

LBL High-tech Buildings Energy Efficiency Activities



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LBL High-tech Building Sponsors

- California Energy Commission – PIER program
- Pacific Gas and Electric Company
- New York State Energy and Development Agency (NYSERDA)
- US - Environmental Protection Agency
- US – Department of Energy
- Northwest Energy Efficiency Alliance
- Universities

Data Center research activities

- Research Roadmap
- Benchmarking, case studies, best practices
- Self-benchmarking protocol
- Power supply efficiency study
- UPS systems efficiency study
- Standby generation losses
- Performance metrics – Computation/watt
- Market study
- EPA report to Congress

Cleanroom research activities

- Research Roadmap
- Benchmarking, case studies, best practices
- Standby generation losses
- Fan-filter and mini-environment studies
- Demand controlled filtration
- Market study
- Training/outreach

Laboratory Energy Efficiency Activities

- Laboratories for the 21st Century (LABS 21)
- Low flow fume hood development
- Benchmarking and case studies
- Training/outreach

Next Phase California Projects (Public Interest Energy Research)

- Develop LEED type criteria for data centers
- Evaluate modular and scalable cooling solutions
- Promote use of air side economizers
 - study filtration
 - failure research and failure data collection
 - collaborate with ASHRAE
- Demonstrate spray cool technology
- Continue DC power initiative

Next phase California projects

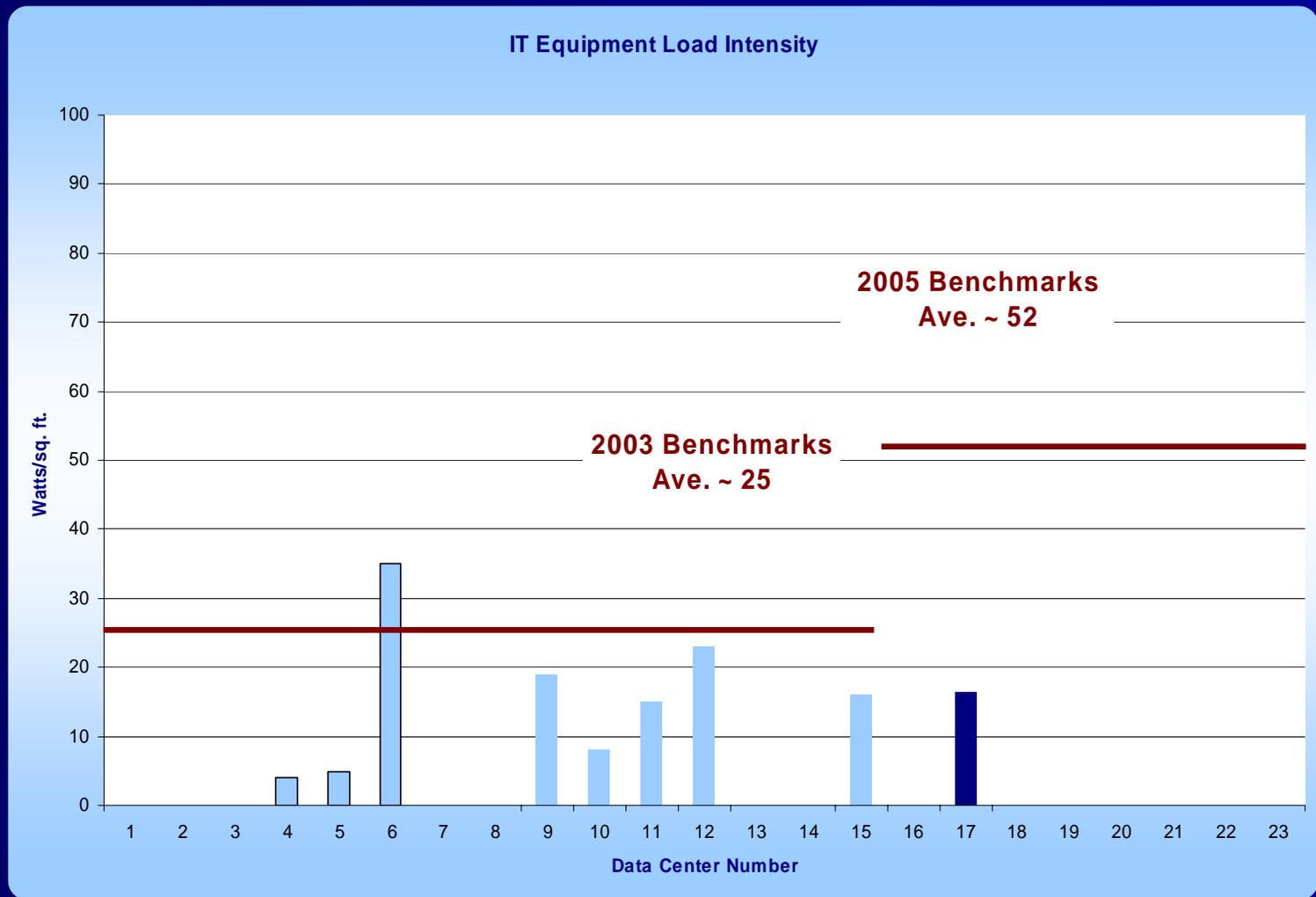
- Develop LEED type criteria for cleanrooms
- Case Studies
- Investigate heat recovery options
- Investigate process efficiency opportunities

Next phase California projects

Investigate cross-cutting issues:

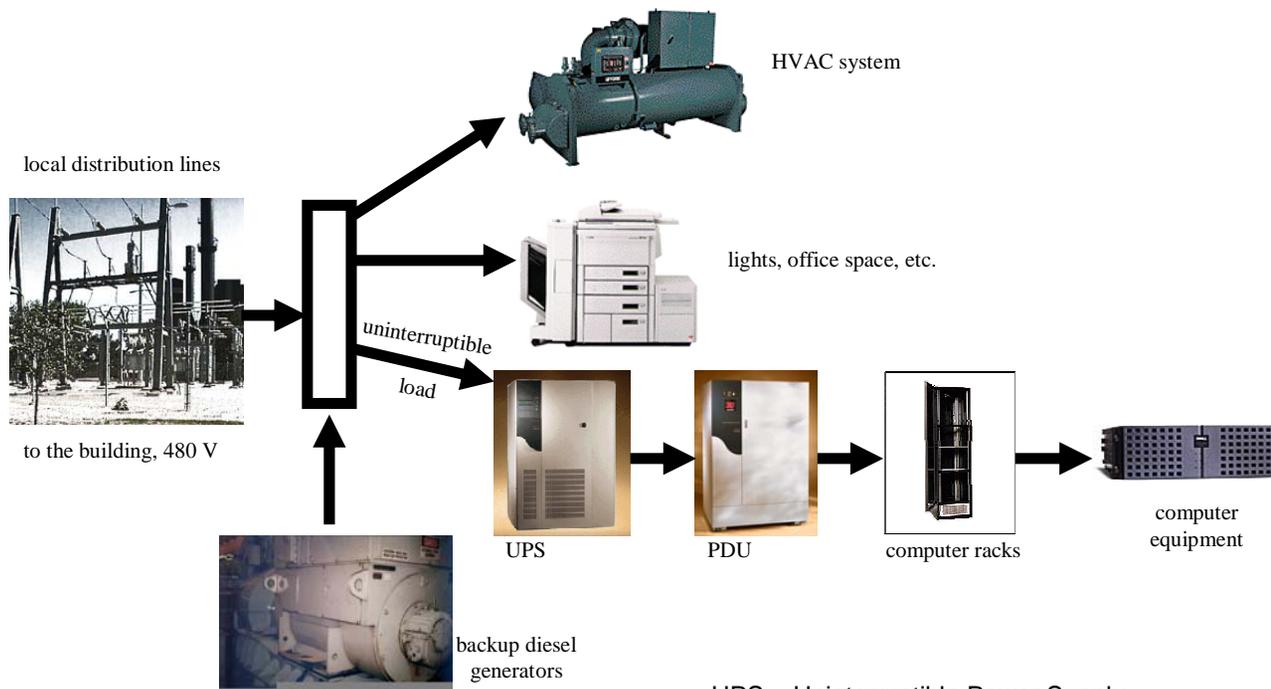
- Low pressure drop design
- Document best practices
- Commissioning strategies

IT equipment load density



Benchmarking energy end use

Electricity Flows in Data Centers

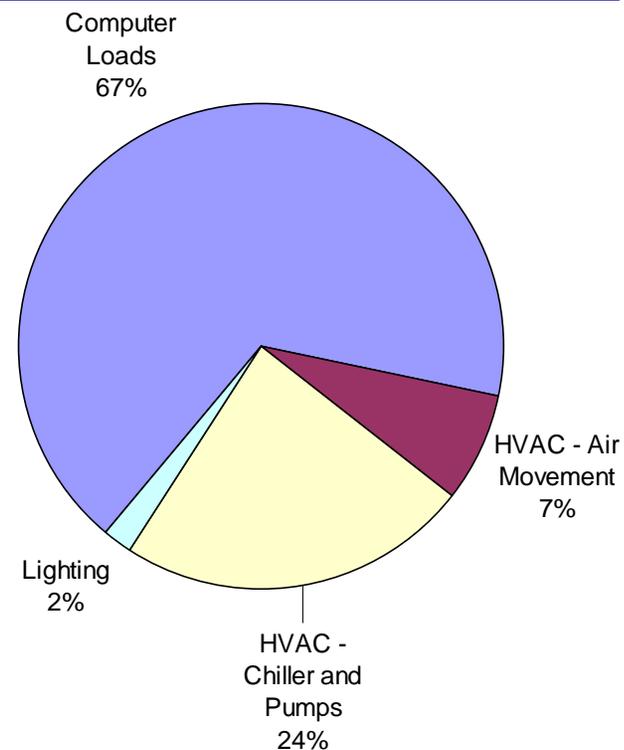
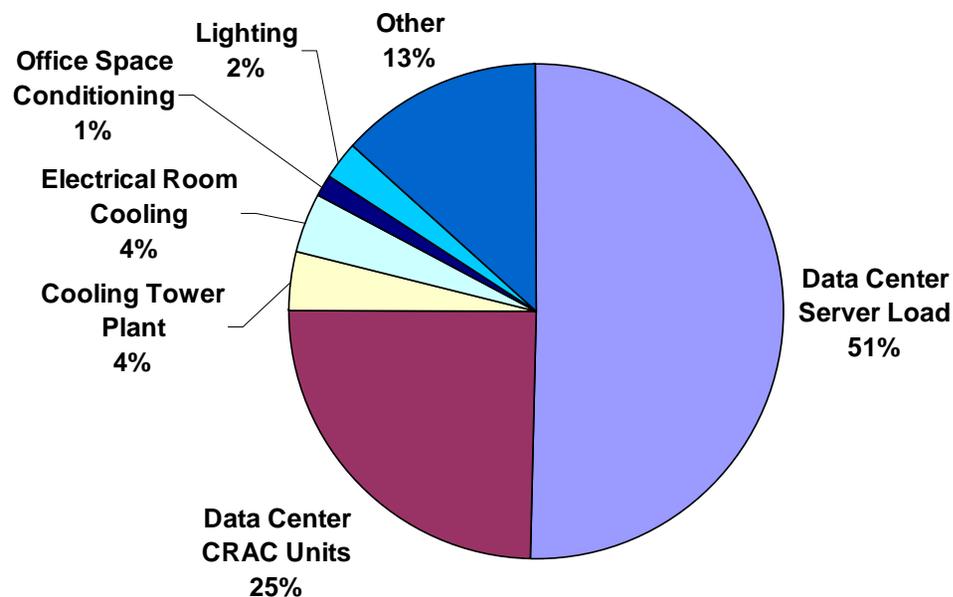


UPS = Uninterruptible Power Supply

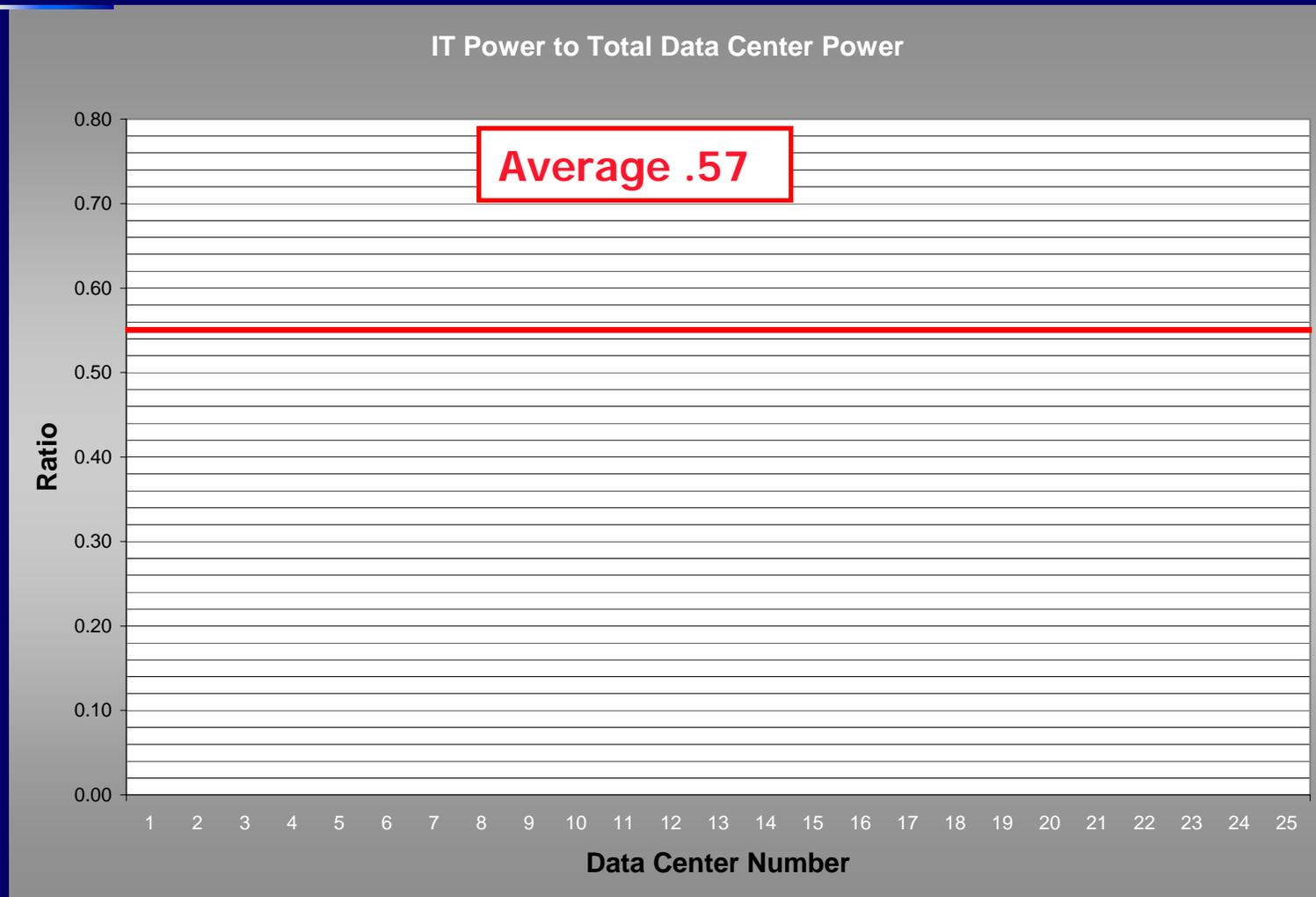
PDU = Power Distribution Unit;

Performance varies

The relative percentages of the energy actually doing computing varied considerably.

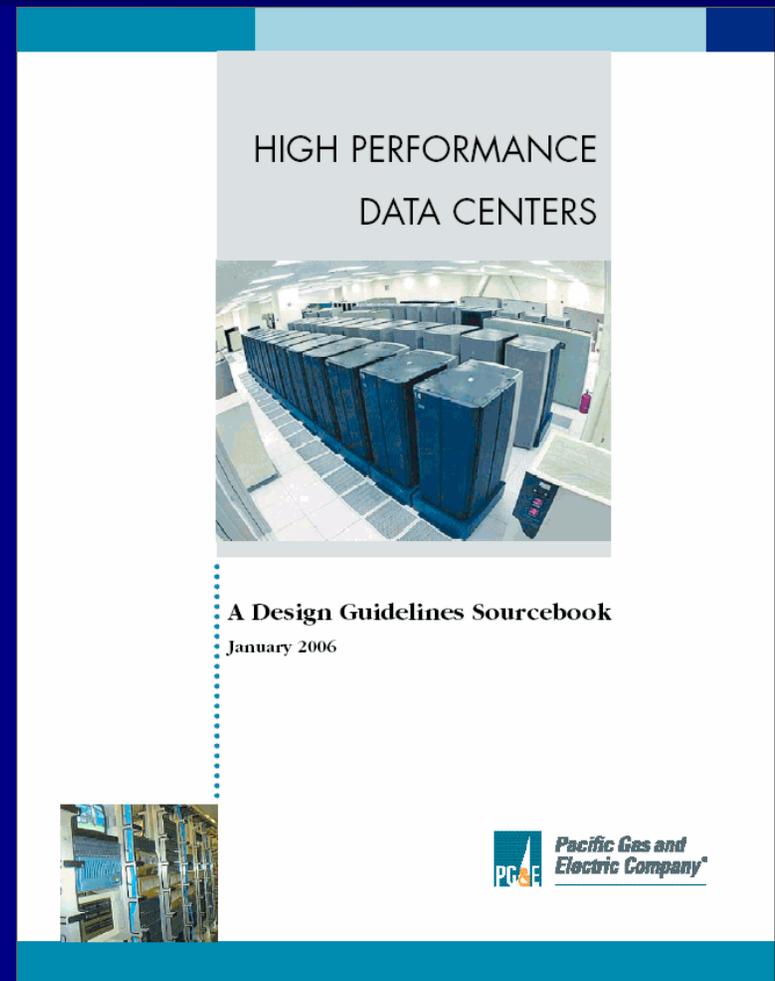


Percentage of power delivered to IT equipment



Design guidelines were developed in collaboration with PG&E

Guides available through
PG&E's Energy Design
Resources Website



Design guidance is summarized in a web based training resource

Data Center Energy Management - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://hightech.lbl.gov/dctraining/TOP.html

mozilla.org Latest Builds

Home >

DATA CENTER ENERGY MANAGEMENT

About Benchmarking Best Practices Checklist Design Intent Documentation Economics Non-energy Benefits Case Studies Tools Emerging Technologies

- This website will give you the tools and information to capture cost-effective savings opportunities to the design of new data centers or to retrofitting existing ones.
- Data center energy costs can be 100-times higher than those for typical buildings. Inefficiencies can hurt the bottom line, erode competitiveness, and reduce uptime.

Presentations
Chart Room
Resources
Exercises
Credits

LAWRENCE BERKELEY NATIONAL LABORATORY

Get Started:
Enter your annual energy cost
 \$/yr
and data center size
 sq ft

ft²/yr

\$75 High
\$5 Low

Range of Energy Costs in Real Data Centers

For public sector and private sector users.

High-Tech Research ■ Applications Team ■ Environmental Energy Technologies Division ■ Berkeley Lab

<http://hightech.lbl.gov/dctraining/TOP.html>

LBNL Data Center demonstration projects

- Outside air economizer demonstration (PG&E)
 - Contamination concerns
 - Humidity control concerns
- DC powering demonstrations (CEC-PIER)
 - Facility level
 - Rack level
- “Air management” demonstration (PG&E)

website: <http://hightech.lbl.gov/>