

WHITE PAPER

HP Products Built to Protect the Environment

Sponsored by: HP

Jean S. Bozman

Crawford Del Prete

CONTRIBUTING ANALYSTS

David Daoud

Matthew Eastwood

Monique Gibelli

Chris Ingle

Jed Scaramella

Raj Dalal

February 2007

EXECUTIVE SUMMARY

Eco-responsibility is an increasingly important item for customers. While the term "eco-responsibility" may have different meanings for different customers, it's clear that what was once an aspiration is now becoming more central to business planning and purchasing decisions.

Customers are becoming mindful of the ways in which their operations affect the environment. This includes labor decisions, parts sourcing, research and development (R&D), as well as in their IT decisions. While this paper focuses on the role of IT and environmental responsibility in the enterprise, this new sense of eco-responsibility is true for all customer types, including consumers. In fact, consumers today are more aware that their everyday decisions impact the environment.

This paper outlines why these efforts are important, and what one supplier, Hewlett-Packard, is doing to increase customers' ability to support eco-friendly initiatives. Specifically, these initiatives address:

- A global supplier code of conduct and partner programs ensuring compliance with environmental regulations and stakeholder expectations
- Energy efficiency and reduction in power/cooling requirements for HP products
- A robust asset-recovery services program that protects the environment through reuse and recycling of IT products and safe disposal of hazardous substances

As an early supplier of eco-aware technologies, HP climbed a learning curve starting in the 1990s and then leveraged what it learned to accelerate its program in recent years. Importantly, HP's large PC and printer product businesses provided it with early insights into developing products with environmental impacts in mind — and programs to prevent environmental damage via reclamation of used products, proper disposal of older products, along with supplier programs to ensure restricted materials are not used in the components on which HP's products are built.

It's important to note that these efforts go far beyond any one aspect of eco-responsibility. They span the entire product life cycle, from design to disposal. At each stage in acquiring and using a product, customers have important decisions to make, such as:

- Is this product consuming too much power?
- Can I easily and securely dispose of it?
- Will my data be properly protected?

Without proper planning, these can be very intimidating and expensive questions to answer. However, with some forethought, these questions can be the basis for a very strong customer eco-responsibility strategy that can not only help customers with real business problems, but also be a basis for competitive differentiation.

SITUATION OVERVIEW

Introduction

Environmental friendliness has become a requirement for IT vendors. No longer a "nice to have," eco-friendliness has been mandated by regulatory bodies around the world. But this is only part of the story; importantly, it is also a matter of economics for vendors and their customers.

Economic issues take two primary forms: operational costs and end-of-life disposal. In a world in which a high dependency on fossil fuels is driving energy costs skyward, concerns about operational costs associated with power management and cooling have become top of mind for many businesses. As landfills approach or reach their capacity around the world, businesses are seeking easier methods to dispose of products following their useful product life. Many assets can be repurposed, extending their end of life while bringing some recovery value to vendors and end customers. Other assets can be recycled in order to reclaim valuable components and raw materials.

Building for the World, Designing for the Future

Environmental considerations are becoming a "must" for IT products and consumer products worldwide. In mature and emerging economies alike, IT users are realizing that environmental consciousness is critical to the global economy. More immediately, they are realizing that environmental consciousness brings very real business considerations for them as well, such as reducing operating costs by reducing their energy consumption requirements.

In addition to rising energy costs, customers pay for other "hidden" fees associated with manufacturing. For example, regulations regarding the proper disposal of product materials containing restricted substances are now in place across major geographic regions. Improper end-of-life disposal can result in additional costs when products reach the end-of-life stage and must be disposed of, repurposed, or recycled.

Further complicating matters, the regulatory situation varies across geographies, with leading roles played by regions such as Europe where governments and citizens alike have long recognized the need to tackle the environmental effects of human activity to reduce greenhouse gas emissions. Realizing that climate change is a global problem over which it has only limited influence, the EU is looking to use its considerable trading power to bring change via market mechanisms that include consumers and businesses alike. A case in point is the British government report recently released by Sir Nicholas Stern, which estimated the cost of global warming could be up to 20% of worldwide GDP over the next century. This has resulted in a number of EU initiatives including the RoHS directive to ensure that products contain fewer environmentally restricted substances, initiatives to limit power consumption in datacenters, and implementation both of carbon and emissions trading schemes.

All of this provides impetus for vendors to change the way they approach multiple aspects of their offerings. In previous decades, considerations such as power and cooling requirements or product end-of-life disposal may have been, at best, afterthoughts during the design process; now, they are becoming forefront considerations. New technologies are being developed to help customers monitor energy use and to maximize energy efficiency. As environmental awareness continues to rise, increased scrutiny will be placed on the eco-friendliness of products. It is likely that even more improvements will be seen at each stage of the product life cycle — from design through manufacture, installation, operation, and retirement/disposal.

Eco-Compliance Driving Customer Buying Behavior

The days when customers are willing to pay a premium for products because they are labeled as "eco-friendly" are over. However, it is clear that when there are economically tangible benefits, such as reduced power and cooling needs, customers are willing to consider the environmental impact of the products they buy. Additionally, environmental regulations are widespread around the world, with some countries requiring products to comply directly with lower carbon emissions, while others are reducing the introduction of hazardous materials into the environment. As costs for environmental compliance continue to rise and as these costs are passed on to businesses and consumers, customer behavior will likely change with eco-friendly products viewed in a more favorable light.

Designing Eco-Friendly Products from the Start

The effort to reduce environmental impact throughout an IT product's life cycle starts with design. Careful materials selection and thoughtful construction lead to less need for the removal of problematic material when products reach their end-of-life stage. Working closely with supply chain partners triggers benefits in procurement of more eco-friendly parts and materials. Designing for power and cooling efficiency reduces demands on energy production as well as improving operating costs for the enterprise.

Worldwide Distribution Increases Burden on IT Vendors

Globalization of production and distribution brings global customers — that is, customers that deploy the same product into all of their offices on a worldwide basis. This has implications for IT product design and manufacturing processes: products must be designed using parts and materials that can be sourced locally and manufactured using processes that can be replicated in local factories worldwide. These global processes ensure consistent quality across a worldwide distribution chain. Equally important, products must meet the environmental regulatory requirements not just of a single country or region, but of all major regulatory bodies throughout the world. This increases the burden on IT vendors to design eco-friendly products from the start and to design them to conform to all laws and regulations everywhere.

Power/Cooling and Energy Efficiency

Power and cooling costs are climbing, inspiring some operators to locate datacenters near hydroelectric plants, reducing utility costs for the datacenter and in turn leading to lower costs that can then be passed on to their customers. But this is not a realistic solution for most datacenters. With the explosion of servers and other IT products in datacenters worldwide, vendors must step up to the challenge of keeping power/cooling costs in check via environmental designs and new technologies.

IDC worldwide server research shows that the issue of power and cooling in the datacenter has become a top priority for IT executives. As datacenters pack smaller form factor technology into available spaces, they experience a twofold challenge:

- ☒ Dramatic increases in the power consumption of the IT infrastructure — IDC surveys show power demands surpassing supply in 40% of datacenters
- ☒ Requirements placed on the facilities organization to provide sufficient cooling for the heat load

Addressing these challenges requires the enterprise to adopt an integrated strategy. On the technology front, there is the need to source systems and technology that provide greater energy efficiency, while on the business side, enterprises must adopt a more cohesive corporate philosophy toward energy conservation.

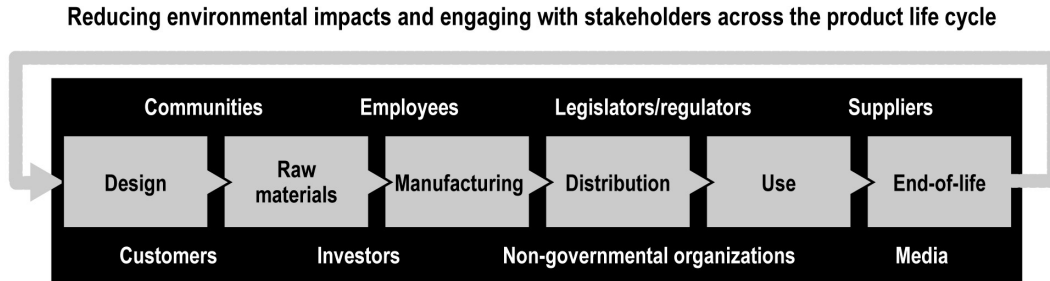
HP's Strategy for Eco-Responsibility

HP Legacy of Eco-Responsibility

HP has been paying close attention to environmental considerations associated with its products for more than 15 years, and recycling its products for more than 20 years. Leveraging its history as one of the first major vendors to place serious focus on environmental responsibility, HP takes a holistic view extending from product design to end of life and each stage in between. For a graphical depiction of these stages, see Figure 1.

FIGURE 1

HP Approach to Reducing Environmental Impacts and Engaging Stakeholders Across the Product Life Cycle



Source: IDC 2007, adapted from HP

HP Playing a Leadership Role as a Global Citizen

Eco-responsibility can be seen as one aspect of continuing to do things "the HP Way." This sense of responsibility, dating to the birth of HP in the 1930s, has been extended to include programs that reuse and recycle materials. In the United States, customers can donate working computer equipment through the HP Donate program to the National Cristina Foundation (NCF) to be provided to people with disabilities.

HP is pursuing a wide variety of initiatives around the world. In Japan, over 600 HP products qualify for the PC Green label, a certification established by the Japan Electronics and Information Technology Industries Association (JEITA) to identify products that incorporate environmentally conscious product design, manufacturing, and end of life.

In Latin America, HP has channeled funds generated from inkjet cartridge recycling programs in Brazil, Mexico, and Peru to support local initiatives. In Peru, HP is working closely with the World Wildlife Federation (WWF) to help protect endangered species. Similarly, in Mexico HP created a trust for the preservation of the wildlife in collaboration with the Natural Resources and Environment Secretariat and Banamex.

As a manufacturer and vendor, HP has made significant progress in the area of environmental impact — and HP works to continue to reduce that impact for the products it builds. This includes working closely with its partner networks, which in turn, affects the network of channel partners that distribute products around the world. Further, by working closely with its partner networks, HP can respond quickly to changes in the market. By sharing best practices with its partners, HP can have a global impact for environmentally friendly products that is larger than its own product "footprint" in the enterprise.

Product Design: Building in Eco-Responsibility from the Start

For HP, reducing the environmental impact associated with its products begins in the design phase. One example of this is materials selection. The goal is to reduce the negative environmental impact of materials used in HP products and to reduce power/cooling needs for products built using those materials.

Importantly, HP leverages the resources of HP Labs, with major Labs centers located in the United States, Europe, and Asia to solve these complex challenges. For example, the recently announced Thermal Logic technology incorporated into its latest blade server offerings demonstrates HP's commitment to playing a leading role using R&D to reduce customers' energy use and associated operating costs.

HP's commitment to environmentally friendly design can be further seen in its development of Design for Environment (DfE) program, which supports the development of products that exceed global regulatory requirements, and its adoption of Design for Recyclability (DfR) standards to facilitate product disassembly and recycling. These design practices help increase material and energy efficiency, demonstrate conformance with international green procurement criteria, and ensure effective recycling of products is possible at end of life.

HP Supplier Code of Conduct

HP's Supplier Code of Conduct is a foundation for the company's ongoing efforts to ensure compliance with HP's Supply Chain Social and Environmental Responsibility (SER) Policy. Demonstrating HP's commitment to minimize the environmental impact associated with its product content and manufacturing processes, SER is a key component the HP Global Citizenship initiative that has been in place for more than four years.

HP started the SER Code of Conduct in 2002 and then recruited other companies to join. Beginning with 50 top suppliers in 2003, the SER organization now includes 450 suppliers worldwide — addressing more than 90% of HP's supply-chain purchasing needs. The top 5 points encompassing this initiative are:

- A clearly defined policy, vision, and direction supported by senior management
- Ongoing development and distribution of HP policies and standards, including the SER and HP's General Specification for the Environment (GSE)
- Conformity assessment and monitoring
- Corrective action planning based on continuous improvement
- Reporting results to internal and external audiences, including the publication of its Global Citizenship Report and local Social and Environmental Responsibility (SER) Reports

Reducing Operating Costs Through Energy Efficiency

For the past decade, HP has funded research and development initiatives to work on products and solutions that deliver power and cooling initiatives. In 1996 HP formed the "Cool Team," a companywide, cross-departmental team to focus on the challenges of power and cooling. With an eye toward providing comprehensive power and cooling benefits for the datacenter, the team made a holistic effort to examine the issue at three different levels: the component level, the system level, and the overall datacenter level.

Resulting innovations include power management systems, which automatically turn off underutilized compute resources, and sensing technology with dashboards that can play important roles in identifying systems that are developing hot spots or exceeding thermal thresholds. These innovations have enabled HP to develop a large number of energy-efficient products. For example, more than 1,000 HP products qualify for the ENERGY STAR label, a voluntary energy efficiency program sponsored by the U.S. Environmental Protection Agency and adopted by Australia, the European Union, Japan, and Korea.

Innovations in Power and Cooling

One key innovation is HP Dynamic Smart Cooling, which HP recently announced and expects to begin deploying by mid-2007. Realizing that ownership of only a portion of the end-to-end infrastructure limits its ability to drive eco-friendly products and practices, HP is building an ecosystem of solution partners to address power efficiency and cooling interoperability. For its Dynamic Smart Cooling, HP is partnering with EYP Mission Critical Facilities, a company based in New York with U.S. offices in Chicago, Washington, D.C., Los Angeles, and San Francisco, and offices outside of the United States in London, among other sites, and a series of affiliate firms worldwide.

HP Thermal Logic is a technology that is already being built into HP's blade server offerings. Incorporating an integrated approach to power and cooling, from processor to enclosure design and from architecture to management, Thermal Logic pools and shares power and cooling resources within the blade server infrastructure, then efficiently delivers those resources based on the performance level required. It enables IT managers to quantify power and cooling needs across the datacenter. This ability to quantify these power/cooling requirements extends down to the level of the individual server, where advances in power and cooling technology turn down the temperature in the rack where many servers are housed, improving operational efficiency.

HP Thermal Logic leverages a number of HP innovations, including Dynamic Power Saver, to provide the most efficient use of power in each blade enclosure. Power supplies are put in "standby" mode when the power demand is low and are incrementally activated, balancing load requirements to ensure optimum efficiency.

There are cooling innovations as well. One is the Parallel Redundant Scalable Enclosure Cooling (PARSEC) architecture, which splits each blade enclosure into multiple zones. Sensors in each zone direct fans to manage blade temperature in

their particular zone, as well as to provide backup cooling for the entire enclosure. Finally, HP Active Cool Fan technology leverages radio aircraft turbofan technology to generate high-pressure differential airflow and provide dynamic levels of airflow to match heat loads.

HP planners estimate that a large datacenter could achieve up to 20% energy reduction compared with traditional power/cooling technologies. For a large datacenter, this could prevent the release of up to 10,000 metric tons of carbon dioxide compared to expected emissions levels from a comparable datacenter running traditional power/cooling technologies.

Asset Recovery Services: HP's Approach to Product End of Life

Long before these types of changes became mandated by governmental regulation, HP embraced the requirement to address the "back half" of the product life cycle and set up its Asset Recovery management program to offer customers eco-friendly product end-of-life programs.

HP's Asset Recovery management program has three critical components:

- Elongate product life cycles through a refurbishing process
- Dispose of units that cannot be refurbished
- Extract useful components and materials from recyclable systems to use them elsewhere

Refurbishment and Reuse

Through its asset recovery service, HP handles the disposition of hardware products using a strict auditing, testing, refurbishment, and resale or recycling process. The ultimate path taken — refurbishment, resale, or recycling — is based on the condition of the hardware and its remarketability. For products that are remarketed, HP shares the proceeds of its sales with its customers, extracting additional value for the customer while elongating the life of the hardware. This is one of the ways in which customers see an immediate business benefit from adopting eco-friendly technologies along with their consumer or IT products.

Recycling and Recovery

For products that have outlived their usefulness, HP instituted a multiphase recycling process that follows proper regulations regarding recycling methods and hazardous materials controls. It includes sorting, shredding, and plastics and metals separation, and provides transport and logistical services to guarantee the proper movement of hardware to HP's facilities. Recycling is offered for a wide range of products including servers, PCs, displays, peripherals, and print cartridges. The extracted products in their final stage become raw commodity material recycled into other industries.

Whether the customer chooses to have its product remarketed or destroyed, HP also offers a wide array of security services to ensure that the data residing on returned

equipment is properly erased and destroyed. This ranges from secure disk wiping (as mandated by federal requirements for data security) to physical drive destruction.

HP's recycling procedures are in strict compliance with local, regional, and international regulations. In fact, HP has led efforts to establish proper recycling policies in the United States, Europe, and in key markets where it operates. Further, HP is looking beyond its own operations to those of its recycling partners by implementing global reuse and recycling standards and by implementing a business process to ensure that recycling partners conduct their operations in an environmentally friendly manner.

In Europe, HP has been working with the EU and national governments, along with its extensive channel partners, on the Waste Electrical and Electronic Equipment (WEEE) directive to ensure it is implemented in a beneficial way. HP has taken a lead in the EU by partnering with other companies to develop the European Recycling Platform (ERP), a consortium of companies focused on developing and implementing a process to collect and recycle waste electronic products.

In Asia/Pacific, HP participates in a number of regional initiatives such as Taiwan Green Mark, an eco-label to promote recycling, pollution reduction, and resource conservation, as well as Australia's Byteback program, chartered to divert end-of-life computer equipment from landfills to environmentally responsible recycling.

HP has taken a leadership role in recycling printers and cartridges around the world. In Australia, HP partners with Planet Ark in a program called Cartridges 4 Planet Ark in which commercial and consumer customers have recycled more than 3 million cartridges since the program's inception. In China HP joined forces with non-governmental organizations to create Cartridges for Dragon Recycling, an initiative that enables the return of end-of-life print cartridges for environmentally sound recycling.

Such initiatives have helped HP recycle 750 million pounds (340,000 tons) of computing and printing supplies to date, with a path toward recycling 1 billion pounds (455,000 tons) by the end of 2007.

Meeting the Challenges

HP will need to overcome a number of challenges in designing, bringing to market, and providing disposal services for eco-friendly products:

- ☒ **Demonstrating business value.** Like other vendors, HP will be challenged to show the business value associated with environmental considerations for product design, engineering, operation, and disposal. Customers will need to be educated on the economic benefits of items such as reduced operational expenses associated with energy efficiency.
- ☒ **Making additional upfront investments to design and manufacturing processes.** This will start with research and development (R&D), which can be addressed by HP Labs, and it will continue with factory fabrication processes that

may require changes in the procurement of materials and assembly of components acquired from other sources.

- ☒ **Reinventing some of the manufacturing technology already in place.** This process is already underway, but it is by no means complete; furthermore, the requirement to continually meet new regulations means that this will not be a one-time effort, but rather an ongoing one.
- ☒ **Maintaining its competitive position.** HP's competitors in the IT and consumer spaces will also be working on the same sets of issues associated with the environment and energy efficiency. In a highly competitive marketplace, HP must continue to monitor the ways in which its competitors come to market and the product deliverables they provide.

HP can address these challenges, but it will come about through continued focus, diligence, and effort. The company has already made a good start with initiatives such as its Supplier Code of Conduct and continuing work with its suppliers, but it will need to maintain its efforts to continue to meet evolving environmental regulations worldwide.

Opportunities

HP's Environmental-Impact Efforts — Where It Can Go from Here

As it creates next-generation products, HP has the opportunity to build in benefits to customers, manufacturing and channel partners, and communities around the world. By employing a continuous-learning process, HP can bring improvements in materials science, product design, and product manufacturing. These in turn can result in new approaches to energy efficiency and in improvements in power/cooling.

Furthermore, environmental awareness will be literally "built into" the next generation of consumer and IT products worldwide. It will be a key to getting business across geographies — especially in places that have already gone down the path of limiting or prohibiting the use of hazardous materials in consumer and IT products. As a volume supplier both in consumer and business markets, HP has the opportunity to build on its early experience in eco-friendly business practices and to replicate these practices on a global basis.

Meeting the Needs of Global Markets

Perhaps the largest opportunity exists in bringing eco-friendly technology to fast-growing emerging markets. Whether in the Americas, Europe/Middle East/Africa (EMEA), or Asia/Pacific, emerging markets have the chance to "leapfrog" more established markets and avoid the problems associated with products that were not designed with environmental impact in mind. In addition, HP can extend its already successful recycling programs to more emerging markets to demonstrate a continued commitment to the environment.

Eco-awareness will also resonate with customers and prospective customers in more mature markets, with the higher levels of attention customers in these markets pay to reducing energy costs associated with power/cooling and as concerns about potential

climate change grow. By tackling environmental issues early on, HP is well positioned to replicate its earlier successes in a wide range of markets worldwide.

CONCLUSION

For decades, the IT industry has existed on the assumption that "more is better." More processing power, more storage, bigger screens, bigger batteries, and lighter composites, all have become core drivers of the industry. Until recently little concern has been given to some of the larger questions facing these innovations, such as:

- Were these innovations created with the environment in mind?
- Can I legally and or cost-effectively dispose of them?
- Can I reuse any parts?

HP has taken a forward-thinking position in design and manufacturing for eco-friendliness, based on its many years of experience both in the consumer space and in managing product assets on behalf of IT end customers. Without compromising performance or price, HP has given considerable thought to the overall impact of its products on the environment, from the way they are designed, to how they are used, to the most effective way for them to be discarded. Its eco-friendly focus is not about any one step in the chain, or a "miracle" material or process that will make all disposal problems go away. It's about finding ways to make incremental improvements in each step of the chain. It's also about extending the thinking about the eco-chain itself, from design to usage to retirement, to include every aspect of a product's life.

Eco-responsibility is a process that will evolve over time. It is important for customers to understand that "kicking the can down the road" is not a long-term solution. In the near-term, customers can realize the benefits of reclaiming and recycling assets that can no longer be used. Further, customers with a holistic strategy to create a more eco-responsible approach to computing will do themselves a great service due to the operational benefits of being energy-efficient. While eco-responsibility will continue to evolve in the future, it will not likely get any easier. The time to start is now.

HP Products and the Environment Document Series

This white paper is part of a series of IDC documents commissioned by HP to discuss its environmentally aware policies and practices. This series includes a core white paper, *HP Products Built to Protect the Environment*, as well as standalone eco-briefs focusing on specific product areas: product design, manufacturing, power and cooling, and product end of life.

Copyright Notice

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2007 IDC. Reproduction without written permission is completely forbidden.