



How can we advance sustainability?

2024 Environmental Sustainability Report


Reporting on our 2023 fiscal year



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Microsoft sustainability

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5M

metric tons of carbon removal contracted in FY23

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18.5K

metric tons of waste diverted from landfills and incinerators

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61M

cubic meters of water replenishment projects contracted by end of FY23

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\$761M

allocated towards climate technologies through our Climate Innovation Fund (CIF)¹

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Reporting disclosure

A key principle of our work is transparency. This report, published annually, includes our strategy, progress against our goals, and key challenges and trends we see in this work. We also publish our environmental data, which is included in the separate [Environmental Data Fact Sheet](#). Deloitte & Touche LLP performed a review relating to specified information within Section 1 of the [Environmental Data Fact Sheet](#).
Read about how we report in Appendix A.

Overview

Reviewing our 2023 progress and learnings

Our employees are at the core of our sustainability journey. Their passion and commitment catalyzes progress in every part of our business and their communities around the world.

Images taken by employees are featured throughout the 2024 Environmental Sustainability Report.

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Captured by:
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Foreword

Accelerating innovation and partnership for people and the planet



Brad Smith
Vice Chair and President



Melanie Nakagawa
Chief Sustainability Officer

Four years ago, Microsoft committed that by 2030 we would become carbon negative, water positive, zero waste, and protect more land than we use. Since that announcement, we have seen major changes both in the technology sector and in our understanding of what it will take to meet our climate goals. New technologies, including generative AI, hold promise for new innovations that can help address the climate crisis. At the same time, the infrastructure and electricity needed for these technologies create new challenges for meeting sustainability commitments across the tech sector. As we take stock as a company in 2024, we remain resolute in our commitment to meet our climate goals and to empower others with the technology needed to build a more sustainable future.

“There is no issue today that connects everyone on the planet more than the issues around climate change.”

At the end of last year, the world met in Dubai at COP28 to assess global sustainability progress. The results were sobering. The world is not on track to meet critical climate goals, and we see many of the world’s challenges reflected in our own situation. During the past four years, we have overcome multiple bottlenecks and have accelerated progress in meaningful ways. As we report here, we are on track in several areas. But not in every area. We therefore are mobilizing to accelerate progress in areas where we’re not yet on track.

In four areas we are on track, and in each of these we see progress that has the potential to have global impact beyond our own sustainability work. These are:

- Reducing our direct operational emissions (Scope 1 and 2).
- Accelerating carbon removal.
- Designing for circularity to minimize waste and reusing cloud hardware.
- Improving biodiversity and protecting more land than we use.

At the same time, there are two areas where we’re not yet on track, and in each of these we are intensively engaged in work to identify and pursue additional breakthroughs. These are:

- Reducing our Scope 3, or indirect, emissions.
- Reducing water use and replenishing more water than we consume in our datacenter operations.

Even amid the challenges, we remain optimistic. We’re encouraged by ongoing progress across our campuses and datacenters, and throughout our value chain. Even more, we’re inspired by the scores of executives and employees across Microsoft who are rolling up their sleeves and identifying new and innovative steps that are helping us to close critical gaps. We all recognize the same thing: there is no issue today that connects everyone on the planet more than the issues around climate change. We all need to succeed together.

Carbon negative

Our carbon negative commitment includes three primary areas: reducing carbon emissions, increasing use of carbon-free electricity, and carbon removal. We made meaningful progress on carbon-free electricity and carbon removal in FY23. Microsoft has taken a first-mover approach to supporting **carbon-free electricity** infrastructure, making long-term investments to bring more carbon-free electricity onto the grids where we operate.

Foreword continued

In 2023, we increased our contracted portfolio of renewable energy assets to more than 19.8 gigawatts (GW), including projects in 21 countries. In FY23, we also contracted 5,015,019 metric tons of **carbon removal** to be retired over the next 15 years. We are continuing to build a portfolio of projects, balanced across low, medium, and high durability solutions.

Carbon reduction continues to be an area of focus, especially as we work to address Scope 3 emissions. In 2023, we saw our Scope 1 and 2 emissions decrease by 6.3% from our 2020 baseline. This area remains on track to meet our goals. But our indirect emissions (Scope 3) increased by 30.9%. In aggregate, across all Scopes 1–3, Microsoft’s emissions are up 29.1% from the 2020 baseline.

The rise in our Scope 3 emissions primarily comes from the construction of more datacenters and the associated embodied carbon in building materials, as well as hardware components such as semiconductors, servers, and racks. Our challenges are in part unique to our position as a leading cloud supplier that is expanding its datacenters. But even more, we reflect the challenges the world must overcome to develop and use greener concrete, steel, fuels, and chips. These are the biggest drivers of our Scope 3 challenges.

We have launched a company-wide initiative to identify and develop the added measures we’ll need to reduce our Scope 3 emissions.

Leaders in every area of the company have stepped up to sponsor and drive this work. This led to the development of more than 80 discrete and significant measures that will help us reduce these emissions—including a new requirement for select scale, high-volume suppliers to use 100% carbon-free electricity for Microsoft delivered goods and services by 2030. As a whole, this work builds on our multi-prong strategy, this year focusing on the following:

- 1 **Improving measurement** by harnessing the power of digital technology to garner better insight and action.
- 2 **Increasing efficiency** by applying datacenter innovations that improve efficiency as quickly as possible.
- 3 **Forging partnerships** to accelerate technology breakthroughs through our investments and AI capabilities, including for greener steel, concrete, and fuels.
- 4 **Building markets** by using our purchasing power to accelerate market demand for these types of breakthroughs.
- 5 **Advocating for public policy** changes that will accelerate climate advances.



Water positive

We take a holistic approach to becoming water positive, which includes **water access**, replenishment, innovation, reduction, and policy. In 2023, we achieved our water access target by providing more than 1.5 million people with access to clean water and sanitation solutions. We contracted **water replenishment** projects estimated to provide more than 25 million m³ in volumetric water benefit over the lifetime of these projects—enough water to fill about 10,000 Olympic sized swimming pools. Finally, we continue to drive **innovation in water**, through first-of-their kind replenishment projects like FIDO, which leverages AI-enabled acoustic analysis to reduce water loss from leakage.

Looking ahead, as our datacenter business continues to grow, so does the need to minimize our water consumption and replenish more than we consume in these operations. In FY23 our progress on water accelerated, and we know we need to implement an even stronger plan to accelerate it further. We therefore are investing in our water positive commitment in four ways:

- 1 We are taking action to **reduce the intensity with which we withdraw resources** by continuing to design and innovate in order to minimize water use and achieve our intensity target.

- 2 Our new **datacenters are designed and optimized to support AI workloads** and will consume zero water for cooling. This initiative aims to further reduce our global reliance on freshwater resources as AI compute demands increase.
- 3 We are **partnering to advance water policy**. In 2023, we joined the Coalition for Water Recycling. Over the coming year we will finalize a position and strategy for water policy.
- 4 We are developing innovative scalable replenishment projects in high water stress locations where we operate datacenters. We recently announced Water United, a new initiative to unite public and private sectors in reducing water loss from leakage across the Colorado River Basin.

Zero waste

Our journey to zero waste includes reducing waste at our campuses and datacenters, advancing circular cloud hardware and packaging, and improving device and packaging circularity. In FY23, we achieved a reuse and recycle rate of 89.4% for servers and components across all cloud hardware, a target that is increasingly important as needs for cloud services continue to grow. In 2023, we also diverted more than 18,537 metric tons of waste from landfills or incinerators across our owned datacenters and campuses, and we reduced single-use plastics in our Microsoft product packaging to 2.7%.

Foreword continued

From expanding our Circular Centers to piloting programs that give a second life to used fiber optic cables through partnerships with local technical schools, we are working to keep materials in use longer and approach our work at every stage with circularity in mind. We are accelerating our work to reuse and recycle cloud hardware wherever possible, and launched two new Circular Centers in Quincy, Washington and Chicago, Illinois in 2023.

Protecting ecosystems

We have committed to protect more land than we use by 2025, while preserving and restoring ecosystems in the areas where we live and work. As of FY23, we exceeded our land protection target by more than 40%. At this point, 15,849 acres of land have been legally designated as permanently protected compared to our goal of 11,000 acres.

We are incorporating green business practices that support the surrounding ecosystems near our campuses and datacenters. This includes regenerative design solutions around our datacenters that enhance local biodiversity, improved stormwater management, and contributing to climate resilience. We are also piloting AI-driven Microsoft technology to provide insights into the overall health of the ecosystem and inform future actions.



Customer and global sustainability

In last year's [Environmental Sustainability Report](#), we announced that we were expanding our ambition to help advance sustainability for our customers and the world. In 2023, we continued this work to empower our customers and partners on their own sustainability journey by creating the technology needed to better manage resources and optimize systems. On a global scale, we focused on accelerating innovation, research, and policy, not only for ourselves but also to support a more sustainable world for all.

The shift from pledges to progress requires action, transparency, and accountability. Microsoft Cloud for Sustainability is helping customers unify data and garner richer insights into the sustainability of their business. In 2023, we expanded Microsoft Sustainability Manager to include Scopes 1, 2, and all 15 categories of Scope 3 carbon emissions to help track progress and inform action across an organization's operations and value chains.

As the world experiences worsening impacts of climate change, we are also helping to put planetary data into the hands of researchers, governments, companies, and individuals through the Planetary Computer. We are providing open access to petabytes of environmental monitoring data to help empower people with actionable information to protect their communities.

Microsoft's sustainability progress requires global engagement. We are investing in innovative solutions, advancing research, and advocating for policies that we believe can drive progress at scale. A hallmark of this effort has been our Climate Innovation Fund (CIF)—our \$1 billion commitment set in 2020 to advance innovation beyond Microsoft's four walls. To date the CIF has allocated \$761 million toward innovative climate technologies¹ including commercial direct air capture technologies, sustainable aviation fuel (SAF), industrial decarbonization, and more.

Our science, research, and AI for Good teams are also working to accelerate solutions and develop climate resilience with AI. In November 2023, we published a [whitepaper](#) and [playbook](#) that expands on the incredible potential of AI for sustainability. Through our AI for Good team, we are collaborating with the United Nations to research the use of AI to advance the Early Warning for All Initiative, with a goal of better understanding the populations that may be at risk of extreme weather events and other threats.

"The shift from pledges to progress requires action, transparency, and accountability."

Last year, Microsoft CEO Satya Nadella called climate change "the defining issue of our generation." To meet this generational challenge, we are putting sustainability at the center of our work. With each emerging technology, with each new opportunity, we ask ourselves an important question: how can we advance sustainability?

As we strive to answer that question, we are developing new approaches, experimenting with new partnerships, and learning as we go. We are optimistic about the role technology can continue to play in accelerating climate progress, and we look forward to working with others on this critical journey for all of us.

A handwritten signature in black ink, appearing to read 'Brad Smith'.

Brad Smith
Vice Chair and President

A handwritten signature in black ink, appearing to read 'Melanie Nakagawa'.

Melanie Nakagawa
Chief Sustainability Officer

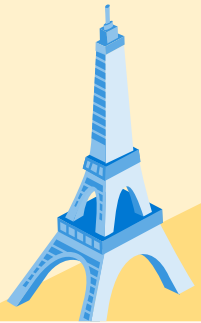
2023 highlights

Carbon

Total renewable electricity use in FY23

23.6 million MWh

This would be enough to power Paris with renewable electricity for about two years.



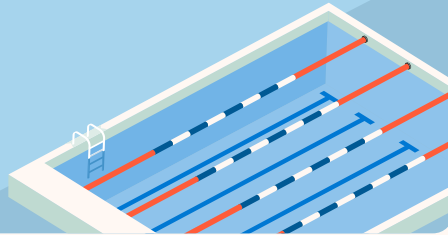
- ✓ 19.8 gigawatts (GW) of renewable energy assets were contracted, including projects in 21 countries around the world.
- ✓ We contracted 5,015,019 metric tons of carbon removal in FY23, and continue to build a portfolio of projects, balanced across low, medium, and high durability solutions.

Water

Total contracted water replenishment since 2020

61.7 million m³

This is enough water to fill over 24,000 Olympic sized swimming pools.



- ✓ We met our water access target by providing more than 1.5 million people with access to clean water and sanitation solutions.
- ✓ Our new datacenters are designed and optimized to support AI workloads and will consume zero water for cooling.

Waste

Total amount of solid waste diverted from landfills and incinerators FY23

18,537 metric tons

This is equivalent to the weight of over 45 commercial passenger jets.



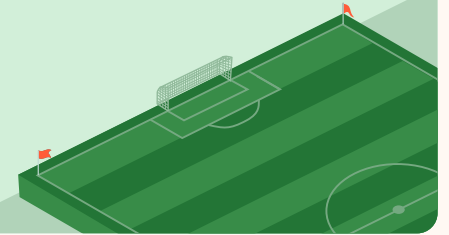
- ✓ 18,537 metric tons of solid waste were diverted from landfills and incinerators across our owned datacenters and campuses.
- ✓ Our reuse and recycle rates of servers and components across all cloud hardware reached 89.4% in FY23.
- ✓ We reduced single-use plastics in our Microsoft product packaging to 2.7% in FY23.

Ecosystems

Total amount of land protected in FY23

15,849 acres

This is equivalent to over 9,000 soccer pitches.



- ✓ 15,849 acres were designated as permanently protected. We exceeded our land protection target of 11,000 by more than 40%.
- ✓ Through the Microsoft Datacenter Community Environmental Sustainability program we are responding to local needs in the communities that host Microsoft datacenters and where our employees live and work.

How we work

Our sustainability journey starts with getting our own house in order. In 2020, we set bold targets to be a carbon-negative, water-positive, zero-waste company that protects ecosystems by 2030. We are committed to sharing our progress, challenges, and learnings through our annual Environmental Sustainability Report to help accelerate global progress toward net zero.

We recognize that our actions alone will not solve the climate crisis. As a global technology provider, we also believe we have a role to play in supporting the thousands of customers and partners who put their trust in Microsoft. We think about Microsoft's role in sustainability through three spheres of influence: Microsoft sustainability, customer sustainability, and global sustainability.



Microsoft sustainability: Taking care of our own environmental footprint

Our sustainability work starts with taking accountability for our operational footprint. This means taking accountability for our operational footprint across our campuses, datacenters, devices, software, and value chain. We look at our operations across the entire life cycle of assets and products, from design to building, usage, and end of life. We are committed to sharing our learnings, accelerating markets, scaling solutions across our value chain, and being transparent about our progress.



Customer sustainability: Delivering digital technology for net zero

Microsoft is committed to providing innovative digital technology to help build a more sustainable world. From managing environmental footprints with Microsoft Cloud for Sustainability to accelerating innovation for new climate technologies, we're working to empower our customers and partners across industries. We are advancing greener software and reducing carbon intensity to improve device sustainability, and helping organizations measure and manage the health of the planet's natural ecosystems with the Microsoft Planetary Computer.



Global sustainability: Enabling a more sustainable world

Microsoft's actions alone cannot solve the climate crisis. As a global technology leader, we are also committed to helping build the enabling societal conditions that will support a net zero economy. We're focused on accelerating the availability of new climate technologies, strengthening our climate policy agenda, helping to develop a more reliable and interoperable carbon accounting system, advocating for skilling programs to expand the green workforce, and working to help enable a just energy transition.

Microsoft sustainability

How are we addressing our environmental footprint?

Our sustainability work starts with taking accountability for our operational footprint. In 2020, we made a bold set of commitments: to be a carbon negative, water positive, zero waste company that protects ecosystems—all by 2030.

We are committed to sharing our learnings, accelerating markets, scaling solutions across our value chain, and being transparent about our progress.

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Captured by:
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Getting to carbon negative

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Our approach

Our commitment to becoming carbon negative requires unprecedented innovation and partnership. Over the last four years since setting our sustainability targets, thousands of companies have also joined the call to reach a net zero future and are taking steps, big and small, to help make that future a reality. This year, technologies like AI brought renewed promise of the role innovation can play in accelerating progress. From improving measurement to increasing datacenter efficiency and improving energy transmission, technology can be a powerful accelerant for the pace and scale the world needs to achieve net zero.

Amid this optimism, we face the realities of the complexity of the challenge. Addressing Scope 1, 2, and 3 emissions requires partnership and systemic action. We need to decarbonize supply chains and take action to build the carbon-free electricity infrastructure needed by Microsoft, our suppliers, our partners, and the world.

In FY23 our emissions increased by 29.1% across Scope 1, 2, and 3 from our 2020 baseline, as we continue to invest in the infrastructure needed to advance new technologies.

Since 2020, our Scope 1 and 2 emissions have decreased by 6%. This result is driven by our ongoing work to advance clean energy procurement, green tariff programs, and use of unbundled renewable energy certificates.

Scope 3 accounts for over 96% of our total emissions, which includes emissions from our supply chain, the life cycle of our hardware and devices, and other indirect sources. Our Scope 3 emissions continue to be our most significant decarbonization challenge. Progress will take deep collaboration across industries.

Microsoft has taken a first-mover approach, making long-term investments to bring more carbon-free electricity onto the grids where we operate, and we continue to advocate for the expansion of clean energy solutions around the world.



Our approach continued

Our journey to carbon negative

We are committed to being carbon negative by 2030 and by 2050 to remove from the atmosphere an equivalent amount of all the carbon dioxide our company has emitted either directly or by our electricity consumption since we were founded in 1975.

Working to help decarbonize the industrial sector



At Microsoft, we are also partnering to address carbon-intensive industries such as building materials, chemical products, and fossil fuels for aviation, shipping, and trucking.

Our targets

Reducing direct emissions

We will reduce our Scope 1 and 2 emissions to near zero by increasing energy efficiency, decarbonization of our operations, and reaching 100% renewable energy by 2025.

Reducing value chain emissions

By 2030, we will reduce our Scope 3 emissions by more than half from a 2020 baseline.

Replacing with 100/100/0 carbon-free energy

By 2030, 100% of our electricity consumption will be matched by zero carbon energy purchases 100% of the time.

Removing the rest of our emissions

By 2030, Microsoft will remove more carbon than it emits. By 2050, we will remove an amount of carbon equivalent to all our historical operational emissions.

Our progress

✓ Scope 1 and 2 emissions

Our Scope 1 and 2 emissions decreased by 6% from the 2020 base year. This result is driven by our ongoing work to advance clean energy procurement, green tariff programs, and use of unbundled renewable energy certificates.

✓ Scope 3 emissions

Our value chain or Scope 3 emissions increased by 30.9% from our 2020 baseline. Microsoft continues to work to scale corporate clean energy purchases across our supply chain and invest to help decarbonize hard-to-abate industries, including steel, concrete, and other building materials used in our datacenters.

✓ 19.8 GW of carbon-free energy

In 2023, we increased our contracted portfolio of renewable energy assets to over 19.8 gigawatts (GW), including projects in 21 countries around the world.

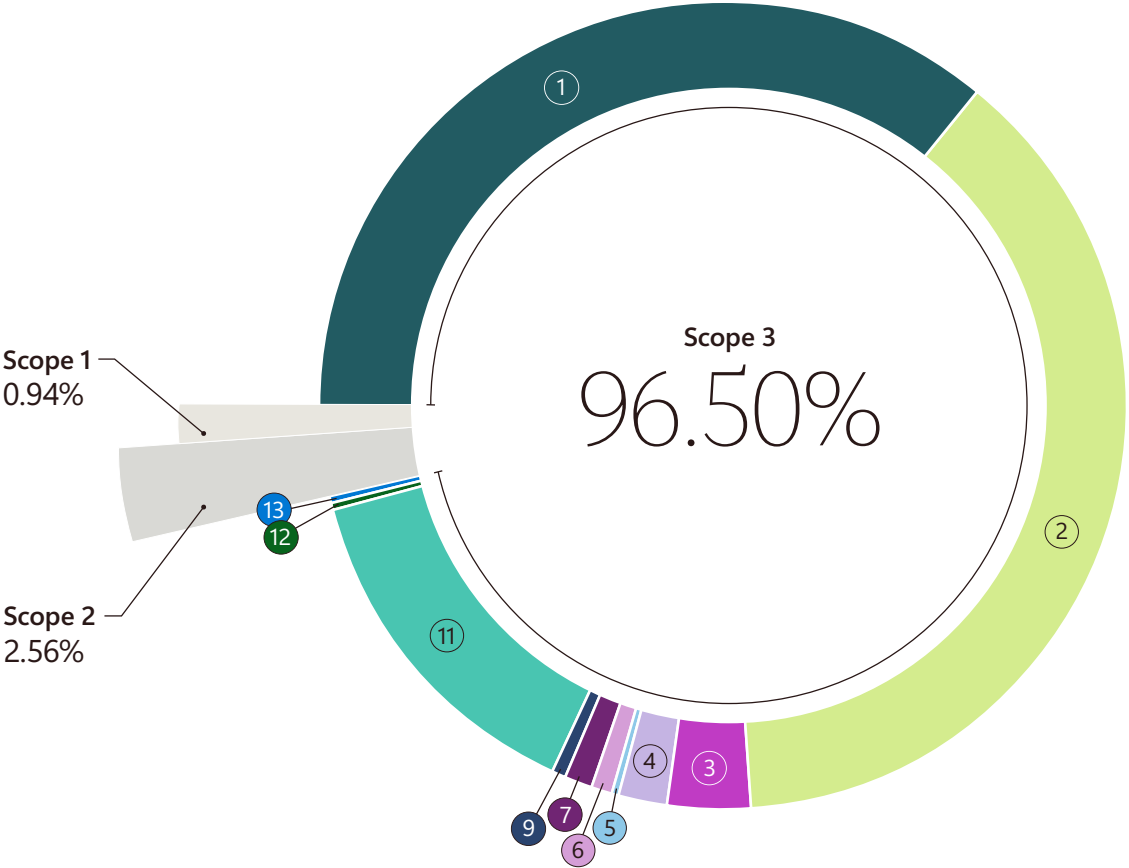
✓ 5M metric tons of carbon removal

We contracted 5,015,019 metric tons of carbon removal in FY23. We are continuing to build a portfolio of projects, balanced across low, medium, and high durability solutions.

Our approach continued

Carbon Table 1–Breaking down our FY23 Scope 3 emissions by source

Microsoft’s Scope 3 emissions continue to account for more than 96% of our total emissions, with the vast majority of these emissions coming from two categories upstream, Purchased Goods and Services (Category 1) and Capital Goods (Category 2), and one downstream, Use of Sold Products (Category 11).



Scope 3 Categories

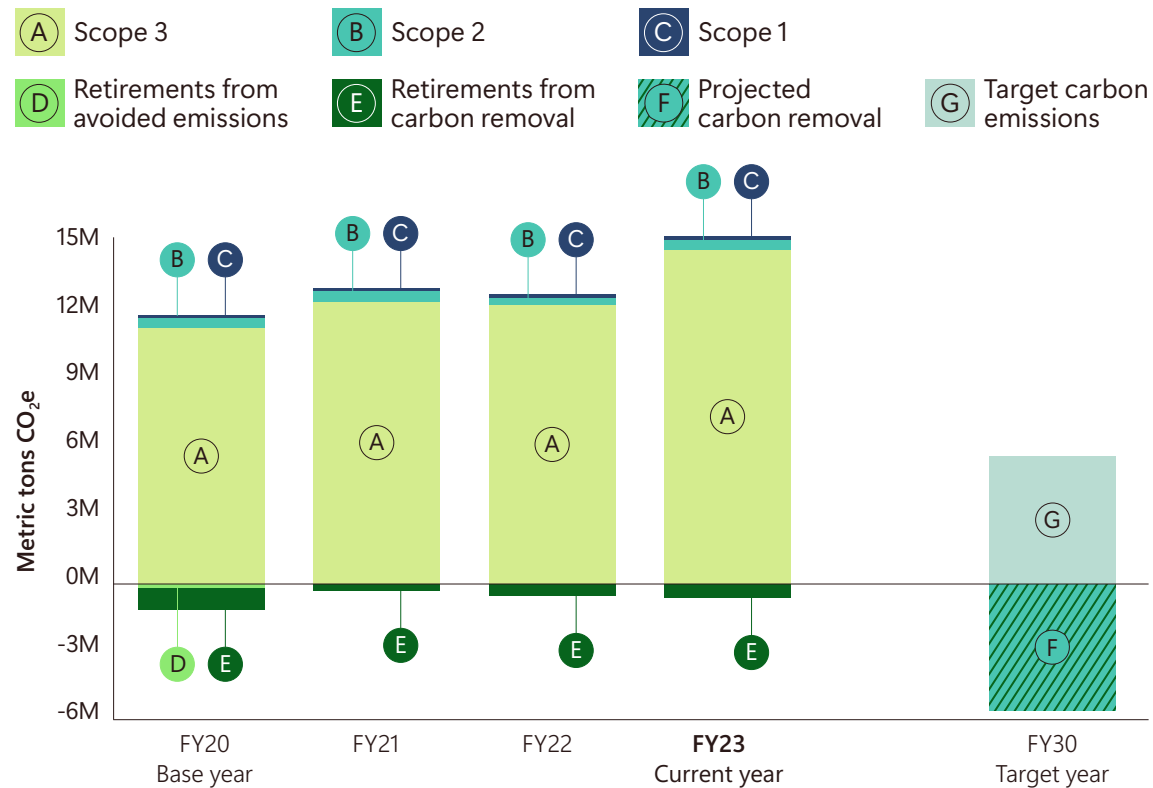
1	Purchased Goods & Services	36.23%
2	Capital Goods	38.24%
3	Fuel-and Energy-Related Activities (Market-Based)	3.39%
4	Upstream Transportation	1.99%
5	Waste	0.05%
6	Business Travel	0.81%
7	Employee Commuting	1.22%
9	Downstream Transportation	0.45%
11	Use of Sold Products	14.05%
12	End of Life of Sold Products	0.03%
13	Downstream Leased Assets	0.05%

Scope 2 and 3 emissions included in this chart are market-based. Scope 3 emissions are management criteria values.

Our approach continued

Carbon Table 2—Tracking progress toward carbon negative by 2030

Microsoft's overall emissions increased by 29.1% in FY23, in relation to our base year. Additionally, we retired 605,354 metrics tons of carbon removal as part of achieving our annual target to be carbon neutral.

[Find out more in our Data Fact Sheet](#)

Key definitions

Carbon-free electricity (CFE)

Microsoft refers to the broader suite of technologies compatible with a fully decarbonized electricity system as CFE. CFE technologies include solar, geothermal, sustainable biomass, hydropower, nuclear, carbon capture utilization and storage, and others with zero direct emissions.

Renewable energy




Electricity technologies including wind, solar, geothermal, sustainable biomass, and sustainable hydropower.²

Scopes 1, 2, and 3

Indirect emissions from all other activities up and down the value chain such as upstream and downstream transportation, materials, and end-of-life impacts, as well as all suppliers' direct Scope 1 and 2 emissions.

Scope 3 represents over 96% of Microsoft's annual emissions in FY23. Our Scope 3 emissions result primarily from the operations of our tens of thousands of suppliers (upstream) and the use of our products across millions of our customers (downstream).

Tackling Scope 3 means decarbonizing industrial processes such as steel, concrete, and other building material production for use in our campus and datacenter construction, as well as jet fuel for business travel and logistics.

 Scope 1	 Scope 2	 Scope 3
Direct emissions created by a company's activities	Indirect emissions from the consumption of the electricity or heat we use	Indirect emissions from all other activities in which we're engaged

Since setting our targets in 2020, data has played an increasingly important role in our journey by allowing us to better measure and manage our resource consumption.

Improving the measurement and efficiency of our operations

Reducing the carbon intensity of our operations is the first pillar of our approach to carbon negative. From the construction of our datacenters and campuses to our daily operations, efficiency is built into our design and use. Since setting our targets in 2020, data has played an increasingly important role in our journey by allowing us to better measure and manage our resource consumption. At Microsoft, we strengthened our supply chain methodologies in 2023 to drive progress in major sectors like building materials, sustainable aviation fuel, and hardware.

Datacenter efficiency

Measuring efficiency

Power usage effectiveness (PUE) is a ratio that describes how efficiently a datacenter uses energy. The lower the number, the better the score. We design and build Microsoft datacenters as close to a PUE of 1.0 as possible. This year our datacenters delivered a design rating of 1.12 PUE and, with each new generation, we will strive to be even more efficient.

Transitioning servers to a low-power state

We continue to seek opportunities to reduce server energy consumption. Using low-power server states, we observed a reduction in energy usage of up to 25% on unallocated servers, with a corresponding reduction in Scope 2 emissions. This year, we expanded our deployment of this technique from a few thousand servers in 2022 to around one million by the end of 2023. This initiative reduces energy usage by thousands of megawatt-hours per month across our global datacenters. A similar initiative targets servers that are awaiting maintenance, reducing energy usage by hundreds of megawatt-hours per month.



◀ We support carbon-free electricity infrastructure through procurement and investment.

Improving resource utilization

Datacenter resources are traditionally designed and built to accommodate peak power demands, often resulting in underutilization and the necessity to construct new datacenters. Microsoft is focused on improving datacenter efficiency by minimizing peak power consumption, effectively harnessing unused power, and maximizing server density within existing datacenters. This is achieved through power harvesting driven by service level agreements (SLAs), intelligent power-aware workload allocation, and utilizing the inherent redundancy in Microsoft internal services to tap into datacenter capacity that is conventionally reserved for use only during power grid or infrastructure failures.

In 2023, these initiatives have directly contributed to a roughly 7% reduction in datacenter power infrastructure and the associated embodied carbon.

Microsoft is also increasing server utilization by oversubscribing central processing unit (CPU) cores of internal workloads that have low CPU utilization. The direct impact in 2023 was an approximately 1.5% reduction in datacenter hardware needs for the Microsoft Azure platform—an improvement of three times over 2022 with a proportional reduction in associated embodied carbon.

Improving the measurement and efficiency of our operations continued

Building operations and construction

Infrastructure decarbonization

Our sustainability standards for new construction continue to expand to meet our climate goals. New campus projects require the procurement of high-efficiency refrigeration systems, all-electric kitchens and mechanical systems, and non-fossil-fuel-powered backup power systems. Combustion is no longer permitted for daily use in any new office construction project in our standard. We have also expanded our requirements to reduce embodied carbon in interior materials.

76.5%

In FY23, 76.5% of our total emissions originated from our suppliers. We believe Microsoft also has a role to play in bringing the global supply chain with us on our journey to net zero.

Innovations in low-carbon concrete

To minimize our carbon impact in constructing datacenters, we build our datacenters to meet LEED Gold certification, with 37 datacenters already meeting this goal globally.³ LEED buildings also use less water, utilize renewable energy and fewer resources, create less waste, and preserve land and habitat. One example of innovation in this area is a series of pilots completed this year using a net-negative embodied carbon limestone alternative to traditional concrete. Derived from algae cultivation in concert with other alternative cementitious materials, the combination yielded a concrete mix that met our performance requirements and achieved an estimated 65% embodied carbon reduction from conventional concrete of a similar strength.

Fleet electrification

On Microsoft campuses around the world, we are making progress toward electrifying our fleet and eliminating dependence on fuel burning vehicles.

To establish the infrastructure needed to support our goal of operating a 100% electric fleet by 2030, we're constructing an Electric Vehicle Fleet Facility that will house, charge, and maintain our electric commute fleet of the future at our Redmond headquarters. The project is currently in the design phase and is pursuing LEED Platinum certification.

Additionally, an underground garage is set to be completed in FY24 as part of our Redmond campus modernization project and will include 130 EV charging stations with 176 additional EV charging stations planned for future phases.

As we continue to electrify our global fleet by 2030, these projects will help us test and implement our EV infrastructure and apply it to more campuses across the globe.

Improve measurements across our supply chain

While we know that the majority of our emissions are from Scope 3, over 96% in 2023, we also needed greater precision on the drivers contributing to these emissions. What we found is that these emissions have three primary, interrelated drivers:

- 1 Electricity use** in both upstream embodied in what we purchase, and downstream from the usage of our products.
- 2 Key material procurement** including semiconductors, steel, cement, aluminum, and plastics.
- 3 Fuel use** from direct travel, commuting, logistics, and embodied in what we purchase.⁴

Achieving net zero is not something we can do alone. As 76.5% of our total emissions originate from our suppliers, we have a role to play in bringing the global supply chain with us on our journey to net zero.

By leaning into education and investing in meaningful tools for carbon reduction, we can move these efforts up the supply chain tier.



- ^ We are working to scale carbon accounting methodologies to drive progress across our supply chain.

Improving the measurement and efficiency of our operations continued

Partnering with our suppliers

Access to granular emissions data from our supply chain is essential to identifying where our largest Scope 3 reduction opportunities exist and how these can be actioned.

To understand the full extent of our Scope 3 carbon footprint, we piloted a new feature in Microsoft Sustainability Manager called the environmental, social, and governance (ESG) value chain solution. In 2023, Microsoft Procurement acted as customer zero, as we used our own technology and utilized the ESG value chain solution as its disclosure platform to successfully collect emissions from top in-scope suppliers. Additionally, due to the flexibility the ESG value chain solution offers, the Procurement Sustainability team was able to customize the platform to collect more advanced, granular emissions data from suppliers. In the future, the ESG value chain solution will enable customers to customize and collect detailed emissions data directly from suppliers.

Advancing procurement of carbon-free electricity

When we identified a near-term need to support suppliers in decarbonizing their electricity consumption, especially our smaller- to medium-sized suppliers who traditionally lack the expertise and resources to navigate this process on their own, we partnered with climate solutions expert 3Degrees to launch Supplier REach, a renewable electricity portal.

The portal assists with Microsoft supplier evaluation and procurement of high-quality carbon-free electricity options based on factors such as their geography and energy load.



Reducing emissions in Cloud Logistics

In 2023, the Cloud Logistics team implemented a three-pillar strategy for emissions reduction:

- 1 Apply industry-leading data models, based on the Global Logistics Emissions Council (GLEC) Framework, to obtain detailed emissions data for each shipment. This “digital twin” of our operations data earned us a finalist spot in Gartner’s 2024 “Power of the Profession” award.
- 2 Utilize data to optimize our supply chain, identifying efficiency gains that helped us avoid over 90,000 mtCO₂e emissions. These savings were achieved by shifting cargo to more carbon-efficient transportation modes, consolidation, and network design.
- 3 Drive transformational solutions in trucking, shipping, and aviation. In partnership with our largest transportation service providers, we have enabled them to source low-carbon or carbon-free logistics services. This led to the successful deployment of electric vehicles and sustainable fuels.

To further our goal of sustainable transportation, we joined collaborations like the Sustainable Aviation Buyers Alliance (SABA) and we have launched a new initiative with cargo-owning peers and suppliers that plans to build the first electric interstate trucking corridor in the United States.

Measuring semiconductor emissions

Driving targeted Scope 3 emission reductions requires more precise measurement.

For semiconductors, this means measuring emissions drivers down to the square centimeter of silicon—a unit of measure required for life cycle assessment (LCA)-based methodologies—and applying product-specific emissions factors. We modeled this for all high-impact components installed and sold by Microsoft.

This advancement, which reflects Microsoft’s application of leading-edge research findings from imec’s Sustainable Semiconductor Technologies and Systems (SSTS) program, enables us to quantify which specific products, manufacturers, geographic locations, and production stages are driving emissions. This specificity deepens our supplier engagement efforts and focuses our policy and advocacy discussions.

90K

By using data to optimize our logistics supply chain, 90,000 mtCO₂e emissions were avoided.

Improving the measurement and efficiency of our operations continued

LinkedIn

Our teams at LinkedIn have developed Healthy & Sustainable Building Materials specifications to guide our Workplace Design and Build team. We have also provided input to and utilized the Embodied Carbon in Construction Calculator (EC3) for identification and evaluation of the carbon intensity of workplace construction materials alternatives. We have piloted a variety of initiatives, including electrified kitchens in four sites, battery back-up and solar installation in one site, and installation of fault detection diagnosis (FDD) in one site. We also conducted a battery versus generator carbon life cycle study.

Expanding campus initiatives

At our LinkedIn campus in Omaha, Nebraska, we have been accessing direct renewable energy through our parking canopy solar installation since July 2022. In FY23, this solar installation project provided approximately 17% of the building's total electricity, including helping to power the all-electric kitchen.

Reducing carbon through our food programs

At LinkedIn, we are committed to reducing the carbon footprint of our food program and have implemented various initiatives to achieve that goal.



One of the key strategies employed to reduce Scope 3 emissions of suppliers' purchased foods in FY23 was to increase local purchasing of agricultural products to, or above, 20% of total purchasing spend, while partnering with regional producers focused on climate-smart agricultural practices and regenerative farming.

Mitigating carbon impacts of travel

We have also implemented an employee-facing travel solution called Tripkicks which supports our corporate sustainability initiatives. In partnership with BCD and Advito, Tripkicks allows employees to better understand their carbon impact before they travel. As employees plan their trips, they are able to see accurate and ISO-Certified carbon dioxide figures, powered by Advito's GATE4 carbon emissions methodology, for each flight option, identifying the most sustainable options.

Reducing the impact of our supply chain

Building transparency

Collaboration across Microsoft has led us to adapt an effective approach to shift from spend-to process-based methodologies for measuring embodied carbon impact of construction materials. This methodology is based on a framework using today's best available third-party verified data via Building Transparency's EC3 tool. This new methodology aims to appropriately incorporate actual global warming potential of the materials we buy, where data is available, with existing spend-based methodologies, as we work to improve our Scope 3 measurement and emissions.



Greenhouse Gas Protocol

In 2023, we submitted responses to four Greenhouse Gas Protocol (GHGP) surveys that kicked off GHGP's comprehensive review of its corporate carbon accounting guidance. Microsoft's survey responses articulated a vision for more accurate, consistent, impact-relevant carbon accounting. We also published a [white paper](#) laying out Microsoft's approach, challenges, and innovations with respect to carbon accounting.

Cognitive visual learning

To improve data quality and reduce manual entry errors, we have been developing a cognitive visual learning (CVL) tool in partnership with the Microsoft Finance team. The CVL AI tool will be capable of automatically reading utility invoices (such as PDFs, Excel files, or image files) in any language and extracting the required data. Ultimately, this innovative tool will streamline reporting on our utility consumption and replace a time-consuming third-party application that is subject to manual error.

Building markets and driving progress

The ability of Microsoft and the technology sector to meet net zero targets is dependent on our collective ability to procure carbon-free electricity and decarbonize our supply chains. Microsoft continues to build and scale carbon-free electricity through our procurement of renewable energy and investing to bring more carbon-free electricity onto the grids where we operate. As one of the largest corporate purchasers of renewable energy, we continue to seek ways to diversify and scale-up supply of impactful renewable energy and mechanisms enabling access for all.

6.6 MW

We are partnering with Clearloop to help decarbonize the grid in the Mississippi Delta region, enabling a 6.6-megawatt project.

Building markets

Accelerating carbon-free electricity circularity

Microsoft's unique position as one of the world's largest corporate renewable energy purchasers provides the opportunity and responsibility to help facilitate a circular economy in the renewable energy sector. Our leadership is enabling and supporting the market due to the scale of our procurement, laying the foundations for renewable energy infrastructure reuse and recycling, concurrently addressing environmental, community, and supply chain challenges. In advancing a circular economy for all, we follow three principles:

- 1 Requiring recycling of renewable energy infrastructure.
- 2 Requiring recycled materials in renewable energy infrastructure manufacturing.
- 3 Using our voice on circular economy for renewable energy public policy.



Sustainability Champion:

John Tien

At Microsoft, I play a role in achieving our sustainability goals by working with suppliers to implement best practices and technology solutions in the sourcing of memory semiconductors. The positive impact of these efforts on Microsoft, our customers, and the planet inspires me to believe that we all have the power to make a difference, both in our personal and professional lives.

Procuring carbon-free electricity

Incorporating environmental justice principles into our carbon-free electricity procurement, we partnered with EKOenergy's Climate Fund to enable the installation of solar-powered refrigeration for a Kenyan fishing village, offering ice and clean water at 20% lower prices for 2,000 households and addressing food security and economic hardship by reducing fish harvest loss.

We have begun embedding community funds in global power purchase agreements (PPAs)—for example, a 366-MW renewable energy deal in Ireland with European developer Statkraft includes such a fund to support local community needs.

We also partnered with Clearloop to expand equitable access to clean energy and help decarbonize the grid in the Mississippi Delta region, enabling a 6.6-megawatt project in Mississippi through an upfront payment for long-term renewable energy credits. Microsoft helped get the project online and provided support for Clearloop's model.



Building markets and driving progress continued

Advancing carbon dioxide removal (CDR)

At Microsoft, we continue to support the development of carbon removal. In FY23 we accelerated procurement of various pathways, building on our long-term agreement framework. We worked through the details in each of those agreements to make sure we are building this first generation of large-scale carbon dioxide removal projects to be as impactful as possible.

These multi-year agreements draw on our renewable energy procurement experience and are structured to help projects obtain external financing. Our carbon removal contracts reflect general industry risks along with the specifics of individual projects to ensure we are buying additional, durable, measurable, and net negative carbon credits.

As we fill our balanced portfolio of greater than 5 million metric tons a year starting in 2030, we are also buying novel solutions, for example enhanced rock weathering, to test what else will be ready for scale by 2030.

5M

In FY23, we procured 5.015 million metric tons of carbon removal in support of our carbon neutral and negative targets.

Progressing towards 2030

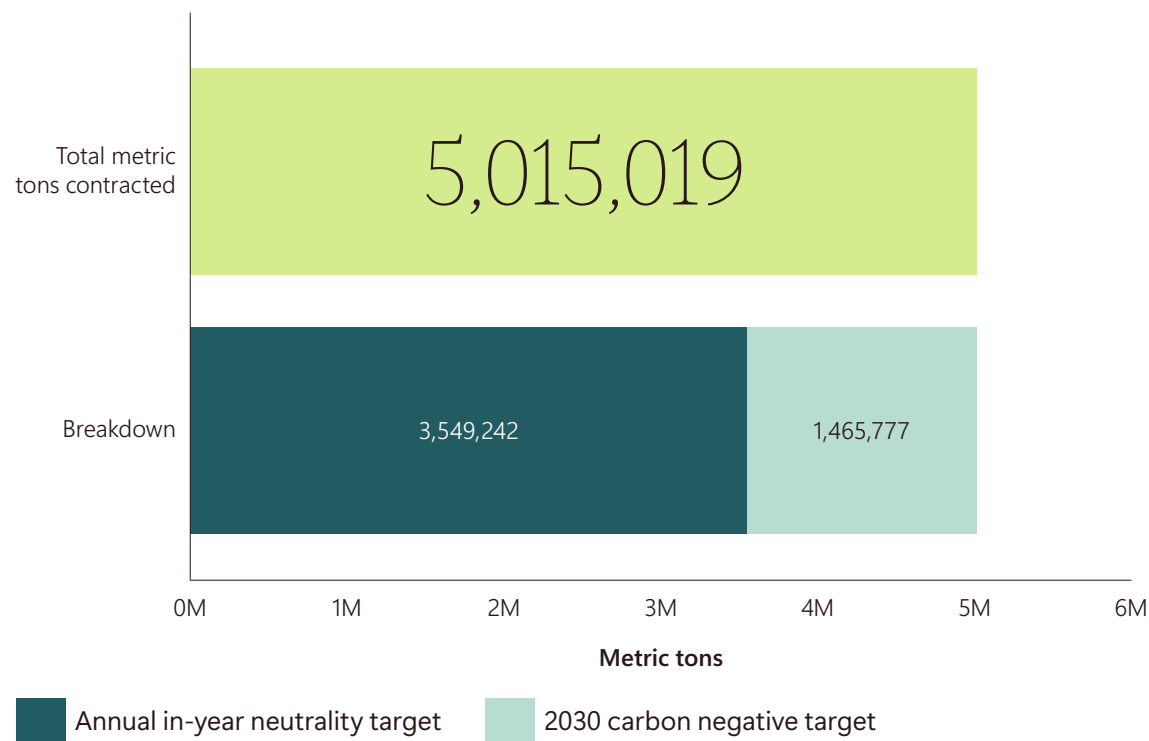
In FY23, we contracted 5,015,019 metric tons of carbon removal to be retired over the next 15 years. Many of these projects entail multi-year commitments to carbon removal. Altogether we expect our contracts signed as of December 2023 to provide 875,000 metric tons toward our 2030 goal of greater than 5 million metric tons. Projects signed in 2023 include the following.

Reforestation in the Amazon: In November 2023, we signed a long-term offtake with Mombak for carbon removal from reforestation in the Brazilian Amazon. We believe Mombak's best-in-class project design and work to bolster a crucial carbon sink and biome represent an extraordinary win for the climate and local communities.



Carbon Table 3—Tracking progress toward carbon negative by 2030

In FY23, we procured 5.015 million metric tons of carbon removals. Carbon removal contracted each year includes credits retired in the same year and to be retired in future years, in support of our annual in-year carbon neutrality and 2030 carbon negative targets.



Find out more in our Data Fact Sheet



Building markets and driving progress continued

Landmark BECCS in Europe: Our recent agreement with Orsted shows the near-term potential of bioenergy with carbon capture and storage (BECCS). This project will add carbon capture to an existing heat and power plant and then store the carbon dioxide geologically to provide significant carbon removals and anchor the high durability category this decade.

Securing the sustainability of biomass for the Orsted project and future biomass-based pathways was a major focus and drove us to support [Carbon Direct's cross-sector work on this topic](#) alongside Frontier Climate. We believe that the time for responsibly scaling BECCS is here and look forward to the coming wave of project developments.



We support carbon-free electricity infrastructure through procurement and investment.

Scaling up carbon removal

Heirloom direct air capture: Heirloom's next direct air capture (DAC) projects will prove their potential to scale towards the megatons per year that society needs this decade to stay on track for the goals of the Paris Agreement. Heirloom's technology of making and breaking limestone to take carbon dioxide out of air is simplicity itself.

Enhanced rock weathering: Our deals this year with UNDO and Lithos explore the novel carbon removal pathways that will reduce outstanding market uncertainties, and which could feasibly scale in the next several years. In addition to the science of enhanced rock weathering (ERW), we note that innovative business models will be important to expand projects with such front-loaded costs.

19.8 GW

We increased our contracted portfolio of renewable energy assets to over 19.8 gigawatts.

Supporting global progress

Meeting our carbon negative goals is tightly linked with global decarbonization. Supporting carbon-free electricity infrastructure through procurement and investment is critical to making this happen. It's a challenge that is bigger than any one company, but Microsoft has taken a first-mover approach, making long-term investments to bring more carbon-free electricity onto the grids where we operate. We continue to seek ways to diversify and scale-up supply of impactful renewable energy and mechanisms enabling access for all.

Partnering to scale clean energy

Microsoft partnership goals are threefold: achieve our own operational needs, accelerate the development of technologies that will help our customers and partners, and rapidly increase the scale of the global sustainability market.

In 2023, Microsoft increased its contracted portfolio of renewable energy assets to over 19.8 gigawatts (GW) across 21 countries. We signed new PPAs around the world, including with AES in [Brazil](#), Constellation Energy in [Virginia](#), Powerex in [Washington](#), Contact Energy in [New Zealand](#), and Lightsource bp in [Poland](#).

Microsoft is the first large commercial entity to use Powerex's wholesale 24x7 Clean Load Service for its new datacenter in Washington state. Under this agreement, Powerex will match Microsoft's hourly datacenter demand with direct deliveries of carbon-free hydro, solar, and wind power on a 24-hour, year-round basis—supplying reliable electricity to our datacenter while also supporting our 100/100/0 goal.

During the hours that Microsoft's contracted renewable resources produce more electricity than the datacenter can use, Powerex will take the surplus renewable power, allowing hydro generation to be reduced and water to be conserved for later use. This will enable clean deliveries back to this datacenter in later hours, when Microsoft's contracted renewable resources produce less electricity than the datacenter needs.

Microsoft and [Helion](#) announced an agreement to provide Microsoft with electricity from its first fusion power plant. The plant is expected to be online by 2028 and will target power generation of 50 MW or greater, dramatically shortening the projected timeline for commercially viable fusion energy. The planned operational date for this first-of-its-kind facility is significantly sooner than typical projections for deployment of commercial fusion power.

Building markets and driving progress continued

The Cajuiuna wind project

Microsoft's first power purchase agreement in Brazil (154 MW) is sourced from the Cajuiuna Wind Complex, developed by AES Brasil, and will be operated by an all-female operations and maintenance (O&M) team. AES Brasil is the first company in the country to have a wind farm operated and maintained locally by a team composed entirely of women.



Deerfoot solar project

The Deerfoot solar project in Canada (37 MW) is majority-owned (51%) by local First Nations, Chiniki and Goodstone. This project is expected to generate economic returns for the Indigenous communities and contribute to the lasting prosperity of the Nations for future generations.

The Skyward Community Solar project

In Oregon, we signed on as the major commercial partner on the Skyward Community Solar project, a solar farm in the Greater Portland area that generates nearly 3.6 million kilowatt-hours of clean energy each year. Clean electricity from the project is fed into the electric grid, replacing fossil fuels and reducing carbon emissions from our workplace operations.



Investing in sustainable aviation fuel

In 2023, Microsoft entered a 10-year contract with World Energy for sustainable aviation fuel (SAF) certificates, aiming to replace 43.7 million gallons of fossil jet fuel, and jointly funded a large-scale global SAF purchase with International Airlines Group (IAG). Additionally, Microsoft joined the Roundtable on Sustainable Biomaterials (RSB), contributing to RSB's sustainability framework and participating in programs supporting SAF development. Together with RSB and Alaska Airlines, Microsoft launched SAF-now.org, an educational resource designed to empower key decision makers with information on topics most relevant to choosing SAF.

Advocating for clean energy infrastructure

In August 2023, Microsoft hosted and participated in the Asia-Pacific Economic Cooperation (APEC) roundtable on GHG accounting standards on August 4 and the APEC Energy Ministers Meeting on August 15.

Microsoft has a direct interest in an expanded and clean electric grid; with over 60 Azure regions operating now or coming soon, and more than 300 datacenters globally. Over half of these regions are in APEC economies.

43.7M

Microsoft entered a 10-year contract with World Energy for sustainable aviation fuel (SAF) certificates, aiming to replace 43.7 million gallons of fossil jet fuel.

Learnings and what's next

Growing the supply for clean energy will require policy advocacy

Microsoft decarbonization policy advocacy is expected to contribute to reducing our upstream emissions in two ways:

- 1 Helping to create more direct corporate renewable procurement options in markets that are currently difficult to access, as in much of Asia-Pacific, thus increasing opportunities for reducing operational emissions in the near term.
- 2 Contributing to the enactment of policies that decarbonize the grids on which our suppliers operate.

These efforts can help to reduce the amount of baseline emissions to be addressed through renewable procurement.

Partnership and investment remains critical for Scope 3 emissions reduction

Collaboration remains critical to success, for Microsoft and our suppliers. While many of our suppliers are willing and want to reduce their footprints, they may still face considerable barriers like access to capital or market knowledge.

As we work to achieve our own operational needs, we are also working to accelerate the development of solutions that will help our customers and partners, and rapidly increase the scale of global sustainability markets.

Scaling markets for lower-carbon materials requires investment

While lower-carbon building construction materials are on the market today, they do not exist at the volume, in the geographies, nor at the scale needed to decarbonize the sector. We continue to pursue key mitigations to embodied carbon risk through extensive collaboration across Microsoft datacenters.

Our actions are focused on accelerating the uptake of low-embodied carbon solutions and driving innovation through new building materials with the potential to drastically reduce embodied carbon from those materials. Building on our experience with other industrial sectors, we will use forward contracting mechanisms to spur the market supply of lower-carbon materials.

Measurement plays an important role in Scope 3 reduction

Driving Scope 3 reductions requires developing better data visibility and more accurate and actionable methodologies than are generally available today. With improved life cycle assessment (LCA) methodologies and detailed analysis of specific products, manufacturers, geographic locations, and emissions life cycle stages, we are better able to understand the complexity of our supply chain and which tangible levers we can pull both with our suppliers and through policy.

Additionally, we are exploring how technology, like AI and blockchain, can further increase accountability and traceability for our Scope 3 carbon emissions.

Sharing our learnings to support global construction efforts

With our Redmond campus modernization project still in progress, we are continuing to catalog emissions, carbon, water, and energy use data. This data will inform future construction and modernization efforts at Microsoft campuses globally.

We will continue to share our learnings in hope that it inspires greater sustainability in construction—as well as transparency in reporting—from other organizations large and small in the future.