

BY THE NUMBERS: DATA CENTERS AND ENERGY

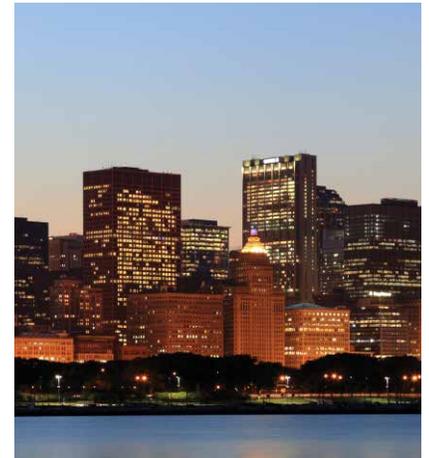
Data centers process a tremendous amount of information and use just as much energy. Today, these facilities are responsible for 2% of all electricity use in the United States (1.3% globally). Since 2006, there has been a 50% increase in the amount of energy that data centers consume.¹ As critical operations, data center management often focuses on reliability, but energy performance does not have to come at the expense of efficiency. Organizations can reduce energy-related operating costs and decrease environmental impact while maintaining zero down time data facilities.

Data centers can be classified as stand-alone single purpose facilities or can be located in multipurpose buildings co-located with office space. In co-located centers, data handling operations and associated thermal control systems use a disproportionate amount of energy per square foot when compared to office space. In these buildings, energy management practices should include data center energy performance.

Decision makers working with data centers have a number of options to reduce costs and improve energy efficiency through management and technology strategies. Advances in technology, the availability of software solutions for processor load shifting, and the increasing granularity of energy use information are creating new opportunities for the energy efficient operation of data centers.

RECOMMENDATIONS INCLUDE:

- **Adjust ambient inlet temperature:** Today, data handling operations may not be operating efficiently due to use of outdated operating standards for average ambient inlet temperature. From 2004 to 2011, the American Society of Refrigeration and Air Conditioning Engineers (ASHRAE) revised the upper limit inlet temperatures for some classes of data centers with humidity control from 77°F to 95°F.² Concerns that higher operating temperatures damage equipment may be outdated. Many companies and agencies have developed policies for data center thermal conditions that have not kept pace with the evolution of technology, and current practice may protect equipment beyond the actual useful lifespan of modern equipment. Revising operating policies and temperature set-points can save energy, and modern data handling equipment can operate in higher temperatures with humidity controls.
- **Utilize sensor technology to create more accurate microclimate management:** Improvements in temperature and humidity monitoring open the opportunity for more precise and dynamic energy efficient cooling solutions in data centers. Monitoring and responding to heat gain between servers or racks of servers can drive savings by spot cooling when demand is high. Using a robust network of wired and wireless temperature and humidity sensors allow data center operators to continuously monitor thermal performance in data centers during various states of processor load in order to develop appropriate cooling strategies to meet operating policies. Fine-tuning of



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¹ EPA, August 2007, Report to Congress on Server and Data Center Energy Efficiency

² 2011 Thermal Guidelines for Data Processing Environments – Expanded Data Center Classes and Usage Guidance

cooling towers, chillers, and air handlers aid to match data center needs with cooling system capabilities. Modular units help building owners and managers to right-size cooling systems and avoid fixed and variable costs associated with oversized systems. In existing buildings, modular units may be used to upgrade or expand cooling capabilities as data center needs change.

- **Re-design the data center to supply cooling when and where it is needed:** Improved air management through the use of flexible barriers, modular cooling equipment, or central air handling units opens the opportunity to supply cooling more selectively. Many data centers are now ducting server racks to air handling units and modular packaged cooling units. This modification allows for improved air management and the possibility of air-side economization, drawing in cool outside air when available and significantly reducing the need to run energy intensive equipment. Some data centers are also using water-cooling techniques to remove heat from servers.³
- **Update computing equipment to reduce overall energy demand:** Equipment and computer selection can improve security and save energy. Many companies are switching to smaller, more efficient desktop computers supported by a central data server (thin clients).
- **Consolidate data centers to fewer, larger installations:** Once widely distributed in order to locate IT near office staff is no longer necessary. Modern data handling and information security allow managers to consolidate data centers and capture the energy saving benefits.
- **Consolidate Servers:** Similar to the consolidation of data centers, the consolidation of data processing and telecommunications services to fewer servers improves utilization rates while reducing cooling loads.

³ Design Recommendations for High Performance Data Centers, Rocky Mountain Institute, 2003.

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