

## Majority of Data Centers in Production are Not Equipped for High Density Operation

Survey shows that while new data centers are being built, many companies' 'newest' data centers are more than four years old, and their low density specifications may shorten the entire data center lifecycle

### INTRODUCTION

The data center is a mission-critical part of any organization. As the demand for service availability, uptime and data management increases the pressure on existing data centers, organizations are realizing that their infrastructure cannot support the demands of today's equipment.

This Aperture Research Institute™ (ARI) survey shows that data centers are aging, with over a third (38%) of responding organizations admitting that their newest data center is over four years old. These older data centers are ill-equipped to cope with the intense power and cooling demands of modern hardware. This problem can only get worse as the enterprise continues to adopt high density hardware: for example, a recent ARI survey showed that one in five of new servers are blades. Blade servers, in particular, cause problems for data center managers, as they are forced to contend with significant power consumption and intense heat generation.

Although 36% of respondents are currently building and/or planning new data centers, the long lead times involved could mean organizations run out of capacity before new data centers are ready. Our research found that it typically takes two years to complete the build of a new data center. Of those data centers that have begun construction, 30% will take between a year and two years to go live, and over 15% will take longer still.

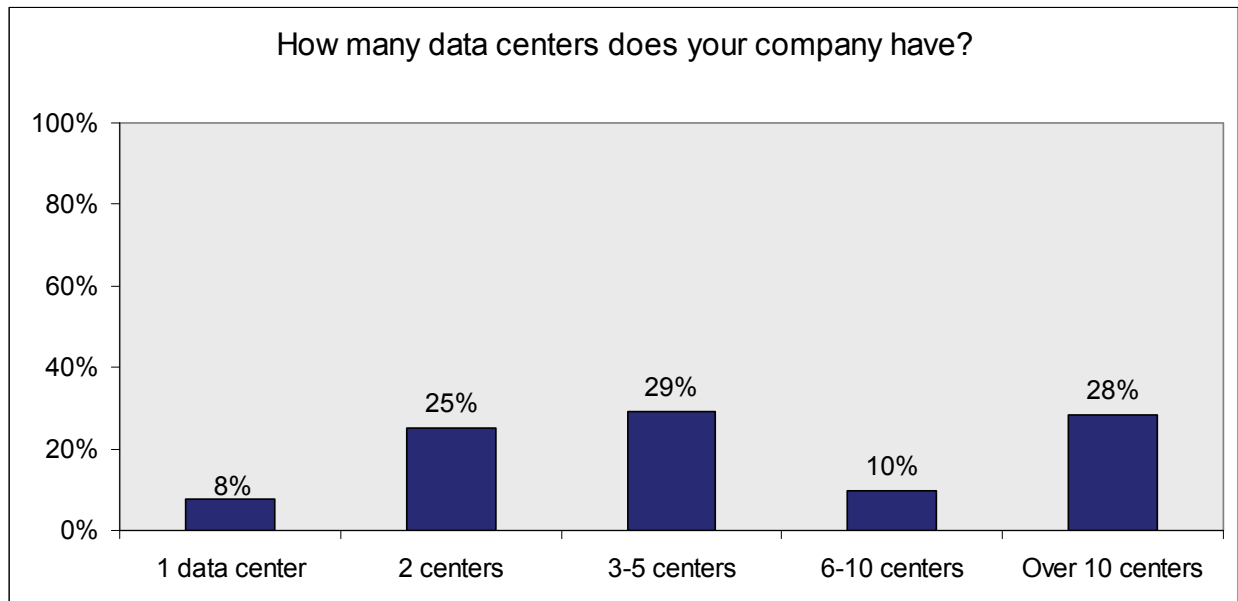
In this research note, the ARI reviews the status of data center builds: their size and scope, power specifications and the time it will take to put them into operation. The investigation highlights the escalating problems caused by high density equipment, and how the time lag between planning and launching a new data center may mean that the lifecycle of many data centers will be reduced as they quickly become functionally obsolete.

The results are based on a detailed survey of more than 100 data center professionals across a range of sectors including the healthcare, banking and insurance, retail, telecommunications, government and pharmaceutical industries.

▶ Read on to find out more

## THE AGING DATA CENTER

Organizations across all industries rely on the data center as the foundation of the enterprise. In this research, the ARI surveyed data center managers from a range of sectors, including the finance, healthcare, retail, pharmaceutical, government and telecommunications industries. The survey showed that organizations typically operate multiple data centers: over a third (38%) of the companies surveyed had more than six distinct data centers and over a quarter (28%) utilized more than ten data centers.

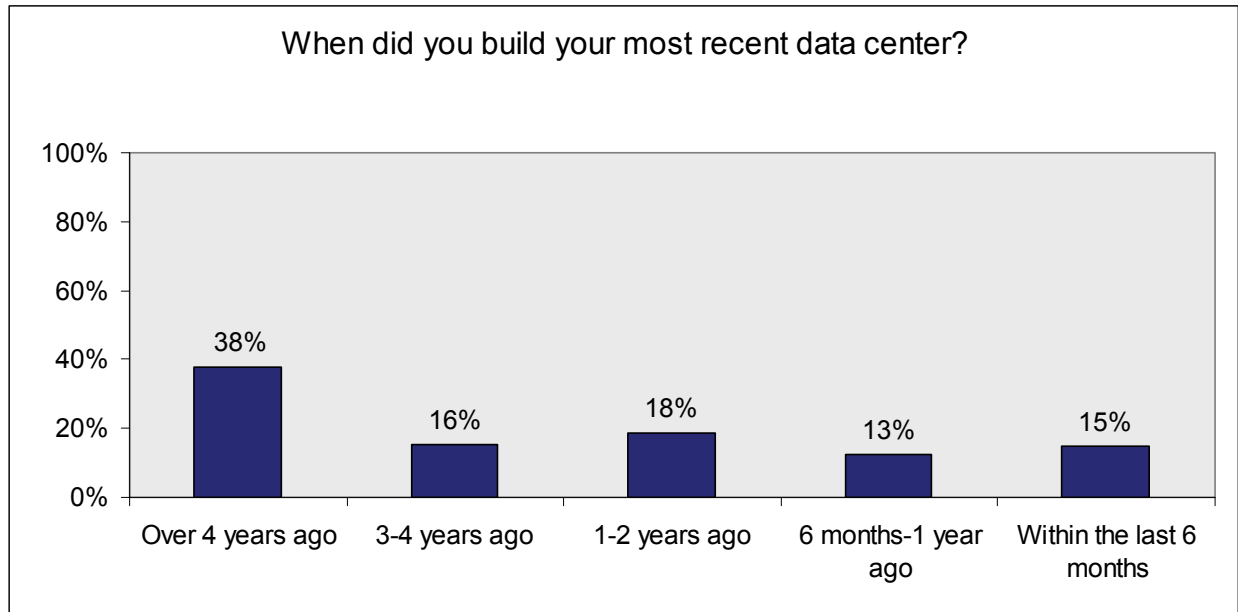


Many organizations have high expectations of their data centers and the survey showed that the majority of data centers are built to provide high availability. The Uptime Institute has created a tiered classification for data centers, which associates the data center configuration and infrastructure with the level of availability it is able to support<sup>1</sup>. Using this system, Tier III was found to be the most common classification of data center in this survey, which typifies companies that have identified a high cost associated with unplanned downtime. A quarter of companies were operating at least one Tier IV data center, the highest level of availability. These organizations understand the vital role that high availability infrastructure plays in winning business and building market share and are typically companies in highly competitive and client-focused sectors with international operations, such as finance or e-commerce.

Despite this focus on a robust infrastructure and high availability, data centers are aging. 37% of the organizations surveyed admitted to the ARI that they built their most recent data center more than four years ago. As our research found that it typically takes two years to complete the build of a new data center, this means that some of the newest data centers in operation were designed up to six years ago. This figure is cause for concern, because most of these data centers will not have been built to the specifications demanded by modern hardware. This presents serious challenges in managing space, power and cooling in the data center, in order to keep the data center functional and serving the business.

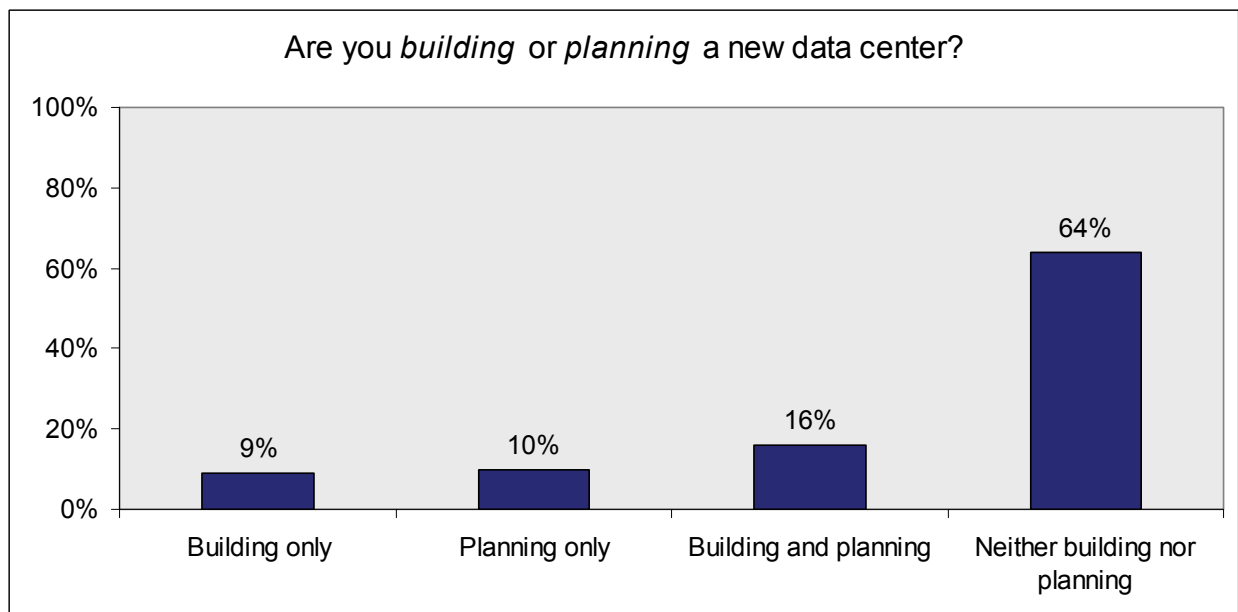
The good news is that organizations are starting to respond to this challenge, and 36% of the companies surveyed are beginning to build and/or plan new data centers. There is a clear recognition of how new data center operations can help the companies scale to meet future demands, as well as presenting a means for the long-term reduction of energy consumption and overall costs.

<sup>1</sup> Tier Classifications Define Site Infrastructure Performance; W. Pitt Turner IV, PE, John H Seader, PE, and Kenneth G Brill; The Uptime Institute, 1996-2006



There are promising signs of investment within the financial sector in particular, which was the largest vertical represented within the 15% of respondents that had built their most recent data center in the past six months.

The research reveals, though, that many organizations will be unprepared for the challenges ahead. 64% of those surveyed are neither planning nor building a data center, which means the data centers at their disposal will be relics, unable to support the latest technology with adequate power and cooling.

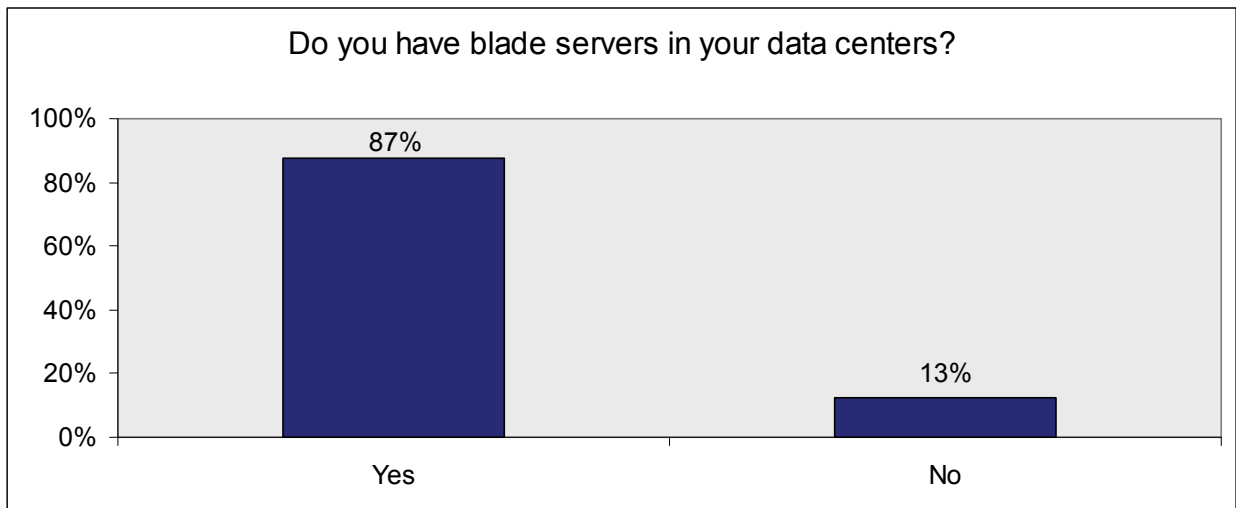


### THE CHALLENGE: HIGH DENSITY EQUIPMENT

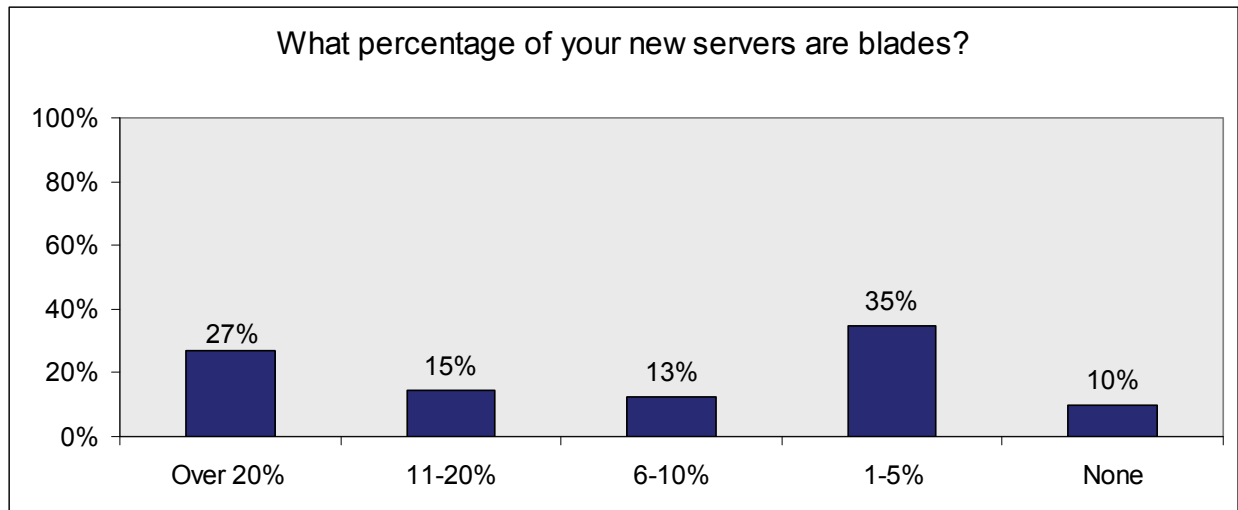
In recent years, blade servers have been increasingly deployed in the data center, a response to the need to squeeze more capacity from existing rack and floor space. With a compact size and easy installation process, blades are an attractive option, but they come at a price.

Although a single blade server may not use more power than a conventional server, a full rack of blade servers consumes much more power than a rack of conventional servers, because more blades fit into a rack. As a result, the demand for power and cooling is far greater when blade servers are widely deployed. Blade servers started to develop a presence in data centers around 2003-2004 and have become prominent in the last couple of years. Data centers over four years old are highly unlikely to have been built with enough power and cooling capacity to support the full potential of blade servers. Where blades are being used in older data centers, there is a significantly greater risk of outage, particularly if power and cooling are poorly managed.

The vast majority of data center managers have already deployed blade servers:



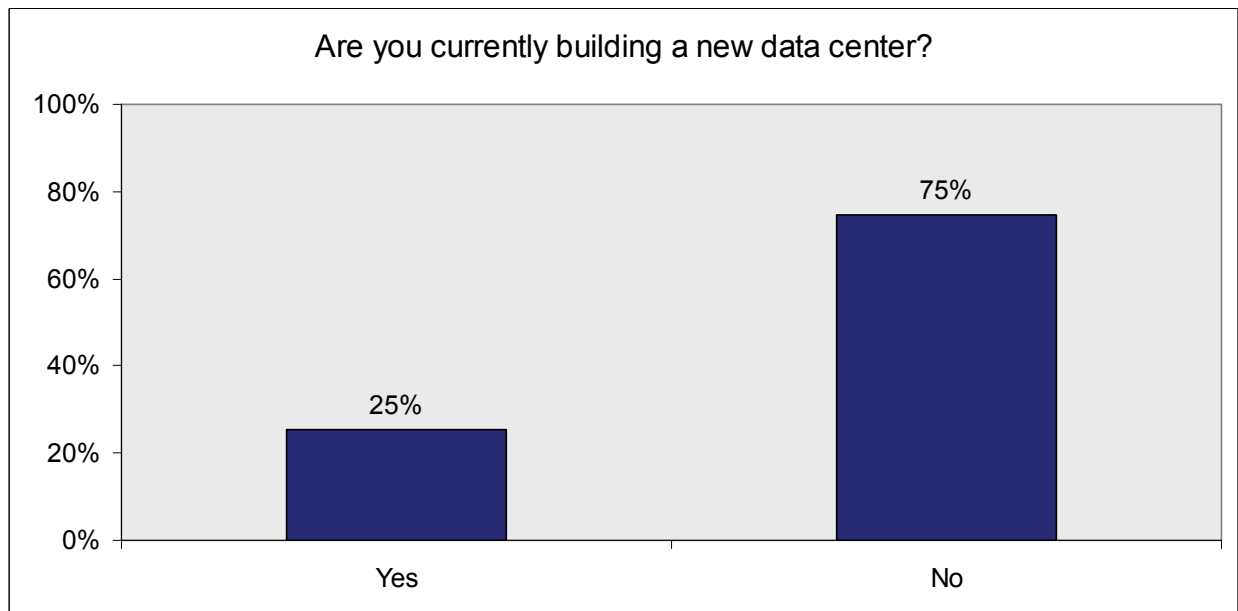
New blade servers continue to be deployed, albeit cautiously. Only 27% of data center managers are using blades for more than a fifth of their new server requirements. The challenges in heating and cooling could be a constraint on the deployment of blade servers, particularly where data centers are more than four years old.



For more information on blade servers and high-density operations, read the previous ARI report [Data Center Professionals Turn to High-Density Computing as Major Boom Continues](#).

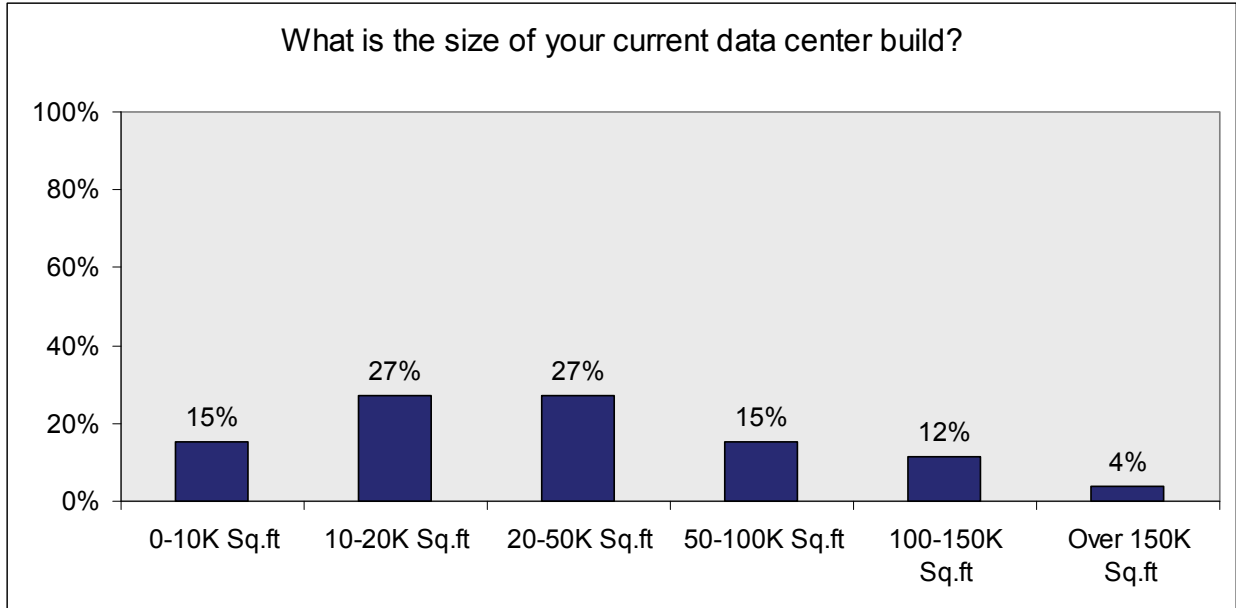
#### DATA CENTERS UNDER CONSTRUCTION

A quarter of the organizations we surveyed are currently building a new data center and there follows a profile of the size, power and tier classifications of these current builds.



It is a cause for concern that 75% of organizations do not have a new data center under construction; even if they are in the planning phase, these companies are a great deal longer than two years away from any planned new build increasing the business's IT capacity.

Of the 25% of companies that are building data centers, 42% are less than 20,000 square feet, 27% are between 20,000 and 50,000 square feet and 31% are between 50,000 and 150,000 square feet plus.

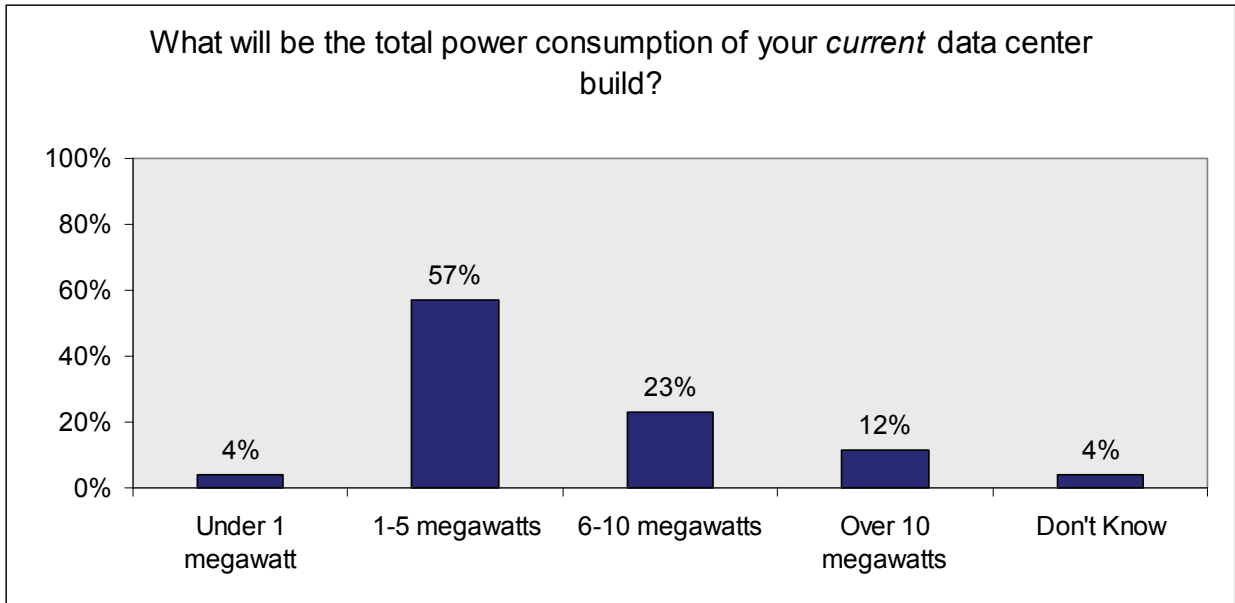


Organizations, particularly those that depend on high density equipment, must be able to plan their power and cooling capacity three years into the future to have confidence they can instigate a new build project in time.

### POWERING THE NEW DATA CENTERS

As many as 23% of new data centers will consume between six and ten megawatts of power, and over half will consume between one and five megawatts. Only when you consider the size of a megawatt, a million watts, or the fact that six megawatts can power 5,000 average homes, does the enormity of this sink in. There's a huge cost involved in operating data centers that consume this much energy. As a rough guide, to power a one-megawatt facility could cost approximately one million dollars every year. Potentially, respondents that are building ten megawatt facilities could face an annual energy bill of ten million dollars.

Since power is often the overriding constraint on the data center and is a significant cost driver, it is worrying that 4% of data center managers did not know the power consumption of the facility they were building.

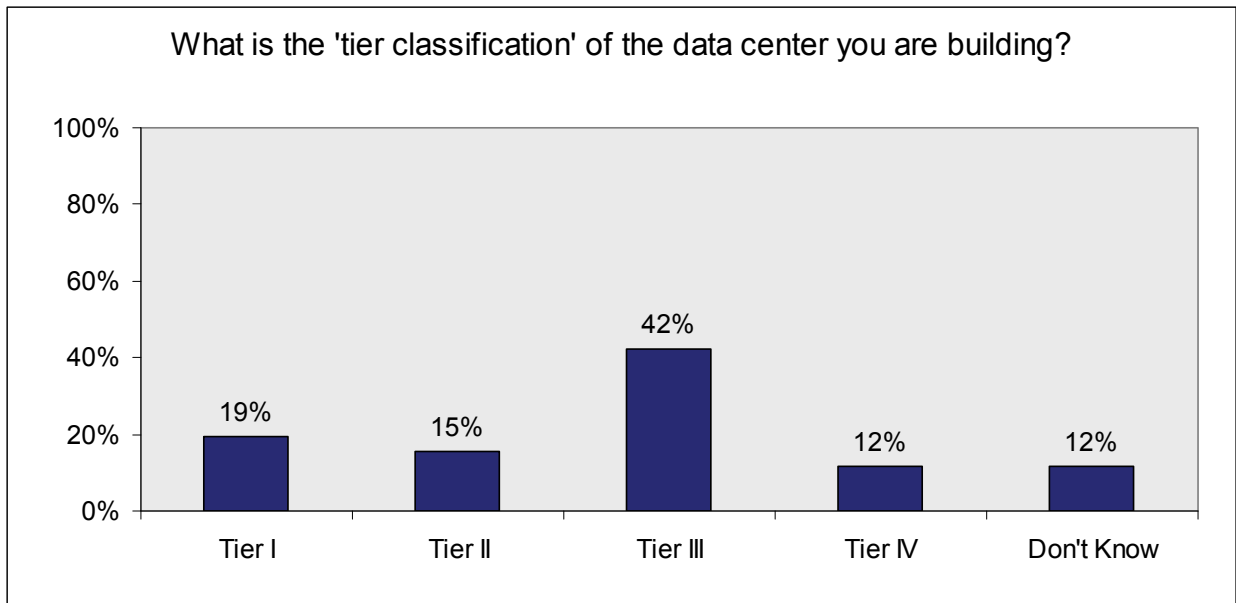


Initiatives from the likes of The Green Grid, the consortium focused on advancing energy efficiency in data centers and business computing ecosystems, are offering companies better tools to help them measure power consumption when rolling out servers in new data centers. For example, as companies address the challenges and cost-saving benefits that can be achieved from new builds, the consortium is helping data center managers to assess whether it is performance per watt or power per rack that should take precedence when it comes to building new data centers.

### TIER CLASSIFICATION

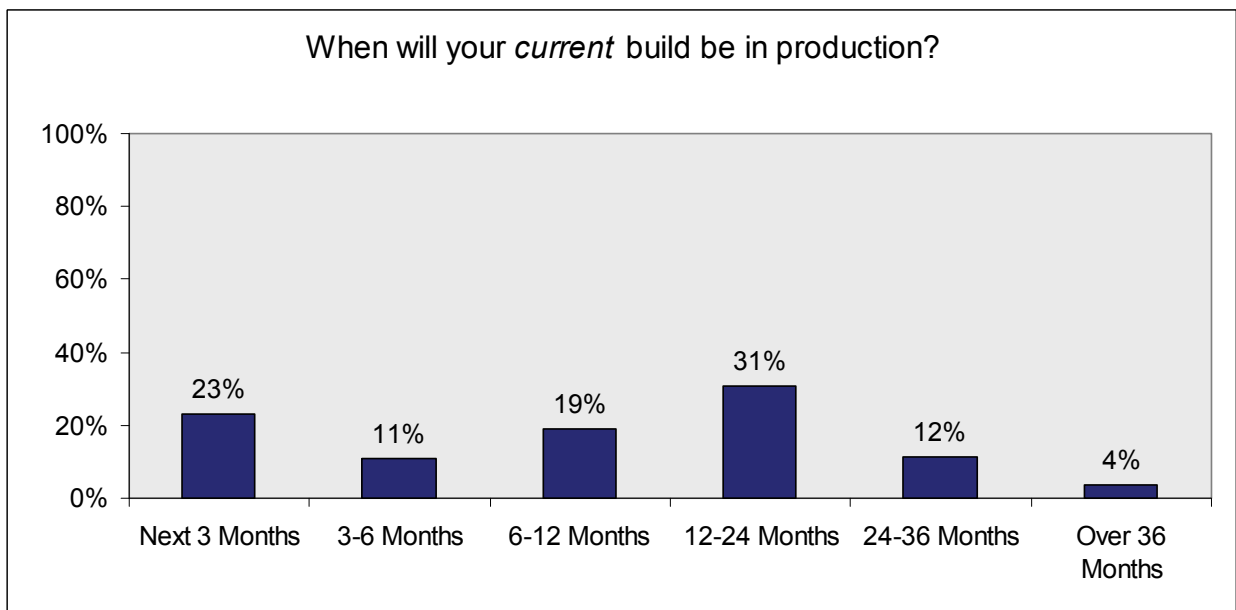
It was surprising, considering the amount of planning required for a new data center build, that more than a tenth (12%) of data center managers did not know the Tier classification of the new center they were building.

Equally unexpected was the number of builds that were Tier I or Tier II. Although each industry, and each business, has unique needs with regards to uptime and availability, Tier I suggests a low availability requirement that is rare in any business today. It is difficult to upgrade a data center by more than one tier level, so it is inadvisable for companies to build low availability infrastructure in the hope they can upgrade later. It is far more responsible to calculate the availability required for current and future business requirements and to design, build and operate the data center to conform to those needs.



Of those that did know their Tier Level, Tier III was the most common classification, which reflects the need for higher availability.

Although work has already begun on these data centers, 31% will take between a year and two years to launch, 12% will take between two and three years and 4% will take over 3 years. These figures illustrate that even once planning has been completed, there is a significant time lag before the data center is ready to serve the business.

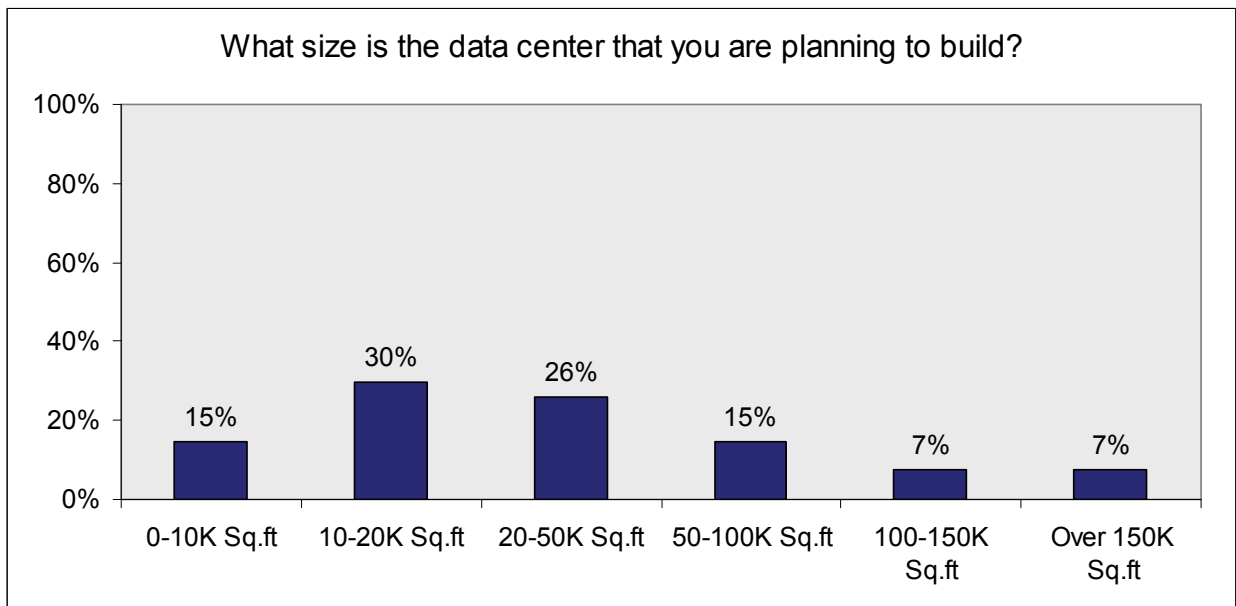


## PLANNING NEW DATA CENTERS

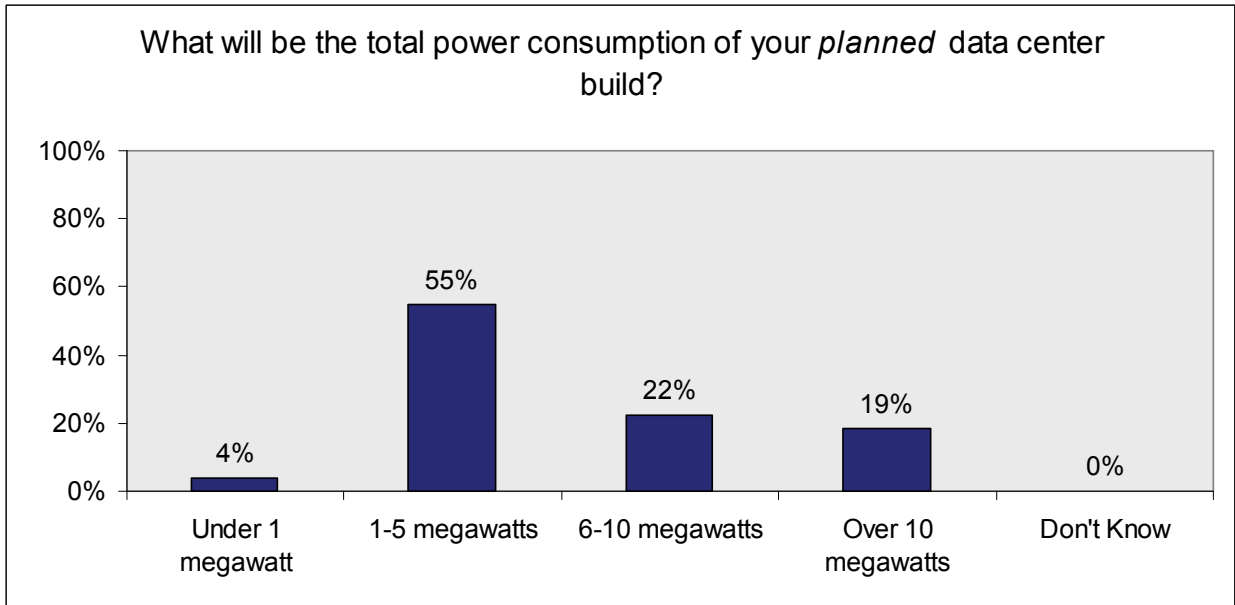
A new data center is a substantial investment in time and money, but with the pressure on existing data centers intensifying, new builds are proving essential for organizations that need a scalable IT infrastructure on which they can rely.

Just over a quarter (26%) of respondents we surveyed are currently planning a new data center and there follows a profile of the size and power classifications of these planned builds.

Of those planning new data centers, almost a third (30%) indicated they were planning to build data centers occupying between 10,000 and 20,000 square feet, a size profile very similar to that of current data center builds. Many inner city companies, particularly visual effects companies and financial institutions, have found themselves 'trapped' by their geographical circumstances. Although it means paying hefty rents on some of the most expensive real estate property in the world, such companies have little choice but to put their trade at the heart of their respective media and financial epicenters. As a result, the data center managers in such companies are under constant pressure to do more in less space. High density equipment is more likely to be deployed for that reason, which increases the power and cooling required.

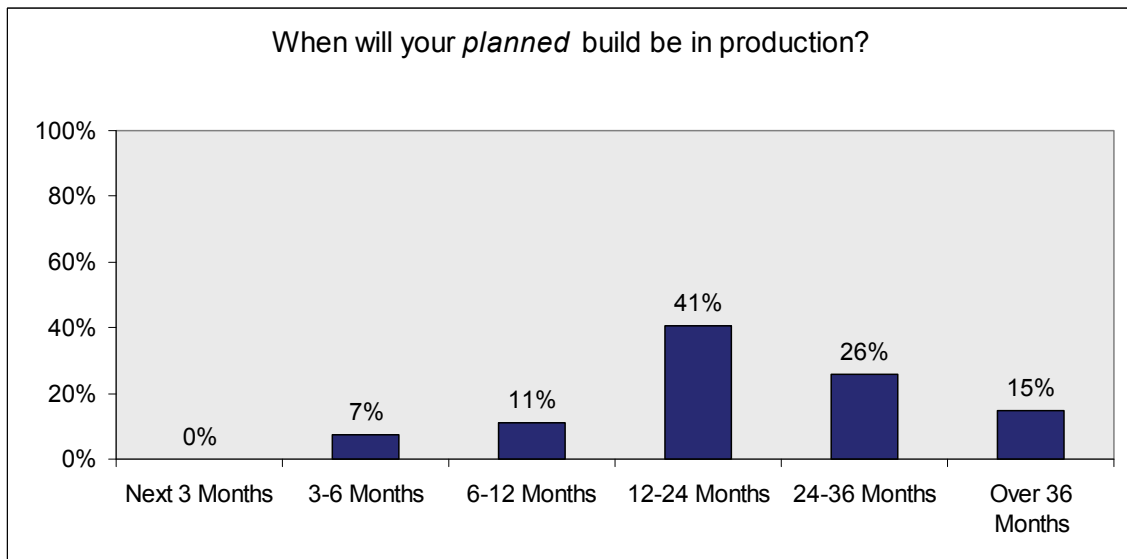


Soaring energy costs, power supply shortages and environmental concerns about energy use have made power and efficiency top priorities in the data center. In recognition of this, all of the managers knew the power consumption of the data centers they were now planning. This compares favorably with the data center managers who are currently building data centers, where 4% did not know the power consumption of the facilities in production. The following results indicate that the forecasted power consumption of both current build and planned build are roughly the same.



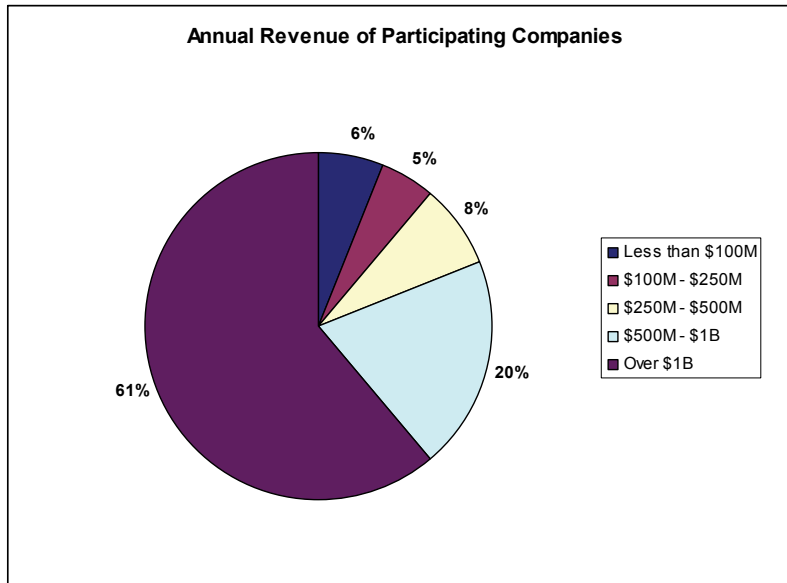
Facilities in the planning stage will take an average of one to two years to go live, with 26% taking between two and three years and a further 15% taking over three years. There have been advances in data center planning tools and an increase in the number of design and engineering firms specializing in data center builds. Combining this with careful selection of green-field sites, land that is undeveloped or agricultural, it is possible that the average data center build time will be reduced. Despite this, we suspect that there will be some who find they run out of capacity before their new build is ready because they are surprised by the long lead-times involved. The limited supply of power or the need for new sub stations will always be a constraint on how quickly new data centers can be built.

The lead time in data center production is one to three years, with one to two years the most common timeframe to reach production. This means that these planned data centers are likely to be years away from deployment, and the 64% who are not yet building or planning will be even further away than that.

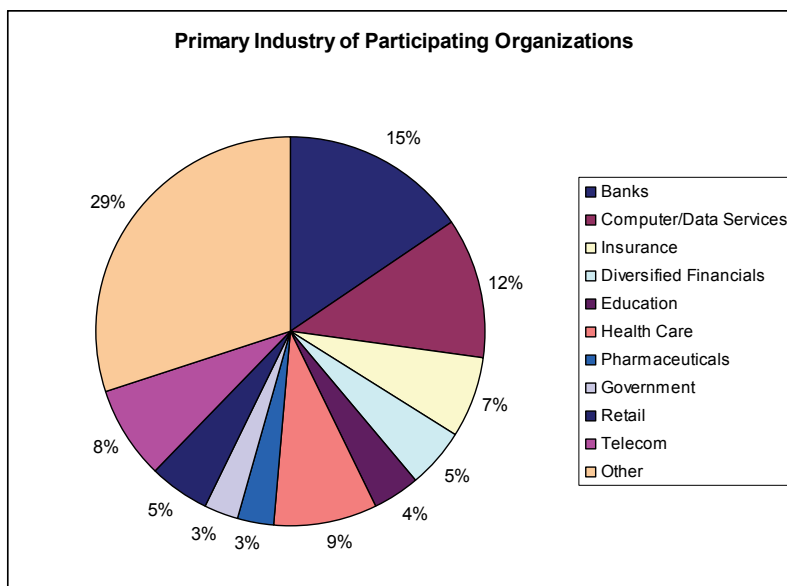


**SURVEY METHODOLOGY**

More than 100 data center professionals and executives from a variety of industries participated in this online survey. Survey participants were solicited from an industry database of Aperture customers and prospects. The charts below illustrate the demographics of companies that took part in the survey.



The chart below shows the cross section of types of businesses that participated in the survey. It includes companies across various vertical industries and ranges from smaller businesses to Fortune 100 companies.



## Conclusions

Data center professionals and the data they manage continue to increase in importance. Over a third of companies surveyed now rely on more than six separate data centers, while more than a quarter operate over 10 data centers.

As organizations increasingly deploy high density devices to meet their capacity demands within limited physical space, the capabilities of the aging data center will become a problem. 38% of organizations are depending on data centers that are at least four years old, and as it typically takes two years to complete the build of a new data center, this means that these data centers were designed up to six years ago, in a pre-high-density era. As their physical infrastructure is designed to legacy specifications, at best they will struggle to support blade servers to their full potential. At worst, the lifecycle of these data centers will be reduced as they become functionally obsolete.

The good news is that organizations are starting to respond to this challenge, and 36% of the companies surveyed are beginning to plan and build new data centers. Conversely, it is a cause for concern that 64% of those surveyed do not have a new data center under construction: even if they were in the planning phase, these organizations would be a great deal longer than two years away from operating any planned new build. For that reason, it is essential that organizations can forecast their capacity requirements three years into the future.

For those who do not wish to deploy a new build, it is essential that they closely monitor their data centers' power and cooling, with particular attention paid to high density devices.

The Aperture Research Institute is dedicated to providing the market with current information and trends on enterprise data centers. The institute plans to publish new research notes on a quarterly basis. To read the latest research findings, visit <http://www.apertureresearchinstitute.org/>.