

Data Center Users' Group Special Report
Inside the Data Center 2008 and Beyond



Executive Summary

If there were any question about the pace of change within a data center, the results of the fall 2008 Data Center Users' Group (DCUG) member survey confirm that it is a truly dynamic environment. Survey results, which in many cases are compared to prior DCUG survey data, report these notable items:

- **Amid implementation of new technologies, increased demands from the business and adoption of the mobile workplace via wireless devices, data centers are always at work and increasing in criticality.** In fact, three out of four respondents said in this year's survey that the data center is more critical today than in past years. And, many of these are large facilities that have had high availability goals for years.
- **Power densities across the room and within the rack are rising sharply.** In doing so, they're pushing facility capacity to the max – and fast. In the last two years, power density per average rack has risen from 6 kW to 8 kW. According to survey respondents, more than 10 percent of them will be out of data center capacity by the end of this year and a total of 68 percent expect to be at capacity within the next three years.
- **Despite tight capital equipment budgets, changes to the data center are still planned.** The current economic climate is impacting more than 35 percent of survey respondents. However, in a sign of just how dynamic and critical the data center has become, more than 75 percent of survey respondents are still planning for changes to take place within their facilities.
- **Availability remains king.** Data center managers will be taking into account corporate initiatives to improve energy usage throughout the data center; yet, this directive is challenged by the understanding that availability remains the top priority.

During tough economic times, data center managers are being asked to do more with less. This report indicates that some are already on their way via a system-wide scalable architecture that drives down total cost of ownership through a focus on flexibility and efficiency without compromising availability. Others face a steep climb, which is likely to be slowed by a lack of funding that may limit deployment of new technologies and ultimately constrain business growth.

Survey Methodology

The Data Center Users' Group (DCUG) is a collection of influential data center, IT and facility managers formed by Emerson Network Power, a business of Emerson. Founded in 2003, the DCUG includes approximately 2,000 members who participate in a collaborative, focused forum that addresses the issues, trends, challenges and solutions associated with building and maintaining a highly available, flexible and cost-effective facility. The group's membership comprises executives with a wide variety of IT and facilities management expertise from an assortment of companies, including board member companies Vanguard, Cincinnati Bell Technology Solutions and JPMorgan Chase, among others. The DCUG membership is surveyed twice each year to provide members with unique insight into data center trends and to ensure the group's meetings address issues of top concern to the membership.

DCUG members received an electronic survey of 32 questions on October 13, 2008. Participants were required to submit their responses by October 21. A total of 167 DCUG

members completed the survey. This report highlights several of the questions posed in the survey. Access to the full report is limited to the DCUG membership.

Respondents primarily represented data center management (68), facilities management (40) and IT management/operations (38). Primary facility size ranged from less than 500 square feet to greater than 50,000 square feet, with the majority of the group falling in the 2,501 square feet to 50,000 square feet range. Figure one shows a specific breakdown.

The open survey time phase coincided with a period of unprecedented turmoil in world financial markets. In the United States, the Dow Jones Industrial Average, the leading measuring stick of the U.S. stock markets, was coming off the worst week in its history. The DJIA closed at 8,451.19 on October 10. By the end of Monday, October 13, the DJIA rallied by more than 900 points to record the biggest single-day gain ever. Volatility continued throughout the open survey period, which closed on October 21 when the DJIA dropped more than 200 points to finish at 9,033.66.

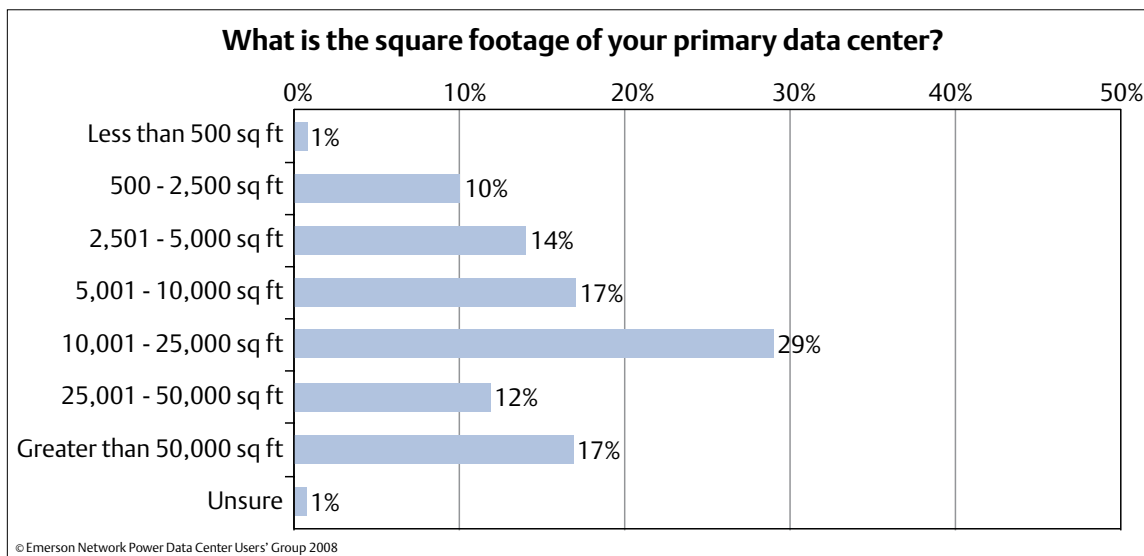


Figure 1. Respondents represented data centers ranging from less than 500 square feet to more than 50,000 square feet.

A Look Inside the Data Center

It's been frequently stated that many business executives believe that their greatest asset is the people they employ. It's certainly tough to disagree with this sentiment. Yet, if this "greatest asset" were asked to identify its greatest asset, technology is likely to be at the top of the list.

Employee productivity and business growth are largely dependent today on the availability of the IT systems housed in corporate data centers and hosting facilities. Although issues such as efficiency have risen in importance in recent years, availability is still paramount. When asked whether or not the data center is more critical today than in the past, 77 percent of respondents affirmed that the data center was more critical (Figure 2). Nearly two-thirds said that the data center was "much more critical today."

According to one survey respondent, "As people become more dependent on reliability, we cannot afford the missteps we have seen in the past. End users are easily swayed to move business when continuity is impacted."

Convincing senior management of this demand for business continuity can be a challenge for some data center managers, including one respondent who noted, "Our problem is getting upper management to buy into how critical the data center is. Until they do, we will not be able to move ahead with some...projects."

Densities Continue to Increase

One of the key data points businesses need to track is the power density (kW) per rack in a data center. Because of the increased deployment of blade servers, switches and other powerful rack-based equipment, the overall power density of the racks that housed them also increased. The room average per rack for respondents was 8 kW, which is up from 6 kW reported in a spring 2006 DCUG survey (Figure 3).

Other contributing factors include the trend of businesses reducing capital costs by putting virtualized servers in smaller spaces and consolidating multiple remote data centers into centralized mega data centers. This compaction increases power requirements, and more power generates more heat.

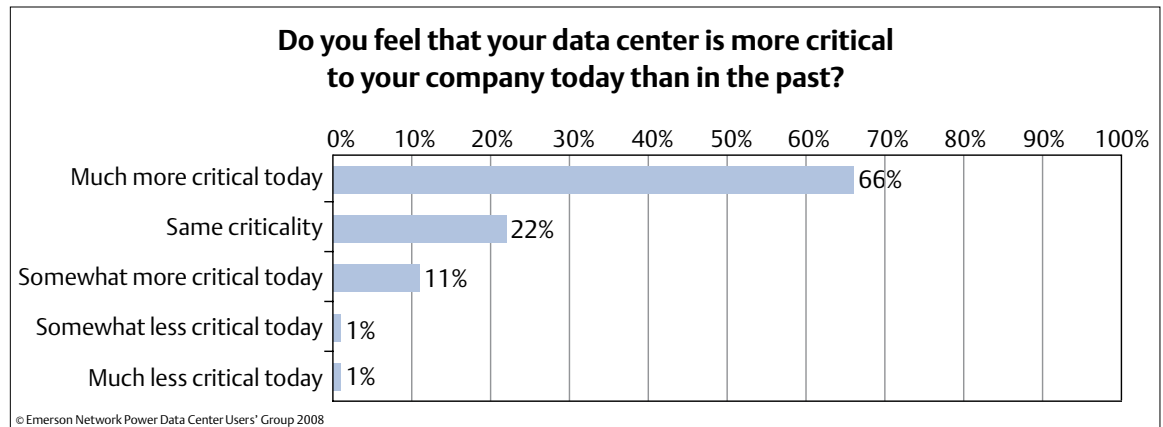


Figure 2. Data center criticality is on the rise for DCUG members.

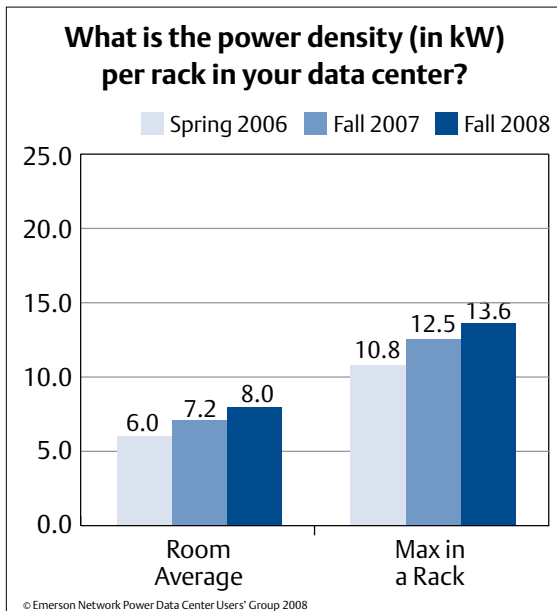


Figure 3. Power densities continue to climb higher as new technologies are deployed.

Businesses operating with racks at higher power densities are also realizing the importance of proper airflow throughout their data center. At higher densities, equipment in the bottom of the rack may consume so much cold air that remaining quantities of cold air are insufficient to cool equipment at the top of the rack. Whereas standard raised-floor cooling can be utilized to support rack densities between 8 kW and 10 kW, higher densities require additional cooling tactics. For example, cold aisle containment systems can support rack densities greater than 10 kW. Deployment of high-density cooling systems enable rack densities up to 30 kW.

There's good news in that this trend is creating opportunities for greater capacities and efficiencies in the data center – if the appropriate support system changes, in the form of scalable power and cooling infrastructure products, are implemented.

For example, cooling located close to the rack increases maximum power density

within the rack. It also reduces the stress on computer room air conditioners that have to work extra hard to maintain a desired temperature level. Cold aisle containment and high density cooling systems are more energy efficient because they move air in a local zone rather than in large volumes across the entire data center space. Additionally, pumped refrigerant technology and distributed cooling modules in high density systems reduces energy consumption up to 30 percent.

On the power side, investments in UPS units that can easily unlock additional capacity on an as-needed basis gained popularity in 2008. As data center managers have adopted this scalable approach, maximum power densities per rack were naturally on the rise at 13.6 kW versus the 10.8 kW reported in the spring 2006 data (Figure 3).

Yet, the difference between maximum kW per rack and the current average kW in those racks leaves little room for the widespread deployment of new technologies. This constraint, largely comprised of available power and cooling, limits business growth and hampers the availability of systems needed to sustain productivity.

Looking Ahead

Data center managers are faced with the grim outlook that their facilities simply cannot support any new applications unless the business invests in new, scalable support systems. Nearly 64 percent of all respondents represent data centers that will not have sufficient capacity by 2011 (Figure 4). Two years ago, 98 percent of respondents to a DCUG survey said that they would not have data center capacity in 2011, so the good news is that some progress has been made. Unfortunately, 11 percent of the survey respondents this year believe their data center's current capacity will only be sufficient

through the end of December 2008. Power leads the way as the primary factor impacting additional compute capacity for 36 percent of respondents.

Based on this reality, it's not a surprise that 77 percent of all respondents plan changes in the coming years for their data centers to be able to meet the unprecedented business demand on technology (Figure 5). Despite the economic conditions at the time of the survey, 47 percent of respondents

plan on renovating or expanding their data center in the next few years. Thirty-eight percent of respondents have plans to build a new data center while 30 percent of respondents will be consolidating multiple data centers.

Of course, implementation of these changes will depend on numerous factors. At a time when the global economy can be described as volatile, nearly all businesses are looking for ways to trim costs and to maximize existing investments.

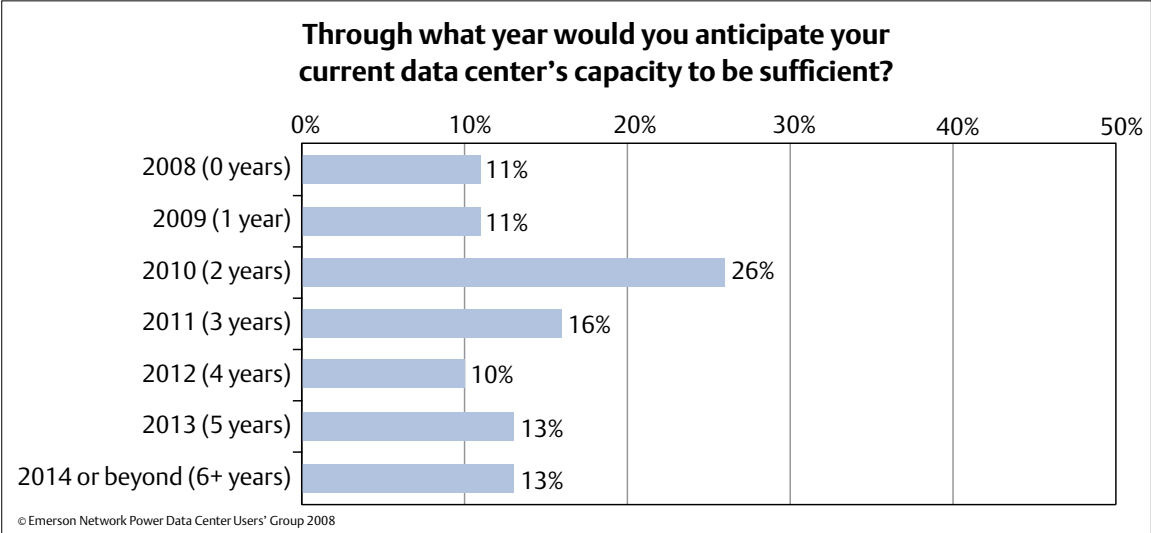


Figure 4. Data center managers continue to be challenged by shrinking capacity, which is limiting their ability to implement new technologies.

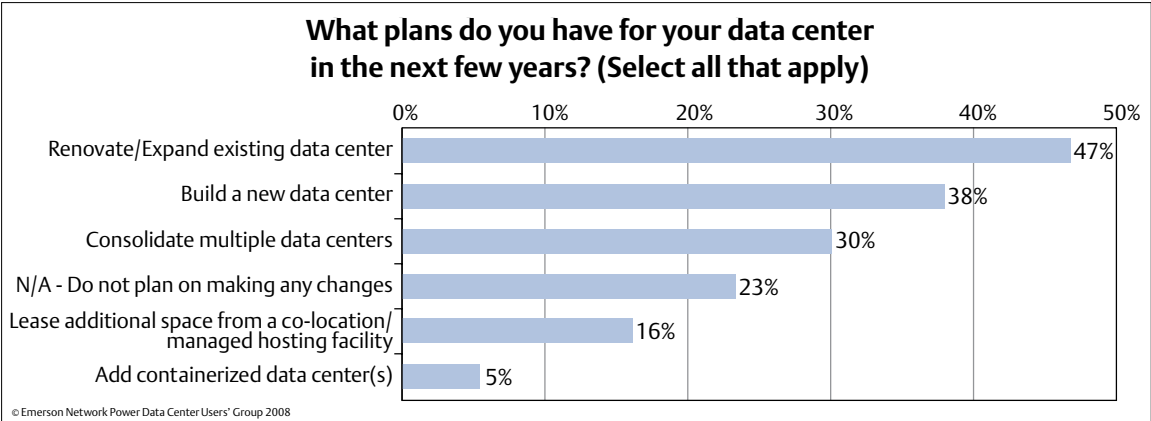


Figure 5. Many changes are planned to accommodate the dynamic data center.

According to 37 percent of survey participants, current economic conditions are impacting their ability to operate or expand their data center (Figure 6). One respondent stated that his or her “company does not want to spend money due to the uncertainty around the future economic situation; (therefore), we are putting off some much needed infrastructure equipment replacements.” Another respondent commented that a data center move that “once was thought a given...now is under review.”

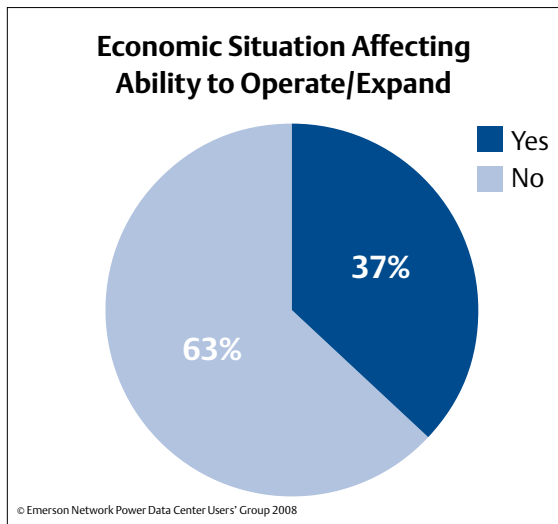


Figure 6.

Data Center Efficiency

Another factor impacting data centers is the drive for businesses to become more energy efficient and aware of their overall impact on the environment.

Data center energy consumption has been driven by the demand within almost every organization for greater computing capacity and increased IT centralization. While this was occurring, global electricity prices increased 56 percent between 2002 and 2006. The financial implications are significant; estimates of annual power costs for U.S. data centers now range as high as \$3.3 billion. Ultimately, the double impact of rising data center energy consumption and rising energy costs has elevated the importance of data center efficiency as a strategy to reduce costs, manage capacity and promote environmental responsibility.

When asked about the key drivers of the energy efficiency initiatives within their organizations, respondents said that corporate initiatives (33 percent) and a desire to get more capacity from their data center (28 percent) were the top two reasons for the second consecutive year (Figure 7).

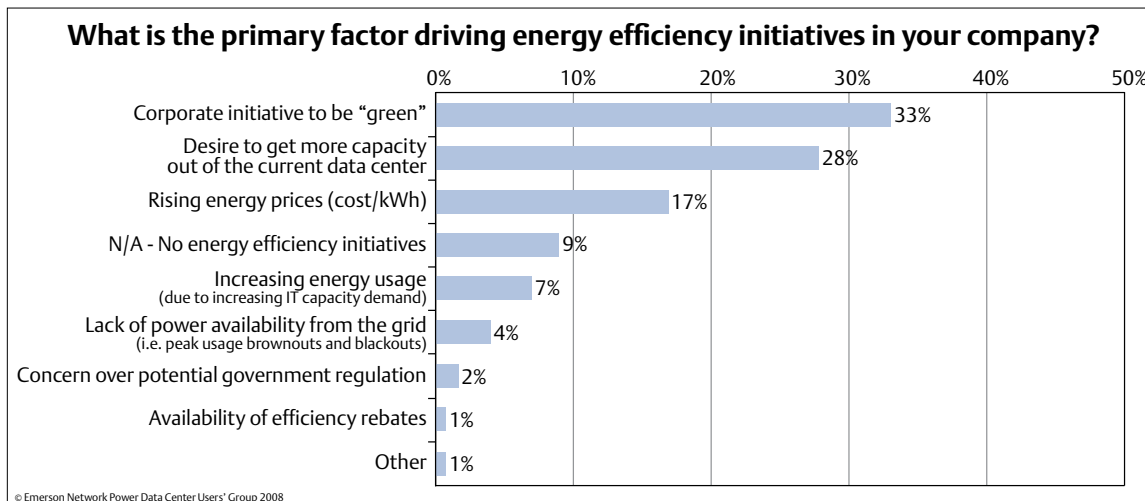


Figure 7. Corporate initiatives emerged as the primary driver of data center energy efficiency initiatives in 2008.

In fall 2007, only 20 percent of respondents said that a corporate initiative to be green was the primary factor driving energy efficiency initiatives.

Availability is King

Despite the many reasons why organizations are paying more attention to energy efficiency and deploying ad hoc initiatives, it appears that organizational priority remains squarely focused on availability. On a continuum of one (reducing energy usage is main priority) to seven (maintaining high availability is our main priority), 69 percent of respondents identified a priority level between five and seven in favor of high availability (Figure 8).

Adding to the challenge is that a comprehensive energy usage strategy remains elusive for a majority of businesses despite one in four respondents having completed an analysis of the efficiency of their data center equipment. Only 28 percent of survey respondents have a documented strategy to reduce energy usage (Figure 9). There has been some progress in this area as only 17 percent

of respondents to the fall 2007 survey indicated that they had a documented strategy in place.

This low number is likely a result of the challenges many enterprises are having in trying to measure and manage energy efficiency. At the top of the list is the time and budget available to measure, and the reality that any improvements

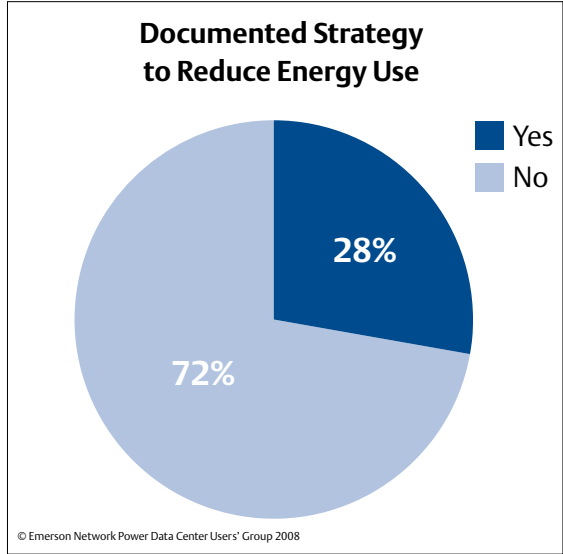


Figure 9. Most companies do not have a plan for reducing energy use.

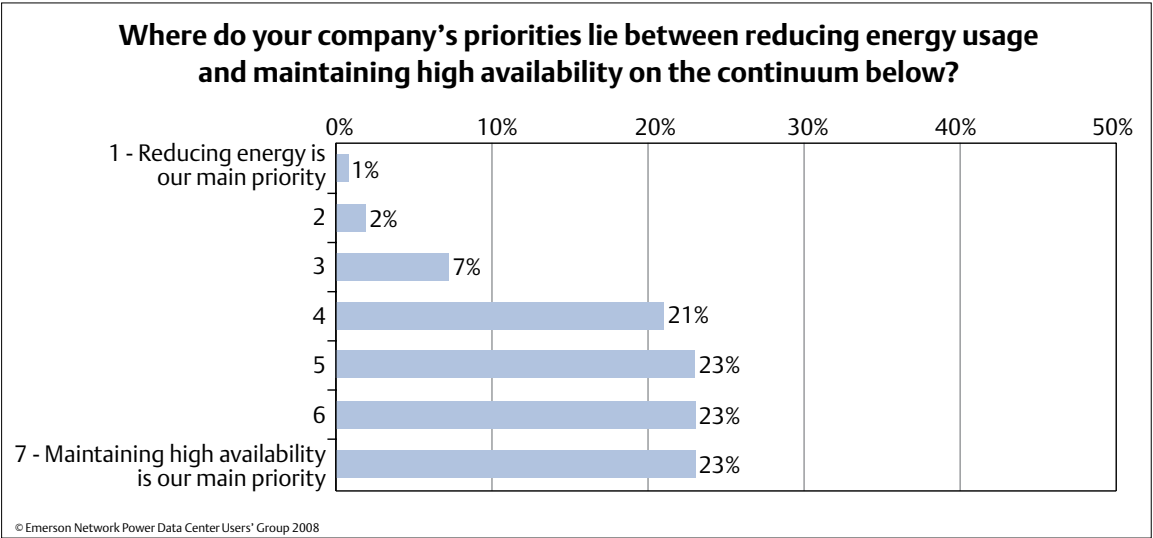


Figure 8. The priority for data center managers remains squarely focused on availability.

made are being offset by equipment adds to support growth (Figure 10). Because data centers can't benchmark against similar facilities, it's difficult to gauge efficiency improvements when new technologies are introduced.

This places data center managers in the undesirable position of trying to convince senior management of productivity increases although energy consumption remained the same.

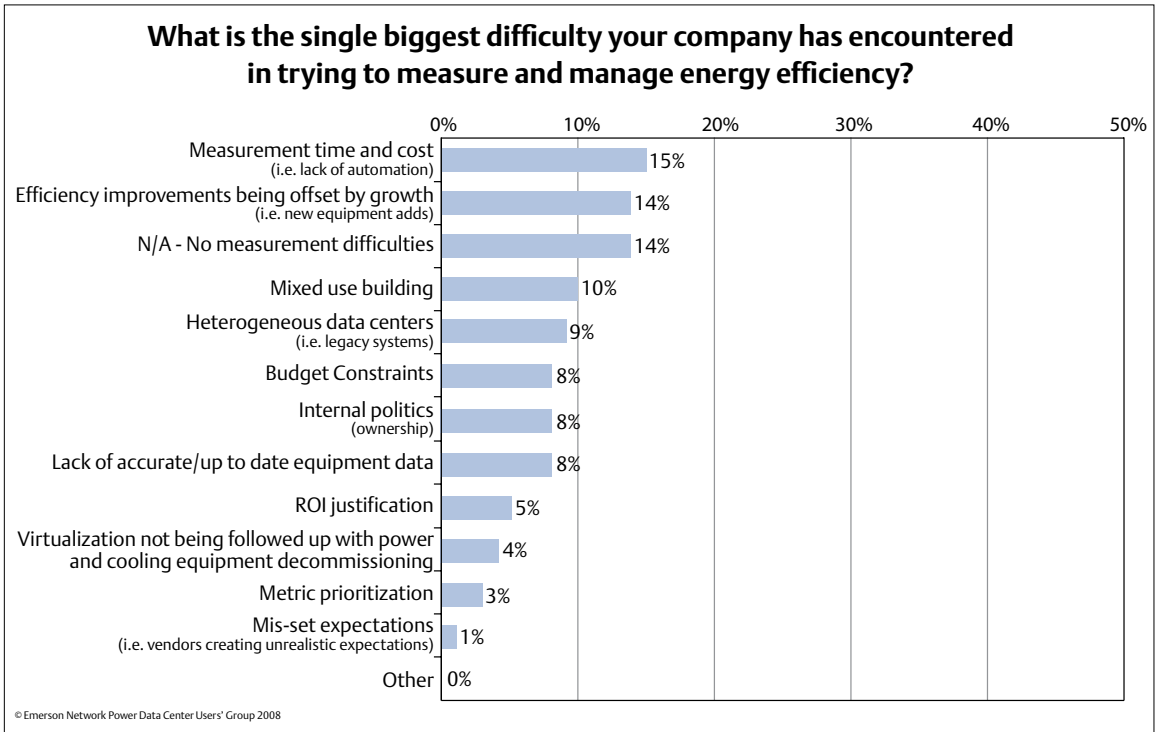


Figure 10. Progress on energy efficiency in the data center hasn't been helped by the absence of a good metric for measuring efficiency.

Conclusion

Results of the Data Center Users' Group fall 2008 survey provide a realistic view into the changes that are occurring throughout data centers. While each facility is uniquely different, the insights provided by the more than 165 survey participants serve as an accurate representation of what's going on inside the data center, including these notable realities:

- Rack and data center densities are continuing to increase. Those data center managers who have implemented support system changes to accommodate density are alleviating some capacity issues and setting the table for increased efficiency.
- Data center managers are unwilling to compromise availability for gains in efficiency.
- Efficiency is being addressed in multiple ways and is being driven as much by capacity as costs. There still does not seem to be a universal driver for efficiency efforts or a common approach that is being adopted.

As data center, IT and facilities managers, and engineers deal with these realities and look ahead at their responsibilities in the coming year, they can plan on a few certainties amid guaranteed change:

- Advent of new technologies means new design and implementation challenges.
- Responsible purchasing decisions must account for energy savings while still meeting rising availability requirements.
- Renewed organizational focus on cost cutting and budget management requires closer attention to the inner workings of the data center to ensure that systems perform at intended levels and last as long as possible.

In conclusion, managing the dynamic data center and its critical infrastructure continues to be a challenge requiring organizational collaboration and systems integration. We expect next year's report to indicate the progress DCUG member companies have made.

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WP165-118
SL-24634

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