DIGITAL & TRENDS

Environmental impact of AI

statista

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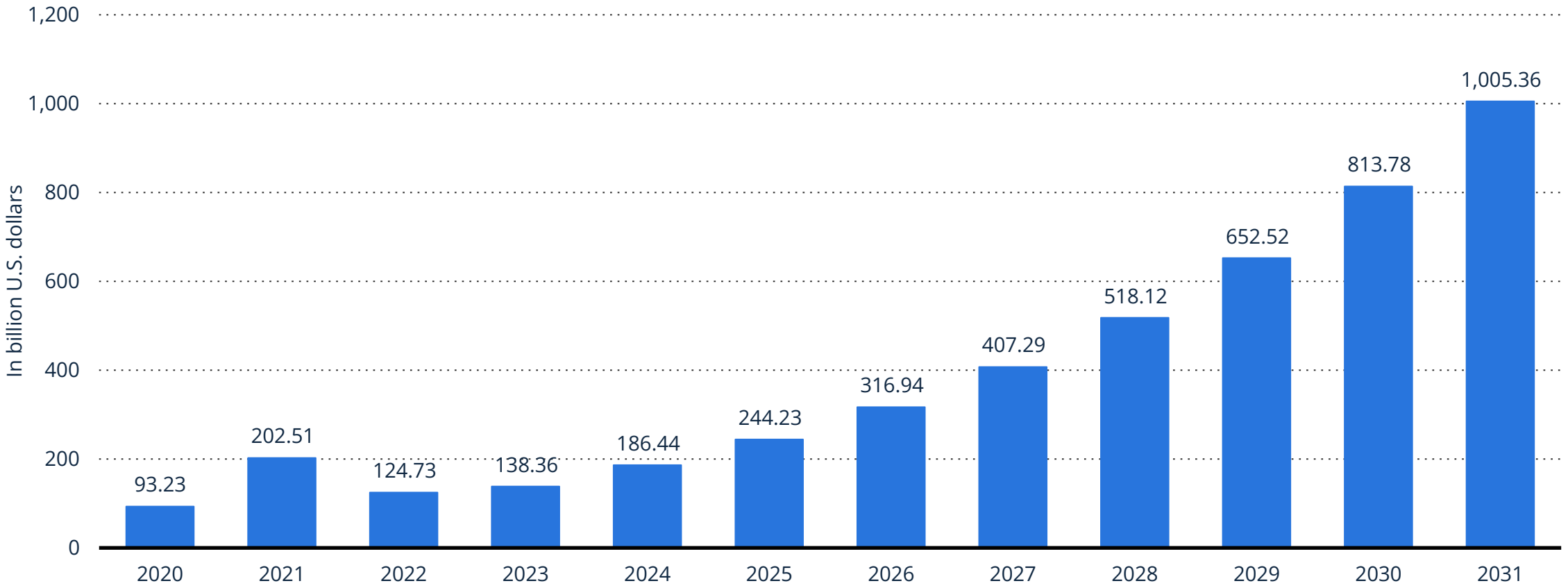
CHAPTER 01

Overview

Artificial intelligence (AI) market size worldwide from 2020 to 2031 (in billion U.S. dollars)

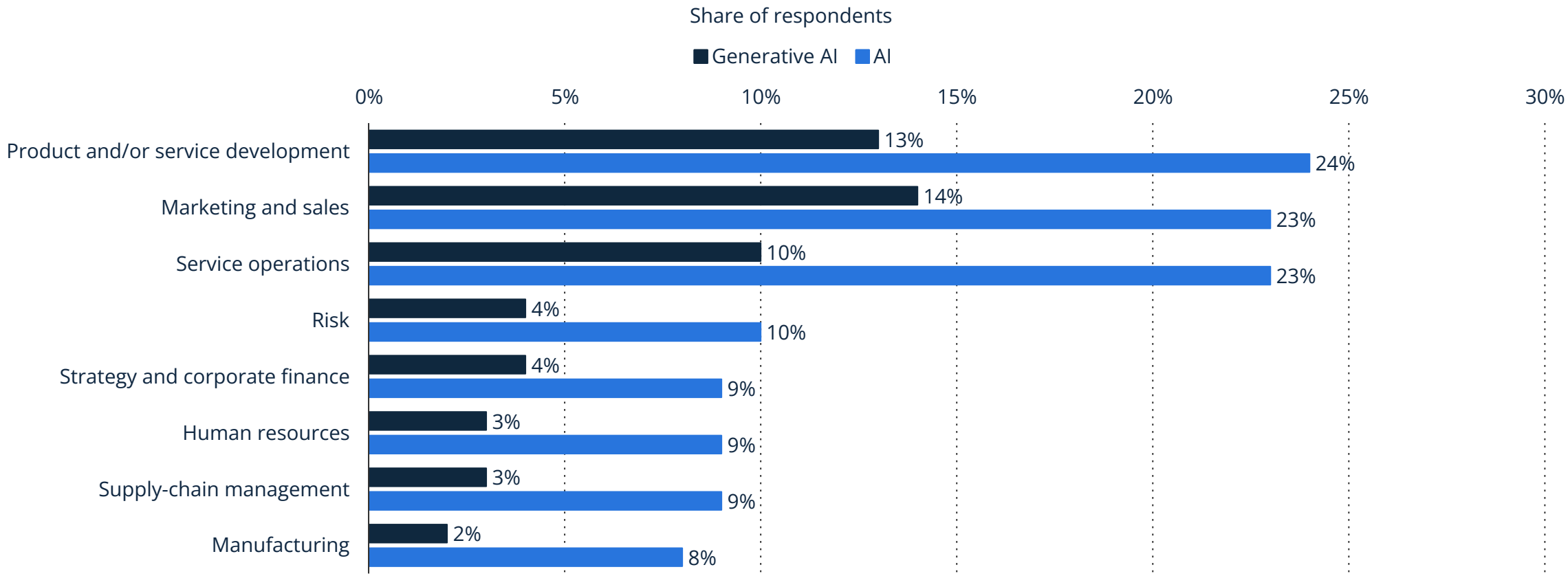
AI market size worldwide from 2020-2031



Description: The market for artificial intelligence grew beyond 244 billion U.S. dollars in 2025, a considerable jump of nearly 50 billion compared to 2023. This staggering growth is expected to continue, with the market racing past the trillion U.S. dollar mark in 2031.AI demands data Data management remains the most difficult task of AI-related infrastructure. This challenge takes many forms for AI companies. Some require more specific data, while others have difficulty maintaining and organizing the [...] Read more
Note(s):
Source(s): Statista

Artificial intelligence (AI) and generative AI adoption in businesses globally in 2023, by function

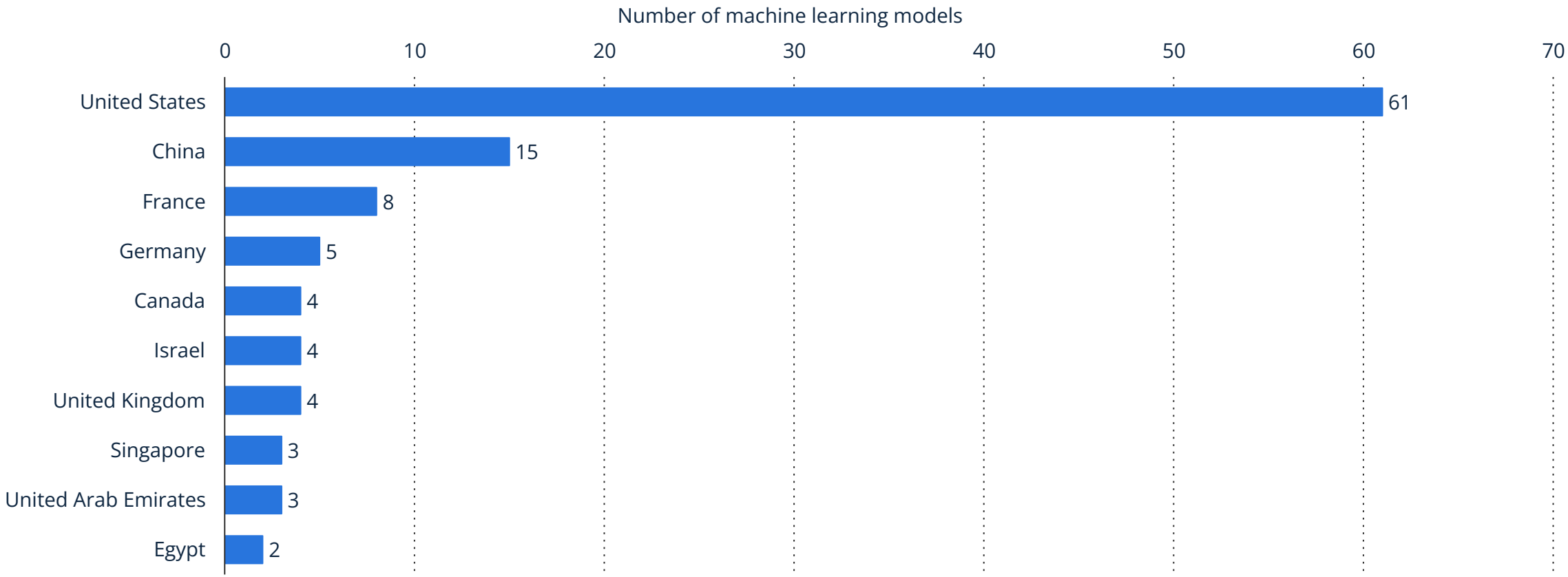
Adoption of AI compared to generative AI in enterprises worldwide in 2023



Description: Artificial intelligence, encompassing all other subbranches, such as machine learning, natural language processing, AI vision, and more, was more widely adopted than generative AI in all functions in businesses in 2023. This is understandable, especially as generative AI is still reaching maturity and full usage. It is noteworthy that in marketing and sales nearly 14 percent of respondents said their business was using generative AI. Read more
Note(s): Worldwide; 2023; 23882 respondents
Source(s): McKinsey & Company; Stanford Medicine

Notable machine learning (ML) models developed globally worldwide in 2023, by geographic area

Number of notable machine learning models globally in 2023, by geographic area



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Description: The United States is by far the largest producer of notable machine learning programs in 2024, with 61, ahead of China's 15. It is notable that France, Germany, and UK, despite accounting for smaller economic size and population, now outproduce China on machine learning programs together, producing some 17 models versus China's 15. Read more
Note(s): Worldwide; 2023; 23882 respondents
Source(s): McKinsey & Company; Stanford University

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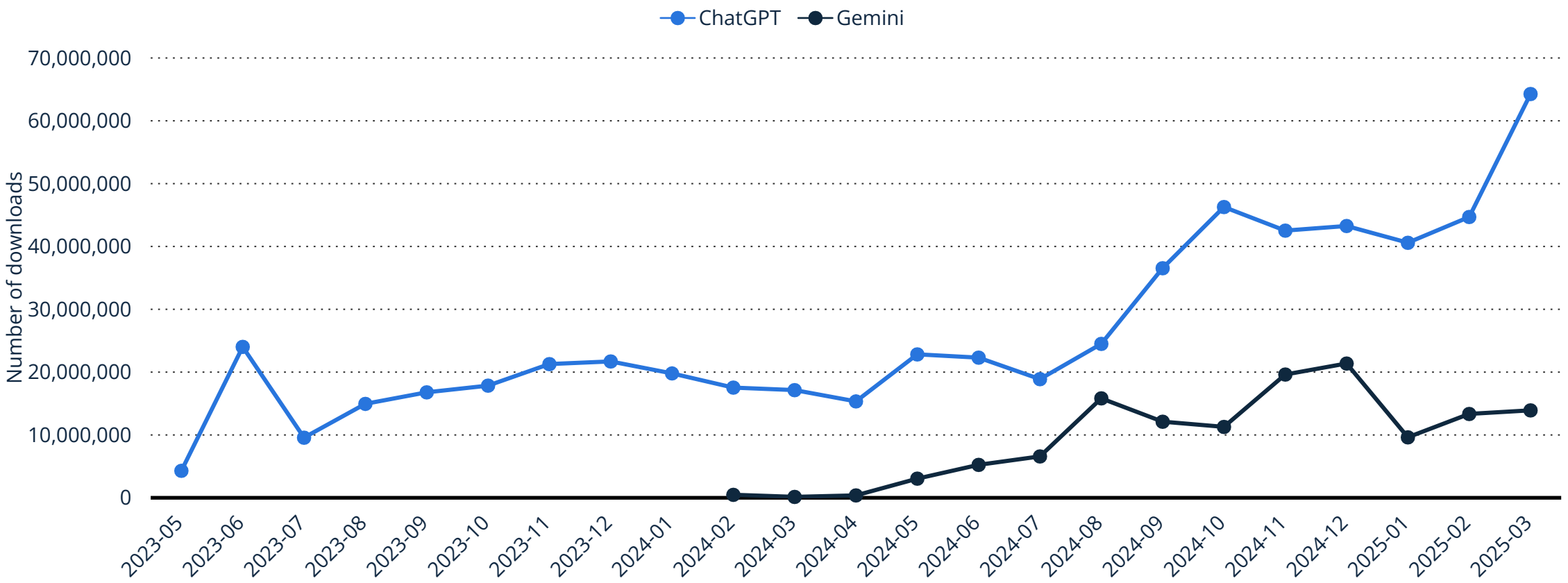
Number of monthly ChatGPT and Gemini mobile app downloads worldwide from May 2023 to March 2025

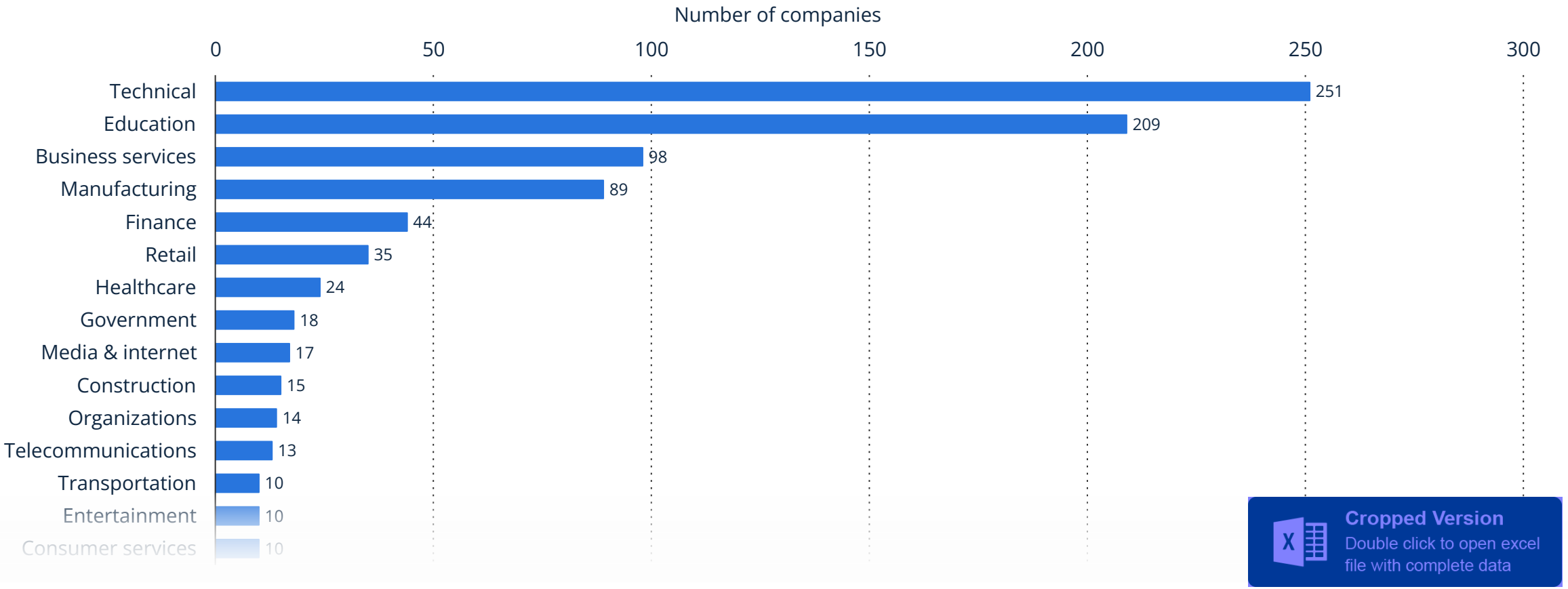
Global ChatGPT and Gemini app downloads 2025



Description: In March 2025, ChatGPT's mobile app recorded over 64.26 million App Store and Google Play downloads worldwide. Google's Gemini AI Assistant mobile app was released on February 8, 2024, and was initially available in the U.S. market only. In the same month, the app registered around 13.92 million downloads.Regional preferences shape AI app adoptionChatGPT has a strong global presence with over 400.61 million monthly active users in February 2025, but regional preferences vary. In [...] Read more
Note(s): Worldwide; May 2023 to March 2025; Google Play and Apple App Store
Source(s): AppMagic

Amount of companies using ChatGPT in their business function in 2023, by industry

Number of companies using ChatGPT within their business 2023, by industry



Cropped Version
Double click to open excel file with complete data

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Description: ChatGPT, an artificial intelligence (AI) powered chatbot, is most used by companies in the technical and education industries, with over 200 companies using it in 2023. It is perhaps unsurprising that the technical field has embraced the use of ChatGPT, but it is interesting that so many educational institutes have begun to use it. While other industries do utilize the OpenAI-made chatbot, there are less than 100 institutions and companies that use ChatGPT in other industries. This is [...] Read more
Note(s): Worldwide; 2023; Companies and institutions
Source(s): Enterprise Apps Today; OpenAI

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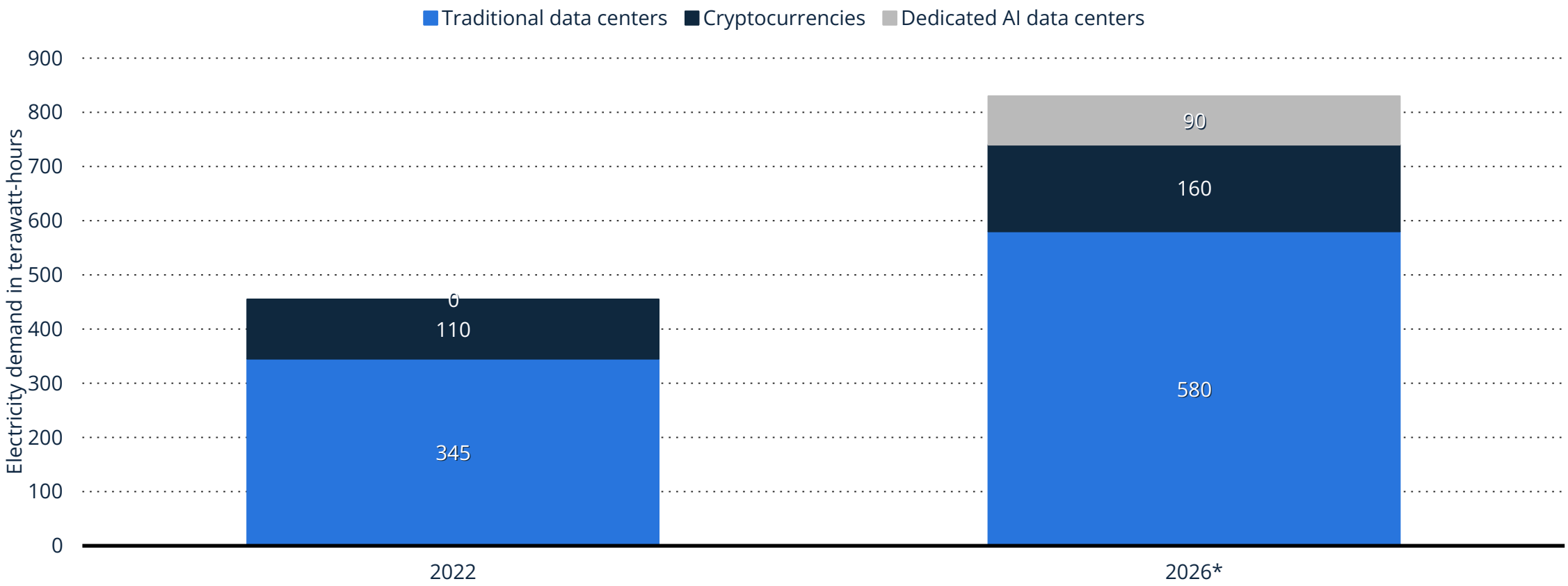
CHAPTER 02

Energy consumption

Electricity demand from data centers, artificial intelligence data centers, and cryptocurrencies worldwide in 2022, with a forecast for 2026 (in terawatt-hours)

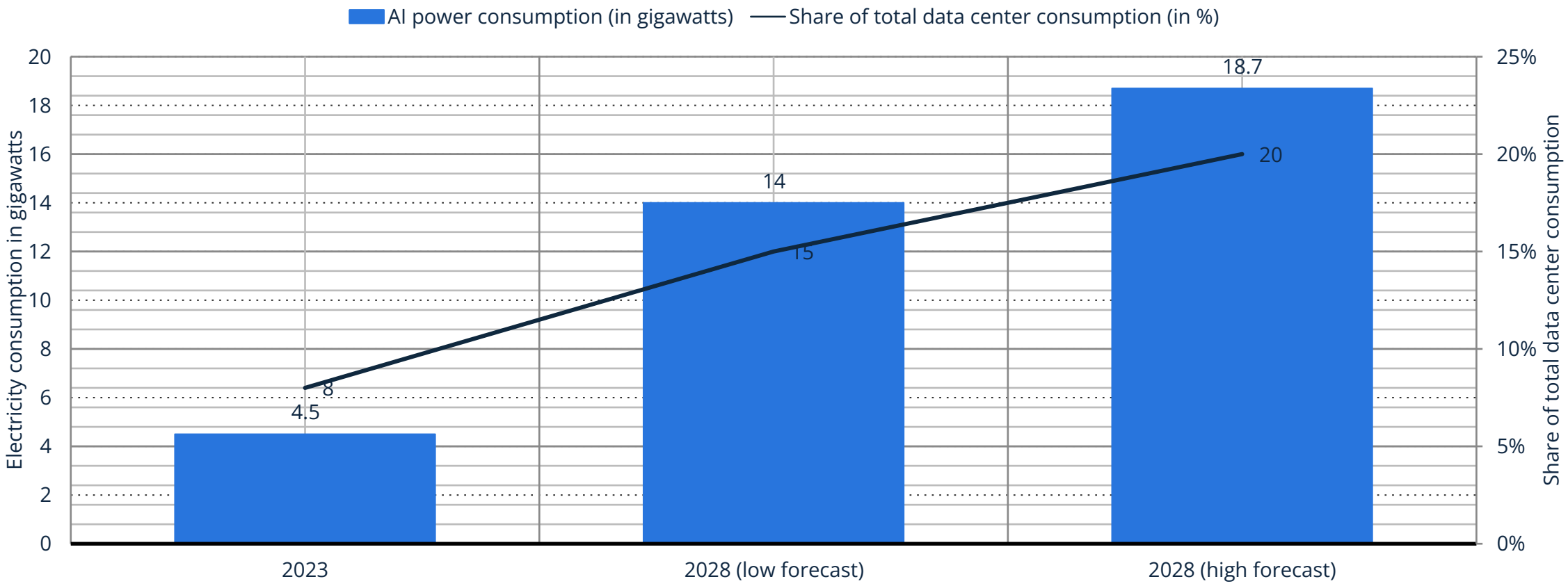
Global electricity demand from data centers and crypto 2022-2026



Description: In 2022, traditional data centers accounted for a power demand of 345 terawatt-hours, while the electricity used by artificial intelligence data centers was close to zero. By 2026, AI data centers demand is forecast to grow to 90 terawatt-hours.By 2026, the overall electricity demand from traditional and AI data centers and cryptocurrencies is forecast to range between 620 and 1050 terawatt-hours, depending on the scenario. Read more
Note(s): Worldwide; 2022; *Forecast
Source(s): IEA; Statista estimates; Various sources (de Vries (2023), carbon-ratings.com, Ireland Central Statistics Office, Danish Energy Agency)

Artificial intelligence power consumption and share of total data center consumption worldwide in 2023, with forecasts to 2028

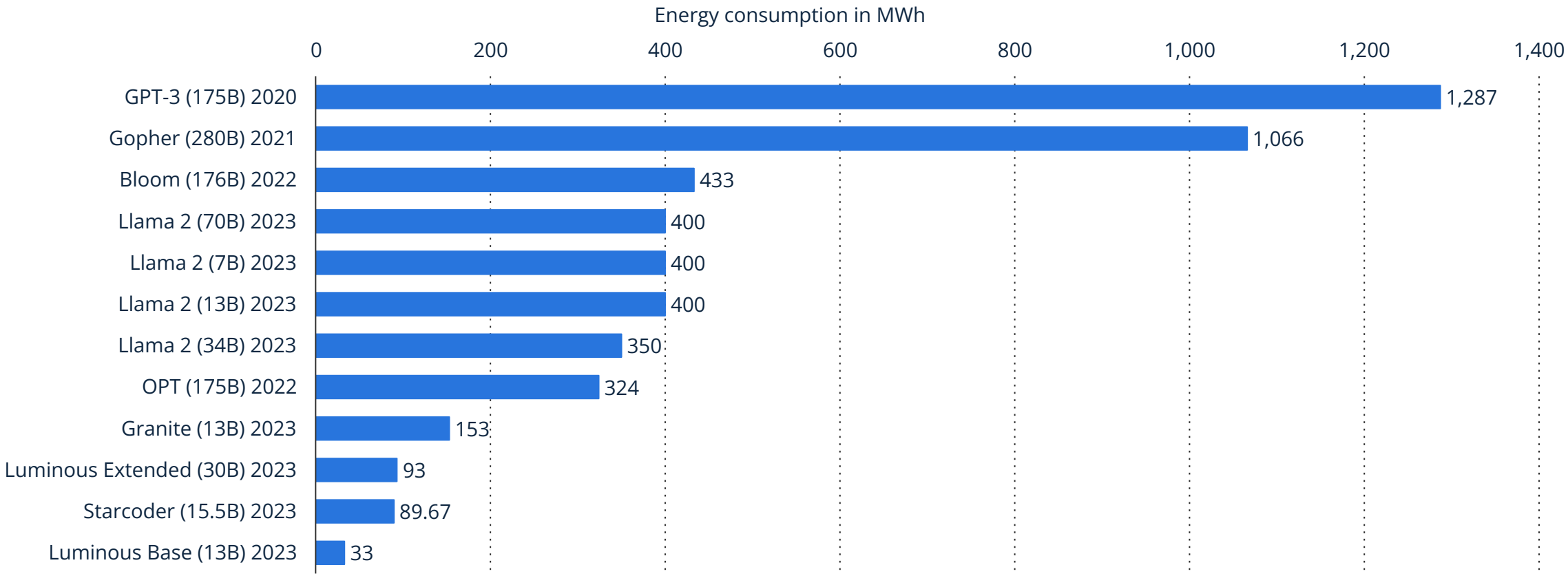
AI electricity consumption worldwide 2023-2028



Description: In 2023, it was estimated that artificial intelligence represented a power consumption of 4.5 gigawatts worldwide, or eight percent of total power consumption in data centers that year. AI's power consumption is expected to grow significantly in the next five years, forecast at 14 to 18.7 gigawatts in 2028. That would account for up to 20 percent of data center power consumption that year. Read more
Note(s): Worldwide; 2023
Source(s): Schneider Electric

Consumption of energy by artificial intelligence (AI) models in 2024 (in MWh)

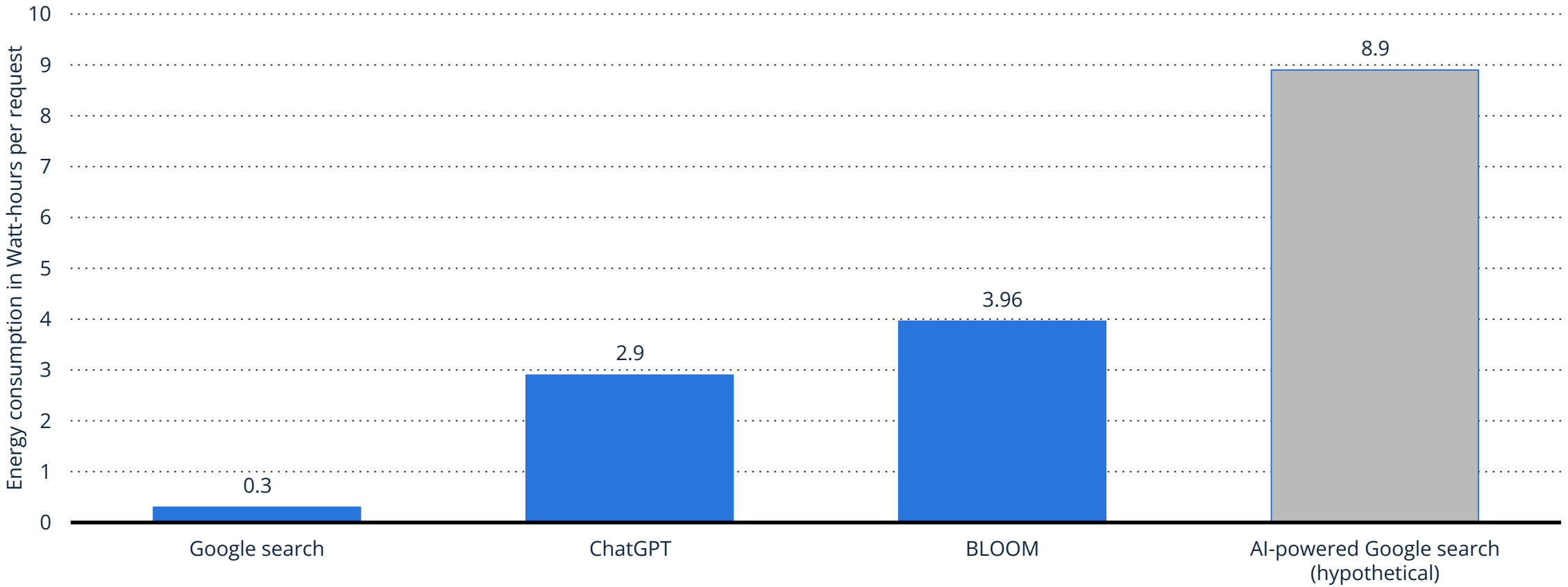
Energy consumption by AI models 2024



Description: GPT-3 is the most energy-intensive AI program trained in 2024, with over 1200 megawatt hours consumed to train the model. Produced in 2020, the model ended up being far more energy intensive than models produced in 2023, most of which were under 400 MWh. Read more
Note(s): Worldwide; 2023; 23882 respondents
Source(s): Stanford University

Estimated energy consumption per request for selected AI-powered systems as of 2023 (in Watt-hours)

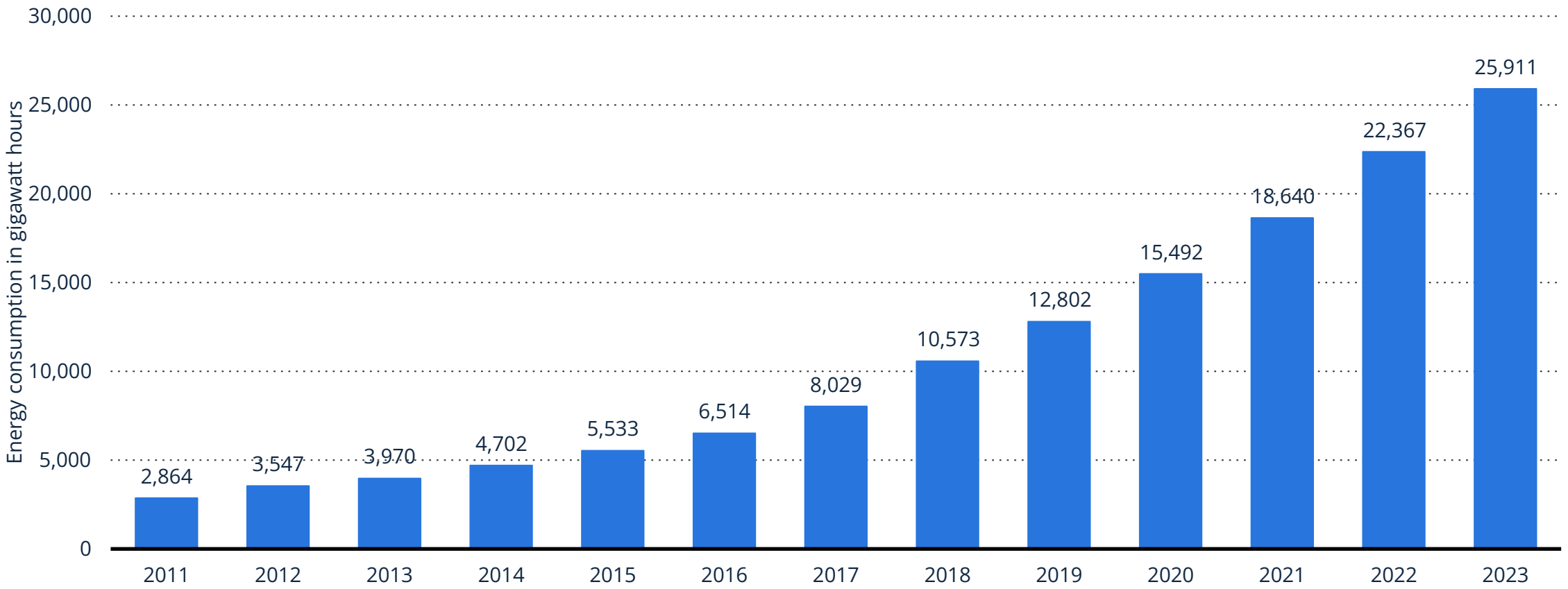
Energy consumption per request for AI systems 2023



Description: The average energy consumption of a ChatGPT request was estimated at 2.9 watt-hours, nearly 10 times that of a regular Google search, which reportedly consumes 0.3 Wh per request. BLOOM had a similar energy consumption, at around four Wh per request.Meanwhile, incorporating generative AI into every Google search could lead to a power consumption of 8.9 Wh per request, based on server power consumption estimations. Read more
Note(s): Worldwide; 2023
Source(s): Expert(s); ScienceDirect; Various sources

Energy consumption of Google from financial year 2011 to 2023 (in gigawatt hours)

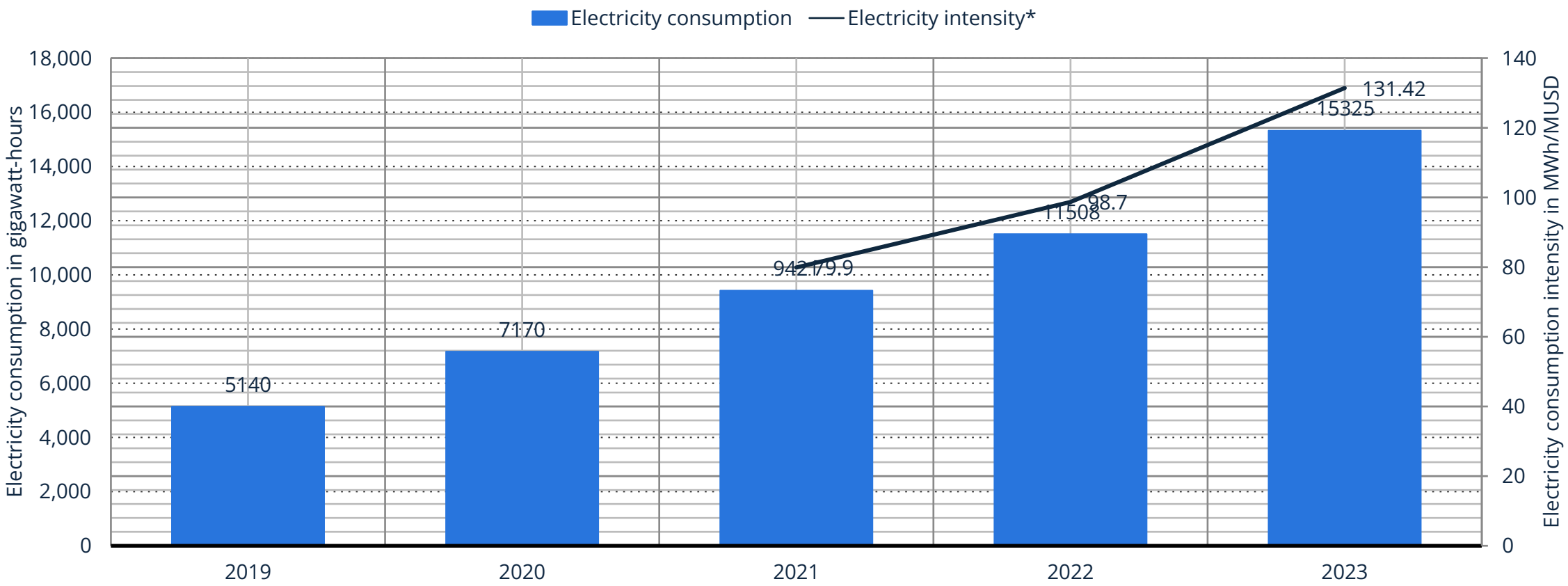
Google energy consumption 2011-2023



Description: Google's energy consumption has increased over the last few years, reaching 25.9 terawatt hours in 2023, up from 12.8 terawatt hours in 2019. The company has made efforts to make its data centers more efficient through customized high-performance servers, using smart temperature and lighting, advanced cooling techniques, and machine learning. Read more
Note(s): Worldwide; 2011 to 2023
Source(s): Google

Electricity consumption and electricity intensity normalized by revenue of Meta from 2019 to 2023

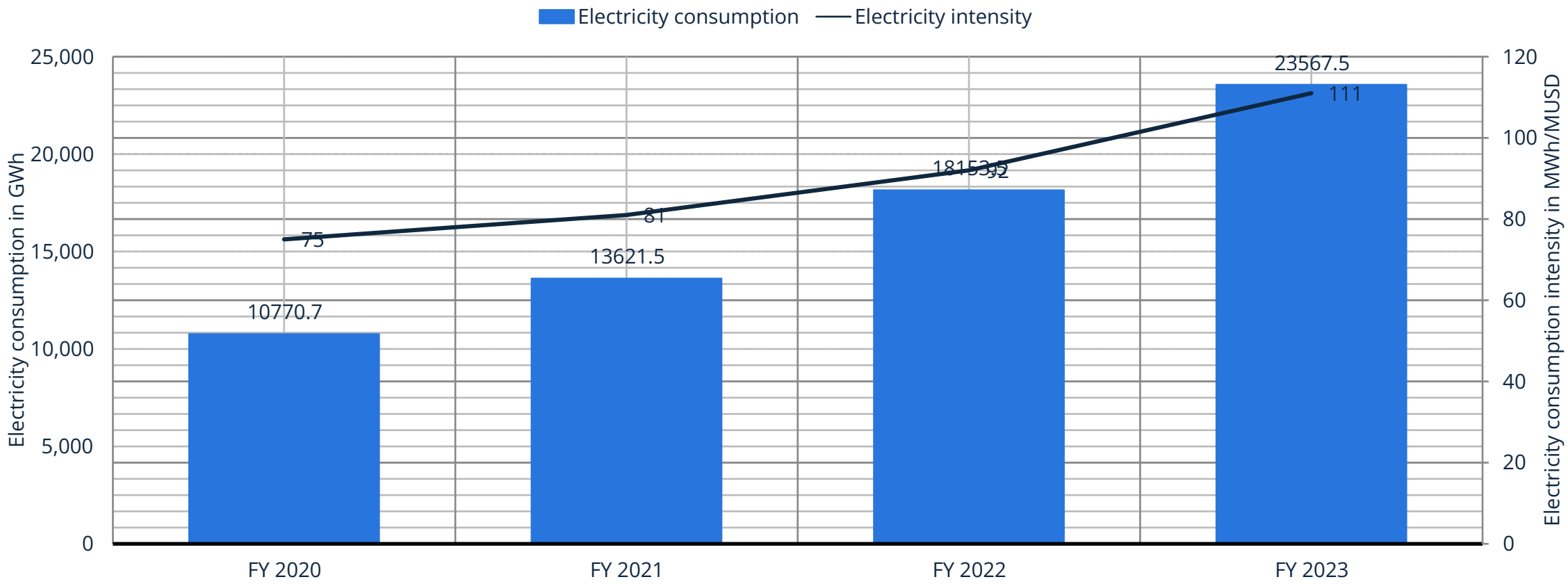
Meta's electricity consumption FY 2019-2023



Description: Meta's electricity consumption increased 33 percent year-on-year in 2023, surpassing 15 terawatt-hours. In comparison to 2019, the company's power consumption nearly tripled. A key factor for Microsoft's power consumption rising has been the expansion of its global data centers. Meta's electricity intensity (consumption normalized by revenue generated) also grew by some 30 percent year-over-year in 2023. Read more
Note(s): Worldwide; 2019 to 2023; * the source did not disclose their electricity intensity for 2019 and 2020.
Source(s): Meta Platforms

Electricity consumption and electricity intensity normalized by revenue of Microsoft from FY 2020 to FY 2023

Microsoft's electricity consumption FY 2020-2023



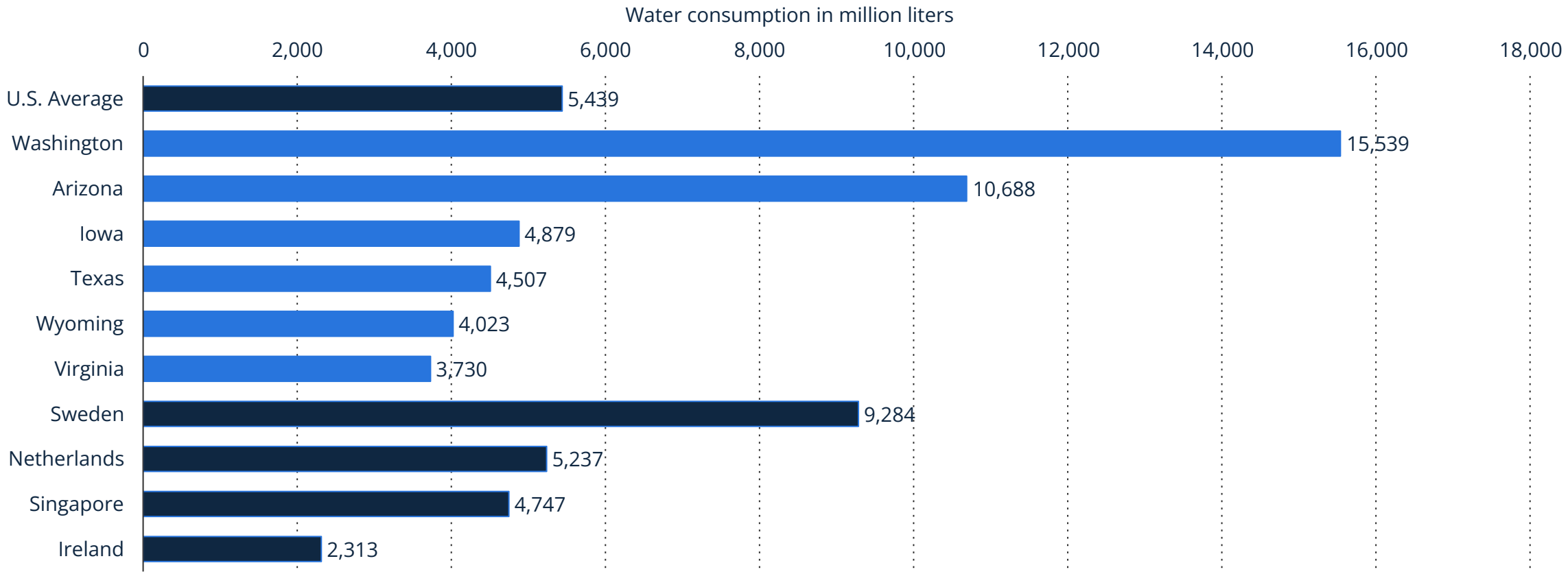
Description: Microsoft's electricty consumption increased 30 percent year-on-year in 2023, surpassing 23 terawatt-hours. In comparison to 2020, the tech company's power consumption more than doubled. When considering its electricity consumption normalized by revenue generated, Microsoft's consumption grew nearly 50 percent between 2020 and 2023, to 111 megawatt-hours per million U.S. dollars of revenue. A key factor for Microsoft's power consumption rising has been the expansion [...] Read more
Note(s): Worldwide; FY 2020 to FY 2023
Source(s): Microsoft

CHAPTER 03

Water demand

Estimated operational water consumption for training GPT-3 as of July 2023, by data center (in million liters)

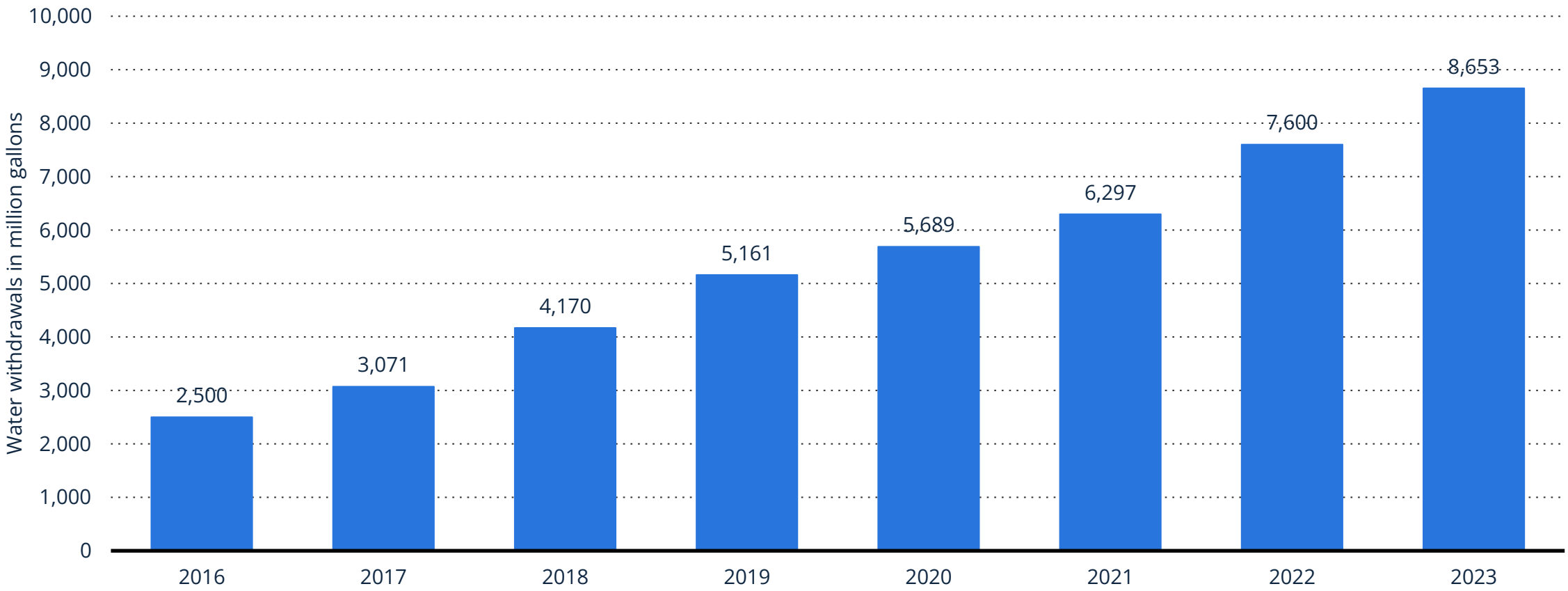
Estimated water consumption for training GPT-3 2023



Description: GPT-3's water consumption for the training phase was estimated at roughly 4.8 billion liters of water, when assuming the model was trained on Microsoft's Iowa data center (OpeanAI has disclosed that the data center was used for training parts of the GPT-4 model). If the model were to have been fully trained in the Washington data center, water consumption could have been as high as 15 billion liters. That would've amounted to more than Microsoft's total water withdrawals in 2023. Read more
Note(s): Worldwide; July 2023; considering both on-site and off-site water
Source(s): Cornell University; Expert(s); University of California, Riverside; University of Texas at Arlington (UTA)

Water withdrawals by Google from 2016 to 2023 (in million gallons)

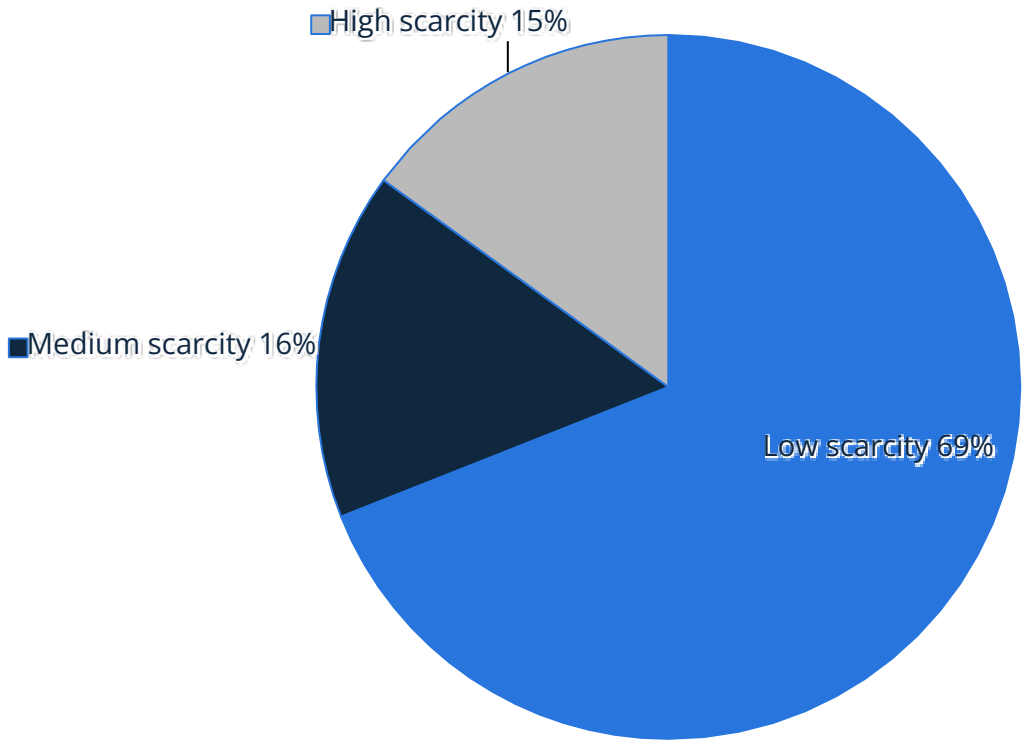
Google water withdrawals 2016-2023



Description: Google's water withdrawals have increased more than three-fold since 2016, reaching 8.6 billion gallons in 2023. Roughly 90 percent of Google's water withdrawals were for use in its data centers around the world. Water is mainly used for cooling the data centers, and the company's increased water consumption is part of its strategy to reduce energy consumption and emissions, compared to air cooling. Read more
Note(s): Worldwide; 2016 to 2023
Source(s): Google

Distribution of water withdrawals by Google in 2023, by water scarcity

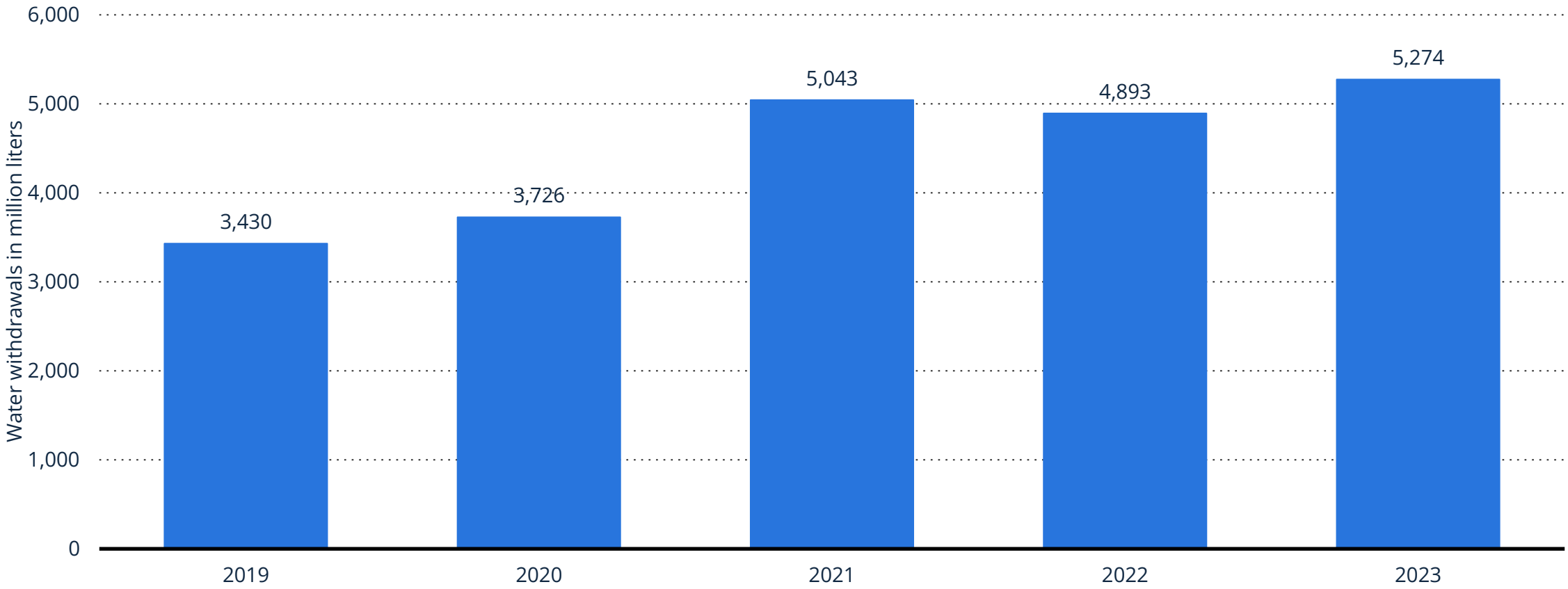
Share of Google's water withdrawals 2023, by scarcity



Description: In 2023, more than two-thirds of Google's water withdrawals came from watersheds with low water scarcity. Meanwhile, 15 percent of the 8.6 billion gallons of Google's water withdrawals came from watersheds with high water scarcity. Roughly 90 percent of Google's water withdrawals were used for cooling in its data centers around the world. Read more
Note(s): Worldwide; 2023; Based on water withdrawals of 8,653.3 million gallons
Source(s): Google

Water withdrawals by Meta worldwide from 2019 to 2023 (in million liters)

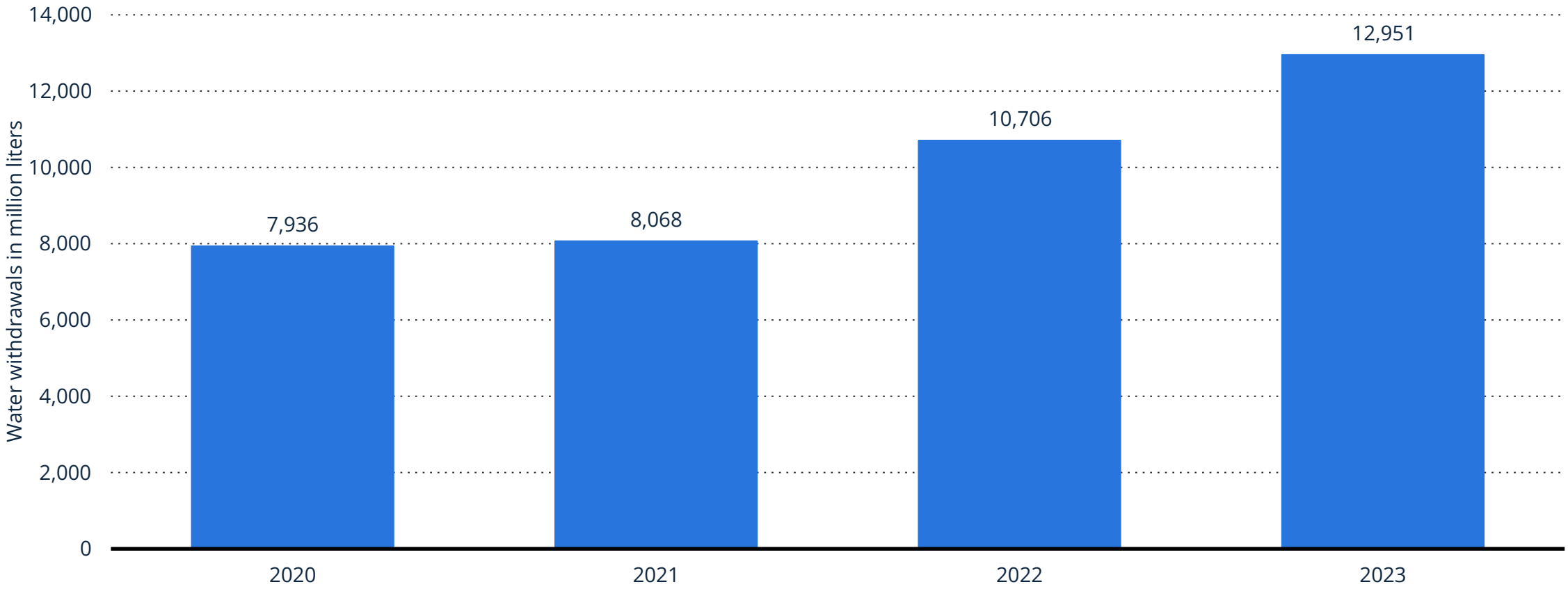
Meta's global water withdrawals 2019-2023



Description: Meta's total water withdrawals amounted to 5.2 billion liters in 2023, the highest figure recorded in the indicated period. In comparison to the previous year, this represented an increase of eight percent. The largest share of Meta's water withdrawals are for use in its data centers. Water is used for air cooling and regulating temperature and humidity. Read more
Note(s): Worldwide; 2019 to 2023
Source(s): Meta Platforms

Water withdrawals by Microsoft worldwide from FY 2020 to FY 2023 (in million liters)

Microsoft water withdrawals 2020-2023



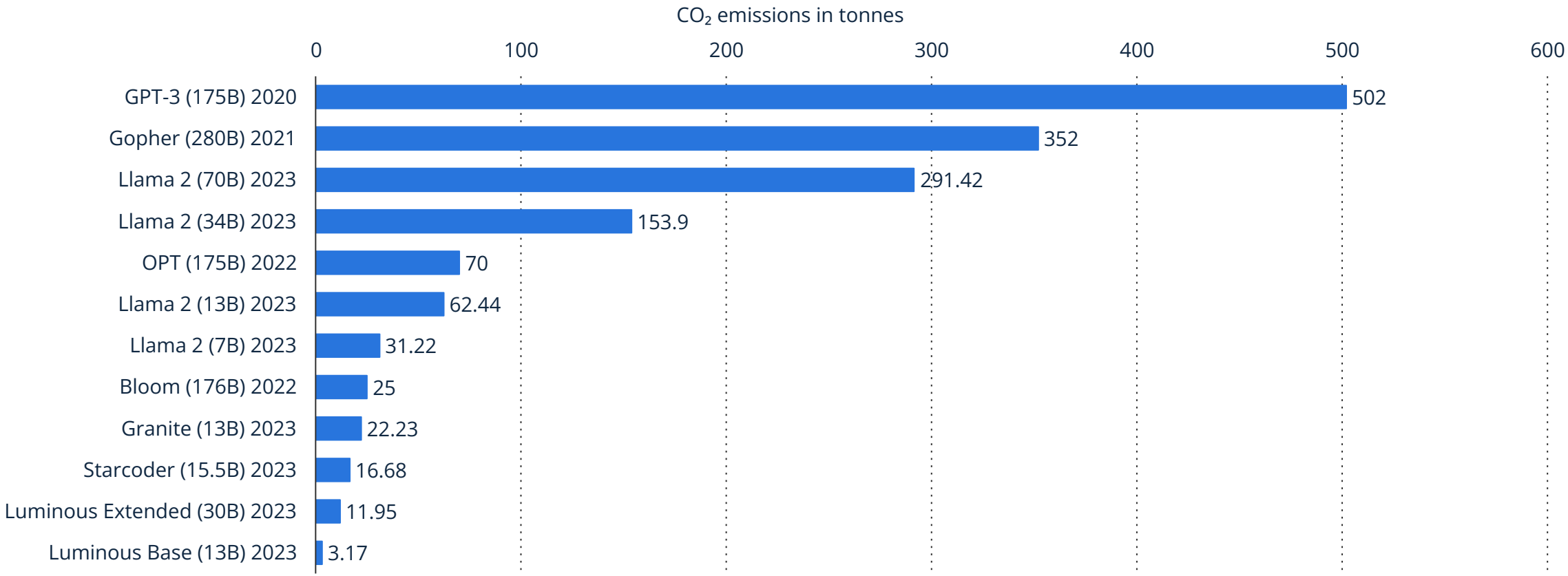
Description: Microsoft's water withdrawals increased more than 60 percent since 2020, reaching roughly 13 billion liters in 2023. The company's growth in water withdrawals is mainly associated with the increasing demand for cooling in data centers. Read more
Note(s): Worldwide; FY 2020 to FY 2023
Source(s): Microsoft

CHAPTER 04

GHG emissions

Emission of CO_2 equivalent by artificial intelligence (AI) models in 2024 (in metric tons)

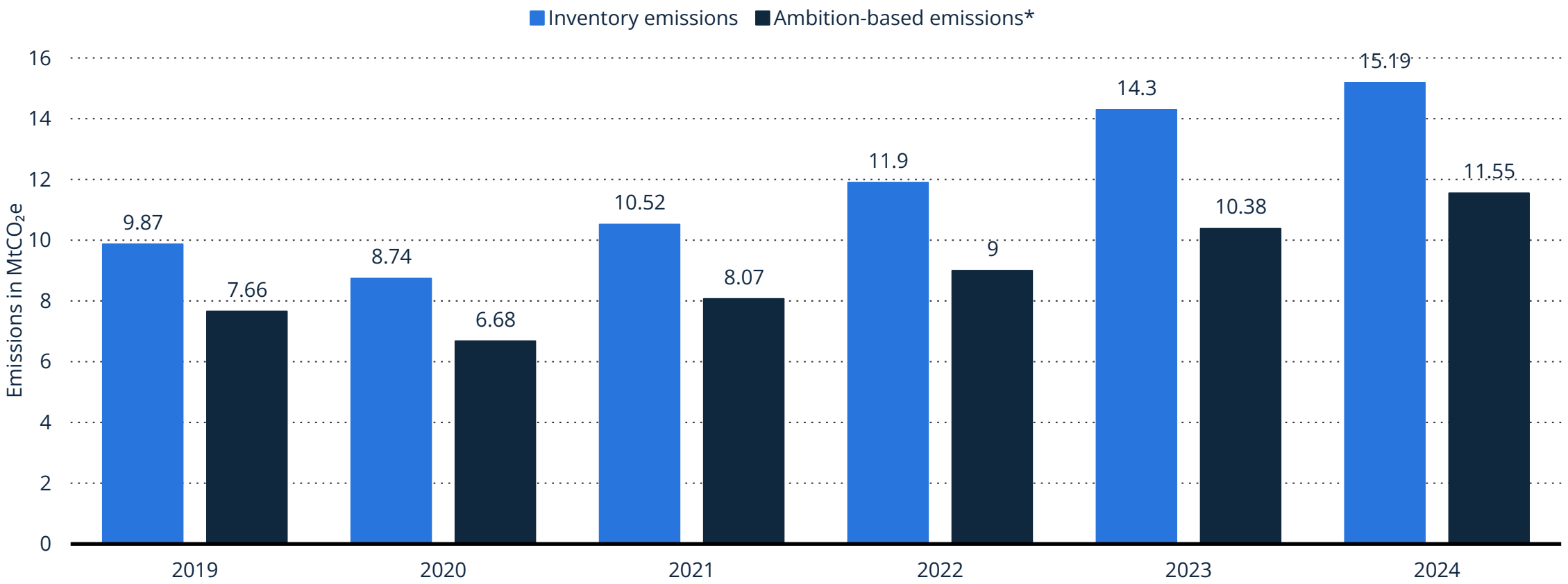
CO_2 equivalent emissions by AI models 2024



Description: GPT-3 is the most heavily CO_2 emitting AI program trained as of 2024, with over 502 tonnes of CO_2 emitted to train the model. Produced in 2020, the model ended up emitting far more CO_2 than most other models, with only Gopher in 2021 being of similar caliber, with 352 tonnes of emissions. Read more
Note(s): Worldwide; 2023; 23882 respondents
Source(s): Stanford University

Google's total greenhouse gas (GHG) emissions from financial year 2019 to 2024 (in million metric tons of carbon dioxide equivalent)

Google's GHG emissions FY 2019-2024



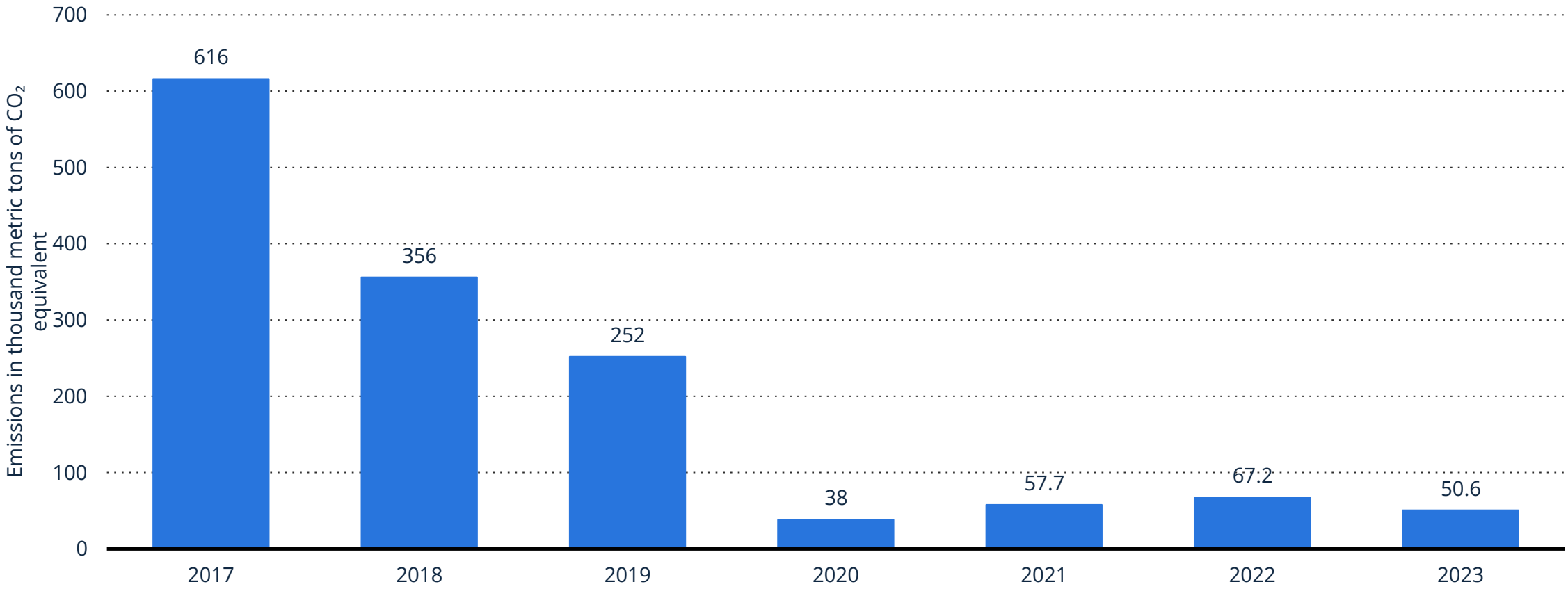
Description: Google's total greenhouse gas (GHG) emissions increased by six percent year-on-year in 2024, to 15.19 million metric tons of carbon dioxide equivalent ($MtCO_2e$). That year, Google's carbon intensity was approximately 8.95 tCO_2e per unit of revenue. Read more

Note(s): Worldwide; FY 2019 to FY 2023; Includes Scope 1, 2 (market-based), and 3 emissions.

Source(s): Google

Operational greenhouse gas emissions from Meta from 2017 to 2023 (in 1,000 metric tons of CO_2 equivalent)

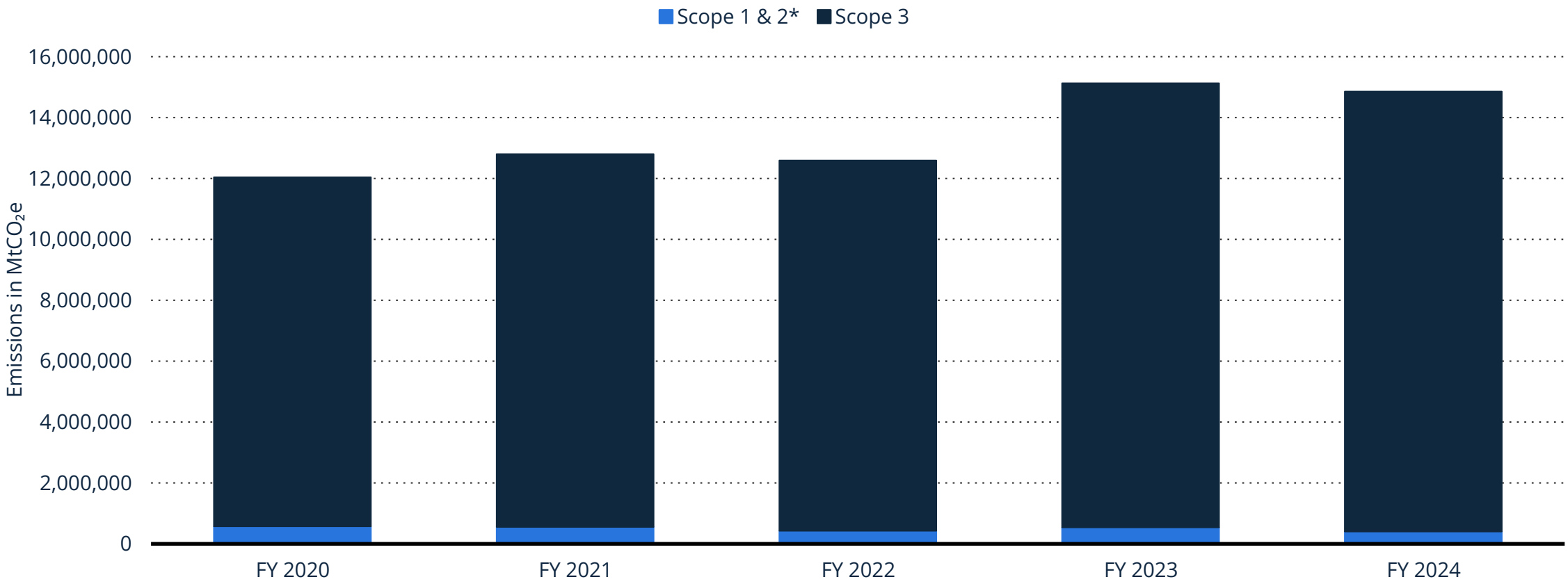
Meta's operational greenhouse gas emissions 2017-2023



Description: Meta's total operational greenhouse gas emissions amounted to 50,610 metric tons of CO_2 equivalent in 2023. Meta cut its operational emissions by 94 percent in 2020 from a 2017 baseline. This was primarily achived by matching 100 percent of the electricity use of its data centers and offices with renewable energy and addressing residual emissions with carbon removal projects. Since then, Meta's operations have produced net zero emissions. Read more
Note(s): Worldwide; 2017 to 2023; Market-based Scope 1 and 2 emissions.
Source(s): Meta Platforms

Annual total greenhouse gas (GHG) emissions released by Microsoft from FY 2020 to FY 2024 (in metric tons of carbon dioxide equivalent)

Microsoft's total greenhouse gas emissions FY 2020-2024



Description: Microsoft's overall greenhouse gas (GHG) emissions were 14.9 million metric tons of carbon dioxide equivalent ($MtCO_2e$) in financial year 2024. Although this was a year-on-year decrease of roughly two percent, Microsoft's scope 1, 2, and 3 emissions have increased by 23 percent relative to the company's 2020 baseline. A key factor for Microsoft's emissions rising has been the expansion of its global data centers.Microsoft has committed to become carbon negative by 2030, and by 2050 aims [...] Read more
Note(s): Worldwide; FY 2020 to FY 2024; GHG emissions with management's criteria.; *Market based. Figures have been rounded. Read more
Source(s): Microsoft

Sources

AppMagic
Cornell University
Enterprise Apps Today
Expert(s)
Expert(s) (Alex de Vries)
Expert(s) (Li, P., Yang, J., Islam, M.A., Ren, S.)
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Microsoft
OpenAI
Schneider Electric
ScienceDirect
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Stanford Medicine
Stanford University
Statista
Statista estimates
University of California, Riverside
University of Texas at Arlington (UTA)
Various sources

Various sources (de Vries (2023), carbon-ratings.com, Ireland Central Statistics Office, Danish Energy Agency)