ONASSIS

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AI Opportunities and Challenges

October 2024

“The future is not what is used to be”

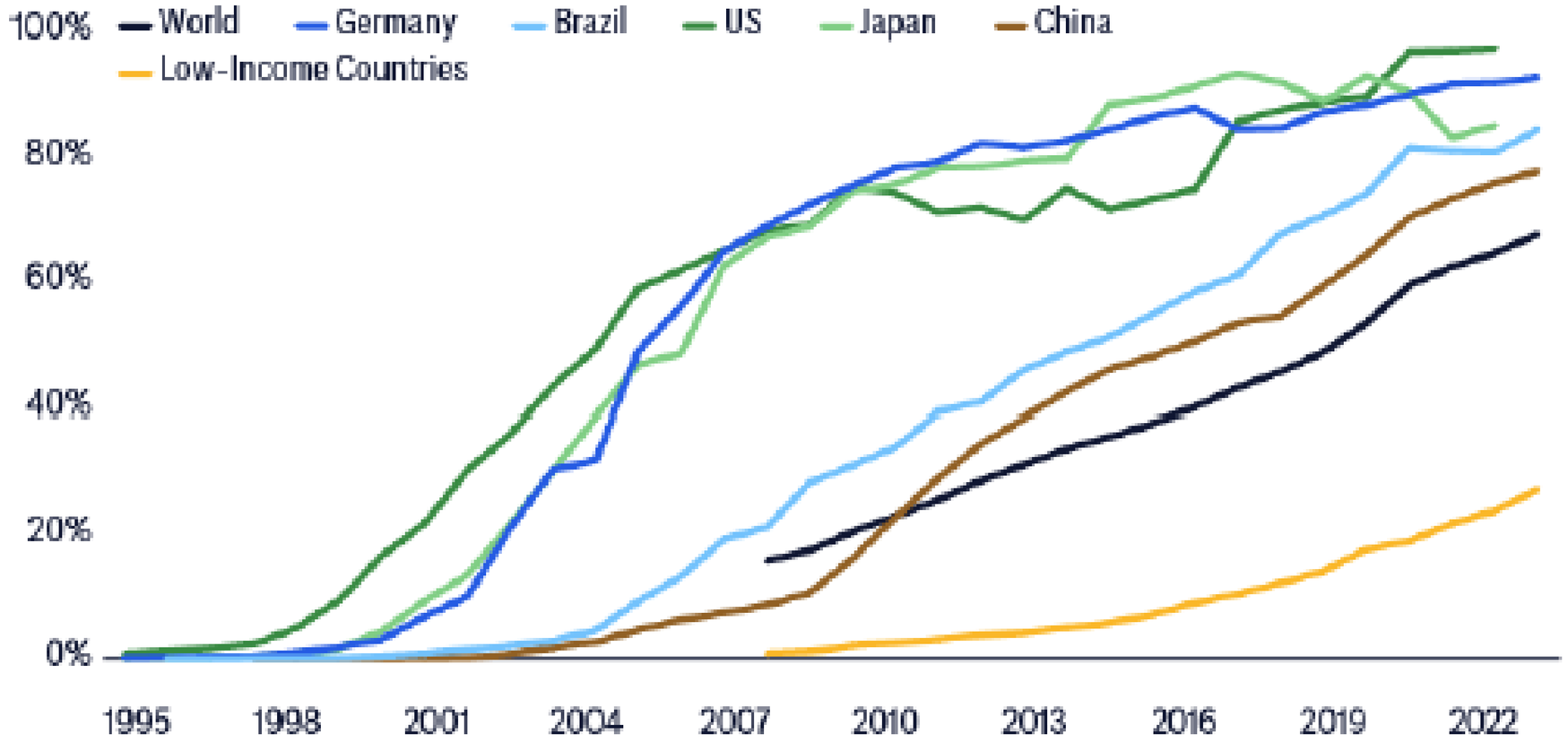
“Yogi” Perre
US professional baseball catcher

2. AI Opportunities and Challenges

- The future, whether we like it or not, includes AI the Digital Economy and Building a Sustainable Future.
- AI as we know it is only a fraction of its potential. Once Quantum Computing becomes common, AI and generally the digital age will be even more transformative.
- AI has a physical location: Processes and Data Center, even the Cloud(s) have a physical presence. They need electrical power, water, skilled personnel and a safe political environment.
- We all understand the Opportunities but what are the Challenges?

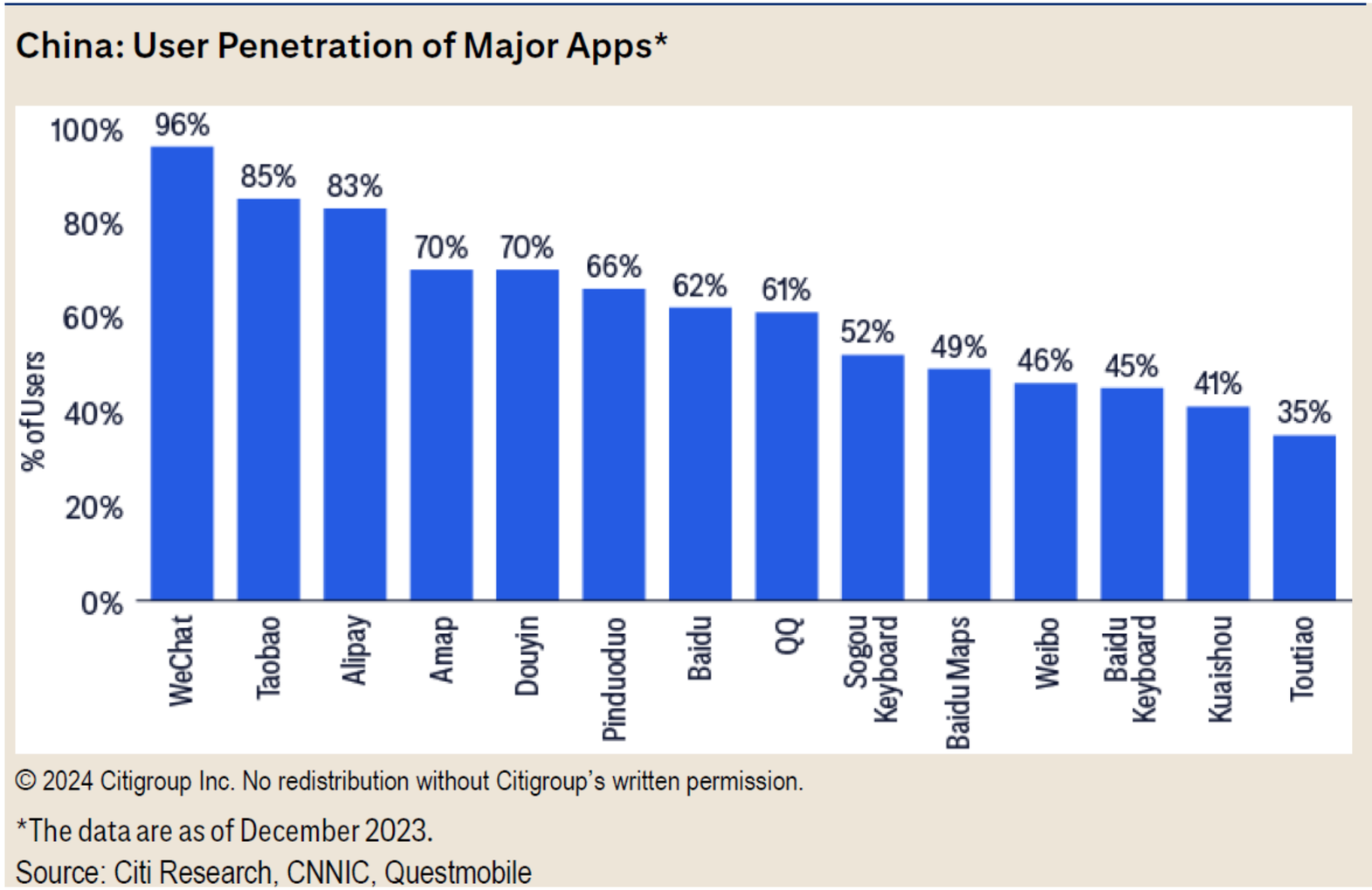
Share of Population Using the Internet

Figure 17. Share of Population Using the Internet



Source: Citi Research, ITU

China: User Penetration of Major Apps

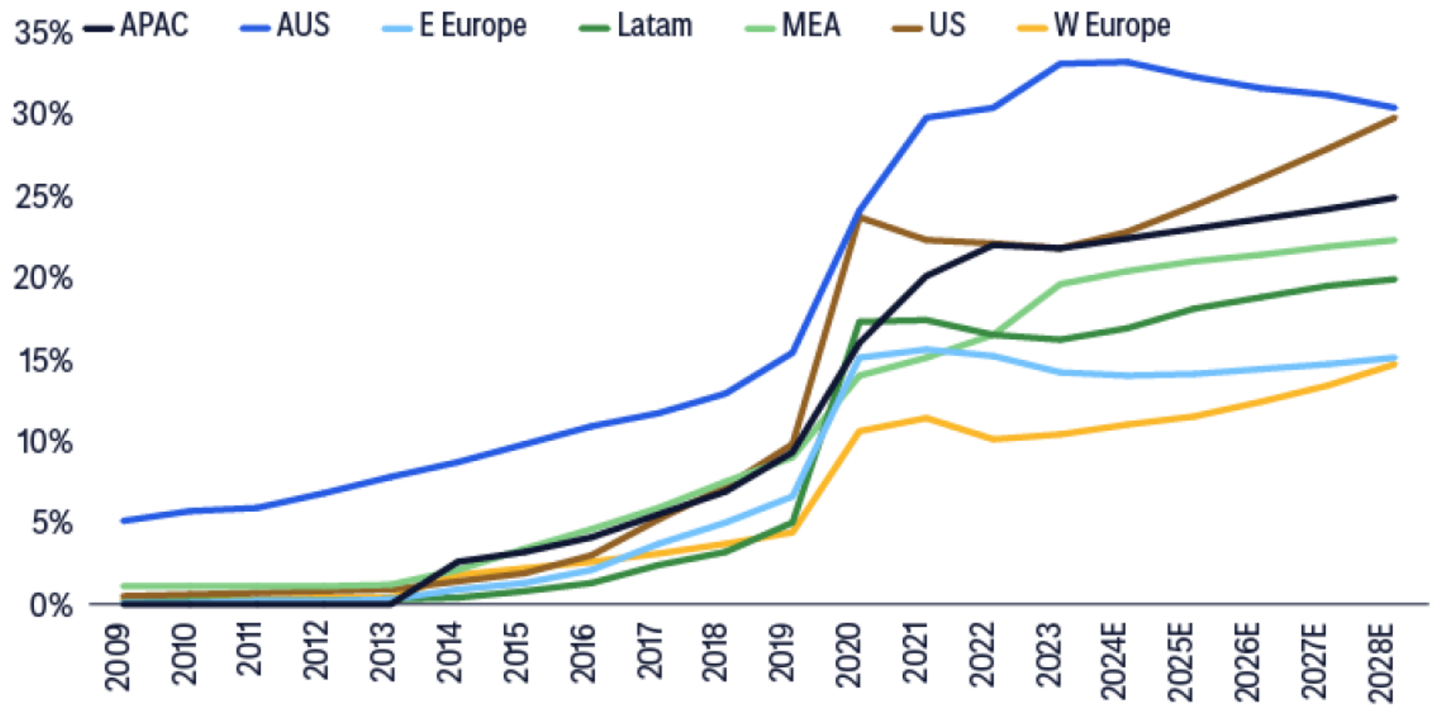


*The data are as of December 2023.

Source: Citi Research, CNNIC, Questmobile

Online Ordering Across Major Global Markets

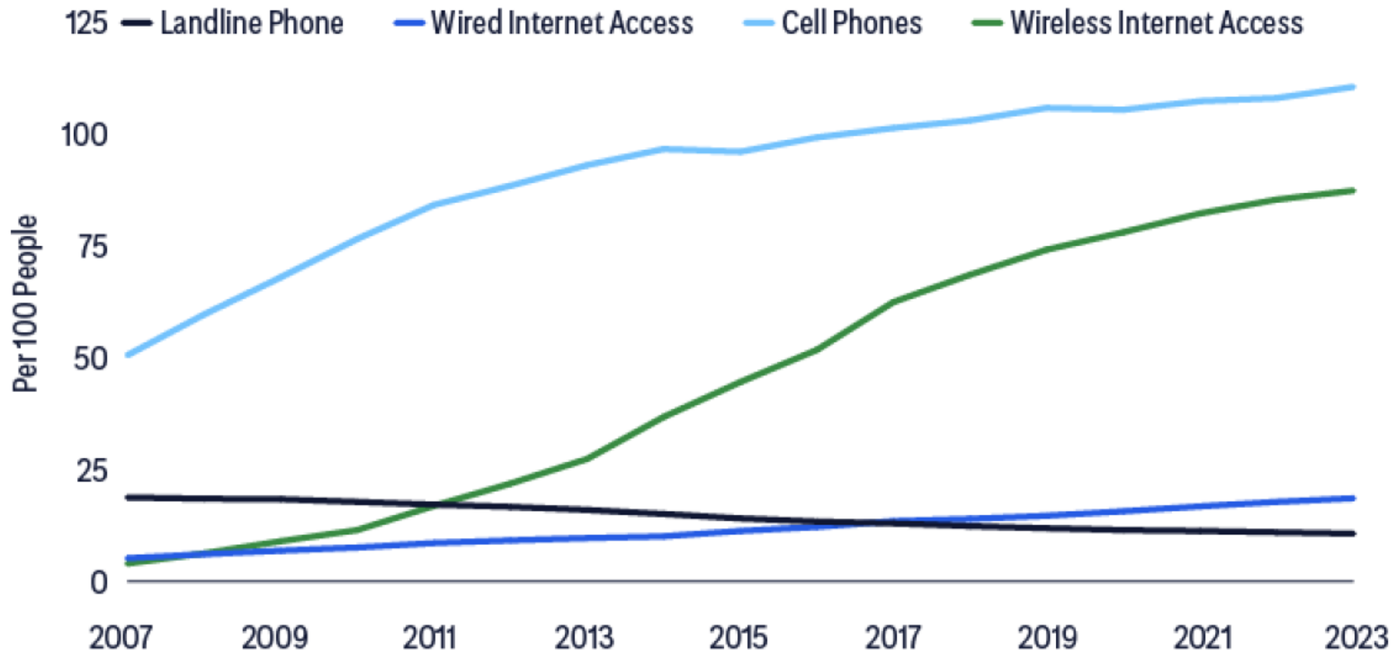
Figure 22. Online Ordering Across Major Global Markets (% of Sales)



Source: Citi Research, Euromonitor

Global Subscriptions for Internet & Telephone Access

Figure 5. Global Subscriptions for Internet & Telephone Access



Source: Citi Research, ITU

3. Outline of Challenges

A. <u>Physical</u>

- Electrical Power Supply: needed for operations but also cooling. Stable and reliable Base Power Production/Grid/Storage
- Water is needed to cool down the data centers
- Skilled labour: Reskilling/Upskilling workers. There will be losers and winners.

  However, the productivity and efficiency improvements will be a major driver of future growth.
- Stable political environment.

B. <u>Political</u>

- Stable supply of materials/dependence on basic materials
- Geopolitical risks/Political intervention risks/Cyber attacks/Hacks/Cyber crimes
- Regulatory and Legal Framework: International enforceability
- Over-regulation vis-à-vis under-regulation

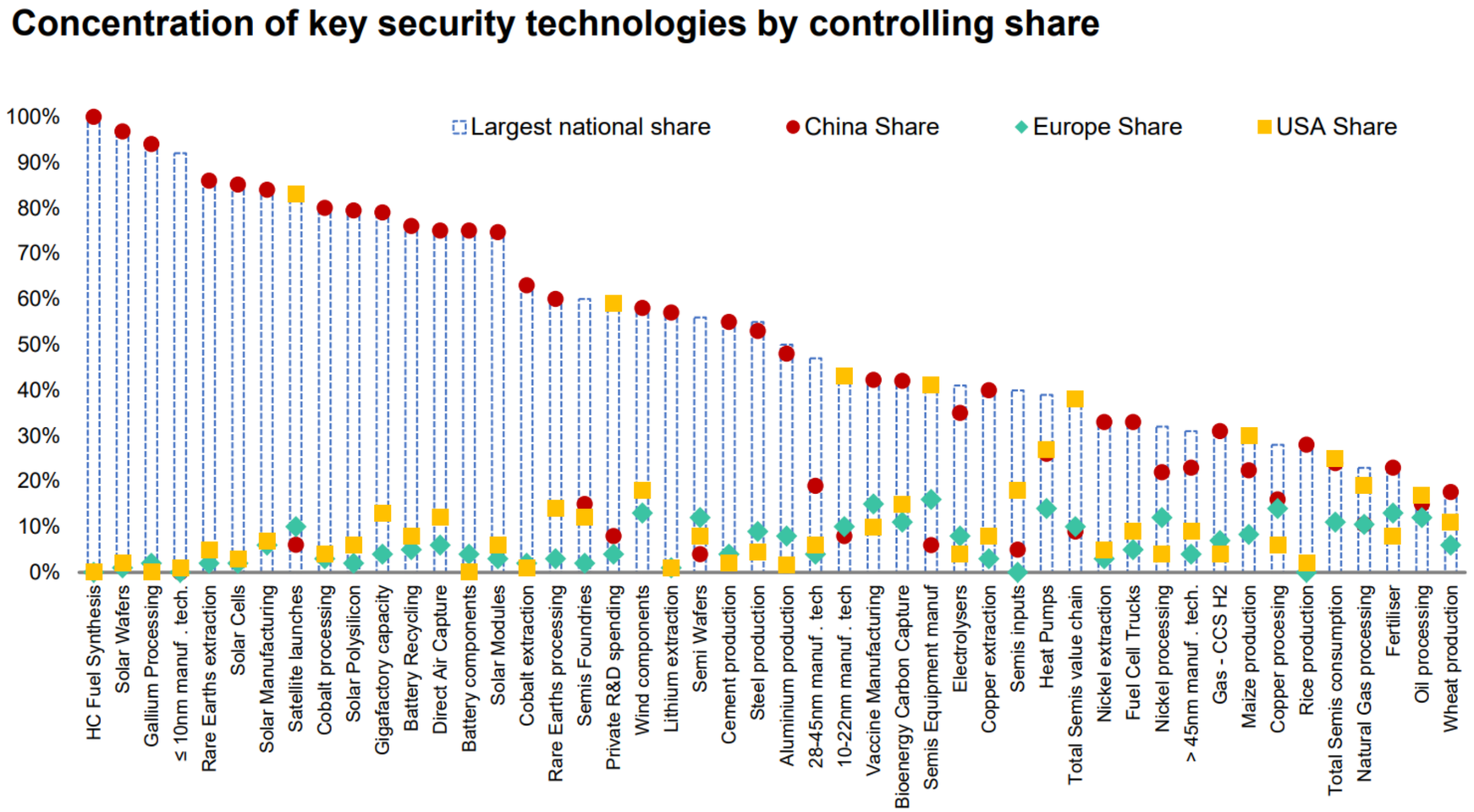
C. <u>Social</u>

- Protection of Intellectual Property Rights
- Monopoly and control by Mega Tech Companies
- What do with all this free time, flood of information and thousands of hours of content to see and digest
- Social Effects: Beyond social media and fake news: Reduced personal contact
- Ethical Concerns
- Upfront investments and Technical Obsolescence
- Financing of AI/Digital Revolution

AI Challenges - Sovereignty

The US & Europe control less than 10% of the raw inputs needed to build, scale, power and control world-leading AI models in a sustainable way. Worsening trade frictions add to the urgency to reshore bleeding-edge semis as well as the components needed for clean energy security as power hungry AI models scale.

Source: Morgan Stanley

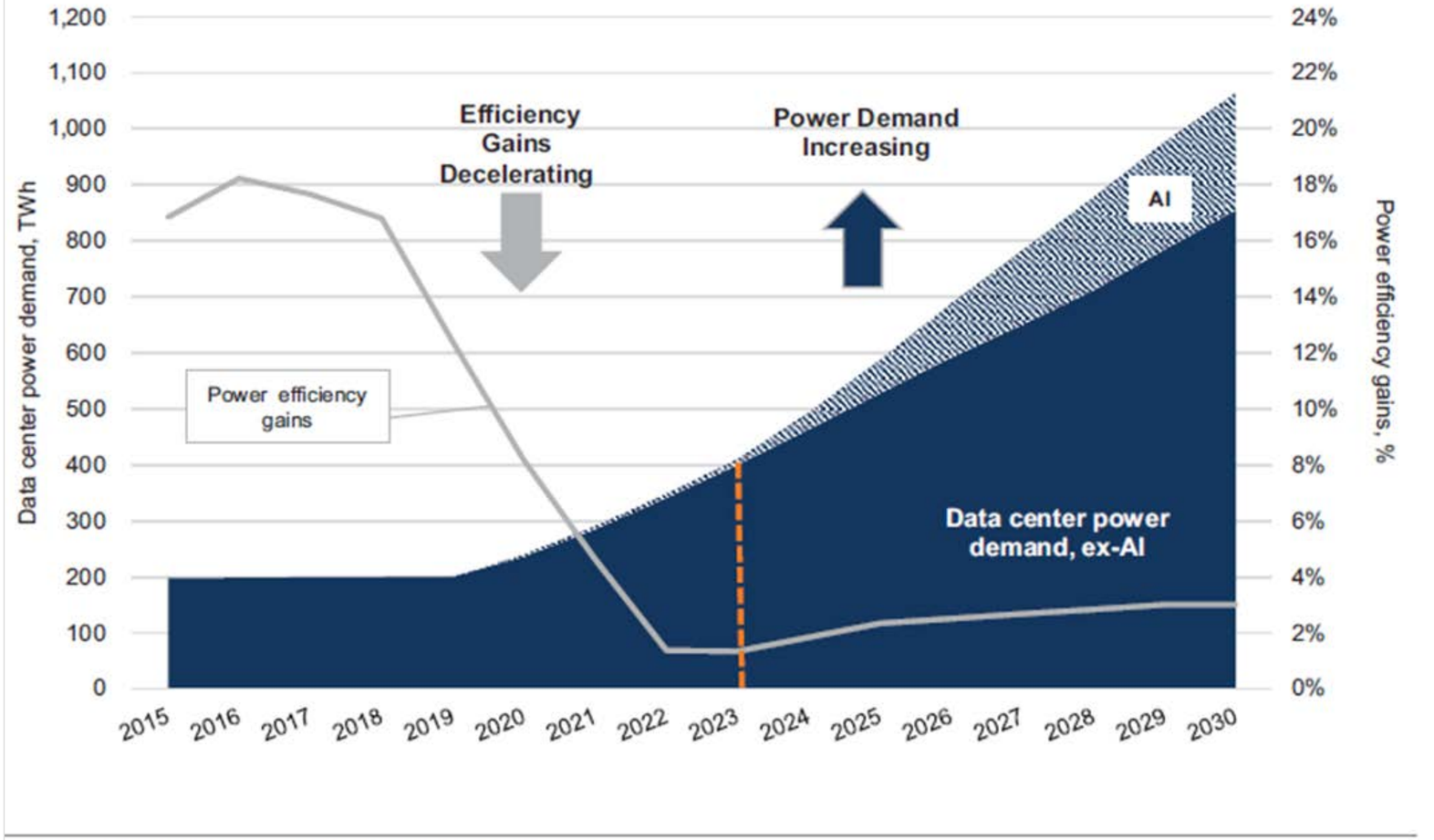


4. Physical infrastructure: Power

- Stable Base Power Supply/LNG + Nuclear
- Electric Grid
- Storage of electricity: Batteries/Other
- Revival of Nuclear as the new net-zero

Exhibit 1: As efficiency gains have decelerated, data demand growth is driving a surge in data center power use, with an AI kicker on the way

Data center electricity consumption, TWh (LHS) and power efficiency gains ex-AI, % (RHS)

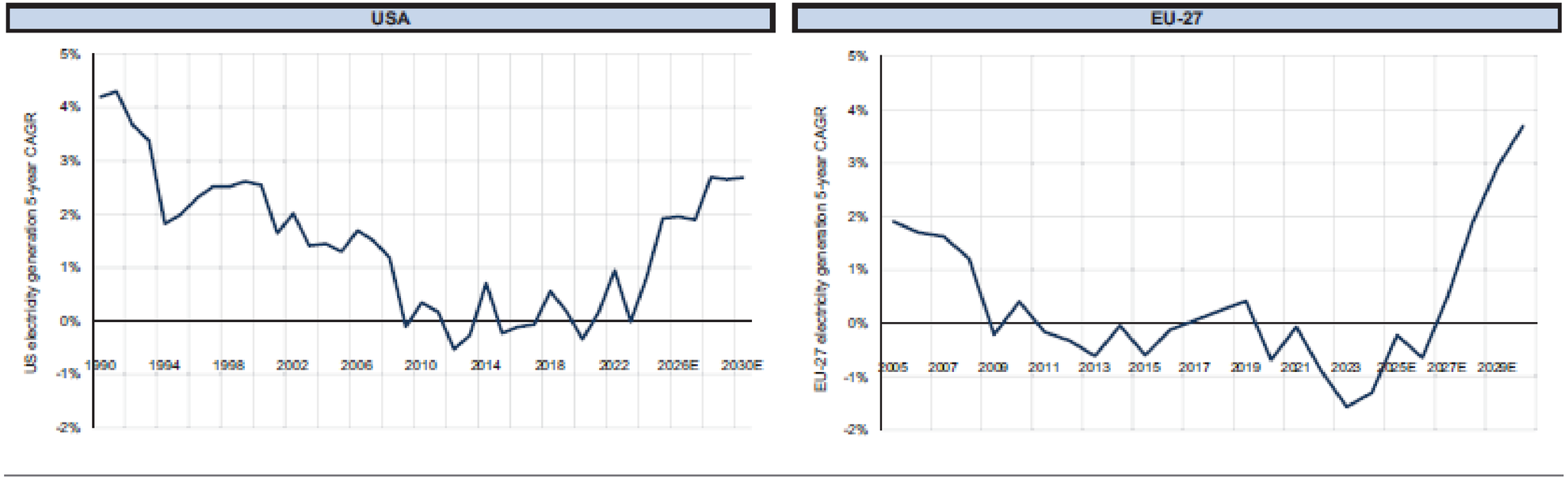


Source: Masanet et al. (2020), IEA, Cisco, Goldman Sachs Global Investment Research

5-yr CAGR for US and European electricity demand

Exhibit 2: Generational Growth: Our Utilities Research teams now expect USA and EU-27 electricity consumption accelerating through the end of the decade to levels not seen in 20+ years

5-yr CAGR for US and European electricity demand; forecasts from our US and Europe Utilities Research teams

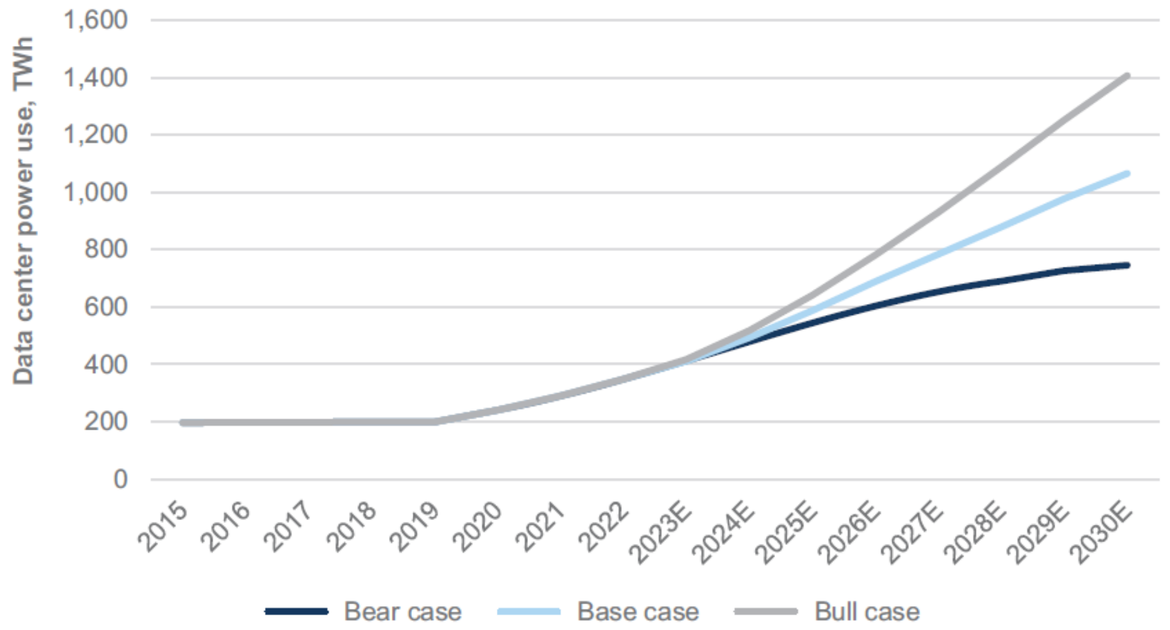


Source: EIA, EMBER, Goldman Sachs Global Investment Research

Electricity demand from data centers in TWh

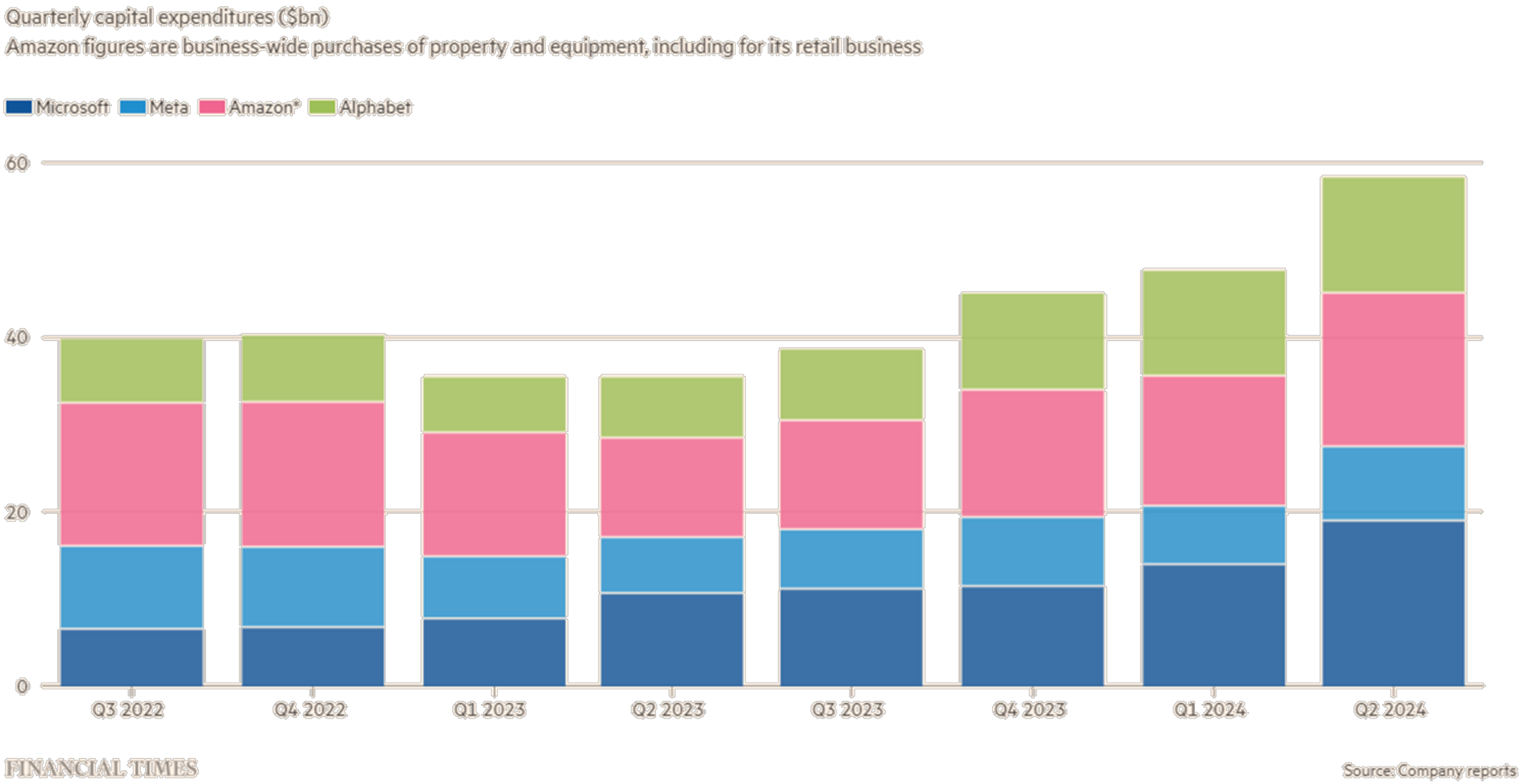
Exhibit 6: We see 2030 power use from data centers 1.8x-3.4x 2023 levels in our bear/bull case

Electricity demand from data centers in TWh, base case, bear case and bull case

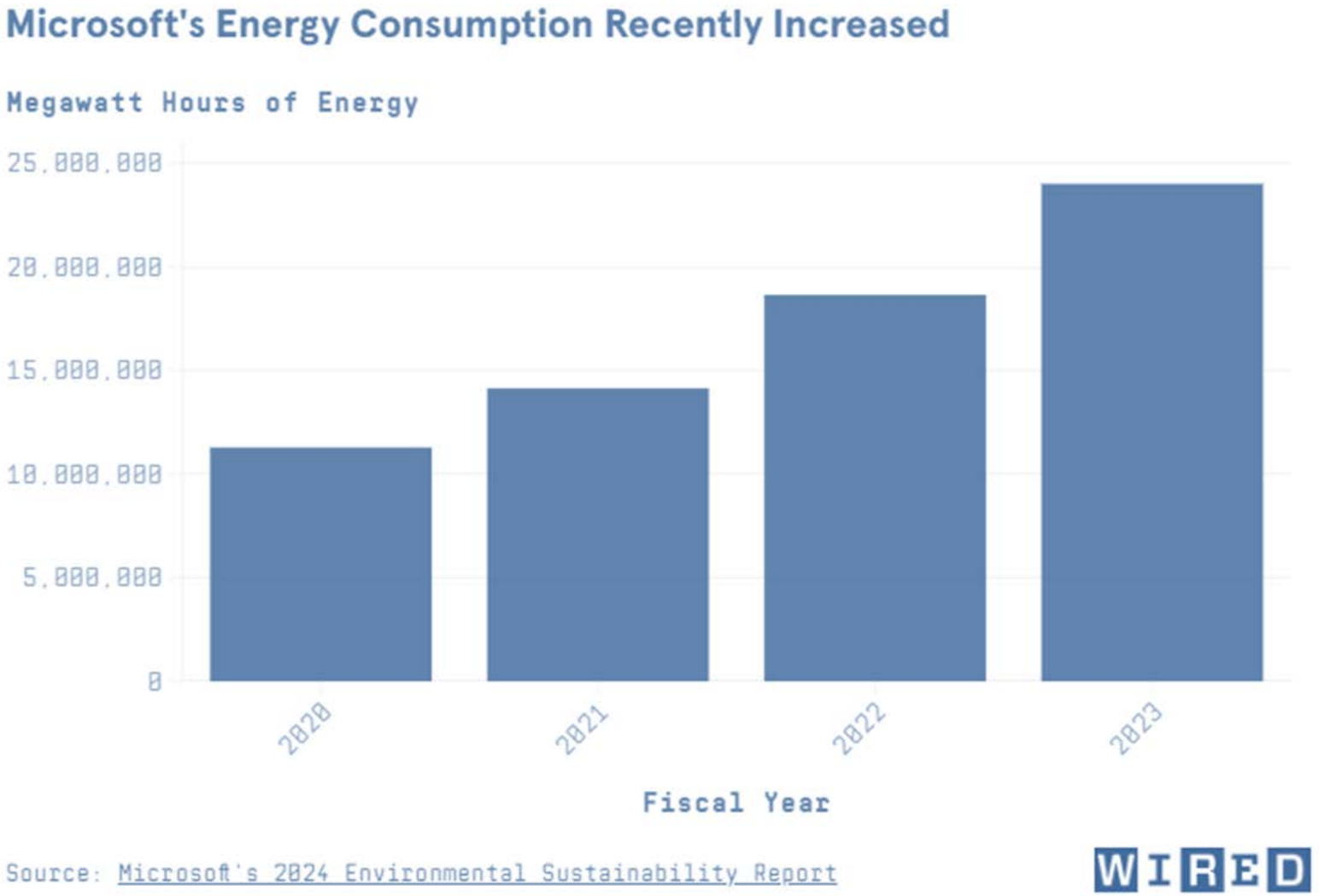


Source: Masanet et. al (2020), Cisco, IEA, Goldman Sachs Global Investment Research

Big Tech companies ramp up infrastructure investment to support AI



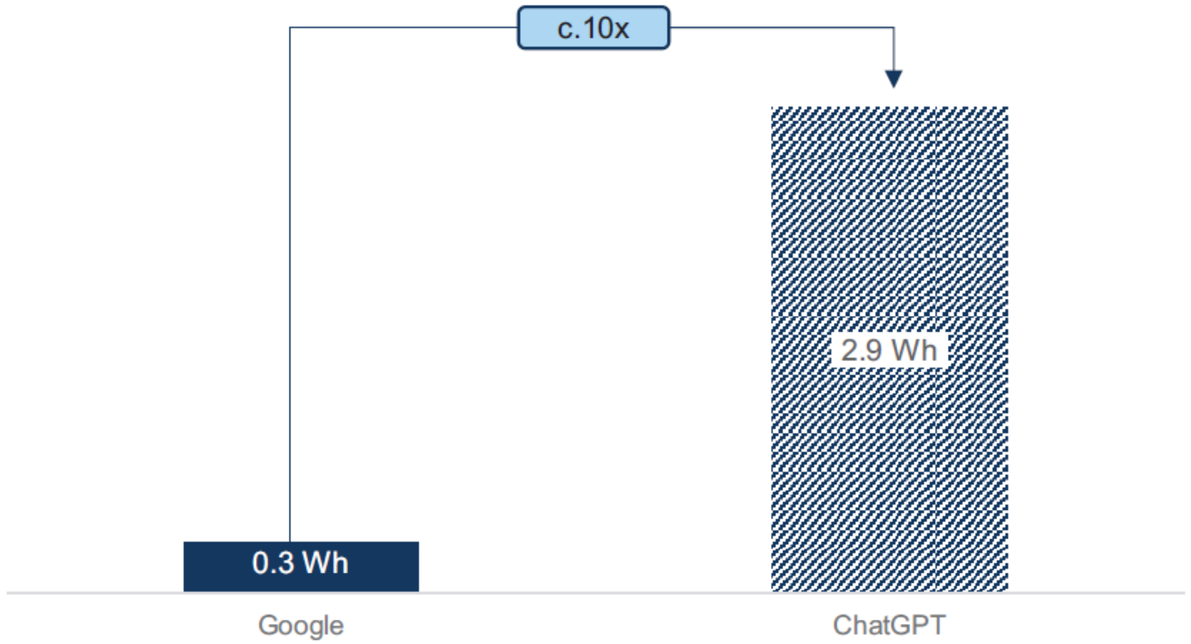
Microsoft’s Energy Consumption Recently Increased



Power consumption per query/search (Wh)

Exhibit 9: ChatGPT queries are 6x-10x as power intensive as traditional Google searches

Power consumption per query/search (Wh)



Source: Google, SemiAnalysis

ChatGPT, total minutes spent by users

Exhibit 11 : ChatGPT, total minutes spent by users

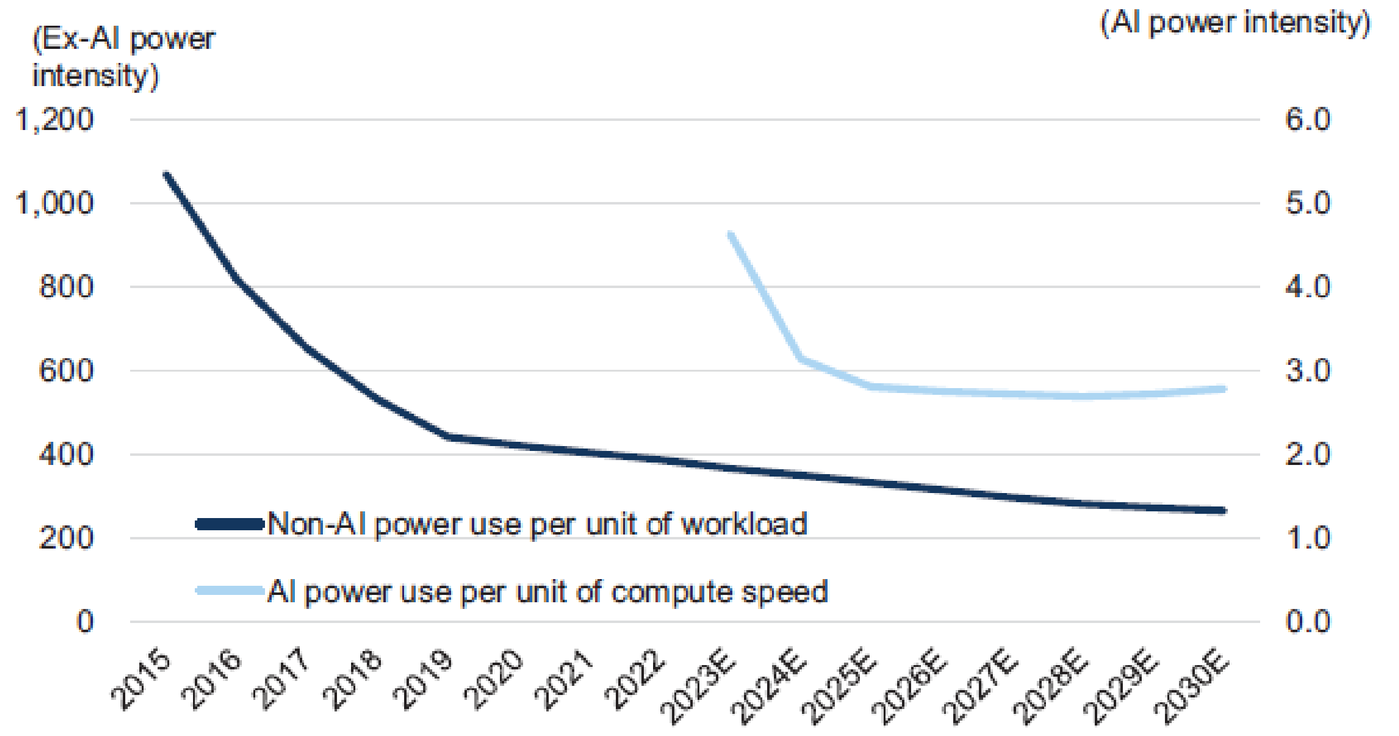
openai.com (old chaptgpt website) and chatgpt.com (new website), Worldwide data on comScore (total minutes spent, in billions)

This chart replaces the one included originally in this report, which was based on number of visits rather than minutes spent, and did not include the new website data. As such, it inaccurately showed a fall-off in ChatGPT visits.

Source: comScore

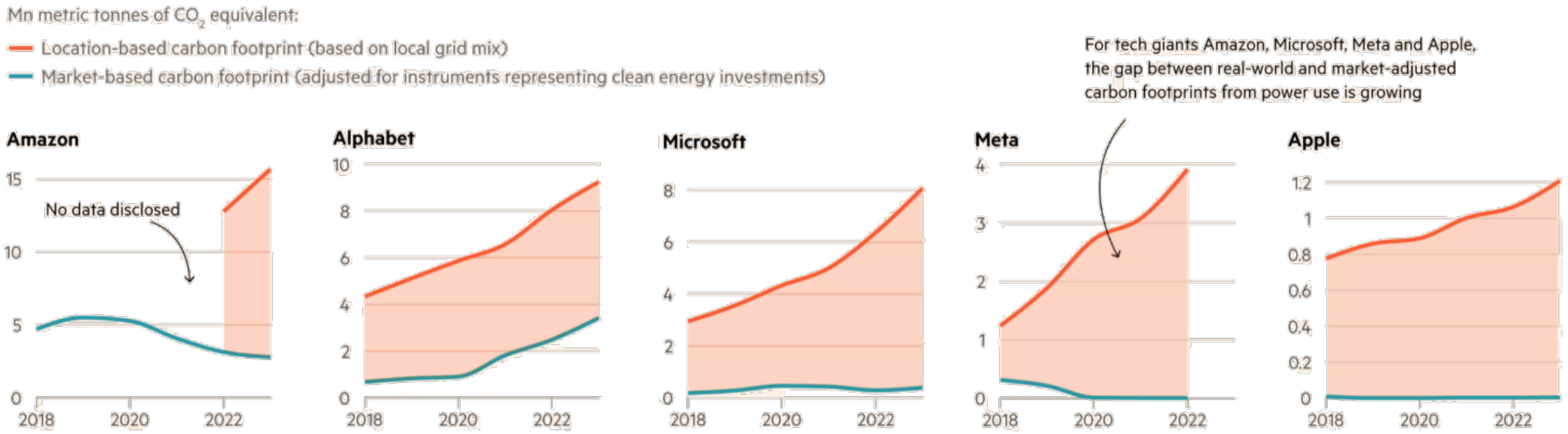
Power intensity from AI and non-AI data center demand

Exhibit 16: The emissions increase is despite efficiency gains lowering power intensity for both non-AI and AI drivers of data center power demand
Power intensity from AI and non-AI data center demand



Source: Masanet et al. (2020), IEA, Cisco, Goldman Sachs Global Investment Research

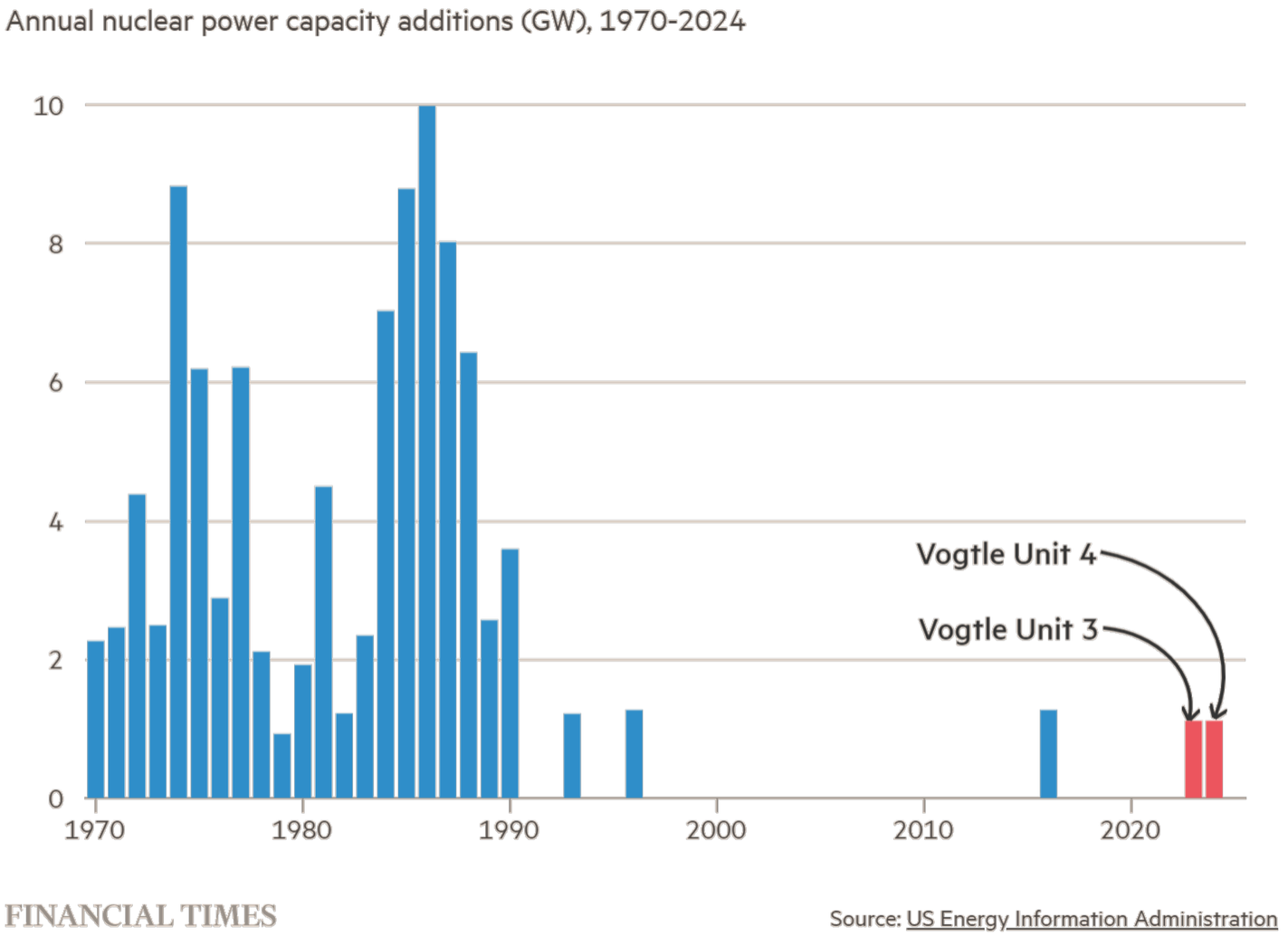
Accounting techniques distract from true surge in tech company emissions



Amazon did not report its emissions from grid use for four consecutive years from 2018 to 2021, FT analysis shows. This disclosure has been a GHG Protocol requirement since 2015. Amazon said its sustainability reports and metrics were validated by third-party independent assurers that measured these against the protocol's requirements.

Source: Company sustainability and auditor reports

First new nuclear reactors since 2016 come online in US



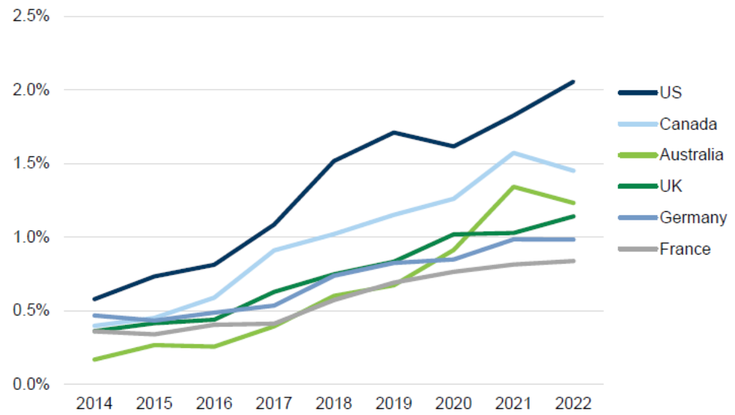
5. Labour Issues

Job Losses? Or job gains? Productivity and efficiency improvements will drive economic growth and therefore overall employment growth. This includes less developed economies with younger more digitally adaptive workforces. There will also be a gain in leisure time.

There is evidence for employment challenges related to technological disruption in the modern IT era. A study by economists Daren Acemoglu and Pascual Restrepo found that technological change displaced workers and created new employment opportunities at roughly the same rate for the first half of the post-war period, but has displaced workers at a faster pace than it has created new opportunities since the 1980s. These results suggest that the direct effects of generative AI on labor demand could be negative in the near- or intermediate-term if AI affects the labor market in a manner similar to earlier advances in information technology (see our economists' report *The Potentially Large Effects of Artificial Intelligence on Economic Growth*.)

Exhibit 10: Job postings that require AI skills were ramping even before 2023

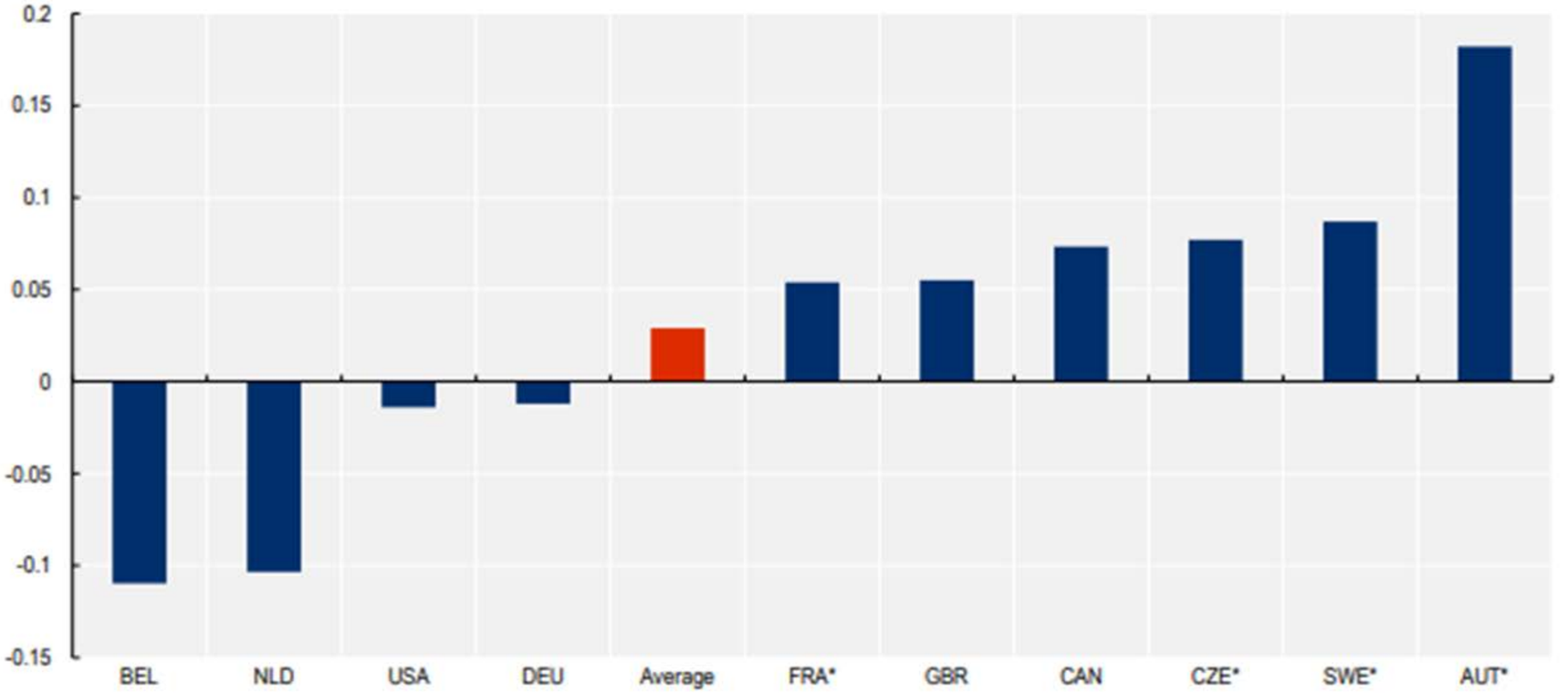
% of job postings that require AI skills (including "machine learning", "NLP", and "neural networks")



Source: AI Index Report (2023), Lightcast, Goldman Sachs Global Investment Research

Figure 4.6. There is modest evidence that establishment AI exposure increases labour demand

Regression coefficients of the effect of AI exposure on establishment vacancy change



[31] Defined as $\ln\left(x + \sqrt{x^2 + 1}\right)$.

AI Challenges – Workforce Displacement

As with any kind of new technology, experts believe AI will complement the work of some people by making them more productive. Other jobs could get wiped out.

The White House report contains numerous caveats, including cautioning that the ultimate impact of AI on workers may change as the technology and its capabilities evolve.

Generative AI is already able to do some tasks that in the past only humans could, such as writing humorous stories, generating realistic images and crafting song lyrics.

Source: CNN

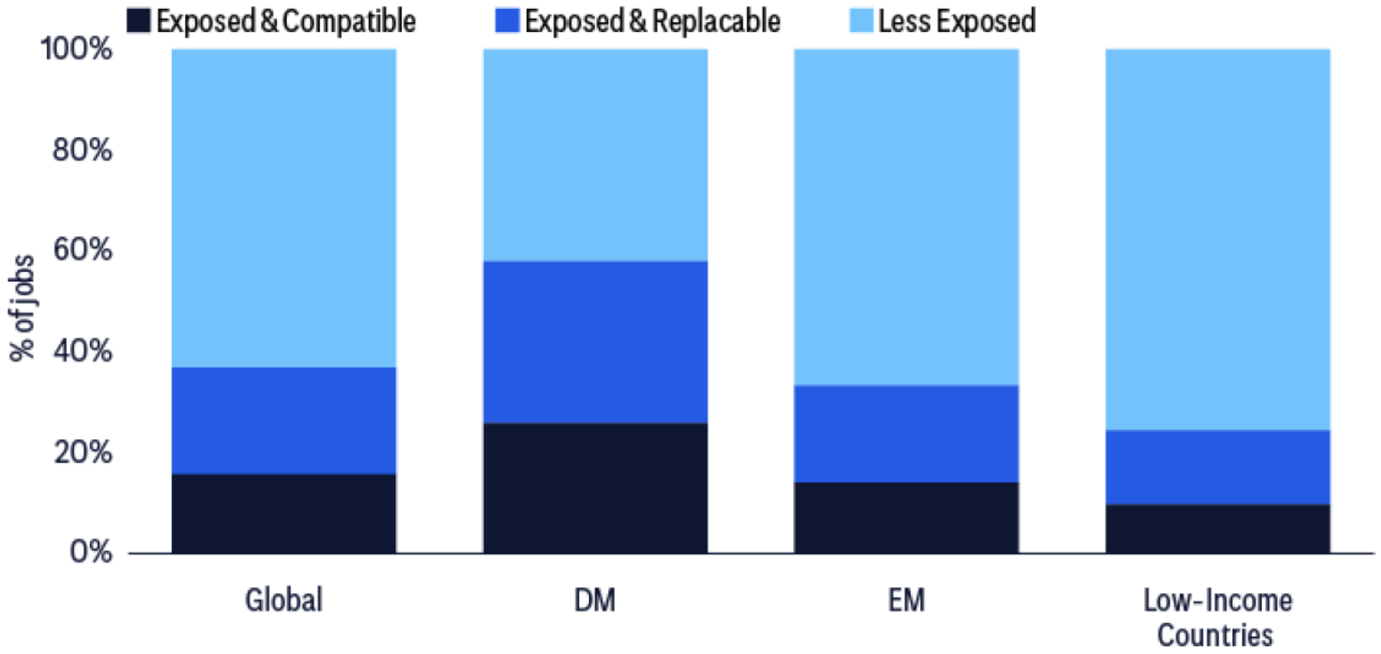
10% of US workers are in jobs most exposed to artificial intelligence, White House says

By Matt Egan, CNN

5 minute read · Published 5:01 AM EDT, Thu March 21, 2024

AI Challenges – Workforce Displacement

Figure 6. Does AI Help or Hurt Workers—Exposure across Job Types



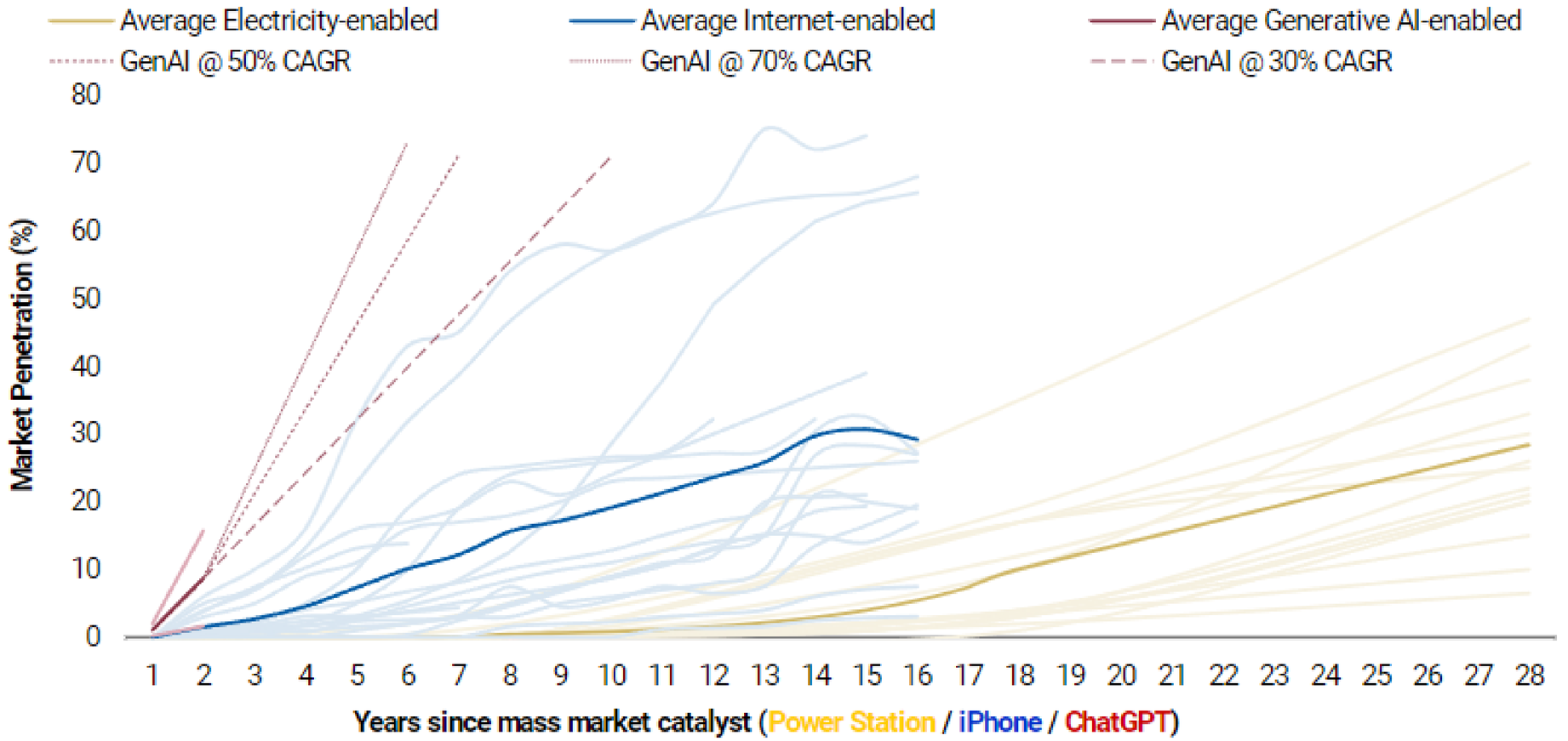
Note: These results were published by the IMF on January 14, 2024.

Source: Citi Research, IMF

6. Outline of Opportunities

- Drivers of increased productivity
    - labour intensity/work from home/automation
    - reduced barriers of entry as costs will be lower
    - consumer empowerment
    - reduction of costs in general
- Driver of bringing emerging economies into the mainstream.
- Driver of the Creator Economy: advertising, media, art and music.
- Expanded access to information, education and entertainment for a wider & less enabled part of the population. This includes in developed countries: the internet and social media are great disseminators of information (fake but also true). Implications for inequality in information.
- Improved communication between people and business
- Enhanced competition/Infection Effect: “the Amazon price” is now the test of competitive pricing.

Exhibit 12: Adoption curves of new technologies (bold lines) and speed of diffusion of that technology into various industries (% of B2B and B2C adoption)



Source: OurWorldinData, Morgan Stanley Research

7. Effect to existing economic activities

- AI Agents and Assistants to become the 21st century “word processor”.
- Legal & accounting, advertising, consulting services offshored but also replaced by AI.
- Storage management/logistics. Delivery times and costs. On time delivery by drone or self driving cars.
- Development and production of new physical goods needed to support the digital economy: copper as well as lithium and rare earths. Semiconductor chips and other hardware.
- Transformation of existing goods: house appliances and industrial equipment (including ships)
- Effects on ship management: efficient monitoring of consumption and emissions. However, the self driven ship is unlikely.

8. New types of economic activities

- Quantum software development/hardware design.
- Cloud data services.
- Production of totally new materials.
- Speeding up drug/vaccines/therapeutic discoveries.
- Scientific discovery is enhanced and transformed through AI.
- Predictive analytics for: stocks trading, consumer behaviour, pandemics and healthcare. High frequency trading.
- All these will need a specialized labour force: biomedical engineers, data center engineers, quantum programmers, network engineers **but also** a host of low skill maintenance and support personnel

9. Ethics etc.

Unlike more restrained AI models like ChatGPT or Google's Gemini, Grok-2 (Musk's xAI company) seems to operate with fewer ethical guardrails. This has resulted in the generation of images that would make other chatbots blush—and regulators frown.

We're talking about AI-generated images that push the boundaries of taste and, in some cases, veer into potentially harmful territory. Examples of Grok-2's controversial creations include:

- An image of Mickey Mouse wearing a "Make America Great Again" hat while holding a cigarette and beer.
- A depiction of Donald Trump embracing a pregnant Kamala Harris.
- A compromising image of Bill Gates involving a certain white powder


FORBES > INNOVATION > ENTERPRISE TECH

AI Gone Wild: How Grok-2 Is Pushing The Boundaries Of Ethics And Innovation

Bernard Marr Contributor

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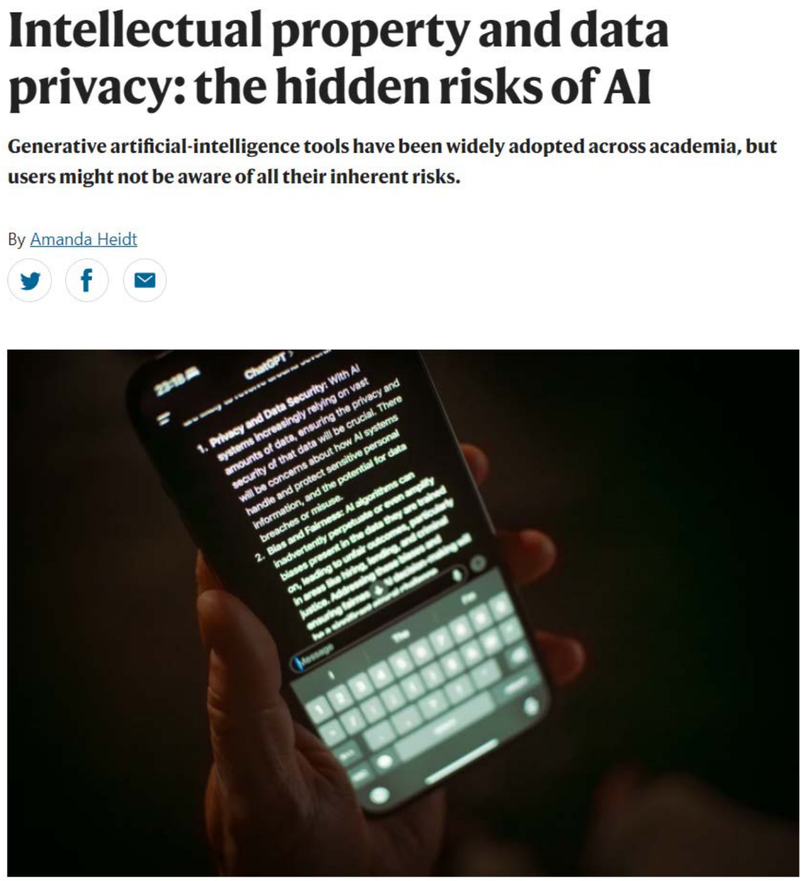
Aug 21, 2024, 01:53am EDT

Source: Forbes

AI challenges – Intellectual Property



Intellectual property and data privacy: the hidden risks of AI

Generative artificial-intelligence tools have been widely adopted across academia, but users might not be aware of all their inherent risks.

By Amanda Heidt

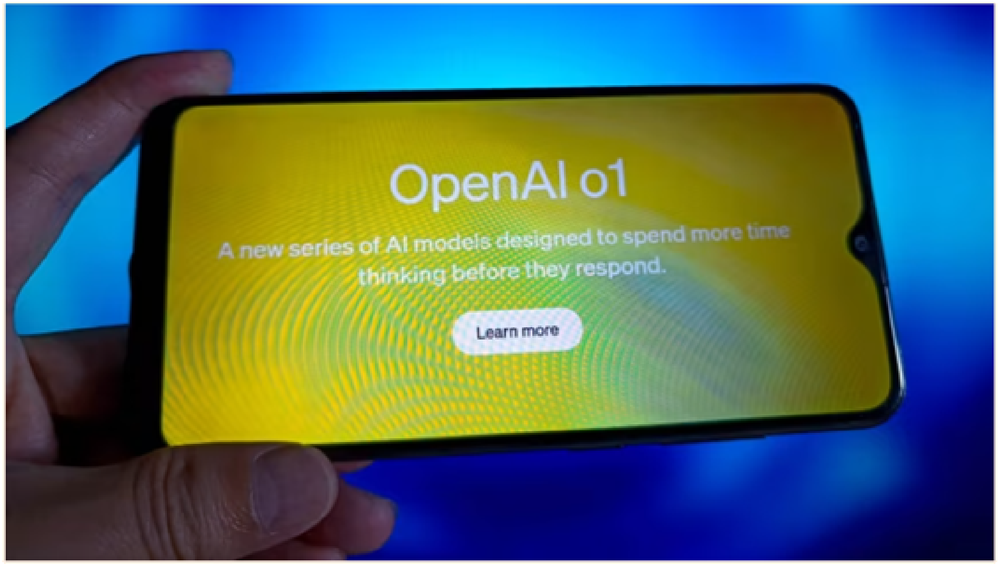
In fields such as academia, in which research output is linked to professional success and prestige, losing out on attribution not only denies people compensation, but also perpetuates reputational harm. “Removing peoples’ names from their work can be really damaging, especially for early-career scientists or people working in places in the global south,” says Evan Spotte-Smith, a computational chemist at Carnegie Mellon University in Pittsburgh, Pennsylvania, who avoids using AI for ethical and moral reasons. Research has shown that members of groups that are marginalized in science have their work published and cited less frequently than average, and overall have access to fewer opportunities for advancement.

Source: Nature

AI challenges - Misuse

OpenAI acknowledges new models increase risk of misuse to create bioweapons

Company unveils o1 models that it claims have new reasoning and problem-solving abilities



OpenAI said it was particularly 'cautious' with how it was bringing o1 to the public because of its advanced capabilities. The product will be widely accessible via ChatGPT's paid subscribers © CFOTO/Future Publishing via Getty Images

OpenAI's system card, a tool to explain how the AI operates, said the new models had a "medium risk" for issues related to chemical, biological, radiological and nuclear (CBRN) weapons — the highest risk that OpenAI has ever given for its models. The company said it meant the technology has "meaningfully improved" the ability of experts to create bioweapons.

Yoshua Bengio, a professor of computer science at the University of Montreal and one of the world's leading AI scientists, said that if OpenAI now represented "medium risk" for chemical and biological weapons "this only reinforces the importance and urgency" of legislation such as a hotly debated bill in California to regulate the sector

Source: FT

AI challenges – Bias

Contributor: James Holdsworth

Date: 12/22/23

What is AI bias?

AI bias, also called machine learning bias or algorithm bias, refers to the occurrence of biased results due to human biases that skew the original training data or AI algorithm—leading to distorted outputs and potentially harmful outcomes.

The models upon which AI efforts are based absorb the biases of society that can be quietly embedded in the mountains of data they're trained on. Historically biased data collection that reflects societal inequity can result in harm to historically marginalized groups in use cases including hiring, policing, credit scoring and many others. According to The Wall Street Journal, “As use of artificial intelligence becomes more widespread, businesses are still struggling to address pervasive bias.”

Source: IBM

“I never think of the future. It comes soon enough”

Albert Einstein

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THANK **YOU**