



Data Centers & The Environment

**The State of Global Environmental
Sustainability in Data Center Design**

December 2018

Today's Data Centers



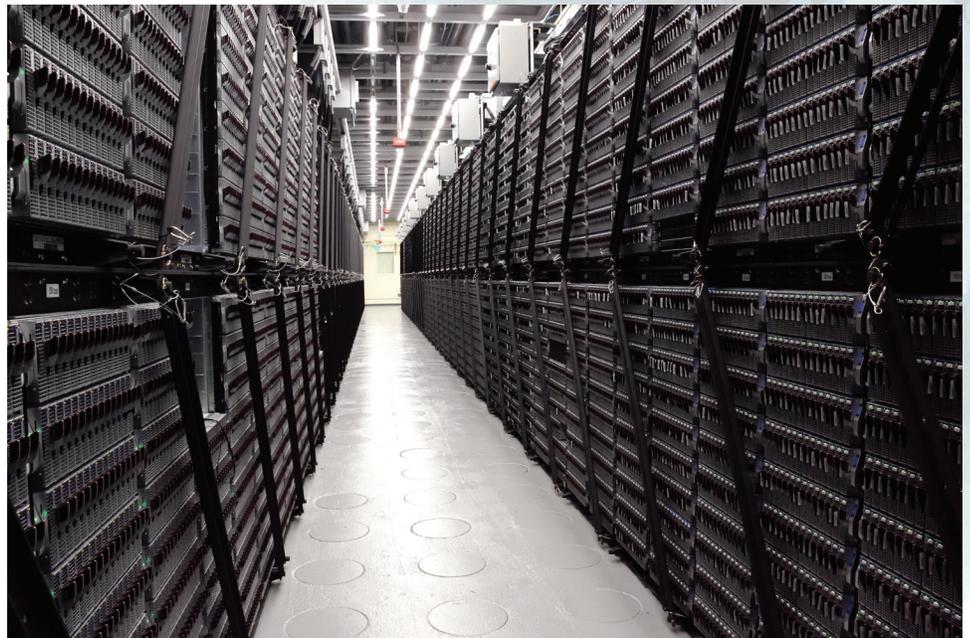
Data centers have a huge impact on the world we live in. Today they account for 3% of the global electricity supply and consume more power than the entire UK¹. Data centers also contribute 2% of the total global greenhouse gas emissions¹. Electronic waste, otherwise known as E-Waste, is another byproduct of data center refresh activity. Per a recent EPA report, E-Waste overall accounts for 2% of solid waste and 70% of toxic waste².



Data center environmental impact can be measured via energy consumption and E-Waste generation.

Total Cost of Ownership (TCO) is a measurement that assesses capital expenses as well as operational expenses. Data centers often use this to gauge the success and effectiveness of their facility design. What TCO misses is the effect that data centers have on the environment, or TCE – the Total Cost to the Environment.

We conducted a survey to understand what businesses are doing to measure and address the environmental impacts of their data centers.



Key Findings



Designing Efficient Data Centers

The results of that survey are discussed in this report. Power efficiency is the first consideration when looking at environmentally conscious data center design. We asked IT Decision Makers (ITDMs) what they looked at when setting their data center design strategy. The respondents ranked energy efficiency as the 4th consideration with only 9% of respondents selecting this as the top criterion. Security (36%), performance (27%) and connectivity (10%) ranked 1st, 2nd, and 3rd respectively.

However, when it came to the execution of the actual data center design, 59% of respondents considered power efficiency as “extremely important” or “important,” outranked by technology considerations in ease of maintenance (74%) and extended product lifecycle (65%).



28% of respondents consider environmental issues in the selection of their data center technology.

Data Center Design Factors

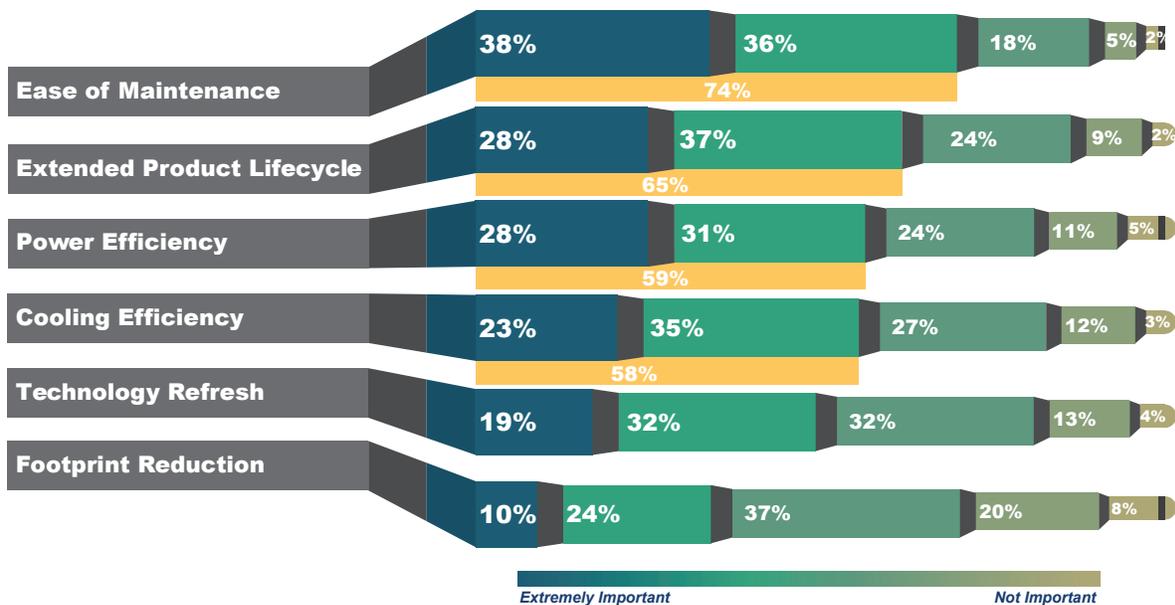


Image 1: Data Center Design Factors

Key Findings



Power Usage Effectiveness (PUE), the ratio of total energy used by a data center facility to the energy delivered to the IT equipment, is becoming one of the most popular metrics used by ITDMs to calculate efficient energy usage. The US Department of Energy indicates that today's average data center PUE is approximately 1.6, but according to IDC over two-thirds of US enterprise data center facilities have a PUE over 2.0³.



The average PUE from respondents was 1.89

Regarding PUE, 58% of the respondents did not know their data center PUE. For those measuring PUE, 22% have an average PUE of 2.0 or higher, and 6% are in the ideal average range between 1.0 and 1.19. When we narrowed down the respondents to those directly managing the day to day activity in the data centers, 50% were unsure of their average PUE.

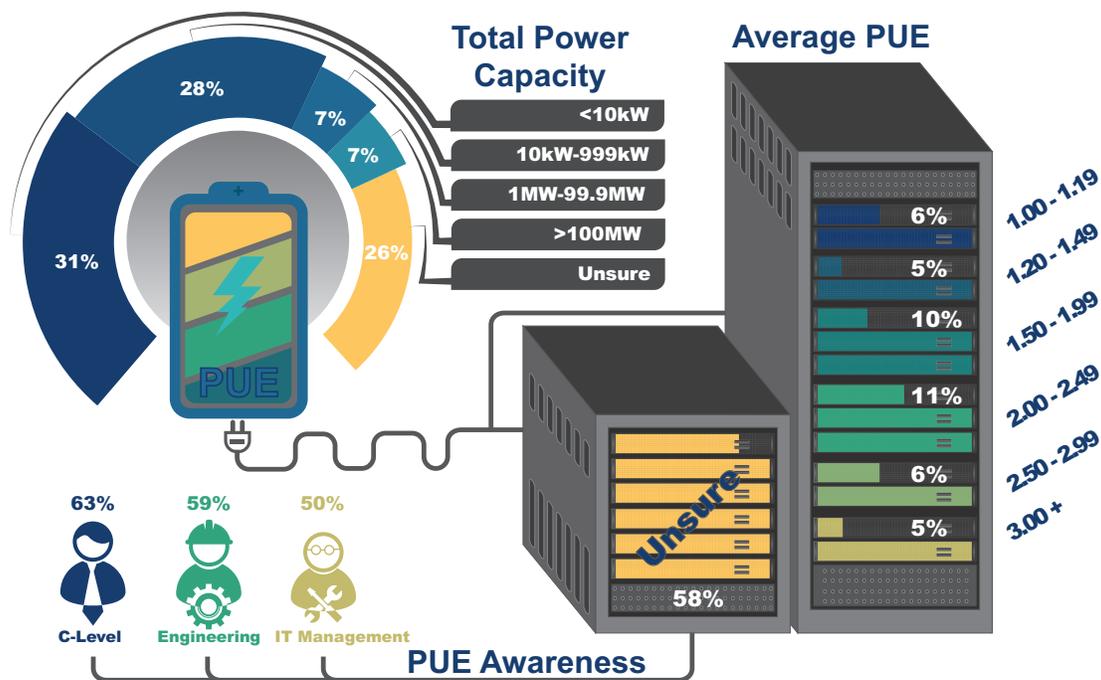


Image 2: Data Center Energy Usage and PUE Measurement

Key Findings



Environmental control is often used as one lever to adjust energy consumption in the data center. One such way this is done is by running the data center at higher temperatures to lessen the strain on HVAC systems and ultimately save on energy consumption and relative costs.

Most ITDMs are running their data center temperature between 21°C and 24°C (43%). Concerns with reliability and performance are the top two reasons they choose not to run the data centers at higher temperatures.

Based on recent server technology advancements, many systems with optimized thermal designs can now run with free-air cooling at ambient temperatures up to 40 degrees Celsius without compromising performance or reliability. Thus, many data centers can improve their PUE and save money by increasing the ambient temperature of their new data centers when deploying these thermal-optimized systems.



Respondents reported a data center ambient temp average of 24.6°C

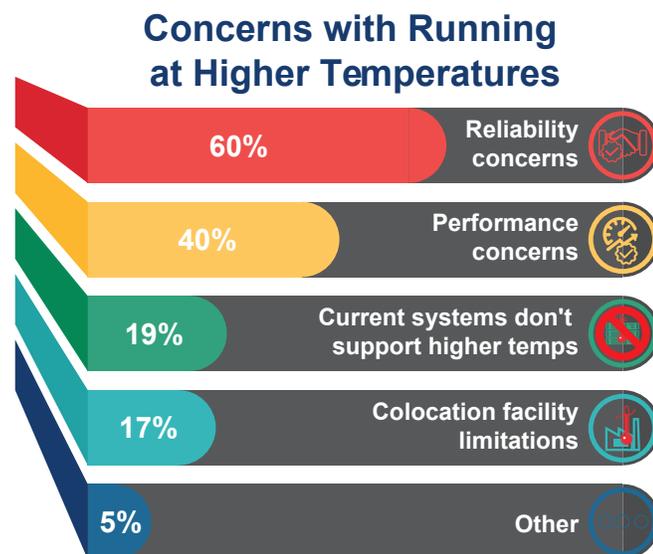
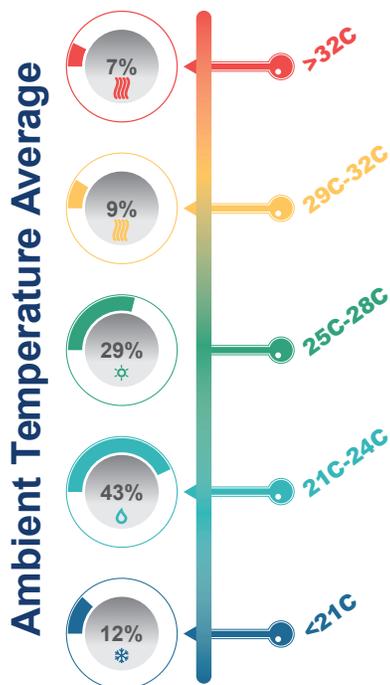


Image 3: Data Center Temperature

Image 4: Data Center Environmental Concerns

Key Findings



Three-quarters of data centers are refreshing their systems in 5 years or less.

Data centers can also control their energy usage by regularly updating their systems to newer technologies with lower power consumption. Improving energy efficiency by lowering power can save companies millions in total energy costs across a data center⁴. The survey showed that on average 47% of data centers are refreshing their systems every 1-3 years and another 28% every 4-5 years. Companies \$1B+ in size were twice as likely to refresh systems every year compared to small businesses.

Refreshing equipment does not always have to be a complete replacement of the server system. Server sub-systems such as compute, memory, fans, power supplies, and chassis, can be refreshed at different rates based on their independent lifecycle. Enabling a modular refresh of sub-systems is another way to reduce not only costs, but also E-Waste. In general, compute and memory module technology improves every 1-2 years, while a well designed power supply can last 10+ years. By disaggregating these modules and enabling refresh at a sub-system level, data centers can reuse longer life cycle elements such as the power supply to enable a reduction in refresh cycle costs as well as E-Waste.

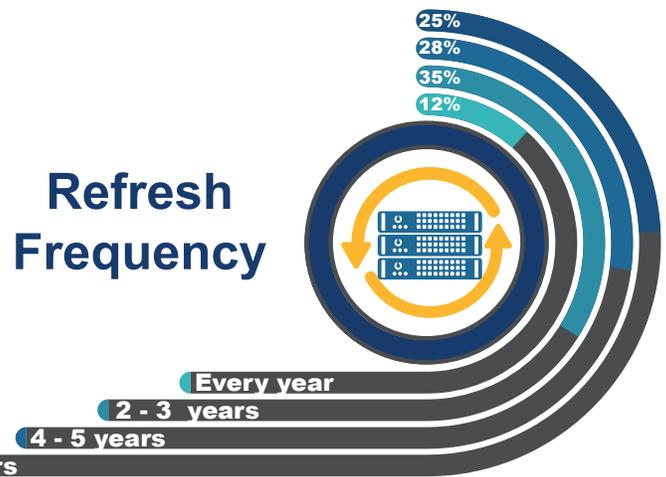
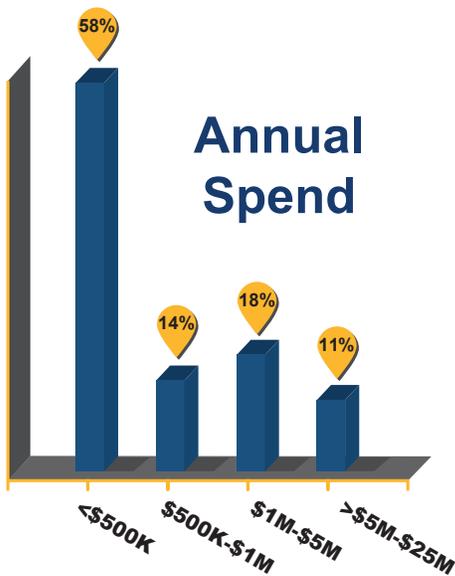


Image 5: Data Center System Refresh

Image 6: Data Center Refresh Frequency

Key Findings



Data Center E-Waste

E-Waste is created when data centers dispose of their server, storage, and networking equipment. An estimated 20 to 50 million metric tonnes of E-Waste is disposed of globally every year depositing heavy metals and other hazardous waste into our landfills². If measures are not taken E-Waste is expected to grow 8% each year².

We asked the survey respondents about the recycling practices employed in their data centers. Many had multiple ways to dispose of E-Waste including partnering with a recycling company, repurposing hardware at their business, or reselling the hardware. 12% do not do any type of systems recycling which directly contributes to the E-Waste problem. Reasons given for not recycling spanned from the process being too time-consuming or costly followed by difficulty finding a proper partner to lack of proper planning for E-Waste management.



Larger companies, \$1B+ in size, were twice as likely to dispose of hardware without recycling than smaller companies.

E-Waste Recycling

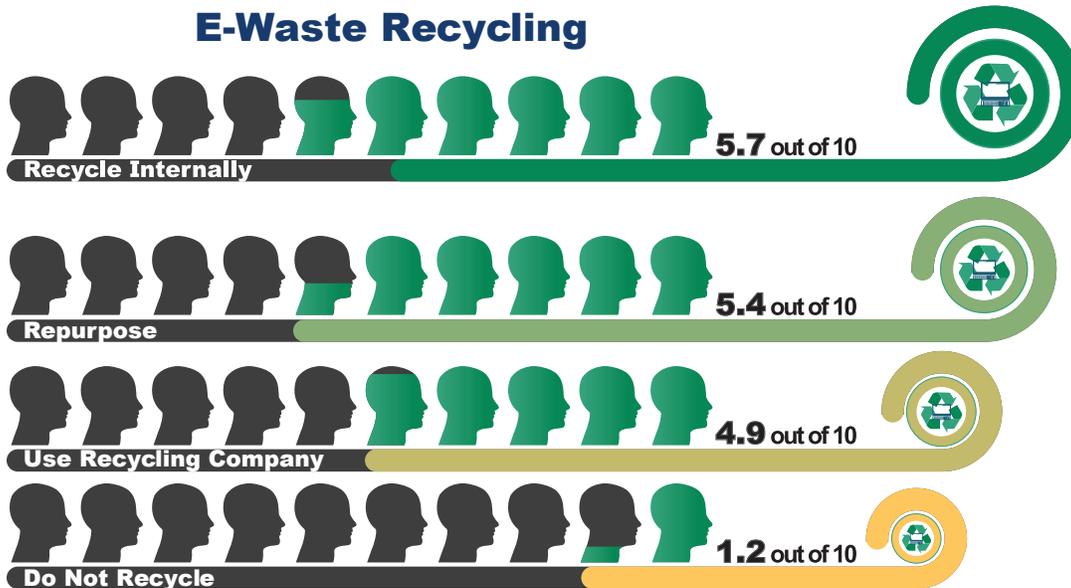


Image 7: Data Center E-Waste Recycling



Corporate Environmental Policies



Larger companies are much more likely to have and follow an official environmental policy.

Businesses are increasingly adopting policies to address environmental issues. The good news is that most companies, 58% according to the survey, already have an environmental policy in place or are developing one today.

There is still more to be done as 43% of the respondent companies don't have an existing environmental policy, amongst which more than half have no intention of developing one in the near future.

Most respondent companies stated they avoid considering environmental issues when implementing data center technologies due to high cost (29%), lack of resources and understanding (27%) and that environmental issues aren't a company priority (14%).

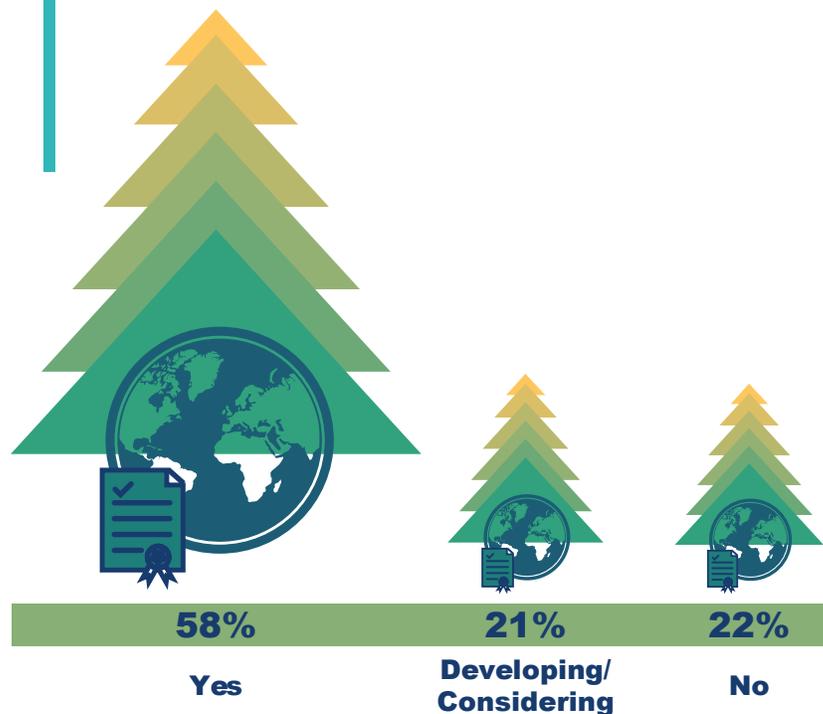


Image 8: Existence of Corporate Environmental Policies

Looking to the Future



Total Cost to the Environment

IT leaders increasingly regard TCO as a measure of operational efficiency for their data centers. However, as shown before in image 2, 50% of the data center management do not know their PUE. On top of that, 12% do not recycle their outdated systems, which adds to the increase in E-Waste when 47% of data centers are refreshing their systems every 1-3 years.

Only 28% of respondents consider environmental issues in the selection of data center technology.

Supermicro challenges them to look more broadly at their strategy and start measuring their data center efficiency with a new metric – the Total Cost to the Environment (TCE).

There are two ways to measure and improve TCE: improved data center power efficiency and a drive towards elimination of E-Waste.

At this year's inaugural Global Climate Action Summit, Supermicro joined 21 innovative companies in the Step Up Declaration, a new alliance dedicated to harnessing the power of the fourth industrial revolution to help reduce greenhouse gas emissions across all economic sectors.

With a focus on innovative technology advancements and data center Total Cost to the Environment (TCE), Supermicro urges industry leaders to incorporate disaggregated Resource-Saving Solutions into their data center plans, with a goal to lower the average data center PUE to 1.30 and reduce their E-Waste by 2025. The health of our environment, our planet, and our citizens may depend on it.

Supermicro Resource-Saving Solutions⁴

MicroBlade™ SuperBlade®



Performance, cost and density optimized, disaggregated Resource-Saving designs

Up to 60% CAPEX Reduction

BigTwin™



Industry's highest performing Twin multi-node system

Up to 50% Power/Cooling Cost Reduction

All-Flash Storage Enclosure

A broad range of versatile JBOF solutions for rapid storage expansion and high availability



Up to 45% Storage Cost Reduction

Supermicro RSD



A rack-scale total solution, empowers companies to build their own agile, efficient, software-defined data centers

56% Space Utilization Improvement

About the Survey



About the Survey

Supermicro commissioned Informa Engage to deploy an environmental data center survey on their behalf via Informa's Electronic Design platform.

Over 1,200 completed surveys were returned where 361 IT Decision Makers (ITDMs) are directly involved in data center selection and management at their organizations.

The analyses in this report are based on those 361 respondents. Of these respondents 42% of them owned and operated their own data center facilities, 33% used a hybrid model, and 25% used data center solution managed solely by a CSP or third-party.

About Supermicro

Supermicro® is a leading global innovator in high-performance, high-efficiency, green computing server and storage systems for datacenter, cloud computing, enterprise IT, Big Data, HPC, embedded, and IoT markets worldwide. Our solutions include complete server, storage, and blade systems, workstations, full racks, networking devices, and server management software, support and services.

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