Building a Better Data Center

24x7 Exchange

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- Vehicle Technologies
- Building Technologies
- Industrial Technologies

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- Wind
- Solar
- Biomass
- Geothermal
- Renewable Hydrogen

**Energy Delivery and Storage**
- Electricity Transmission and Distribution
- Alternative Fuels
- Hydrogen Delivery and Storage
Research Support Facility (RSF)

• Occupied July 2010
• Expected to exceed LEED Platinum requirements
• 220,000 sq. ft.
• Supports ~750 administrative staff
• Model for new buildings
• Contains NREL’s Data Center
Research Support Facility (RSF)

- Average US office building: 90 kBtu/sf/year
- ASHRAE code for new commercial space: 55 kBtu/sf/year
- Chesapeake Bay Foundation, Annapolis, Md.: 40 kBtu/sf/year
- Big Horn Hardware, Silverthorne, Colo.: 40 kBtu/sf/year
- NREL RSF: 35.1 kBtu/sf/yr, including the Data Center
- NREL Thermal Test Facility: 29 kBtu/sf/year
Research Support Facility (RSF)

- Projected to be the World's Largest Net Zero Energy Building.
- 1.6 MW of on-site photovoltaics (PV) are being installed.
- A Design/Build Project that came in ahead of schedule and on budget.
- Cost Per Square Foot Comparable to Other Commercial Buildings.
Building A Better Data Center

What do we mean by “Building a Better Data Center?”

Optimize your facility to maximize energy efficiency.

Employ Best Practices for power and cable management.

Manage Air Flow

Measure and Monitor Power Consumption
Why Is This Important?

- Many data centers are facing a power and cooling crisis.
- Data center power demands are expected to increase.
- Energy costs for equipment are expected to exceed initial equipment costs over lifecycle.
- Energy costs are rising.
- 2-3% of all power produced in the U.S. is used in data centers.
- “Data centers worldwide now consume more energy annually than Sweden”

*New York Times June 2009*
Power Usage Effectiveness (PUE)

\[ \text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}} \]

Total Facility Power Consists of:

- IT Equipment Power
- Mechanical Cooling
- Lighting
- Electrical Line Loss & Conversion
PUE and Your Bottom Line

Going Green is Good for Your Bottom Line

The Average Data Center has a PUE 2.5

Per 100kW based on $0.10 per kWh
Electricity used per Year 2,190,000 kWh
Annual Power Cost $219,000

Improved Data Center of PUE 1.5

Electricity used per Year 1,314,000 kWh
Annual Power Cost $131,400
Annual Power Cost Saving of: $87,600 per Year

Calculations provided by 42U.Com
Arrange your Data Center in Hot & Cold Aisles
Cold Aisle Containment easier to retrofit in existing facilities

May require relocation of cabinets to facilitate hot air return to CRAC units.

According to Gartner Research either technique works equally as well.
Uninterruptible Power Supply (UPS)

What features to look for:

- 95% + Energy Efficiency
- Scalable Design
- Built In Redundancy
- End user Serviceable
- Provide uptime till Gen Set starts
- Operate in efficiency “Sweet Spot”
Cooling Systems

- Economize, Economize, Economize
  - Air-side economizer
  - Water-side economizer
  - Flat Plate economizer
  - Cooling Tower
- Layout data center using hot and cold aisles
- Direct air return to CRAC units
- Run Data Center 5° warmer.
- In Row A/C Units
- DX Overhead A/C Units
Best Practices for a Better Data Center

- Use energy-efficient equipment
- Upgrade legacy equipment
- Consolidate & virtualize servers
- Right-size IT infrastructure
- Good relationship between IT and Facilities
- Track & manage Data Center energy consumption
- Perform long-term capacity planning for power
- Make energy consumption a part of TCO analysis
- Implement targeted/adaptive cooling solutions
- Improve airflow management
- Standardize your equipment
10 Things You Can Do Now

1. Decommission obsolete equipment.
2. Perform regular maintenance on Computer Room Air Conditioners.
3. Remove excess sub floor cabling and wiring.
4. Adopt “clean” Data Center Practices; use anti-static sticky mats at entrances, no cardboard, no food & drink, regular cleanings and minimize access.
5. Replace long power cords with shorter lengths to improve air flow.
6. Get rid of “rack spaghetti”, use wire management and zip ties or Velcro wraps to secure wiring.
7. Turn off the lights – install motion sensor switches if possible.
8. Cover all open rack spaces with blanking panels.
9. Use “Kool Loc” to cover floor openings and brush panels front mounted cable connections.
10. Configure your racks in a hot aisle/cold aisle.
Questions
The U.S. Department of Energy’s

National Renewable Energy Laboratory

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