WHITE PAPER

CHATSWORTH PRODUCTS

Digital Resilience: Merging IT Growth with Environmental Responsibility

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Year-round wildfire seasons. Air quality emergencies. Record-high ocean temperatures. Rapid hurricane intensification. Rogue tropical storms. Thousand-year flood events.

In an era when climate-related extremes are increasingly commonplace, a candid discussion of IT sustainability has never been more important.

This is particularly true when various estimates find that digital pollution contributes 2.5% to 3.5% to overall global CO2 emissions. Concurrently, the energy required to power servers and related IT technology is increasing by 9% per year.[1]

And while the high-speed growth of our industry has brought with it extraordinary benefits—transformed communications and worldwide connectivity—this vast growth has also raised red flags about our environmental impact.

This white paper will offer an overview of what a sustainable company looks like across all business categories. It will provide a look into organizations that succeed by embracing sustainable practices while continuing to innovate. Additionally, it will go on to explore the hurdles, opportunities, and strategies associated with achieving sustainability in the IT sector—delving into data center design and operation, energy efficiency and renewable options, cooling system challenges and opportunities, as well as future challenges facing the industry.

What Is A Sustainable Business?

Plenty has been written about the business side of a sustainable company. For example, in decades past a company would have been considered successful (and therefore sustainable) if it merely generated enough revenue for its owners to stay in business. More recently, success has variously been described as taking a company public or increasing shareholder value or being acquired by a larger corporation.

That was then.

Today, as the climate conditions in which we do business become more fraught, companies increasingly define success through a lens of economic, environmental, and social sustainability:

- Economic: fair commercial development
- Environmental: reducing waste and conserving natural resources
- Social: supporting human rights and human dignity

To this end, many companies now report on sustainability as a corollary to financial reporting, referencing the pillars above in their internal goals and metrics.

According to sustainable-investment strategies, global assets managed now total more than $30 trillion, which is 33% of all managed assets.

Companies with a strong environmental record have been shown to allocate capital to sustainable technologies such as renewable energy, waste reduction initiatives, and renewable energy partnerships.

Meanwhile, consumers are increasingly seeking out products and companies they consider to be eco-friendly. A 2022 McKinsey and NielsenIQ survey confirmed that US consumers support companies and products that make claims about environmental, social and governance initiatives when backed by verifiable actions. In fact, the growth of such products "accounted for 56% of all growth—18% more than would have been expected over the previous five-year span."[2]

It's in this context that many annual lists of "best companies" are now determined, with entries that range from automobile manufacturers to biotech to healthcare systems to outdoor apparel and gear.

Other "best" lists now rank companies based on their corporate sustainability performance, measuring factors such as resource management, sustainable revenue and investment, racial and gender diversity, and supplier performance.

How must the IT and data center landscape—with its rapid growth, ever-increasing power consumption, and escalating water usage—change to contend for positions on these lists? And what steps can be implemented quickly as part of a long-term strategy?

If we agree that "sustainable IT" is both a desirable and necessary goal, as defined in the context of the pillars above, then there are numerous approaches related to data center design; the development, use, and disposal of IT hardware; implementation and management of IT systems; and related business processes that can help achieve that outcome.

From The Outset

Various estimates find that digital pollution contributes 2.5% to 3.5% to overall global CO2 emissions. Concurrently, the energy required to power servers and related IT technology is increasing by 9% per year.

Designing the best-possible data center—either within an existing footprint or from the ground up—can help future-proof an IT operation by ensuring performance, scalability, and longevity.

For companies that view environmental sustainability as an important business issue, Chatsworth Products (CPI) collaborates to explore, configure, and build robust and resilient infrastructure that can significantly reduce energy consumption and associated carbon emissions.

Toward that goal, selecting the right cabinet ecosystem is a cornerstone in promoting and improving eco-friendly practices, as it enables a company to host energy-efficient, high-density servers, power supplies, and cooling systems.

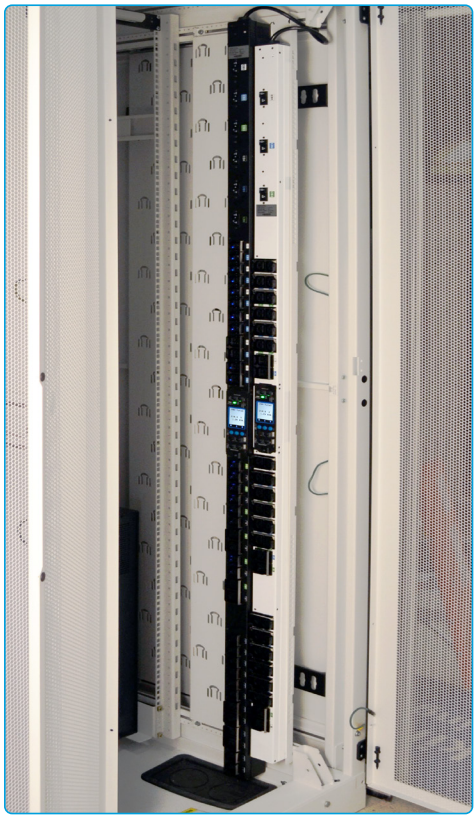
Furthermore, incorporating intelligent real-time monitoring to track power usage, temperature, and total system health optimizes energy use and enables proactive maintenance.

Based on this kind of power and environmental information, predictive power modeling (PPM) helps improve capacity planning to determine the best use of space, power, and cooling resources.

PPM can also mitigate and minimize downtime in data centers by ensuring IT equipment consistently receives the appropriate voltage, frequency, and wave forms required for proper operation. Additionally, monitoring UPS battery charge or generator fuel levels ensures that devices can reliably provide the ride-though times required to sustain uptime during most outages.

Power distribution devices at the cabinet, row, or floor level have branch overcurrent protection with finite capacities. Monitoring the amperage and power usage of these devices ensures that data center operators are notified of impending issues—so corrective action can be taken before an actual downtime event.

Collectively, these tools provide invaluable insights into the performance of the cabinet ecosystem, empowering operators to make data-driven decisions that enhance efficiency and reduce costs, while helping achieve sustainability goals.



Cooling Systems

Data center design and infrastructure has long been reflective of power and cooling requirements of four to six kilowatts per server rack. Now, however, power and server density per rack are escalating. In addition to higher thermal power, they have lower temperature requirements.

Data center operators now must predict a variety of unknowns, including the future power of their standard IT rack, the upper limits of their high-density racks, and the cooling requirements of those systems.

Infrastructure budgets will influence these prognostications, meaning that adaptability in data center design and decision-making will be key.

Legacy air-based cooling systems, using fans and air conditioners to circulate cool air throughout racks and cabinets, have been a data center staple. Hot- and cold-aisles, as well as raised-floors, are common in these systems. But as the size of data centers increase and the heat they generate rises, this type of cooling is less effective.

Liquid-based, direct-to-chip, and immersion cooling systems are becoming widespread, using water and dielectric fluids to absorb heat and transport it to a heat exchanger. Since up to 40% of data center electricity is used to remove unwanted heat from IT equipment[3], it is becoming increasingly common to capture and repurpose that energy, which would otherwise be wasted. One of the most typical uses for this energy is to warm the air and water in the facility it comes from.

Additionally, the ability to redirect this controllable “waste heat or regular heat” at higher temperatures creates an array of possible applications for industry and agriculture, including water desalinization, greenhouses, and the manufacture of wood pellets for stoves.

By embracing sustainable practices such as these, businesses can not only achieve operational cost savings but also contribute to a greener future.

Cabinet Ecosystems And The "Circular Economy"

Our legacy global economic model has been characterized as "take, make, and throw away" - a path that led to our current environmental predicament.

By way of contrast, a circular economy model[4] begins by doing away with practices and policies that harm human health and natural systems.

In the context of information technology, this includes the massive resources required to power a sprawling infrastructure, the related production of greenhouse gases, mining of materials used in IT hardware, and irresponsible management of devices.

Lengthening the lifecycle of IT equipment, supported by CPI's ZetaFrame® Cabinet Ecosystem, is integral in reducing manufacturing, transportation, usage, and disposal impacts. Adopting innovative products designed for longevity and peak performance, optimizing server usage, and transitioning to more efficient computing all contribute to a circular and sustainable IT model, promoting resource reuse and minimizing the impact of hazardous materials.

For organizations looking to reduce the environmental impact of their IT domain, a circular, sustainable model encourages the adoption of innovative products designed for a long life at peak performance, keeping materials circulating for as long as possible. The right cabinet ecosystem is an essential part of that model, optimizing server usage, extending the use of existing assets, and informing the transition to more efficient computing.

This, in turn, promotes the reuse or recycling of valuable resources and helps minimize the environmental impact of hazardous materials.

Multifaceted Energy Sourcing And Solutions

Because data centers, network infrastructure, and end-user devices require vast amounts of energy, power generation is a significant contributor to the IT sector's carbon footprint.

Fortunately, new technologies and policies are emerging to meet the mutual demands of the economy and the environment. These are particularly timely given the scale and pace at which the industry and its consumption of resources are growing.

Grid-Scale Renewable Energy Procurement

Power Purchase Agreement
Through direct power purchasing agreements (PPAs) with renewable energy providers, along with agreements with utility providers for them to purchase renewable energy, companies can reduce their dependence on local utilities and fossil fuels to achieve sustainability goals.

Virtual Power Purchase Agreements
Like a power purchase agreement, a virtual power purchase agreement (VPPA) is a contract with the developer of an energy project in which a buyer agrees to purchase the energy produced by the project over a set period of time at a predetermined price per unit of energy, such as a megawatt-hour (MWh). VPPAs can help insulate companies against rising electricity costs by locking in a fixed price at current rates.

Renewable Energy Certificates
Renewable energy providers earn a renewable energy credit (REC) for every megawatt-hour of electricity they produce. That credit can then be sold or traded to other entities, including electrical utilities and other companies. Through these transactions, companies can state they are powered by renewable energy, whether wholly or in part, depending on their REC investment.

Renewable Energy Credits and Offsets
The precursor to RECs, carbon offset credits represent a metric ton of carbon emissions not released into the atmosphere due to renewable energy generation. Buying these credits enables companies to claim carbon neutrality, even if they still produce carbon emissions of their own.

Community Renewable Energy Partnerships
In the U.S., the Department of Energy now partners with local communities and business stakeholders to enable and expand access to affordable clean energy. These partnerships support development of renewable energy sources that are secure and reliable, as well as socially and environmentally equitable.

Onsite Sources
Transitioning to renewable energy sources, such as solar and wind, is essential for sustainable growth. Companies and data centers are turning to an array of renewable tactics to increase their energy efficiency and reduce their carbon footprint.

Onsite solar panel systems are a common source of renewable power generation. Combined with effective energy storage solutions and recycling of waste heat, companies can warm and cool their facilities while cutting costs.

Like their solar brethren, wind energy systems have been deployed to directly power data centers in regions around the world. In addition to reducing the load on local grids and reliance on fossil fuels, companies also purchase wind energy from local utilities, as well as participate in the renewable energy certificate economy.

Global Regulations and Standards

There will never be a time when companies are not obliged to wrestle with supply-chain challenges, rising energy prices, and increasing labor costs. **Thrown into this dynamic mix is an accelerating international mandate for:**

- Energy efficiency and sustainability standards designed to reduce carbon emissions
- Water usage and conservation, especially in regions faced with water insecurity
- Waste management and recycling requirements in the disposal of IT equipment

In the European Union, the Energy Efficiency Directive [5] now requires data centers with an IT power demand of 100 kw or more to report their energy performance annually. **On the environmental front, they must also account for:**

- Power and water use, and carbon emissions
- Energy reuse, including renewables
- Temperature set points in security
- Cooling effectiveness ratios

In the US, similar regulatory reporting mandates have been proposed at the state level, including reporting on carbon reduction and sustainability (Virginia), as well as reducing carbon emissions by 60% by 2027 in Oregon.[6]

Jay Dietrich, research director of sustainability at the Uptime Institute, expects US laws to quickly catch up with those in the EU. **In anticipation of that eventuality, he recommended that data centers prepare for future reporting mandates by:**

- Engaging with industry efforts to develop simple, standardized energy-efficiency metrics
- Create a strategy to comply with the most likely reporting requirements
- Establish data collection and management processes for mandated information

Conclusion

The global IT revolution has permanently changed our world. As a driver of economic growth and 24/7 interconnectedness, it has empowered positive and transformative change. In the face of rapid and volatile change to our climate, however, the environmental impact of IT systems, infrastructure, and practices has become a challenge that cannot be understated.

At CPI, we know how much sustainability matters. Toward our own sustainability goals, we are proactively forming teams to manage a number of initiatives, and are closely collaborating with our vendor partners to create comprehensive plans. These encompass, but are not limited to, waste reduction in manufacturing, transportation, use, and disposal; forging renewable energy partnerships; and enhancing supplier performance.

We have committed to these steps, and are exploring many others, to be in line with what we see as a global imperative—to further the undeniable benefits of "information technology" while helping minimize the industry's environmental impact as it continues to expand.

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Ian Cathcart has more than 20 years of experience in the telecommunications industry in areas ranging from cabling installations, manufacturing, laboratory testing, developing and delivering BICSI certified courses. In his role at CPI, Ian focuses on data center design, product specification and helping customers apply best practices to their data center cooling issues. Ian achieved BICSI RCDD designation in 2007.

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