  - Measurement for 1-year after occupancy
- Credit 6: Green Power
  - Solar, wind, geothermal, biomass, low-impact hydro

Materials and Resources

- Prerequisite 1: Storage & Collection of Recyclables
- Credit 1.1: Building Reuse
  - Maintain 75% of existing Walls, Floors & Roof
- Credit 1.2: Building Reuse
  - Maintain 95% of existing Walls, Floors & Roof
- Credit 1.3: Building Reuse
  - Maintain 50% of interior non-structural elements

- Credit 2.1: Construction Waste Management
  - Divert 50% from Disposal
- Credit 2.1: Construction Waste Management
  - Divert 75% from Disposal
- Credit 3.1: Materials Reuse 5%
- Credit 3.2: Materials Reuse 10%
  - Items no longer able to serve their original function
- Credit 4.1: Recycled Content 10%
- Credit 4.2: Recycled Content 20%

- Credit 5.1: Regional Materials 10%
- Credit 5.2: Regional Materials 20%
  - Extracted, processed & manufactured regionally within 200 miles of the project site
  - MEP excluded
- Credit 6: Rapidly Renewable Materials
  - Linoleum, cork, bamboo, cotton bolt insulation
- Credit 7: Certified Wood

Indoor Environmental Quality

- Prerequisite 1: Minimum IAQ Performance
  - Meet the minimum requirements of ASHRAE 62.1
- Prerequisite 2: Environmental Tobacco Smoke Control
  - Prohibit smoking in the building
  - Locate smoking area 25ft from entries

- Credit 1: Outdoor Air Delivery Monitoring
  - Monitor CO_2
- Credit 2: Increased Ventilation
- Credit 3.1: Construction IAQ Management Plan During Construction
  - HVAC Protection
- Credit 3.2: Construction IAQ Management Plan Before Occupancy
  - Building flush out with OA

- Credit 4.1: Low-Emitting Materials Adhesives & Sealants
- Credit 4.2: Low-Emitting Materials Paints & Coatings
- Credit 4.3: Low-Emitting Materials Carpets
- Credit 4.4: Low-Emitting Materials Composite Wood & Agrifiber Products
- Credit 5: Indoor Chemical & Pollutant Source Control

- Credit 6.1: Controllability of Systems: Lighting
  - Provide individual lighting controls for 90% of building occupants
- Credit 6.2: Controllability of Systems: Thermal Comfort
  - Provide individual comfort controls for 50% of the building occupants

- Credit 7.1: Thermal Comfort Design
  - Design HVAC systems to meet the requirements of ASHRAE standard 55: Thermal comfort conditions for Human Occupancy
- Credit 7.2: Thermal Comfort Verification
  - Implement a thermal comfort survey of building occupants within a period of 6 to 18 months after occupancy

- Credit 8.1: Day light and views
  - Day light 75% of spaces
- Credit 8.2: Daylight and Views
  - Views for 90% of Spaces

Innovation and Design Process

- Credit 1.1 through 1.4: Innovation in Design
  - May be for next increment of requirement of existing credit
  - May be for strategic not addressed as existing

- LEED Credit 2: LEED Accredited Professional

Summary

- Some LEED concepts should be obtained for all Data Center Projects
- Some LEED concepts conflict with Data Center Best practice
- Data Centers consumed:
  - 1.25% of U.S. electric sales in 2005
  - Predicted to rise to 2.5% in 2011
- Consider a LEED rating for your next Data Center project

Questions ?

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