ECONOMIC WHITE PAPER

Greener Data Centers with Sustainable FlashStack Software-defined Hybrid-cloud Infrastructure

Reducing the Environmental Impact of Data Growth with FlashStack

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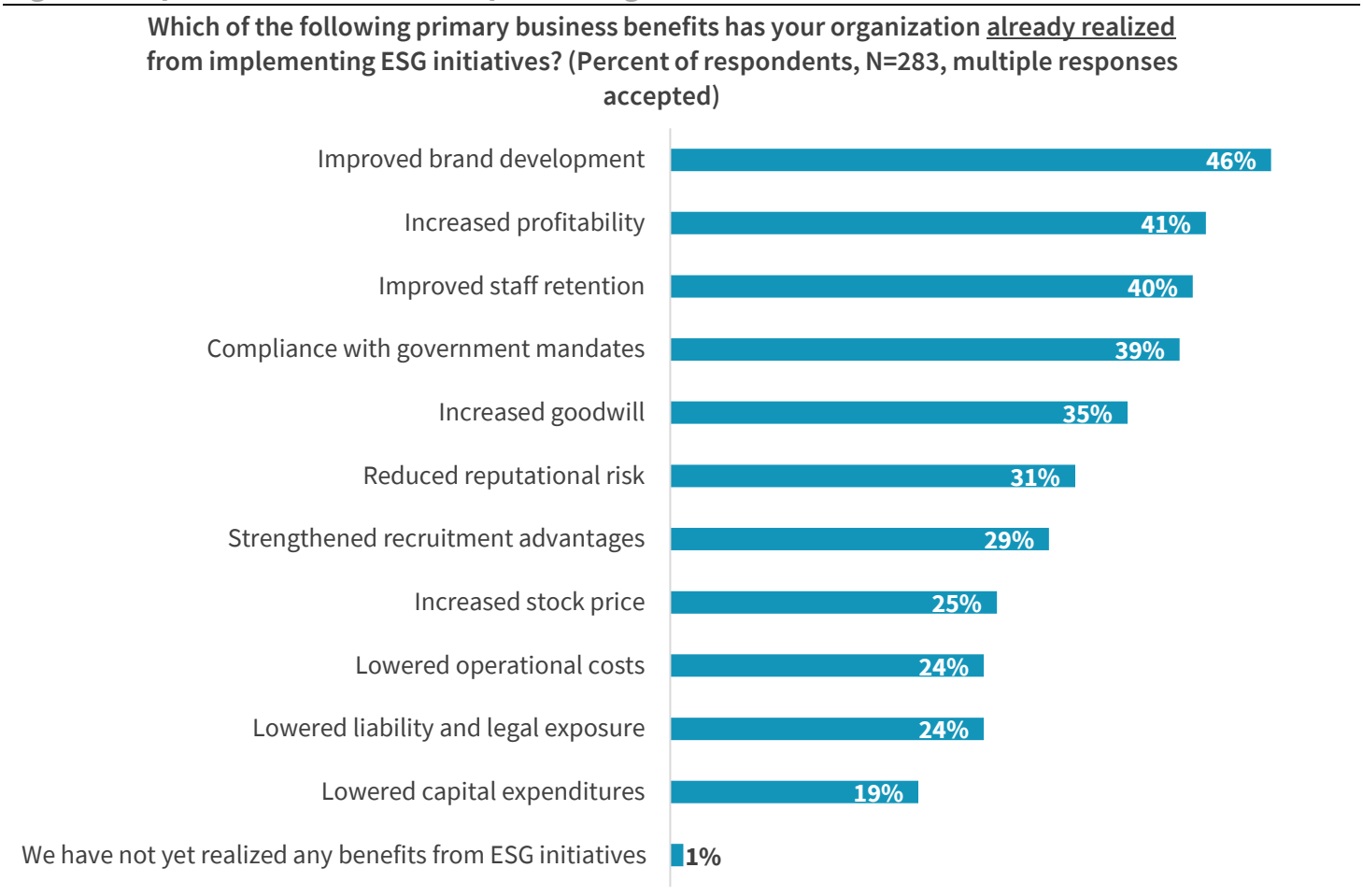
Sustainability Challenges

Environmental, social, and governance (ESG) awareness and responsibility are major challenges faced by humanity today. It is a broad and complex matter for companies to embrace, but one that will bring positive transformation for both society and businesses if we are all genuinely committed to the essence of ESG mandates. These mandates are more than just personal commitments; they are also becoming major strategic imperatives for organizations. Organizations' investors, customers, and partners want to ensure that the technologies, services, and suppliers they support take sustainability issues seriously and are aligned with their own sustainability initiatives.

According to research from TechTarget's Enterprise Strategy Group, improved brand development (46%) and increased profitability (41%) were the most common benefits early ESG adopters have realized to date (see Figure 1). Four in ten respondents cited improved staff retention (40%), followed by compliance with government mandates (39%), increased goodwill (35%), and reduced reputational risk.[1]

Figure 1. Top Business Benefits of Implementing ESG initiatives



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Today's accelerated data growth has negatively impacted our environment since data centers need to consume high levels of energy and water, contributing to the global total greenhouse gas emissions. Data centers also produce e-waste when they dispose of storage, servers, and networking equipment in landfills, polluting the environment with heavy metals and other hazardous waste.

[1] Source: Enterprise Strategy Group Research Report, *The Role of ESG Programs in IT Decision Making*, September 2022.

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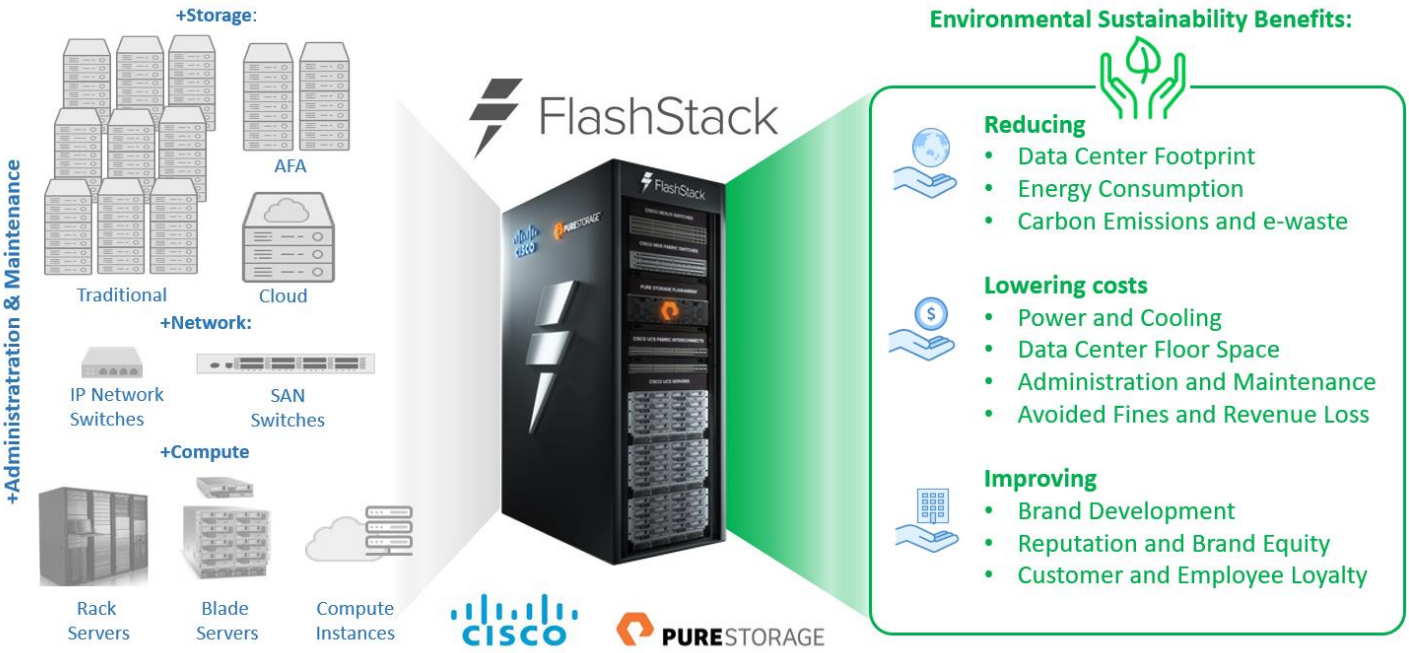
Many organizations struggle with the amount of space needed in their data centers, the power and cooling consumed, and the e-waste they produce. The burden falls on organizations and IT departments to find ways to mitigate possible reputational and business risks in the face of growing pressure for more sustainable practices. Companies must partner with a vendor that can ensure a successful ESG strategy for their organization, help offload the burden to their IT team, and be better for the environment.

FlashStack by Pure and Cisco

FlashStack is a software-defined hybrid-cloud infrastructure solution and holistic alternative to status quo converged and hyper-converged infrastructure offerings. The FlashStack solution is a validated, full stack infrastructure developed jointly by Cisco and Pure Storage for the most popular and demanding workloads. The solution offers sustainable predesigned data center architectures that incorporate computing, storage, and network design best practices to reduce IT risk by validating the architecture and helping ensure compatibility among the components, as shown in Figure 2.

Figure 2. FlashStack Single Integrated Modern Solution



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

FlashStack delivers a software-defined solution that can also be consumed as a service, featuring these benefits:

- Modern infrastructure designs from Cisco and Pure Storage that are well-aligned to current and future sustainability initiatives.
- A single interface that manages storage, compute, and network layers.
- Real-time consumption monitoring and management.
- Industry-leading storage data reduction and global flash management.
- Tier 1 resiliency with zero performance loss.
- Built-in disaster recovery and protection and support for Cisco's leading cybersecurity suite.

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FlashStack Hybrid-cloud Architecture Provides Environmental Sustainability

Our society and industries are using more natural resources than our planet can regenerate and are polluting at an increasingly alarming rate, putting pressure on inefficient data centers to focus on sustainability initiatives. The obvious and immediate first step in sustainability solutions for company leaders and IT teams is to reduce data center footprint. Consolidating inefficient storage arrays, network, and compute technologies into smaller, more powerful, and energy-efficient solutions is a logical first step in reducing the carbon footprint of data centers, but there is more to consider when planning for sustainability. Cisco and Pure understand the impact technology infrastructure has on our environment and the importance of leading by example to do what is environmentally correct.

A Sustainable Vision for Your Company

Alignment with a company's corporate environmental vision and commitment is often overlooked when investing in a new IT solution that reduces its data center footprint. It goes beyond finding the most efficient solution for the moment to understanding that the technology companies that organizations partner with are committed to ensuring that efficiency and the environmental impact of its products and services are always top of mind.

With FlashStack, customers can be assured that they are making the right choice. Cisco and Pure have both been publicly recognized for their environmental commitment[2] to lowering the impact of their products, services, and supply chains. Pure Storage is committed to building high efficiencies in all areas of its design and is free to innovate without the same restrictions and compromises that are faced by alternative vendors built on inefficient legacy platforms.

Efficient Technologies Today

A large benefit of FlashStack's design is the ability to consolidate workloads running on aging and inefficient hardware and significantly reduce the data center footprint through denser designs and proven data reduction technologies. FlashStack storage modular design principles and DirectFlash technology offer flexibility and ultra-high density and efficiency from flash, compared to other technologies.

Enterprise Strategy Group has previously validated the significantly improved levels of data reduction of up to 10:1 provided through FlashStack's always-on data reduction technologies when compared to alternative storage solutions.[3] On the server and compute side, Cisco's UCS X-Series, with its midplane-less design and simpler physical connections, is a truly modular system that allows customers to easily add or change nodes or modules as needed without having to make changes to the architecture. Enterprise Strategy Group also validated a 2 to 1 reduction in the number of X-Series server blades required to run the same workload, compared to older generation servers and blades. A customer shared with us during an interview that each X-Series blade could run twice as many instances as they were running per blade on the previous generation servers.

> **"FlashStack helped us create efficiencies that will help us conserve energy and prevent unnecessary costs."**

Adaptable and Future-ready

Purchasing flexible and future-ready technology is essential for organizations when they plan to reduce their data center footprints. This is the kind of technology that keeps organizations' infrastructure always modern without disruptive or costly forklift upgrades. While older architectures are designed in a repeatable manner with the next few years in mind,

[2] For more information, refer to Pure Storage's 2021 ESG Report: Technology & Sustainability and Cisco's Environmental Sustainability page.
[3] Source: Enterprise Strategy Group Economic Validation, *Validating the Economics of Improved Storage Efficiency with Pure Storage*, September 2019.

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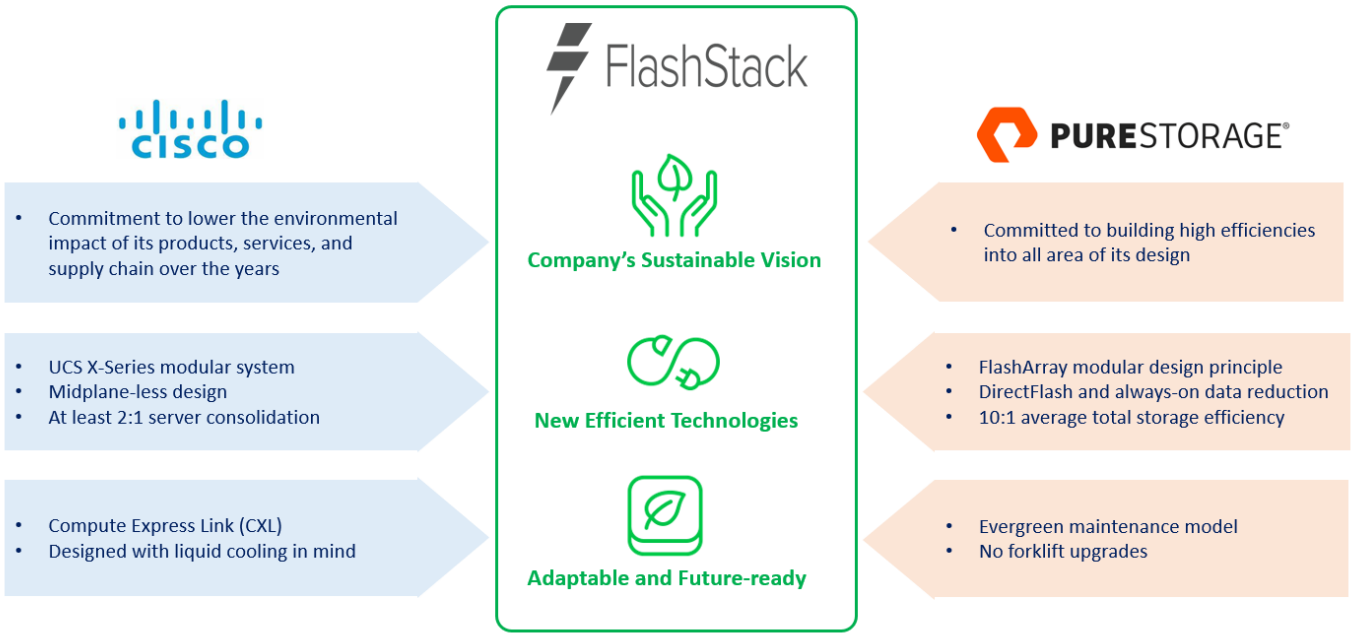
Cisco and Pure have redesigned FlashStack from the ground up, with a focus on achieving long-term sustainability. This means lower power consumption and a longer expected lifespan for hardware components.

Customers mentioned that, with FlashStack's Evergreen storage plans, they could take advantage of the latest improvements in hardware technology over time without having to research, plan, or purchase new storage arrays. As new arrays were developed, these customers simply upgraded in place with no disruption in service, providing improved performance and scalability for their workloads. Adding to this, Cisco UCS X-Series' reduced complexity and adaptability to future technologies, such as liquid-cooling, low-wattage CPUs, and new interconnect technologies, make FlashStack a great choice when considering a solution that will offer performance, adaptability, and efficiency, along with a reduced data center footprint.

Figure 3. Total Data Center Environment Data Efficiency with FlashStack



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Organizations' Choice of Hybrid-cloud Infrastructure Is Critical to their Environmental Sustainability Initiatives in the Future

IT solution vendors and providers must take responsibility for the environmental impact and consequences of their design choices and consumption models. Modern companies that plan to survive for the long term must look beyond the current "take-make-dispose" model of the planet's limited natural resources. The linear model many companies have been following for decades has proven to be problematic and irresponsible. We have seen the devastating consequences of climate change manifesting in natural disasters such as fires, hurricanes, and floods. A logical alternative to this model is the closed-loop system, also known as a circular economy model. This is an economic model where no waste is generated: after use, everything is ideally repaired, reused, or recycled. Sustainability-conscious companies must strive to adopt this closed-loop model to build long-term prosperity that benefits everybody involved.

FlashStack's holistic approach begins with how they design, build, and deliver products; value their assets; and turn them into new products. The following sections describe the concepts of a circular economy model and how Cisco and Pure implement them with FlashStack.

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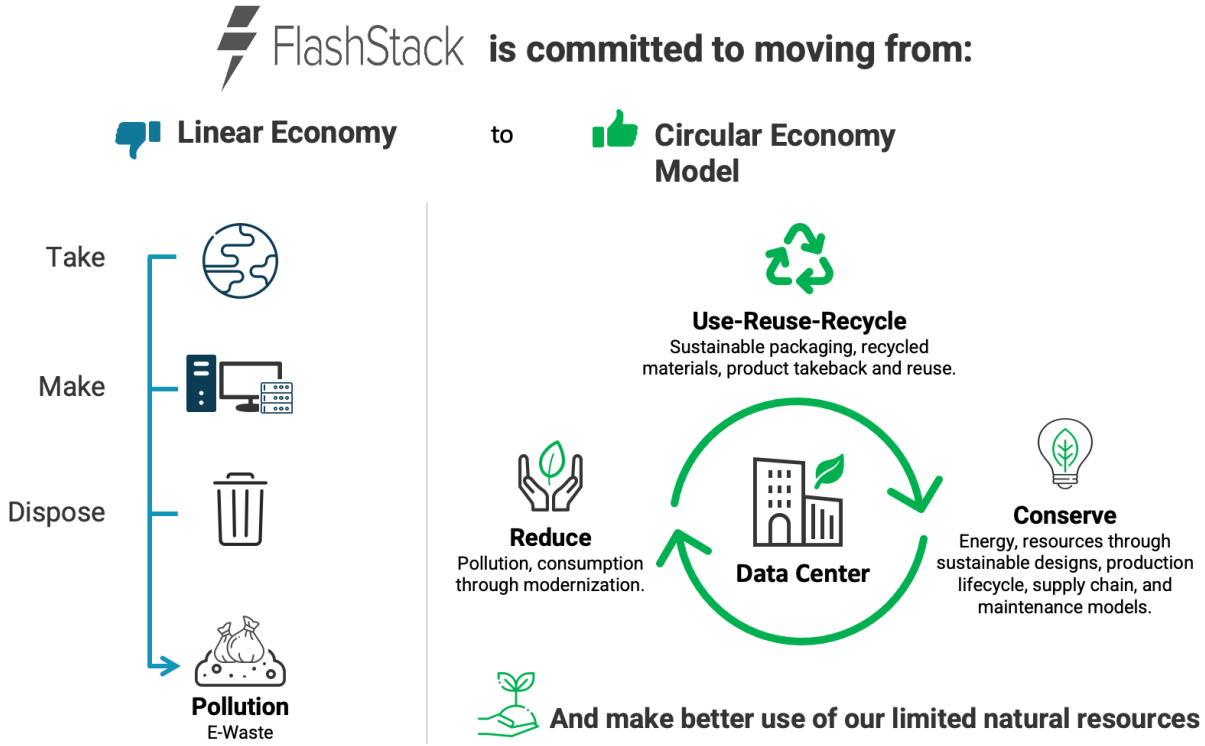
Figure 4. FlashStack Environmental Sustainability Initiatives and Commitments



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Reduce Energy Consumption and Pollution

Reducing energy consumption and associated pollution is the first concept of the circular economy. It calls us to rethink the way our actions impact the environment. Pure and Cisco are committed to meeting net zero emissions by 2040, with a goal of possibly reaching them as early as 2025. A modernized FlashStack deployment aims to reduce pollution and consumption of resources with:

- A modular design and flexible consumption model that reduce unnecessary resource consumption over a longer product lifespan.
- Pure Storage built-for-flash software combined with DirectFlash, which, when combined with industry-leading always-on data reduction technology, dramatically reduces storage footprint and the power and cooling required, compared with legacy SSD-based designs.
- UCS X-Series technology, which is designed to optimize power and cooling efficiency. X-Series provides an 11 percent improvement in performance related to power and cooling, based on the Server Efficiency Rating Tool (SERT) benchmark results. The efficient 7U X-Series design maximizes rack real estate and offers maximum power and cooling flexibility compared with smaller standard x86 designs. An efficient power delivery system minimizes the many internal power conversions that result in excess heat and power loss. All Cisco UCS product families are ENERGY STAR certified and use efficient components like high-efficiency, Titanium-rated power supplies.
- Usage-aware tools that help to optimize energy efficiency and reduce power and cooling consumption and costs.

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Conserve Materials and Maximize Useful Lifetime of Components

FlashStack benefits from a conscious commitment to hardware design practices from Cisco and Pure aimed at conserving both energy and resources through sustainable designs, product lifecycle efficiencies, and supply chain accountability.

- Pure Storage Evergreen subscriptions maximize the usable lifetime of infrastructure components and ensure that customers always benefit from the latest hardware innovations without the need for forklift upgrades that result in unnecessary waste.
- The X-Series architecture is designed to offer maximum component element life with stateless infrastructure and design elements aimed at minimizing the number of required systems, cables, network and storage ports, adapters, etc. Cisco minimizes elements within the overall system architecture that consume power, generate heat, add cost, and require additional management points. Disaggregating the x86 node design extends the useful life of server elements by changing or updating only those that are required instead of the whole chassis.
- Pure and Cisco are committed to employing procedures and policies that best comply with mandated technology product-related laws and regulations aimed at conserving energy and resources.
- Pure and Cisco are committed to working with their technology partners to help minimize the negative environmental impacts of their supply chain.

Use-Reuse-Recycle to Minimize e-waste

E-waste is generated when technology products are upgraded or replaced, have reached end-of-life and require disposal, or when packaged in excessive or single-use packaging. By making conscious choices in packaging, product design, and component lifecycles, organizations can minimize e-waste. FlashStack aligns with the use-reuse-recycle concept of the circular model through:

- Sustainable packaging, offering multiple options to reduce packaging in larger volume orders.
- Replacing many of the single-use plastic components, such as bezels, with easily recyclable metal designs.
- Product takeback and reuse initiatives with free removal and transport of equipment at customers' end of use. Pure and Cisco reuse and recycle 99.9% of what is returned to them. Certified remanufactured products are available through Cisco Refresh, and Pure Storage is committed to the fact that upgraded or retired hardware never ends up in a landfill.

A Solid Environmental Sustainability Strategy Powered by FlashStack also Provides Tangible Benefits to the Business

A genuine commitment to lowering the environmental impact of organizations' technologies and services will result in significant immediate and long-term benefits. Many companies already realize it is a win-win situation, and those willing to join the cause will as well.

Improve Revenue and Shareholder Value

Organizations with environmentally friendly practices benefit from a stronger reputation, improving their brand image, customer loyalty, and employee productivity. FlashStack allows customers to show their stakeholders that by doing what is

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right for the environment, they also improve profitability by reducing their expenses and increasing their competitive advantage.

Environmental Compliance

As a recent Enterprise Strategy Group report explained, "The motivations for ESG vary by the organization—from the altruism of reducing carbon footprints and promoting social equity; through pressure from customers, peer organizations, and even employees; to the pain avoidance achieved by proactively pursuing ESG compliance in anticipation of it becoming a requirement. These motives move the majority of organizations to take action. When asked to identify why they believe the ESG programs of their IT suppliers influence or will influence their organizations' purchasing decisions, almost half of the respondents to Enterprise Strategy Group research indicated that their company is committed to promoting fairness (49%) and slightly more than half indicated that their company is committed to reducing their carbon footprint (51%), while 45% indicated that they were required by customers and partners to apply ESG assessment to their technology suppliers. Nearly two-thirds (64%) believe that ESG will become more critical within their organizations, so they're being proactive and basing purchasing decisions today on the requirements they expect to be in place in the future."[4]

With FlashStack, organizations can better respond to the growing pressure for more sustainable practices from government mandates, as well as from their shareholders, customers, and employees.

Operational Cost Savings

With FlashStack, customers have realized significant savings from lower power, cooling, and data center floor space costs, which have contributed to lower administration and maintenance costs since the customers don't have to manage and maintain many racks of storage, networking, and DR appliances. A company shared with us that they chose FlashStack mainly because of the cost savings they experienced in their data center but also because it shared the same environmental values as their company.

> **"Pure reduced the physical storage footprint in our data center by 86%, saving $1 million per year in space, heat, cooling, and maintenance."**

Figure 5 summarizes FlashStack's benefits to both the environment and to the business:

[4] Source: Enterprise Strategy Group Research Report, *The Role of ESG Programs in IT Decision Making*, September 2022.

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Figure 5. FlashStack Benefits to the Environment and to Business

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

The Bigger Truth

Modern IT organizations must take responsibility for their actions, products, and services, as they threaten not only their business stability in the long term—in the forms of investment, customer loyalty, and supply chain risk—but also our planet. Company leaders and IT teams are faced with the challenge of partnering with vendors and solutions that won't compromise their business requirements, that will help them reduce both data center footprint and operational cost, and that are well-aligned with their environmental sustainability goals. Those who fail to do so and engage in poor and unresponsible environmental practices will face fines, penalties, and negative impact to brand reputation in the future.

In recent research, Enterprise Strategy Group found that organizations are willing to pay a substantial price premium for more ESG-compliant IT solutions. Given that other purchase considerations such as performance, efficacy, and product features are equivalent, nearly all (96%) believe that their organizations will pay a premium for similar products from suppliers with superior sustainability commitments, with 6% willing to pay a 16% to 20% premium.[5] Enterprise Strategy Group has validated and quantified the reduction in footprint and other operational efficiencies and economic savings provided by Pure and Cisco in several previous reports (listed below). How to begin the journey to a net-zero future is a complex but necessary problem for organizations to solve, and FlashStack can help businesses bridge the gap today and get there tomorrow. For those organizations looking to better meet ESG mandates and do what is right for our planet today and tomorrow, Enterprise Strategy Group recommends considering FlashStack Hybrid-cloud Infrastructure.

[5]Source: Enterprise Strategy Group Research Report, *The Role of ESG Programs in IT Decision Making*, September 2022.

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Previous Validation Reports:

Enterprise Strategy Group Validation, *Analyzing the Benefits of Cisco Intersight*, July 2022.

Enterprise Strategy Group Technical Validation, *Cisco UCS X-Series Modular System*, June 2022.

Enterprise Strategy Group Economic Validation, *Analyzing the Economic Benefits of the Pure Evergreen Storage Program*, March 2022.

Enterprise Strategy Group Economic Validation, *Validating the Economics of Improved Storage Efficiency with Pure Storage*, September 2019.

Enterprise Strategy Group Economic Validation, *Quantifying the Value of Pure FlashStack Converged Infrastructure Solution versus Cloud-based IaaS*, March 2019.

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