A photograph of a modern building at night. The building has a glass facade that reflects the city lights. In the foreground, there is a courtyard with several potted plants. The sky is dark blue, and the city lights are visible in the background.

**Sustainability is  
the next growth  
area, high tech  
are you ready?**

accenture





## Table of contents

3

Introduction

4

Industry context

5 Emerging technologies and their sustainability impacts

5G | IoT | Blockchain & Bitcoin

6 The journey to zero net carbon

Let no crisis go to waste | Bridging the gap

7

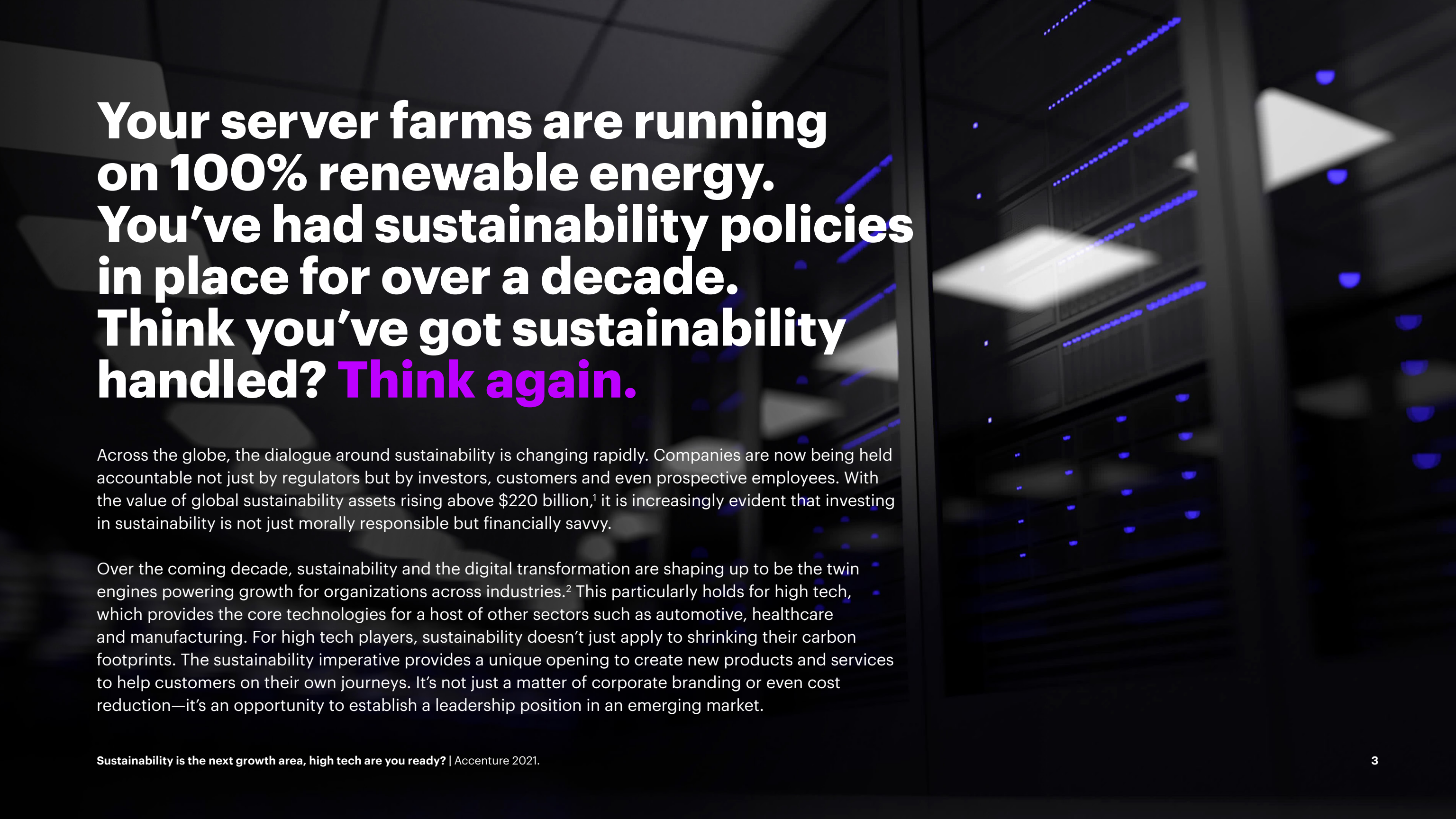
Getting started

8 Shift to green cloud | 9 Smart buildings |

11 Smart manufacturing

13

Conclusion



# Your server farms are running on 100% renewable energy. You've had sustainability policies in place for over a decade. Think you've got sustainability handled? **Think again.**

Across the globe, the dialogue around sustainability is changing rapidly. Companies are now being held accountable not just by regulators but by investors, customers and even prospective employees. With the value of global sustainability assets rising above \$220 billion,<sup>1</sup> it is increasingly evident that investing in sustainability is not just morally responsible but financially savvy.

Over the coming decade, sustainability and the digital transformation are shaping up to be the twin engines powering growth for organizations across industries.<sup>2</sup> This particularly holds for high tech, which provides the core technologies for a host of other sectors such as automotive, healthcare and manufacturing. For high tech players, sustainability doesn't just apply to shrinking their carbon footprints. The sustainability imperative provides a unique opening to create new products and services to help customers on their own journeys. It's not just a matter of corporate branding or even cost reduction—it's an opportunity to establish a leadership position in an emerging market.



## Industry context

High tech companies are innovators, continuously creating the next generation of products and services to improve the lives of their customers. Emerging technologies such as 5G, blockchain and AI will unlock new use cases for the smart, connected devices that make up the Internet of Things (IoT). In doing so, they will exponentially increase the uptake of electronics products and the supporting infrastructure. These technologies will undeniably benefit both consumers and industry. At the same time, production and usage will cause a massive surge in energy consumption, water usage and CO<sub>2</sub> emissions. Meanwhile, a corporation's commitment to sustainability is becoming an ever-greater priority in the eyes of shareholders, customers and society at large. Unless high tech players quickly develop policies to address these issues, they risk being simultaneously applauded for their innovations and criticized for the environmental impact of those innovations.

To thrive during this transition, organizations must move swiftly to identify and manage the downstream environmental, social and governance (ESG) impacts of their products and services across industries. They need to go beyond just leading by example, developing sustainable products and services to help customers go through their own sustainability transformations. It's an emerging market. As always, there will be winners and losers. The transition to greater sustainability presents a tremendous revenue-generating opportunity for the companies that act quickly to both develop and adopt greener technologies.





## Emerging technologies and their sustainability impacts

In this new technology landscape, high tech companies are experiencing unprecedented levels of demand for their products. This holds whether they specialize in consumer electronics, enterprise technology, communications gear, or other emerging technologies. While this bolsters the balance sheets, it also unfortunately exacerbates the sustainability issue.

### 5G

5G provides next-generation connectivity across wireless devices. The standard was designed with the IoT in mind, providing significant improvements in speed, connection density and communications latency. These capabilities will pave the way for entirely new use cases ranging from autonomous vehicles to intelligent power grids to augmented-reality retail experiences. The result will be massive uptake in both the consumer and industrial spheres.

According to a recent Accenture analysis, 5G is expected to boost US GDP by \$1.5 trillion over the period from 2021 through 2025.<sup>3</sup> Much of this growth will be fueled by the production and deployment of billions of connected devices. As more devices are used in homes, cars, factories and warehouses, the environmental impact of 5G as a technology will intensify. Global energy usage will skyrocket. And the enhanced capabilities of each new market entry will only increase the overall demand for

electronic devices, further exacerbating the issue.

### IoT

Although many IoT devices are designed for energy efficiency, any savings at the unit level will be swamped by the sheer number of connected things. Indeed, the energy consumed by the estimated 50 billion new IoT devices expected to be produced and used will dwarf the amount used by today's electronics. Furthermore, a variety of specialty metals such as tungsten and cobalt are currently used in IoT devices. It is extremely difficult to recycle or reclaim these materials, creating a further barrier to sustainable practices. However, that won't stop the IoT from being ruled out scale. It is critical to consider both how to best leverage IoT technologies for positive sustainability opportunities and also how to make IoT manufacturing itself more sustainable.

### Blockchain & Bitcoin

Emerging technologies, like blockchain and bitcoin leverage semiconductor chips which lie at the heart of 5G networking gear and the IoT devices, mobile handsets and data centers that use it. Semiconductor manufacturing has an enormous carbon footprint, from the mining processes used to extract and refine the component materials to the chip fabrication steps themselves. Semiconductor processing is resource intensive. A single semiconductor fab can consume 1 TWh of energy per year<sup>4</sup> and two to four million gallons of ultra-pure water per day. Indeed, Apple



estimates that 86% of the lifetime carbon emissions of the iPhone 12 Pro are generated during manufacturing.<sup>5</sup> To place this in context, the lifetime carbon emissions of a single smart phone of medium use are equivalent to that of a medium-sized car driving approximately 200 miles—and there are nearly eight billion mobile phones in use today.<sup>6</sup>

There are serious sustainability issues as a result of these new technologies. High tech companies need to avoid being so focused on the initial market opportunities that they fail to take the sustainability imperative seriously. They also need to avoid being so overwhelmed by tackling their own sustainability programs that they fail to recognize the chance to establish new markets.



## The journey to zero net carbon

### Let no crisis go to waste

The environmental crisis is global in nature. For a solution, companies can look to the response to another global disruptor: COVID-19. The pandemic has showcased three essential techniques for tackling a crisis of this magnitude:

1. Take a systems approach
2. Use measurement and access to data to inform policy and drive action
3. Cooperate and collaborate—it takes an ecosystem

The impact of the environmental crisis will be greater and longer term than the pandemic. The template of systems thinking, data and collaboration will be critical.

### Bridging the gap

Under increasing pressure from stakeholders ranging from investors to consumers, many high tech companies have made sustainability goals like achieving a net zero carbon footprint by a specific date. Achieving these objectives is not easy. It starts with overcoming a massive obstacle: Few COOs, if asked on an earnings call, could give a confident accounting of their real ESG impact across their entire value chain. And it's difficult to fix a problem if you don't know the scope.

Any project needs to begin with a comprehensive sustainability analysis, with as broad a scope as possible. Microsoft has estimated that 90% of the impact a company has is either upstream or downstream of its core operations.<sup>7</sup> Most organizations today do not necessarily know what or where that 90% is, but it is quickly becoming their responsibility.

**Sustainability analysis needs to expand beyond reducing the negative impact of direct actions, to driving positive impact of projects, products and services beyond the organization's own four walls.**





## Getting started: actions for high tech to enable the transition

To get ahead of the curve on sustainability, high tech players need to focus their efforts on three key areas:

1. Optimizing usage of cloud resources
2. Transitioning to energy-efficient smart buildings
3. Improving semiconductor design and processing

By applying these techniques, organizations will position themselves to not just meet but also exceed their sustainability targets. After accomplishing that milestone, they can also work to identify ways to transfer their knowledge, techniques and equipment to other client organizations in order to not only make a better world but also to build a better balance sheet.



## Shift to green cloud

The amount of computing power used for advanced technologies such as deep learning, AI/ML, blockchain, and now 5G applications is driving developers and consumers to consider how to manage rising costs as data usage continues to increase. Meanwhile, the overall information and communications technology (ICT) industry accounts for about 1.4% of global emissions.<sup>8</sup> The first step in reaching sustainability with data is transitioning away from traditional data centers, which double their energy requirements about every four years.

The transition to the cloud is not enough to meet sustainability goals due to the exponential growth of cloud adoption among consumers. Although migration to the public cloud can reduce total cost of ownership by 30-40%,<sup>9</sup> not all cloud migration approaches are the same. Green cloud is focused on optimizing the energy usage and efficiency of cloud resources (see sidebar).

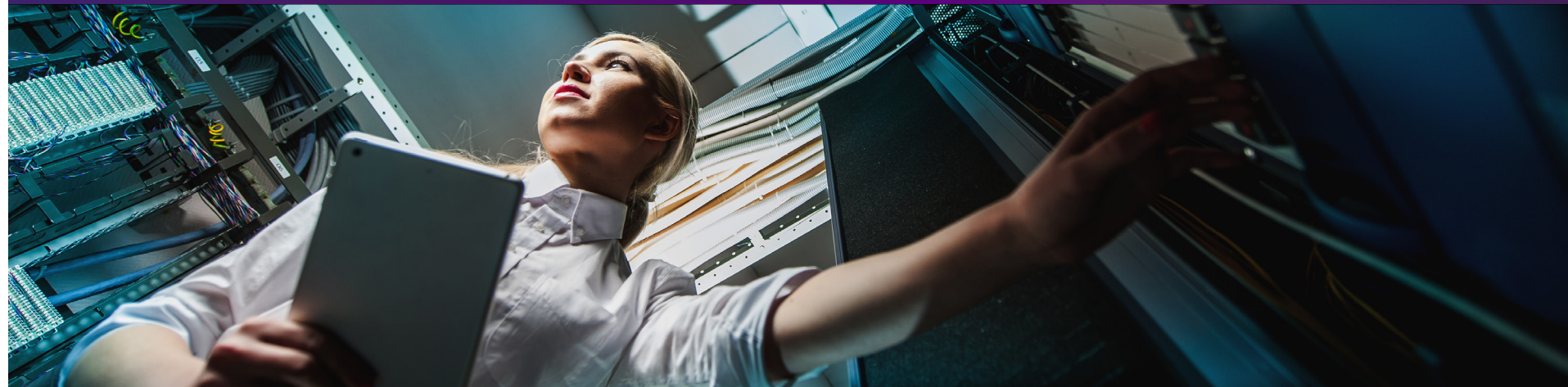
To make cloud workloads greener, customers should shift workloads to run in geographic regions with more renewable energy on the grid. There should also be a focus on choosing the most effective coding language for the task at hand to minimize inefficiencies, as well as configuring applications to run specifically on the cloud.<sup>10</sup>

## SPOTLIGHT | Green Cloud Advisor

Accenture's MyNav Green Cloud Advisor helps companies design cloud solutions that reduce carbon emissions and lay a foundation for responsible innovation.

Green Cloud Advisor establishes a baseline of existing data-center energy consumption, computing requirements and sustainability goals. It then applies proprietary algorithms to quantify the "greenness" of potential cloud solution options, based on a range of information such as the cloud service providers' carbon emissions goals, locations, energy sources and readiness to transition to clean energy.

**As companies accelerate cloud adoption, Green Cloud Advisor can help them simultaneously address one of their most pressing challenges—reducing emissions and waste—with greener IT practices.**





## Smart buildings

Presently, the total energy consumption of residential and commercial buildings accounts for about 40% of total U.S. energy consumption or 20% of global consumption.<sup>11,12</sup> Approximately two thirds of the building square footage in existence today will still be in use in 2050.<sup>13</sup> To meet greenhouse gas reduction targets such as those laid out in the Paris Climate Agreement, energy-squandering facilities around the world will need to be transformed into high-efficiency smart buildings.

Smart buildings use automated processes to control building operations such as climate control, lighting, security and more. A smart building gathers operational and condition data from a network of smart sensors, running analytics against the data to identify issues and manage the building according to business functions and services (see Johnson Controls sidebar). This infrastructure helps owners, operators and facilities managers improve asset reliability and performance. The approach reduces energy consumption, optimizes space utilization and minimizes the environmental impact of buildings. Studies have shown that these techniques also measurably increase employee productivity.

Smart buildings provide an example of companies using green technology to both cut costs and generate revenue. High tech innovators can develop smart building products and services to sell into this market while also testing them and using them to achieve their own sustainability goals.

## Relevant Accenture sustainability offerings

Sustainability measurement  
Net carbon zero





## SPOTLIGHT | Johnson Controls and Accenture team for sustainability

With a focus on building automation and control, Johnson Controls (JCI) is a textbook example of a company that is both developing products and services positioned for the sustainability market and using that technology to reduce its carbon footprint. The company is combining JCI's hardware and software with Accenture's expertise in data analytics and systems integration to provide solutions focused around three key areas:

1. **Building digitalization and transformation**
2. **Energy optimization**
3. **Responsible value chains and circular economy**

As an example, customers can use the solutions to adjust airflow into buildings depending upon occupancy. Traditional HVAC solutions focus on maintaining steady-state airflow. With the combination of sensors, analytics and smart controllers, the building automation system can automatically lower airflow when fewer people are present and boost airflow when occupancy rises. Accenture applied this technology to reduce energy and emissions by 10% to 20% while lowering operations costs across real estate by 20% to 30%.<sup>14</sup>

In conjunction with Accenture, it provides solutions for:

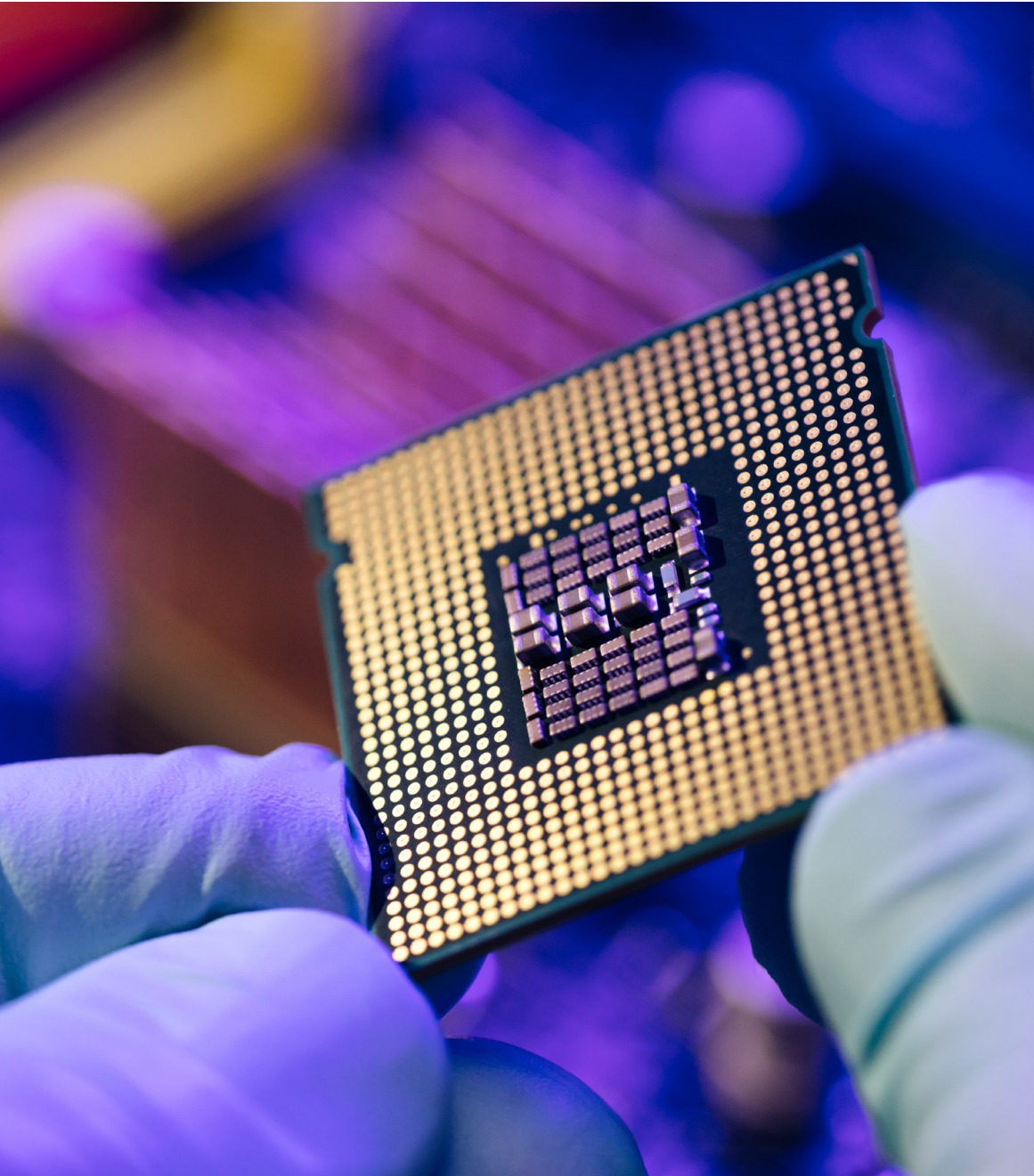
- **Sustainability services:** Accelerating buildings & operations sustainability services; supplying C-suite visibility into real-time environmental, social and governance data
- **Return to work solutions:** OpenBlue Healthy Building integrated or deployed modularly, include a combination of hardware & software to manage spaces and occupant experiences
- **Security partnership:** Amplifying customers physical & cybersecurity capabilities creating a new market, "cyber-physical security" that surface threats below normal

## Examples of sustainability offerings for smart buildings include:

- Using IoT and edge computing for monitoring environmental controls
- Integrating diverse business systems to create energy and resources dashboards
- Leveraging 5G and AI to minimize building pollution and improve supply chain management by locating facilities and sources closer together







## Smart manufacturing

Semiconductor fabrication is a complex, exacting, highly automated process that patterns dozens or even hundreds of devices on a single wafer. As a result, even small process issues can decimate yield and unscheduled downtime can cost millions of dollars per hour. To this, add the sustainability issues already mentioned, as well as the use of expensive and often toxic materials and it's clear that semiconductor processing presents a target of opportunity for intelligent manufacturing techniques.

### **Analytics for process control**

The industry has long used data harvesting and process software in an attempt to maximize yield and throughput. With the growth of the IoT and the widespread availability of AI and machine learning, semiconductor manufacturers finally have the tools to tame data overload and achieve high levels of innovation, yield and improvement at the same time.

Smart manufacturing ties traditional manufacturing processes with fab, line and automation design using simulation to test options and optimize processes and production outcomes. It also integrates manufacturing and production planning and scheduling to provide detailed visibility from shop floor to top floor, across the plant and across the globe. Further, it combines data from sensors and other IoT equipped devices to mine the input for historical and current insights, and future predictions.

Companies can analyze the historic record and current condition data to implement predictive maintenance programs, identifying developing defects well in advance of failure to prevent unscheduled downtime. Custom analytics can be used to predict process issues, for the example in the case of one manufacturer who has crafted analytics to detect impending deposition process failures, preventing significant yield reductions.

### **Digital twins**

At a more sophisticated level, digital twin technologies show real promise in making semiconductor manufacturing more efficient. The digital twin is a detailed simulation of a real asset that is updated in real time with a constant stream of data from sensors and other types of input. It provides a testbed for trying out new processes and analyzing issues. Currently used in industries like aerospace and automotive, digital twin technology enables semiconductor companies to optimize throughput, yield and cost with a fast ramp time while minimizing inefficiencies.



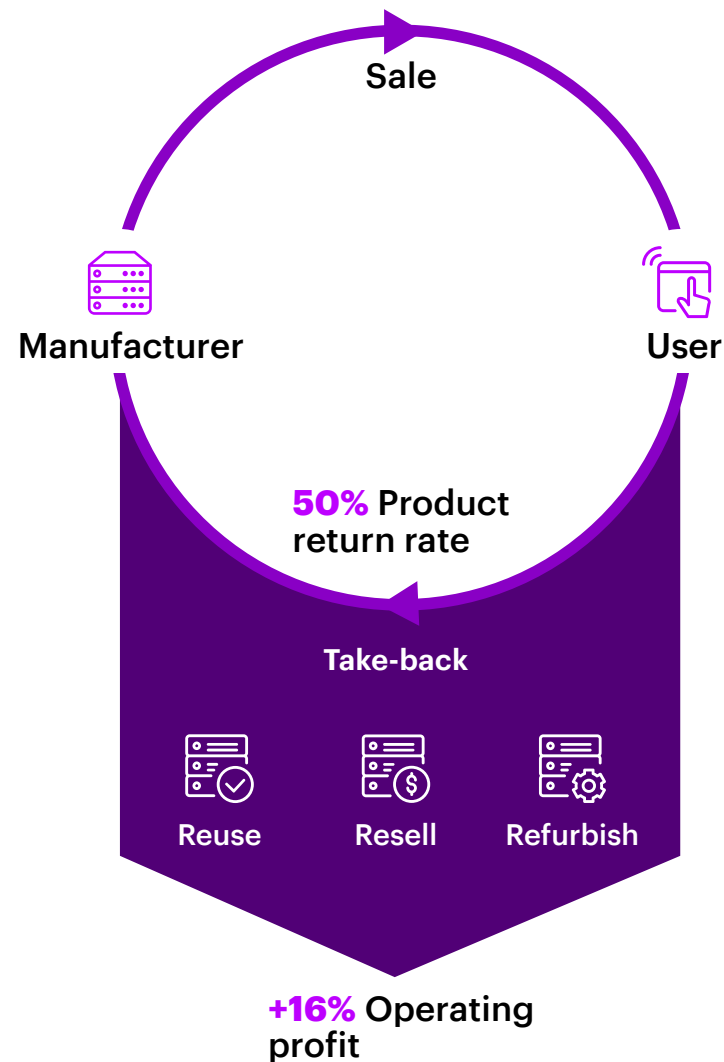
The smart manufacturing vision of semiconductor production is one that is optimized, reliable, high yield, completely documented and in the future—sustainable. The analytics can be applied to not just a single asset but also between machines in a family or in a line or fab.

### Circular design

Whether stemming from consumers upgrading to the latest smart phone or data centers swapping out servers to keep up with the demands of AI, more than 50 million tons of e-waste accumulate every year.<sup>15</sup> The raw materials alone are worth an estimated \$60 billion.<sup>16</sup> As we've already noted, recovering any of the valuable materials from prematurely discarded devices is not practical. The bigger issue is that raw materials represent only about 1% of the cost of a server, for example.<sup>17</sup> The current linear model (manufacture, use, discard, recycle) is inadequate to address even current levels of e-waste, let alone the massive increase that we'll see as the 5G/IoT revolution swings into high gear. E-waste is both hurting the planet and costing high tech companies money.

The solution is to adopt a circular model. Instead of attempting to recycle after the fact, engineering teams need to consider sustainability from the beginning. Designing products for reuse, resale, repair, refurbishment and remanufacturing can boost operating profit for a company by 16%.<sup>18</sup> Modifying business models for recovery of products can bring up to 35% in cost savings, an 80% reduction in material losses and a 45% reduction in CO<sub>2</sub> emissions.<sup>19</sup>

### Circular design and takeback program for servers



Source: Accenture, No Time to E-Waste, 2020.

Let's consider a couple of examples of how this might work. A server manufacturer could refund customers a certain amount of the sale price to return the device, which can then be refurbished and given a new life. Alternatively, companies can adopt a hardware-as-a-service model, giving them control over the refurbishment cycle, as well as a source of recurring revenue. A high-performance computer server could be refurbished and resold for general compute, for instance. After a certain period of time, it could be refurbished again and used for data storage. For properly designed product, this kind of virtuous circle can be both straightforward and financially rewarding.

**Google**, for example, has applied circularity principles in its data centers, saving hundreds of millions of dollars annually. More than one third of the servers it deployed in 2016, for example, were refurbished/remanufactured.<sup>20</sup> The company also resold nearly 2 million units into secondary markets.<sup>21</sup>

**Cisco** has developed a detailed circularity strategy, repairing more than 1 million parts per year.<sup>22</sup> The company remanufactures, reuses and recycles roughly 14,000 metric tons of products annually.<sup>23</sup>

By avoiding single-use inputs and designing for refurbishment and longevity, high tech manufacturers can save money and even potentially create new revenue streams while reducing their carbon footprints.



## Conclusion

High tech companies are in a time of challenge and opportunity. It's important to note that they are not on their own in this effort, however. An unprecedented amount of public financing is available to accelerate transformation programs in all industries for which sustainability and innovation are essential.

Meanwhile, Accenture is helping customers build these new green cloud and technology businesses, aided by Accenture IP like MyNav, and teams in Strategy, Technology, AI, Interactive and Operations. We are helping companies realize the opportunity in sustainability, not just resolve their own risk. By focusing on the full value chain through green cloud and IT and through our sustainable services we help them measure and address the impact they are having.



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## About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world’s largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With 624,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives.

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The Accenture High Tech industry practice is committed to building compelling customer and partner experiences, reinventing core operations and scaling new business models through the power of digital transformation. Within the High Tech Industry, we work across the semiconductor, enterprise technology, consumer technology, communications technology and medical equipment sectors. With our deep expertise, we help organizations navigate through constant change and technology disruptions to drive long-term growth and expansion. Our teams have a strong track record in maximizing new market opportunities in areas such as cloud, IoT, 5G, AI and emerging technologies.

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