Efficiency  • Increase Your Data Center Energy Efficiency • Increase Center Energy Efficiency • Increase Your Data Center Energy Efficiency

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Optimize the Central Plant
Typically, a central cooling plant and air handlers are more efficient than distributed air conditioning units. Begin with an efficient water cooled variable speed chiller, add high efficiency air handlers, low-pressure drop components, and finish with an integrated control system that minimizes unnecessary dehumidification and simultaneous heating and cooling. Use temperature resets to allow use of medium-temperature chilled water (55 degrees Fahrenheit or higher). Warmer chilled water improves chiller plant efficiency and eliminates the need for the chiller during many hours of operation (lower cooling).

Free Cooling
Can you design your data center for free cooling? Can you retrofit the outside air supply? Can you retrofit a water side economizer (use cooling tower to pre-cool return “chilled” water)? It is all about humidity and temperature.

Right Sizing
When the ultimate load is uncertain, data center cooling systems are often oversized and operate at inefficient part loads. Therefore, it makes sense to pre-install fixed elements such as ducts and pipes, but design for modular growth of the mechanical equipment. Include variable speed fans, pumps and compressors. Right size all your plant equipment—overbuilding in advance of actual needs makes many subsystems operate inefficiently.

Use Liquid Cooling of Racks and Computers
Water is 3,500 times more effective than air on a volume basis; so it cools servers and appliances more efficiently than air conditioning! Today, you can purchase liquid cooled racks. Manufacturers are prototyping liquid-cooled computers as well.

People are Key
Facilities and IT staff bring different perspectives to create better solutions when it comes to data center energy efficiency. Ask your counterpart to lunch so you can begin to learn about their challenges and explain your own.

Commit to Improved Design and Operations
• Benchmark existing facilities
• Document design intent
• Introduce energy optimization early in the design process
• Use life-cycle total cost of ownership analysis
• Continuously monitor energy and environmental conditions
• Re-commission as a regular part of maintenance
• Empower IT and facilities staff to work together

Learn More
You can get more information about the following topics at the websites listed below:
  • Air management
  • Right sizing
  • Central plant optimization
  • Efficient air handling
  • Free cooling
  • Humidity control
  • Server efficiency
  • Liquid cooling
  • Improving power chain
  • UPSs and equipment power supplies
  • On-site generation
  • Designing, measuring & optimizing processes

A Problem That You Can Fix
Data Center energy efficiency is derived from addressing BOTH your hardware equipment AND your infrastructure.

Less than half the power used by a typical data center powers its IT equipment. Where does the other half go? To support infrastructure including cooling systems, UPS inefficiencies, power distribution losses and lighting. Why does this matter?

• By 2010, the power costs for the data center equipment over its useful life will exceed the cost of the original capital investment.
• By 2020, the carbon footprint of data centers will exceed the airline industry
• With today’s best practices, 20-50% energy savings are possible, extending the life and capacity of existing data center infrastructures, avoiding millions of metric tons of carbon emissions, and saving.

Key Best Practices

How To Start

Discover how you can change the course of energy use in your data center with the Quick Start Guide to Increase Data Center Energy Efficiency. This step-by-step guide helps you:

1. Learn more about the best practices for energy efficiency
2. Identify the areas where you can implement these practices
3. Prioritize your efforts to achieve the greatest impact

The energy used by a single rack of emerging generation servers (20kW plus air-conditioning) each year is equivalent to the energy required to drive an average car coast-to-coast about 300 times (25 miles per gallon).

—Evan Mills, Lawrence Berkeley Lab, 2008

DOE Save Energy Now Tools and Resources:
www.eere.energy.gov/datacenters
Energy Star® Program:
www.energystar.gov
Lawrence Berkeley National Laboratory (LBNL):
http://hightech.lbl.gov/datacenters
ASHRAE Data Center Technical Guidebooks:
http://tc99.ashraetcs.org

Quick Start Guide to Increase
Data Center Energy Efficiency

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A Quick Start to Energy Efficiency

Energy Usage in Data Centers

How Energy Gets to Your Servers

Power plant inefficiencies and transmission line losses mean that just 15% of source energy is typically available to your servers. Because support infrastructure typically consumes approximately half of site energy, improvements in IT efficiency (e.g., server virtualization, consolidation, storage and network gear) yield a 2:1 ratio in total energy savings. Additionally, the following key changes to the on site power chain presents substantial savings opportunities:

- Increase distribution voltage
- DC distribution
- Improve equipment power supplies
- Improve uninterruptible power supplies and transformer efficiency
- Monitor energy at all levels

High Level Facility Metrics

Measuring where you are now is a good place to start.

Energy Benchmarking and Continuous Monitoring

Energy benchmarking can be effective in helping to determine the efficiency of your current data center and to identify better-performing designs and strategies. As new strategies are implemented, energy benchmarking will enable comparisons of performance.

The benefits of measuring, monitoring, and taking steps to optimize your energy efficiency also will enable you to extend the life and capacity of your existing data center infrastructure, as well as avoid millions of metric tons of carbon emissions that would result from expansion.

Lowering PUE (Total Facility Energy/IT Equipment Energy)

In a study of 25 data centers studied by Lawrence Berkeley National Laboratory (LBNL), roughly 87% of the site energy reaches the IT equipment in the best case, while in the worst case only 33% makes it to the IT equipment. The lower your PUE, the more efficient is your data center infrastructure (power distribution and cooling).

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