A GUIDE TO
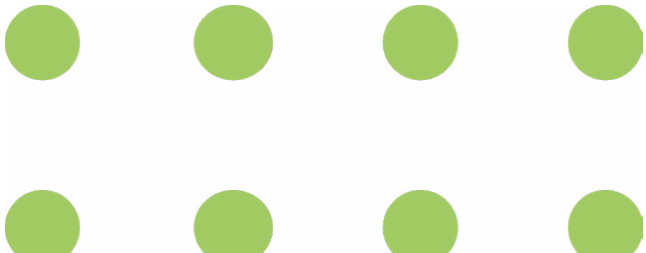# STORAGE SUSTAINABILITY

It is often said that data is an organization's most valuable asset—as such it requires enterprise storage infrastructure. Rising energy costs, increased economic pressures, and growing awareness of global climate change have put executive eyes on the data center.

Achieving sustainability goals can require untangling decades of infrastructure and operations decisions. According to the IBM Institute of Business Value research, 73% of executives have set a net-zero carbon offset goal. Moreover, 86% of companies have a sustainability strategy, but only 35% of companies have taken action toward meeting those goals. Why the disconnect? Sustainable business operations can require unwinding decades of operational processes and infrastructure investments—but doing so can serve as a catalyst for business transformation.

The pressure to examine resource consumption is not just coming from executives, either; two-thirds of consumers say they change their buying behaviors in part due to environmental factors. Consumers are pushing companies to pivot to more sustainable operations, and that includes their data centers. Fortunately, IBM Flash Storage products not only offer greater energy efficiency over industry leading competitors, but also greater storage density.

Read on to discover how these features can make a difference for the environment—and for your organization's bottom line.

73%
of executives have set a net-zero carbon offset goal

2/3
of respondents globally say they change their consumer behaviors in part due to environmental factors

39%
consider sustainability a top priority today, and 53% say it will be a top priority within 3 years

Source: 2022 IBM Institute of Business Value research

What Resources Go Into Your Data Center?

Regardless of whether an organization puts their data in a public cloud, a colocation (Colo) facility or hosts in on-premise, their storage workloads incur environmental and economic costs. Some of these costs may be less obvious, depending on which model is used. For example:
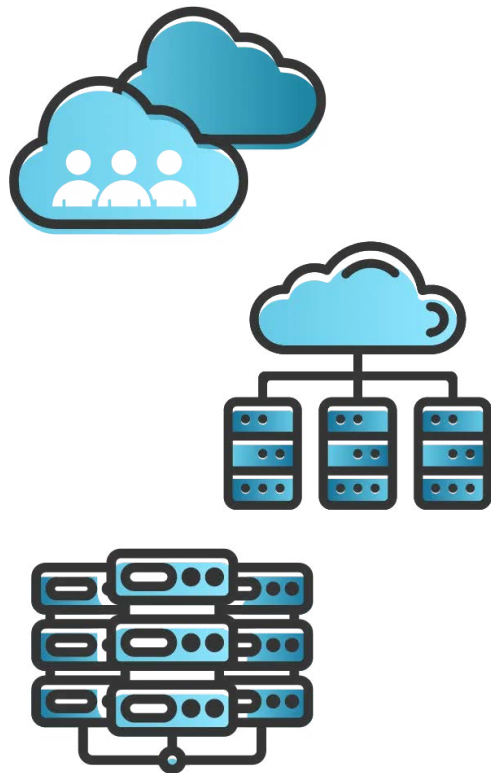
Public cloud providers often break the cost of storage infrastructure into an opaque rate of $X per GB, per month. The costs involved with on-premise data centers can be more nuanced. The physical size of the data center and operating temperature of the hardware devices therein determines how much power (measured in kilowatts per hour or kWh) is required to cool the space.

Colo facilities strike a balance between public cloud and on-premise data centers. Facilities may bill in different ways; some Colo facilities might have flat fees for rack spaces and power feeds, while others may meter costs based on kilowatt hours for power and BTU per hour for cooling.

On-premise data centers require large capital expenditures up front but have the lowest total cost of ownership over the hardware life cycle. IBM Flash Storage devices offer industry-leading lifespans. This adds up when costs are amortized over several years.

Comparing Costs

Staff costs for administration must also be factored in, regardless of which data center model is used.

A final consideration is what happens after storage hardware leaves your data center matters. Are devices recycled, refurbished or sent to a landfill? These considerations might not be reflected in profit and loss reports, but they do impact progress toward carbon-neutral efforts. Environmental and budgetary costs can be difficult to compare at first glance, but they work hand in hand toward reducing data center costs and environmental impact.

Public Cloud
$X per GB/month

Colo Facility
$X per rack space/month, plus costs per kW/H

On-Premise Data Center
Hardware investments, plus costs per kW/H

Energy Consumption Costs
Are Top of Mind

Business leaders may not be able to rattle off the costs per kilowatt hour for the devices in their data centers, but the increasing popularity of Colo facilities has brought the costs of power, rack space and facility cooling for storage infrastructure top of mind. Differing price structures can make it difficult to make quick cost comparisons, however.

Given these apples to oranges cost comparisons, IT leaders are facing increasing pressure to fully document the costs of on-premise and public cloud storage offerings—and resource consumption can correlate closely with overall cost.

Carbon footprint is the ultimate measuring stick of sustainability, but depending on an organization's location and the tools it has available, it can be difficult to measure. Data center energy consumption then becomes a proxy for sustainability. Other metrics such as capacity density also factor in. Denser storage requires a smaller total hardware footprint, which in turn requires smaller data centers that require less energy to cool.

Executives may not have sustainability goals top of mind, but they certainly are thinking of the bottom line. While metrics like capacity density and energy efficiency measure slightly different things, they all equate to less resource consumption and greater cost savings.

Glossary of Storage Sustainability Terms

Carbon footprint

Simply put, carbon footprint equals activity data multiplied by emission factor. Everyone knows about carbon footprint, but depending on your organization's location and the tools you have available, it can be difficult to calculate.
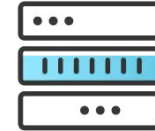
Capacity density

More dense storage requires less power to cool, thereby making it more efficient.

Energy consumption

The greenest energy is the energy you are not using in the first place, which is why overall energy consumption for both devices and facility cooling should be top of mind.

Energy efficiency

How much energy does your storage device demand to achieve the terabytes and performance that your workload requires? Energy efficiency essentially tracks how much power each device draws.

Storage Sustainability Metrics

Energy consumption
Kilowatt hours (kWH)

Capacity
Terabyte per watt (TB/W)

Density
Watts per unit (W/U

Performance
Input/output operations per second, per watt (IOPS/W)

Environment
Operation temperature and cooling needs

Sustainability as a Springboard for Business Transformation

As the C-suite takes action toward their organizations' sustainability goals, pressure is mounting to document resource savings. This is especially true when planning for a new data center or a data center consolidation project. These efforts are not just busy work, however; they can be a springboard for business transformation. Consolidation efforts can force organizations to look at modernizing and creating cost savings in their storage infrastructure. But a renewed focus on resource consumption adds another layer of motivation for businesses—and in many situations that is just as important as hard cost savings.

Hardware upgrades can force organizations to take a closer look at what data they are storing, and what the performance needs of that workload truly are. Sustainable storage hardware may require a greater cash outlay at the outset, but infrastructure investment shows significant ROI over a 48-month period. And for many organizations, properly documenting the reduction in resource consumption is just as important as the cost savings.

IBM FlashCore Modules:
Key to a Sustainable Storage Strategy

Less resource consumption and a reduced hardware footprint creates a more sustainable storage option. And the proprietary technology in IBM FlashCore Modules enables capacity density and energy efficiency in a way that is impossible with commodity flash storage devices. The FlashCore Modules employ the NVMe protocol and high-speed NAND memory to provide high throughput and IOPS with predictable latency.

Because of innovative hardware compression on the card, IBM FlashCore Modules can deliver industry-leading performance while using quad-level cell (QLC) memory—the lowest-cost memory available—for mission-critical, tier zero workloads. This shift to computational storage enables greater storage capacity density.

Capacity ratio also matters when crafting a sustainable storage strategy. Requiring fewer storage devices reduces your data center's energy consumption in a more impactful way than energy efficient devices can accomplish on their own. Moreover, more dense storage occupies less rack space and requires less power for cooling.

IBM can deliver one Petabyte of effective storage capacity in one rack unit of space while only consuming one kW of power, i.e., a 1:1:1 ratio. IBM competitors cannot come close to that level of sustainability—all in the size of a pizza box.

IBM FlashCore Modules are also more sustainable over the lifespan of the product. As you apply the same voltage to the same gates over time, the transistor gates start to wear—and the drives themselves must be replaced. This produces a tremendous amount of product waste over the six-plus year lifespan of a device.

Conversely, IBM FlashCore Module drives have variable voltage technology on the transistor gates. As the device gets older, the threshold to turn a gate on a transistor changes, allowing devices to last up to 6x longer than competitive storage hardware. When devices do reach the end of their lifespan, they are repurposed and recycled. By weight, less of 2% of IBM devices end up in landfills.

A sustainable storage strategy requires examining the resource consumption and costs of hardware over the lifespan of the device. With innovative technology to enable industry-leading capacity density and energy efficiency, IBM FlashCore Modules can be the critical piece to helping your business reach its sustainability goals today and for years to come.

Modern Tape Is Pivotal to Sustainable Storage Strategies

Whether you are looking at core production storage or examining long-term archive options, sustainable choices can make a difference in the total power consumption of your data center. While most clients no longer use tape for traditional backup, implementing modern tape for long-term archive is a highly cost-effective and efficient way to manage large volumes of data.

Physical tape does not consume power when it is storing data in an archive library, and only consumes minimal power to periodically read and validate the data and/or restore the data. IBM software plus physical tape provides a seamless experience for end users without some of the traditional headaches associated with tape—all at a very low power consumption rate and one-tenth the cost of public cloud archive storage.
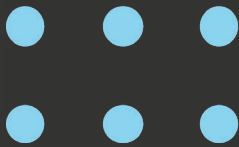
# Case Study: Consolidation Yields Operational Efficiency

Time and time again, organizations have taken advantage of consolidation projects to springboard sustainability efforts. For example, a large consumer packaged goods manufacturer undertook a storage consolidation project that brought that company's server footprint from 14 racks in one data center to just 20 rack units, which are a portion of a rack, spread across two data centers.

This consolidation project means that the business requires less power to cool its data centers, has more flexibility when relocating other hardware and consumes less power overall. All of this is a significant improvement for their operational efficiency and sustainability efforts. This is just one of a many similar examples of how IBM Flash Storage enables consolidations and savings.
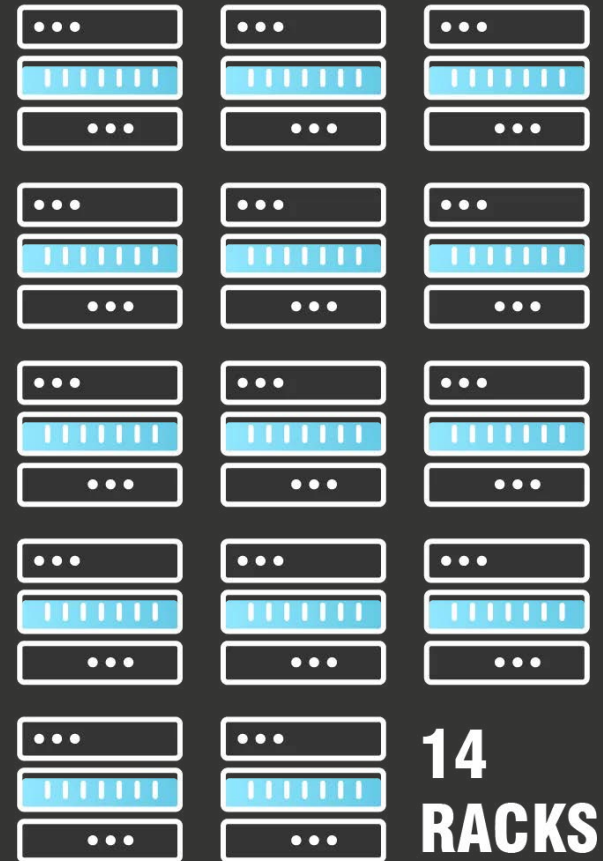
LESS THAN HALF OF ONE RACK

14 RACKS
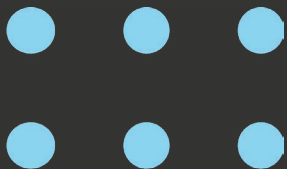
Sustainability Is a Business Imperative

If your business is one of the 35% of organizations that have taken steps toward achieving their sustainability goals or is still considering its next steps for environmental and carbon-neutral goals, taking a closer look at your data center is critical. Implementing a sustainable storage strategy doesn't just benefit the environment; it can also have a positive impact on budgets and operational efficiency.
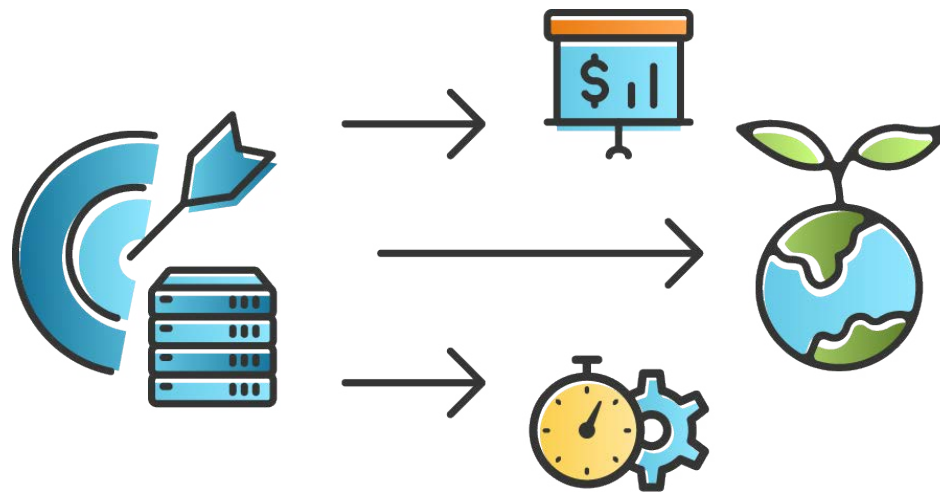
Focusing on sustainability forces organizations to have better visibility into their data center operations. Until you sit down and do the math, you do not understand the impact that small choices can have on your data center energy consumption. If your data storage is denser and more energy efficient, it will take up less rack space and consume less power. Cost savings may be a strong motivation, but with IBM, the storage sustainability story is equally as compelling.

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Evolving Solutions can help your organization accelerate transformation or put your sustainability strategy in motion.