J.P.Morgan

Navigating the Future

Key themes impacting business over the next decade | September 2025

Corporate Advisory | Corporate Finance Advisory

Introducing “Navigating the Future”

We are pleased to introduce “Navigating the Future,” Corporate Finance Advisory’s new piece on long-term themes impacting corporate planning and decision-making. In it, we examine a few trends that have the potential to drive significant macroeconomic, geopolitical and technological outcomes over the next decade and beyond.

Nearly 80 years ago in an essay titled “The Facts of Life,” a demographer undertook an exercise to forecast the future for *The Atlantic*. Amid a period of rapid, post-war economic transformation and enormous demographic shifts, the writer predicted that the (then) recent increase in births…

“*…will be felt in 1945-1950 in congested kindergartens and primary grades. By 1955-1960 it will be crowding in the high schools. A few years later it will be crowding the labor markets with entering workers, filling the colleges, swelling the number of marriages, stimulating the demand for homes. By 1970, a reflected secondary wave of births will be under way. By 1985 the number of workers over age 45 will mount sharply. Shortly after the turn of the century the wave will break on the retirement systems and pension funds of the country.”*

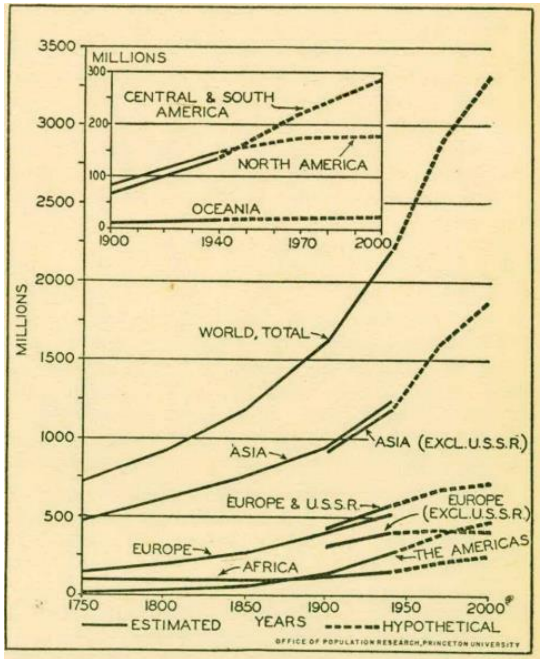


Fig. 2. Estimated and hypothetical populations of major sections of the world, 1750 – 2000 (values for 1750 – 1900 from Carr-Saunders, *World Population*, p. 42). [From Notestein, “Population — The Long View,” p. 55, in *Food for the World*, edited by Theodore W. Schultz, University of Chicago Press, 1945.]

While *The Atlantic* got it right on many fronts, the article reminds us of the hazards of predicting the future. Industrialization, transformational geopolitical alliances, seismic technological and medical advances, and unprecedented global migration influenced population shifts in ways one could never have predicted.

Nonetheless, as we contemplate the rapidly accelerating impacts of AI development, and the trends in energy and health, our work operates on the premise that we must anticipate the possible scenarios of the future, even if we get some of it wrong.

We hope this serves as a powerful, data-driven analysis that supports your planning for the years ahead.

Rama Variankaval
Global Head of Corporate Advisory

Evan Junek
Global Head of Corporate Finance Advisory

Source: Frank W. Notestein writing for *The Atlantic’s* June 1946 issue

Executive summary

Change is accelerating

- The compounding effects of technological advancement has accelerated the pace of change, adoption, and disruption
- At the same time, global trade dynamics and economic systems are also undergoing significant upheavals

We present three possible scenarios that could drive significant change in the next decade

- AI moves towards “artificial general intelligence” (AGI), *supporting productivity improvements at least on par with precedents like the steam engine or electricity*
- Power demand spikes in near-term but elevated investment supports *a significant decline in the cost of energy over the long-term*
- Advancements in medicine and biotechnology *increase global life expectancy and improve quality of life* along the way, also contributing to productivity gains

Each of these scenarios has implications for corporate decision-makers looking to the future

- Every industry gets transformed by shifts in productivity, and changes to input cost
- Early movers who anticipate these seismic changes will be the winners in their sectors
- Multi-factor modeling can help identify key attributes that could help or hurt sectors under these scenarios

Long-term scenario analysis is inherently flawed but remains a critical part of strategic planning

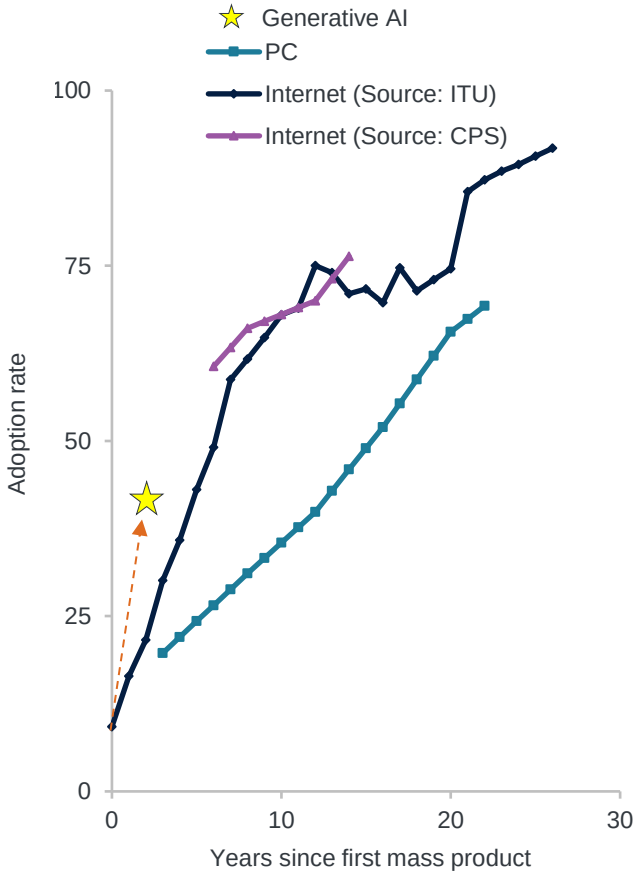
- The future is unknowable but anticipating change – even with unexpected results – supports better preparation

The world is changing at a rapid pace

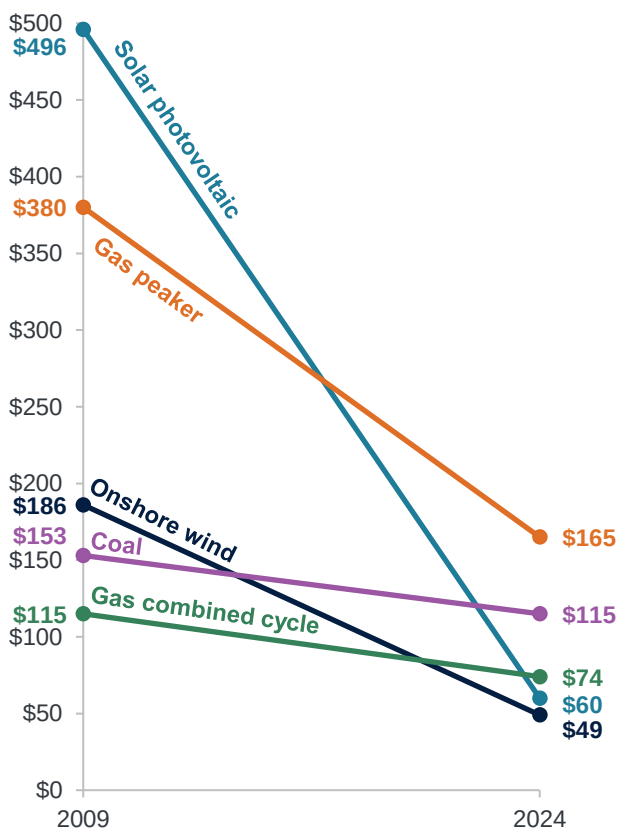
The world today
vs. 10 years ago

+11%	+2.8%	+1 year	+15%
Global population change[1]	*Avg. annual GDP growth*	*Life expectancy* (now 73 years)	*Per capita labor output*

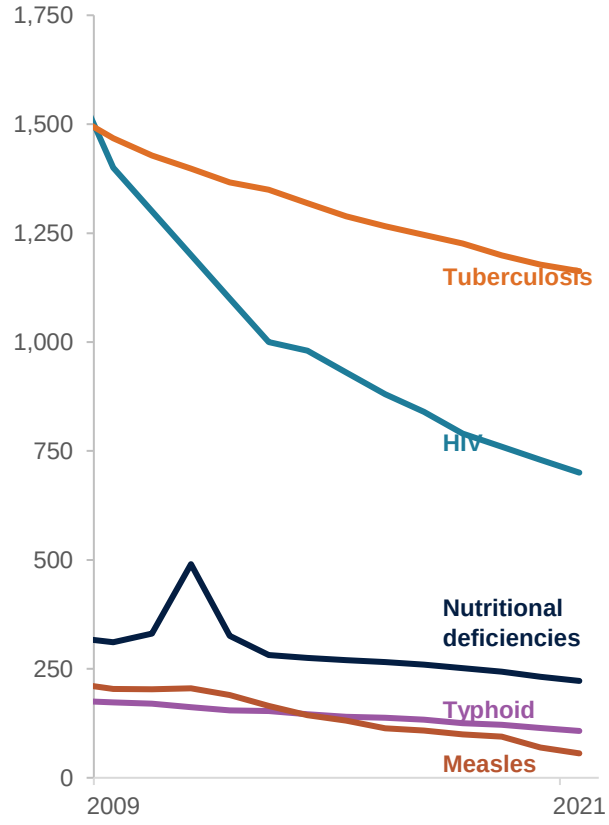
ADOPTION RATE OF GENERATIVE AI VS OTHER TECHNOLOGIES[2]



GLOBAL CHANGE IN PRICE OF ELECTRICITY FROM NEW POWER PLANTS



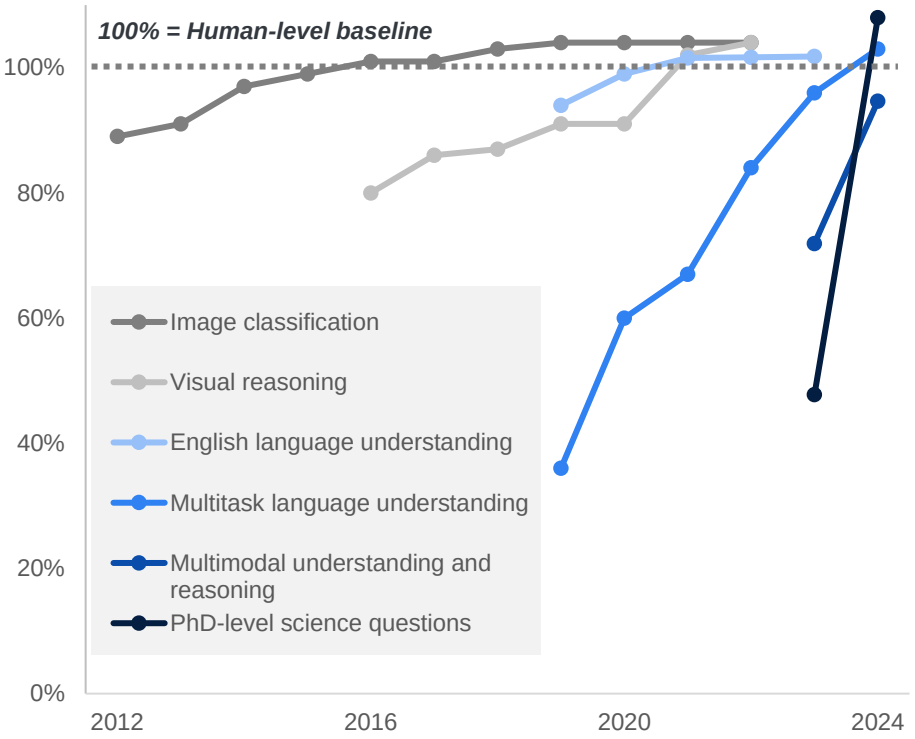
GLOBAL DEATHS FROM INFECTIOUS DISEASE (IN 000S)



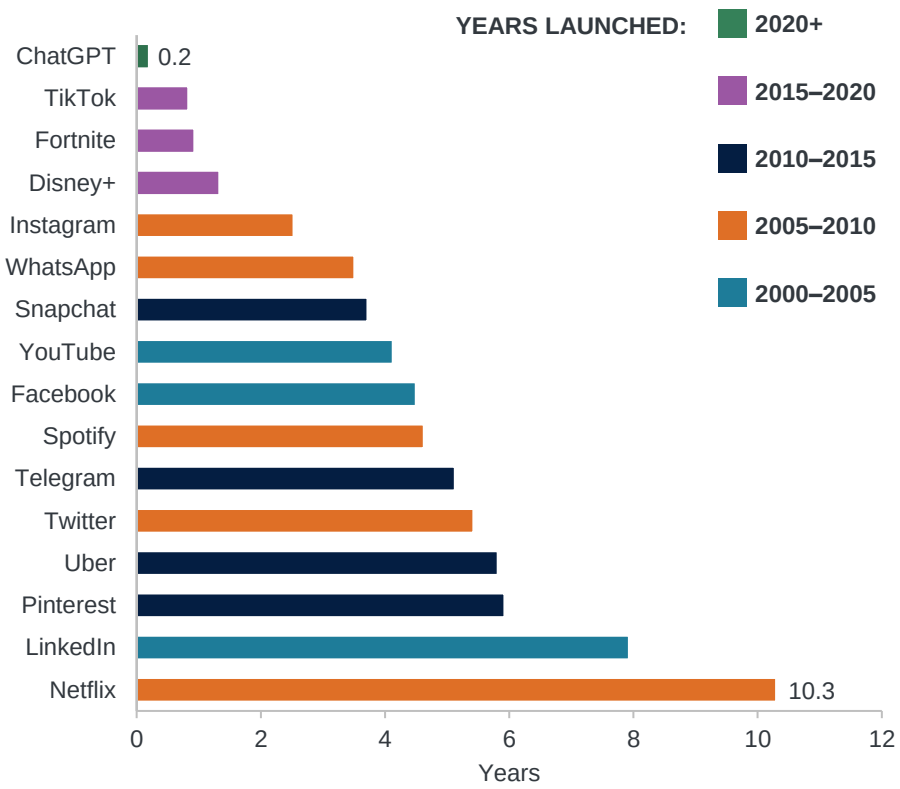
Sources: Bureau of Labor Statistics, United Nations, Organization for Economic Co-operation & Development (OECD), World Bank, International Labour Organization
Note: [1] 2015 population was 7.3bn, U.S. Census Bureau estimates 2025 population will be 8.1bn; [2] Federal Reserve Bank of St. Louis, Generative AI based on August 2024 Real-Time Population Survey, PC and Internet (CPS) are from the BLS Current Population Survey, Internet (ITU) based on International Telecommunication Union

AI development and adoption has been extraordinary

AI model performance benchmarks vs. human performance[1]



Years to reach 100mm Users – 2000 – 2023[2]



Key insights

+600mm
ChatGPT Active Users [3]

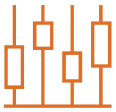
32% CAGR
Capex growth since 2020 [4]

78%
Of firms reported using AI in 2024 [5]

+100
AI models released in 2024 [6]

Source:[1] Stanford Artificial Intelligence Index 2025; [2] BOND, "AI & Universities" (2024) via company filings, press; [3] Monthly, Sensor Tower May 2025; [4] Capex from 2020 – 2025E as of August 2025, includes Alphabet, Amazon, Meta, Microsoft, Nvidia, Oracle; [5] McKinsey Global Surveys on the state of AI, 42% of survey respondents represented organizations with annual revenues of $500mm+; [6] Epoch AI May 2025, vs. ~55 in 2023, includes models larger than 10^{23} FLOP (floating point operations per second)

AI's current capabilities are already influencing everyday experiences

		Current examples	Impact
 **Navigation with computer vision**	**Enabling vehicles to complete unmanned, self-guided journeys**	• On-site transport automation • Autonomous tractor trailers • Unmanned taxis • Driverless commercial deliveries • Self-directed driving	• **Logistics businesses expand revenue and margins:** freight rapidly scales with round-the-clock driving and saving on total cost of tractor-trailer operation of up to 42%[1]
 **Problem solving and data analysis**	**Solving prompted problem statements using LLMs trained on textbooks, coding courses, and Q&A forums**	• Text-prompted data analysis • No-code widget creation • In-line coding assistants • AI-enabled bug fixing	• **Cost of software development is slashed:** AI assistants increase software developer deadline completion by 25-30% for complex tasks[1] • Analysis agent integrations in software and platforms shrink the time from data to insight
 **Decision-making in Healthcare**	**Rules-based tasks and processes can be executed by AI with lower error rates than humans in some cases**	• Automated oncology screening • Emergency room / urgent care triage • Pre-appointment diagnostic assistance	• **ER efficiency greatly improved leading to better patient outcomes and resource allocation:** AI triage systems accurately categorize the severity of patient acuity better than both nurses and clinicians[2]

Source: [1] McKinsey; [2] "Improving ED Emergency Severity Index Acuity Assignment Using Machine Learning and Clinical Natural Language Processing" (Ivanov O, Wolf L, Brecher D, et al., 2021)

Our AI scenario envisions continued and significant improvements

AI's answers to: "What are the top things AI can do today? What will AI be capable of in 2030 and 2035?"

"Technological advancements, data availability and quality, interdisciplinary research, ethical and responsible frameworks, education and workforce development and increased public understanding of AI and its benefits are required to achieve advanced AI capabilities"

AI's caveats about its future

"These advancements will depend on continuous research, ethical considerations and societal acceptance"

"These capabilities are continually evolving, with ongoing research and development pushing the boundaries of what AI can achieve"

2035

- **Human-level general intelligence:** Perform any intellectual task a human can do
- **Medical research:** Accelerate R&D and personalized medicine
- **Tackle global challenges:** Climate change, resource management, disease eradication
- **Collaboration:** Assist humans in creative fields (i.e., art, music)
- **Ethical decision making:** Develop frameworks to help robotics and processes navigate moral dilemmas
- **Smart cities:** Traffic management, infrastructure monitoring, resource optimization

2030

- **Advanced NLP:** Sophisticated, human-like interaction and translation
- **Healthcare diagnostics:** Enhanced disease diagnosis, treatment recommendations
- **Personalized education:** Tailored experiences adapted to learning styles and needs
- **Emotional intelligence:** Ability to detect emotion and have more empathetic human interaction
- **Cybersecurity:** More intelligent threat identification and mitigation tactics
- **Environmental monitoring:** Ecosystem management and climate change prediction

Today

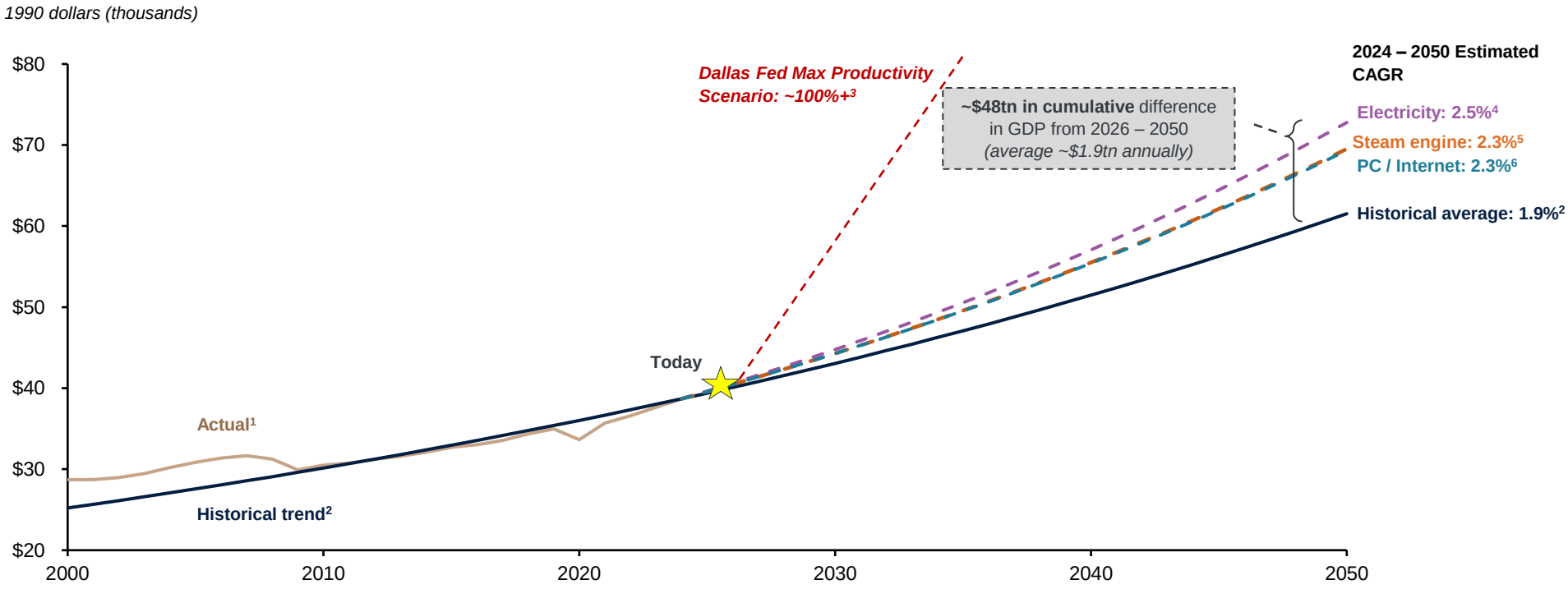
- **Natural Language Processing (NLP):** Chatbots, virtual assistants, language translation, copy-editing
- **Computer vision:** Facial recognition, object detection, medical imaging analysis, autonomous driving
- **Speech recognition:** Speech-to-text conversation
- **Predictive analytics:** Fraud detection and prediction, supply chain optimization
- **Robotics:** Control robots in manufacturing, logistics and personal assistance
- **Creative arts:** Generate music, art and literature

AI Capabilities

Source: Large language model responses on August 26, 2025 (referenced Capegemini 2025 Tech Report, June 2025 hyperscaler earnings call transcripts, PwC)

AI's contributions to labor productivity conservatively increase U.S. GDP by an average of $1.9trn per year

GPD PER CAPITA UNDER PREVIOUS TECH INNOVATION SCENARIOS



Note: [1] Real gross domestic product (GDP) per capita in 1990 dollars; [2] The line is a trend line fitted to the data for 1870–2024 with a trend growth rate of 1.9 percent per year until 2050; [3] Assuming heaviest reliance on AI in the "benign scenario" presented by the Dallas Fed; [4] Assumes 2.46% GDP growth from 2025 – 2030; [5] Assumes 2.28% GDP growth in 2025 – 2050; [6] Assumes 2.27% GDP growth in 2025 - 2050

Economically transformative innovations and time to peak productivity upside[7]

Innovation	Year invented	Time to peak productivity	Productivity upside
Steam engine	1796	61 years	30%
Electricity	1880	32 years	31%
PC/Internet[8]	1981	15 years	13%

AI has the potential to drive productivity growth further and faster than technological precedents

Source: Federal Reserve Bank of Dallas, National Bureau of Economic Research, Bureau of Economic Analysis, "Understanding Productivity Growth in the Industrial Revolution" (Crafts, 2021), "The Solow Productivity Paradox in Historical Perspective" (Crafts, 2002); Note: [7] Innovations' estimated cumulative total factor productivity (TFP) contribution to GDP growth vs. baseline expected growth; [8] 1981 corresponds to IBM's release of the IBM 5150 Personal Computer

Evaluating corporate leverage to AI adoption

Overview of J.P. Morgan's AI leverage factor model

J.P. MORGAN'S SIX FACTOR AI LEVERAGE MODEL

Opportunity to create efficiencies

Gross margin per employee

High margin revenue per employee | ***Marginal efficiency gains*** with AI as a 'co-pilot' to highly specialized work

Low revenue per employee | More *opportunity to streamline* production / tasks and **improve cost efficiency**

Gross margin

High margin | ***Greater flexibility*** to invest in AI capabilities

Low margin | ***Less capacity*** to invest heavily enough in AI capabilities that drive appreciable growth

Potential to increase innovation

R&D / Sales

High R&D / Sales | R&D is major growth driver and AI can ***enhance and expedite R&D discoveries***

Low R&D / Sales | May have ***less propensity*** toward integrating AI into R&D processes

Intangible assets (excl. Goodwill)

High intangible assets | AI can ***use existing data*** to deliver ***value driving insights***

Low intangible assets | ***Limited differentiated data*** for artificial intelligence to be deployed on

Ability to adapt

Share price return since ChatGPT released

Stable or increasing | Resilient to and/or benefitting from competitive pressures added by outsized AI stock performance

Decreasing | Market may view ability to adapt / grow in the future as limited

Workforce skill

Highly skilled workforce | AI could ***replace knowledge workers*** first

Lower skilled workforce | More likely to be insulated from AI disruptions

Industries best-positioned to adopt and benefit from advanced AI will be most resilient and competitive in the long-term

All sectors stand to benefit from AI, but the "knowledge economy" has the most room to leverage AI

HOW MUCH LEVERAGE COULD AI OFFER EACH INDUSTRY?

● 75th percentile or greater | ● 25th percentile or lower | ● Neutral

	Industry	Efficiency[1]	Innovation[2]	Adaptability[3]	AI "Leverage Factor"
	Pharmaceuticals, Biotechnology & Life Sciences	●	●	●	●
1	Software & Services	●	●	●	●
1	Financial Services	●	●	●	●
1	Telecommunication Services	●	●	●	●
1	Media & Entertainment	●	●	●	●
1	Semiconductors & Semiconductor Equipment	●	●	●	●
1	Health Care Equipment & Services	●	●	●	●
1	Commercial & Professional Services	●	●	●	●
1	Technology Hardware & Equipment	●	●	●	●
1	Insurance	●	●	●	●
1	Real Estate Management & Development	●	●	●	●
2	*S&P 500 average*	●	●	●	●
2	Equity Real Estate Investment Trusts (REITs)	●	●	●	●
2	Utilities	●	●	●	●
2	Household & Personal Products	●	●	●	●
2	Consumer Services	●	●	●	●
2	Banks	●	●	●	●
2	Consumer Durables & Apparel	●	●	●	●
2	Capital Goods	●	●	●	●
2	Materials	●	●	●	●
2	Consumer Discretionary Distribution & Retail	●	●	●	●
3	Energy	●	●	●	●
3	Transportation	●	●	●	●
3	Automobiles & Components	●	●	●	●
3	Food, Beverage & Tobacco	●	●	●	●
3	Consumer Staples Distribution & Retail	●	●	●	●

**Based on S&P 500 firms*

Interpreting the scores

1. **Services sectors** that invest heavily in intellectual property **R&D** and have consistent **balance sheet flexibility** are best positioned unlock **AI's long-term benefits**
2. Across the S&P 500, **broad AI adoption is a net benefit**, but more limited value of adoption in some sectors balances substantial value in others
3. Long-standing **efficiencies gained from automation** in manufacturing and goods-heavy sectors **can be improved with AI**, but **impact will not be as pronounced** as services sectors

AI's impact will be felt most acutely in services sectors rather than manufacturing or consumer sectors – a significant deviation from prior transformational technologies

Source: MSCI, Factset as of 8/15/2025, Note: Based on z-scores using the following metrics: [1] Gross margin and gross margin per employee as of year end 2024; [2] R&D as % of sales (R&D as of 12/31/2024 and Sales as of most recent LTM period as of 8/15/2025), Intangible assets minus goodwill as of 8/15/2025; [3] Price return since ChatGPT release (11/30/2022 through 8/15/2025) and Workforce skill as defined by MSCI

Despite the potential benefits, AI dissemination comes with risks

ONGOING AI DISSEMINATION RISKS (ACCORDING TO A LARGE LANGUAGE MODEL)

Bias and Disinformation

- **Incorrect information** is a common issue, leading to inaccurate outputs

AI Dependence & Human Cognitive Decline

- **Over-reliance** on AI tools leads to declines in critical thinking and decision making

Job Loss & Inequality Expansion

- **Automation** of some jobs could displace rules- or process-based career paths

Environmental Concerns

- **AI data center power and water consumption** is comparable to that of some countries' current consumption

IMPACTS OF AI RISK

60%+ of adults overall are **highly concerned about** others getting **inaccurate information from AI**[2]

62% of people report **engaging in less critical thinking** when using AI[3]

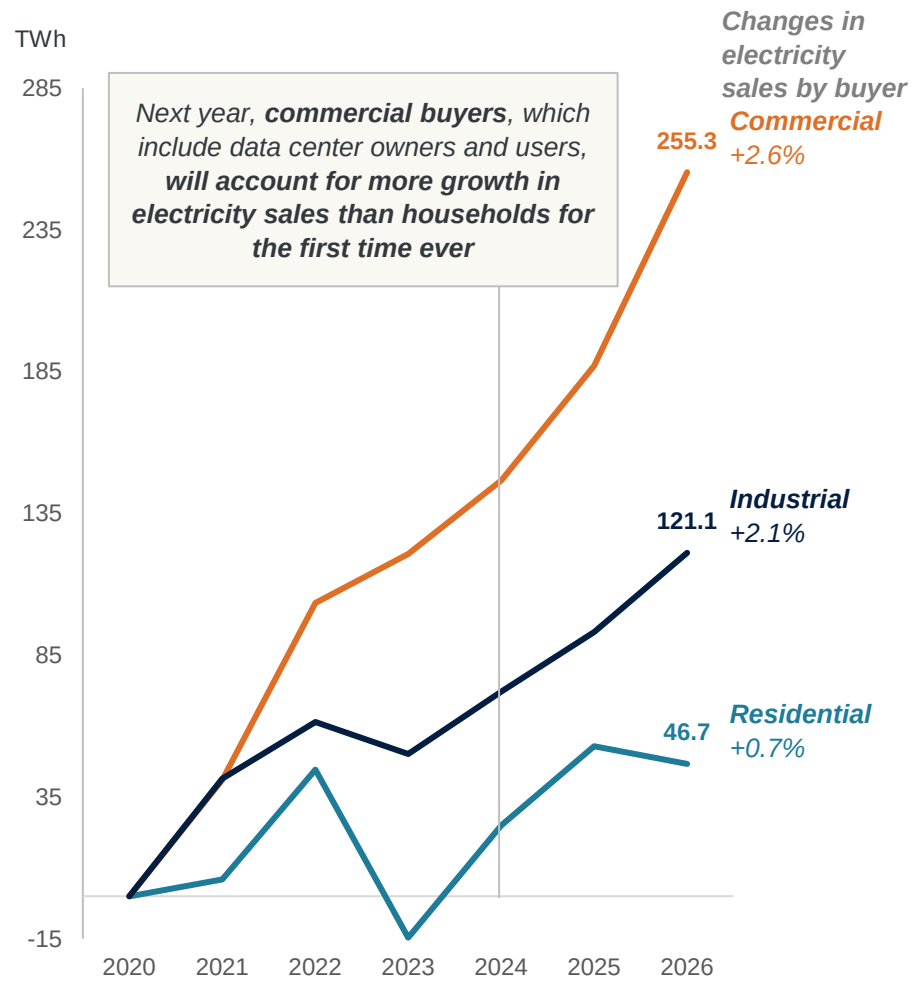
AI could impact up to **40%** of jobs globally, and up to **60%** in advanced economies[4]

AI's global annual water usage is projected to reach **4.2 – 6.6 billion cubic meters** by 2027[5]

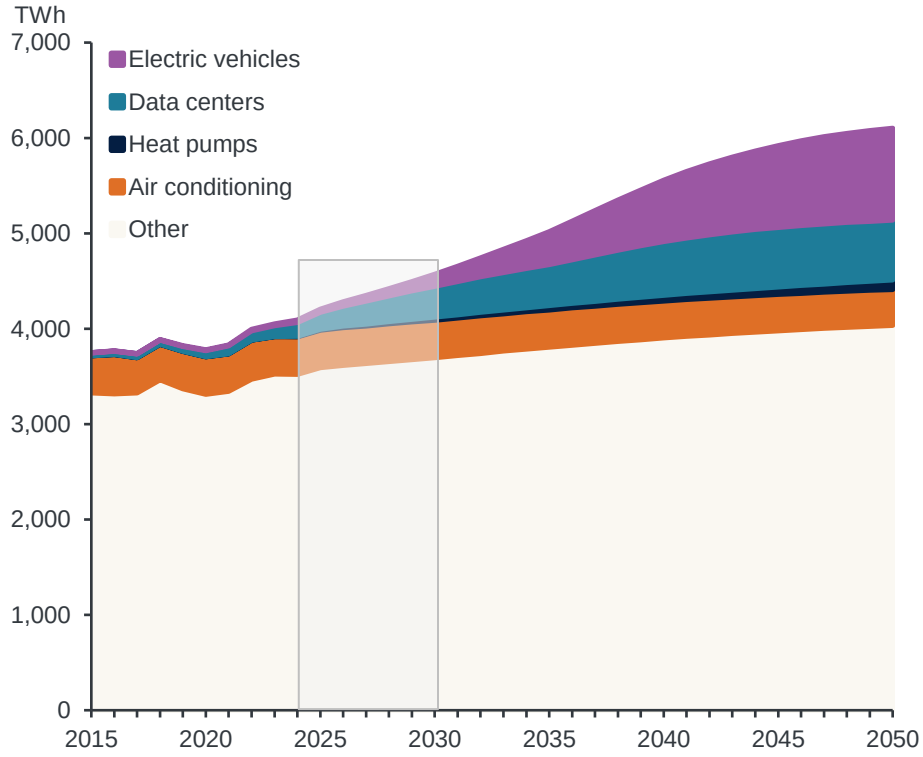
Note: [1] Light editing from JPM; [2] Pew Research, April 2025; [3] Carnegie Mellon University & Microsoft Research; [4] IMF; [5] UIUC Center for Secure Water

AI data centers drive a significant increase in power demand

CHANGE IN U.S. ELECTRICITY SALES TO ULTIMATE CUSTOMERS



PROJECTION OF FINAL ELECTRICITY CONSUMPTION IN THE U.S.



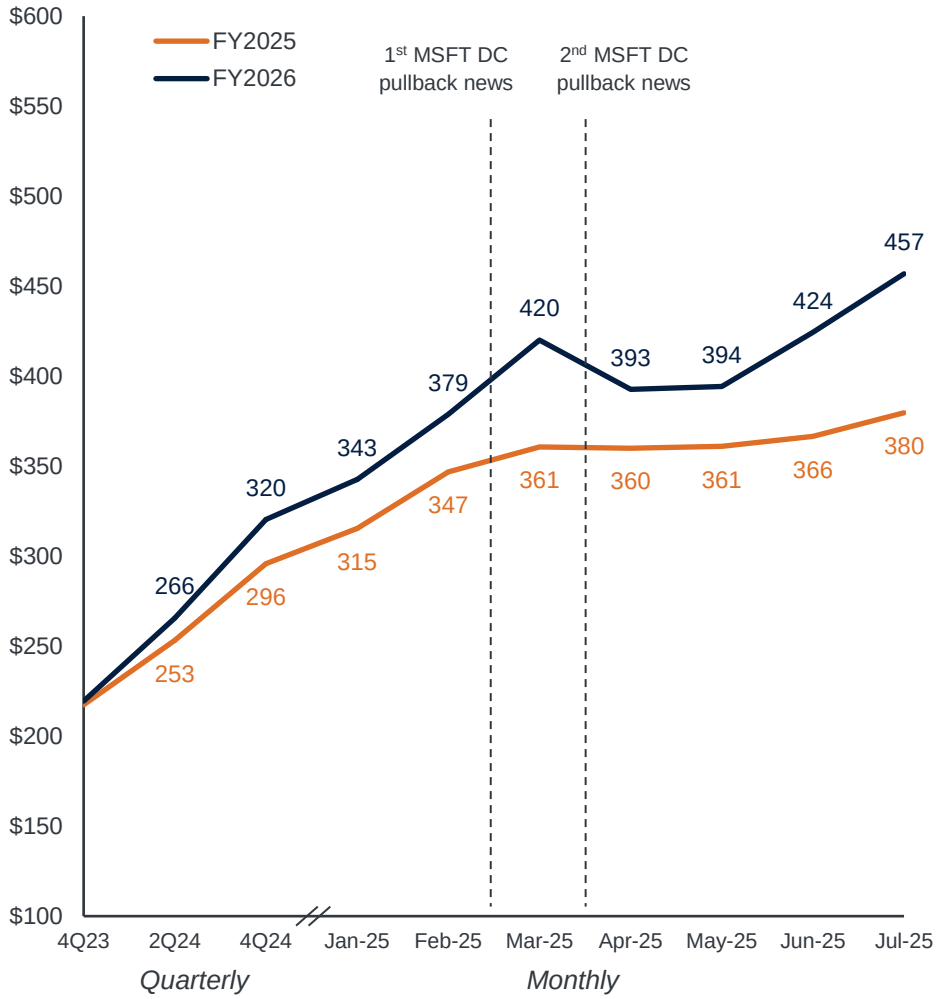
Driver	% of total demand in 2024	% of total demand in 2030
EV	1%	3%
Data centers	3%	7%
Heat pumps	0%	1%
AC	10%	9%

The expected annual growth of U.S. electricity consumption between 2020 and 2026 is 17x annual growth rates in prior 15 years

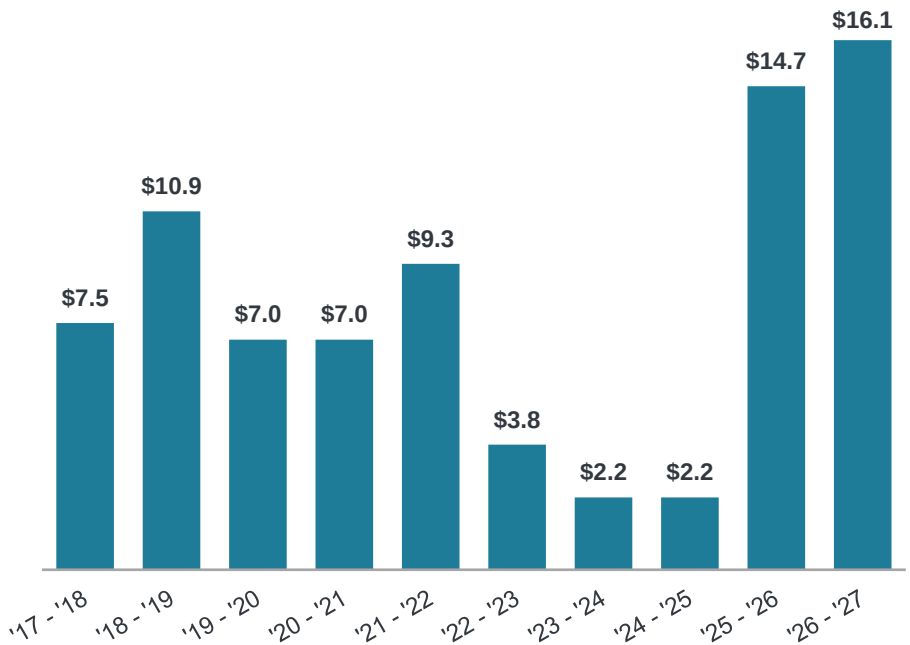
Source: U.S. Energy Information Administration, BNEF Economic Transition Scenario

Hyperscaler growth continues to outpace expectations which drives near term increases in energy costs in the market

2025 / 2026 FY HYPERSCALER CAPEX CONSENSUS ESTIMATES ($BN)[1]



PJM CAPACITY COSTS – LATEST AUCTION ($BN)[2]



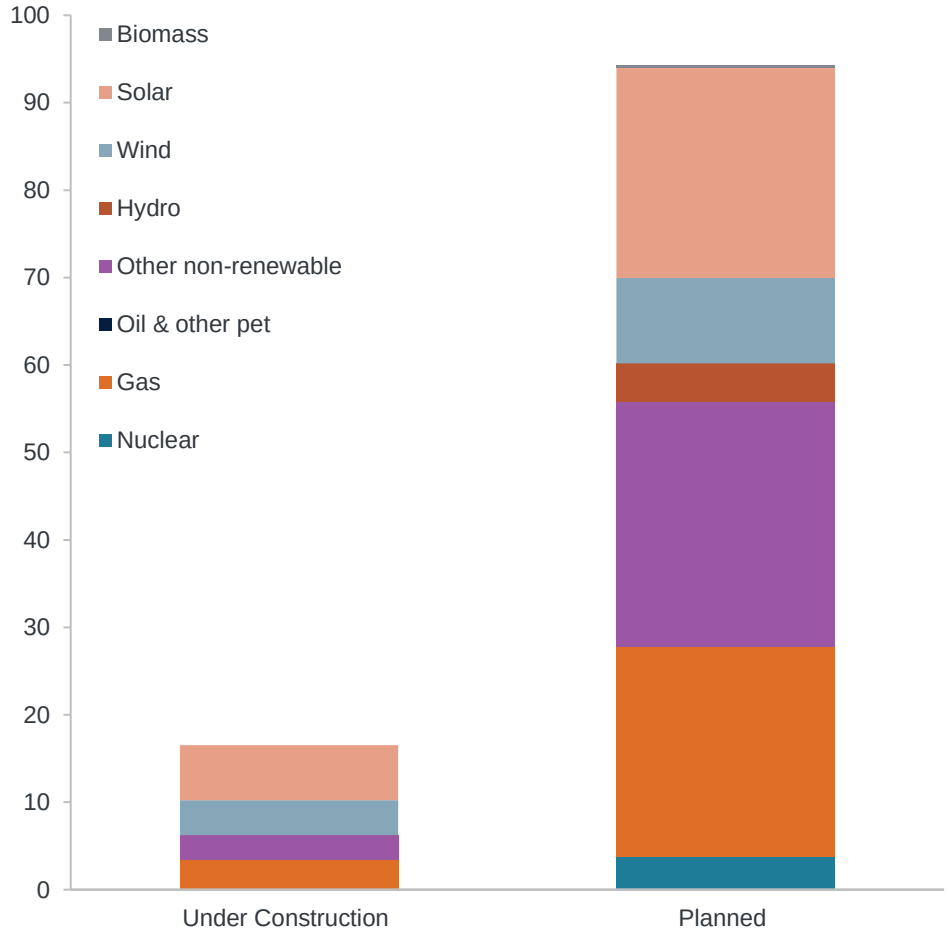
- Capacity **prices hit a record high** in the '26-'27 JPM auction
  - Capacity auctions are held to **ensure sufficient electricity capacity is available during peak demand** periods
  - Record prices indicate that new **demand**, including data centers, is **outpacing new generation** development
- ~8GW of **demand response** resources were offered in the auction – consistent with prior years – however in the past 2 auctions, ***100%*** *of demand response resources* ***cleared,*** *compared to ~80% in the 2 prior*

Hyperscalers are contributing to price volatility in the short term

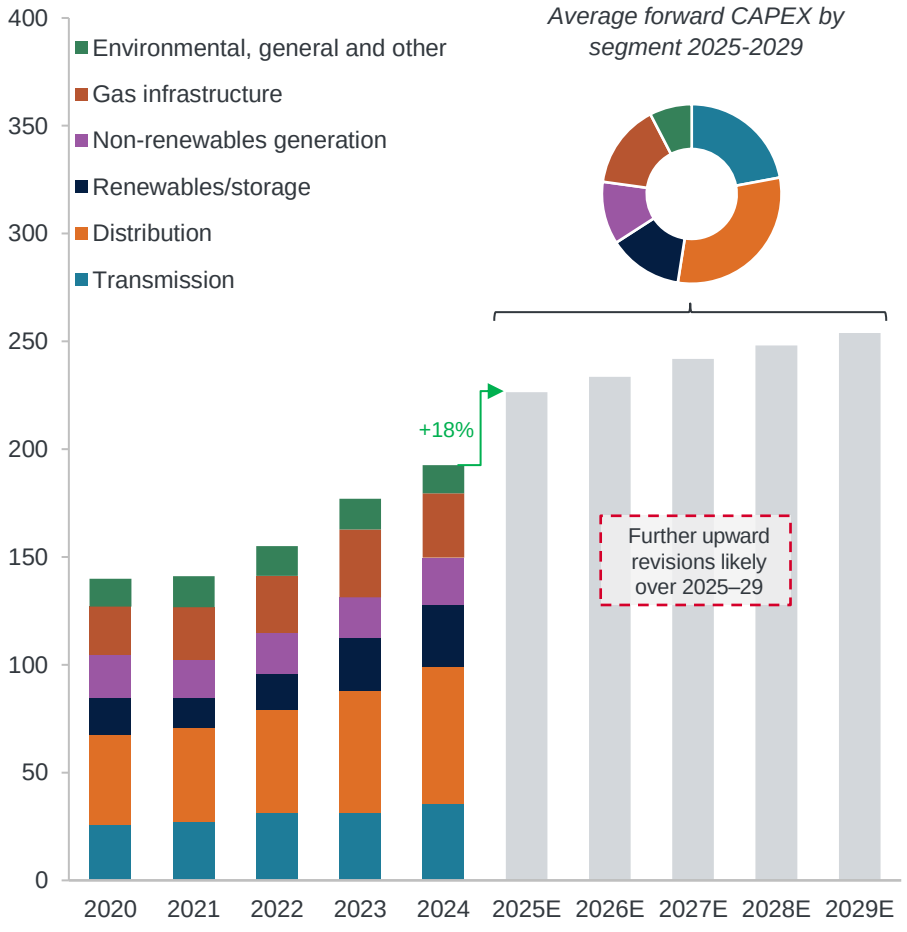
Sources: [1] FactSet as of August 11th, 2025. Represents company FY2025 and FY2026 aggregated mean consensus estimates for each company on a 100-day lookback for quarter data points and aggregating and averaging all reports in the month for the month data points. Companies include Google, Amazon, Meta, Apple, Microsoft, Oracle, Tencent, Alibaba, and Baidu; [2] Utility Dive, PJM 2026/2027 Base Residual Auction Report; PJM is a regional energy entity responsible for power transmission in 13 U.S. states

In our energy scenario, utilities aggressively expand capex and capacity to meet growing demand

NORTH AMERICAN UTILITIES NET OWNED CAPACITY GENERATION ADDITIONS BY TECHNOLOGY (GW)



NORTH AMERICAN UTILITY CAPEX BY SEGMENT ($BN)

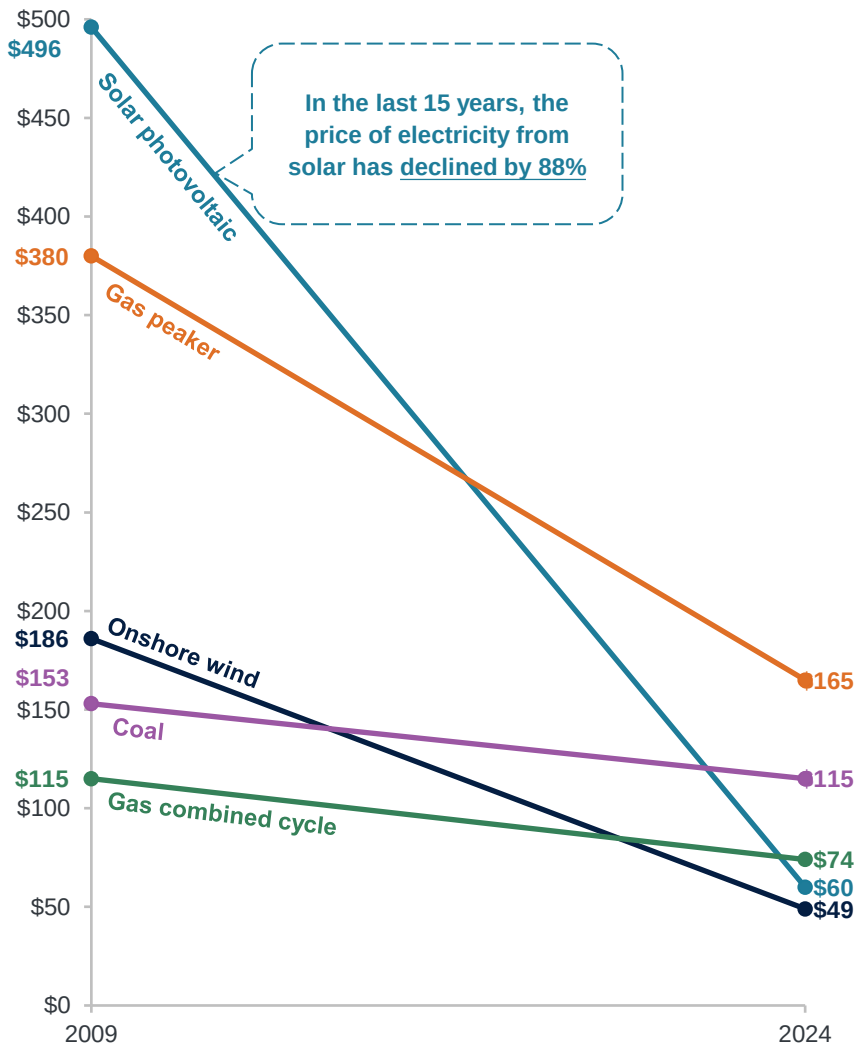


Utility investments and capacity expansion drive down energy costs in the long term

Source: S&P Global Commodity Insights; company reports

Electricity generation costs continue to decline

GLOBAL CHANGE IN PRICE OF ELECTRICITY FROM NEW POWER PLANTS ($/MWH)

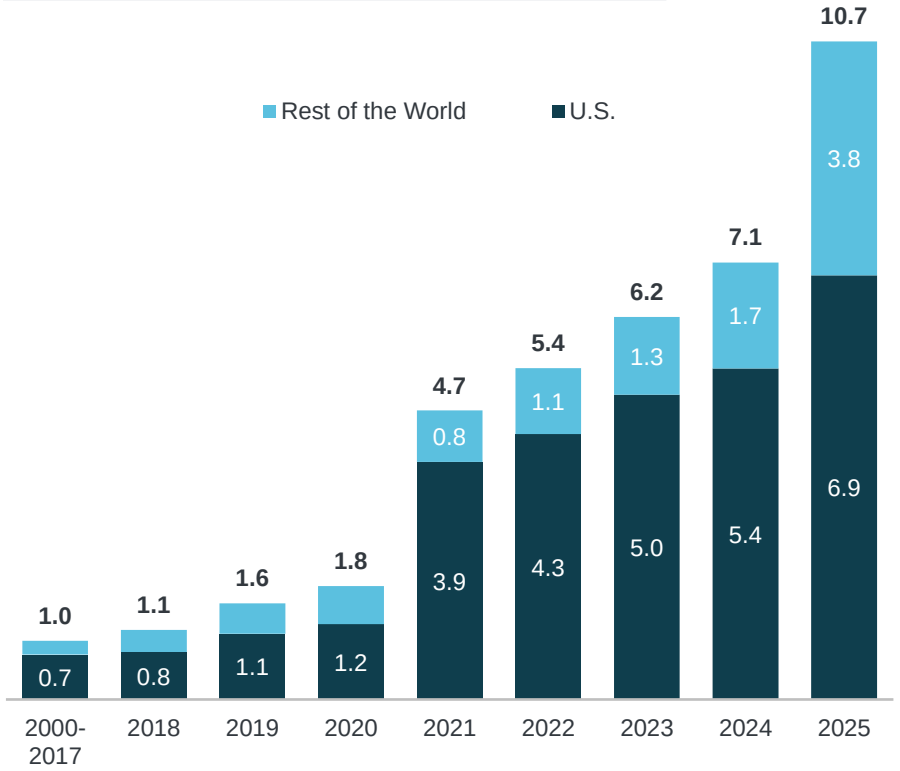


CUTTING EDGE SOLUTIONS: NUCLEAR FUSION

Nuclear fusion combines 2 light atomic nuclei to form a single, heavier one while releasing massive amounts of energy

- Could generate **4x more energy per kg of fuel than fission** and nearly **4M times more energy than burning oil or coal**
- 1st U.S. fusion plant is set to begin operations by the early 2030s[1]

Cumulative investment in the fusion industry ($Bn)[2]:



Renewables deflation and new technologies could affordably supply future energy demand

Source: IAEA, Our World in Data; MIT, Pitchbook, Fusion Industry Association; Note: [1] Commonwealth Fusion Systems to build first commercial fusion power plant in Virginia, U.S.;[2] Pitchbook as of 8/14/2025

Existing solutions and expected advancements provide flexibility, enhance grid reliability, and reduce cost

Demand Side Response

"[Google has] been working to bring flexible demand capabilities into our data center fleet, which enables us to ***shift or reduce power demand during certain hours or times of the year****. These capabilities, often referred to as demand response, have* ***several advantages, especially as we continue to see electricity growth in the U.S. and elsewhere"***

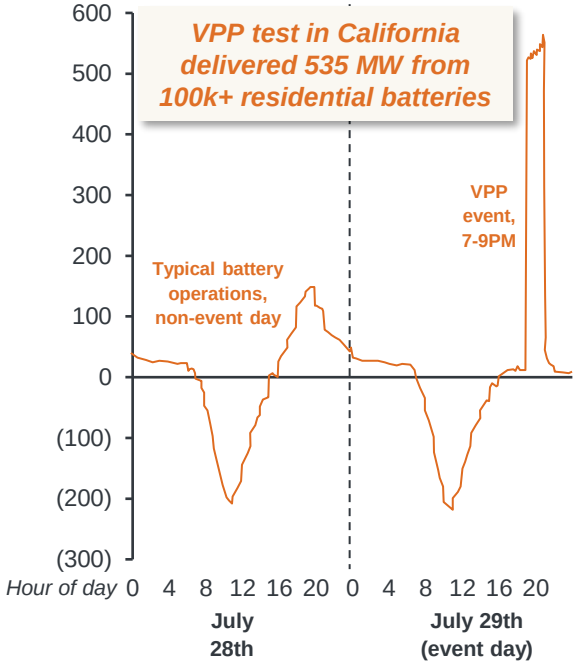
Google

- Google announced agreements with local utilities to enable demand response for machine learning workloads
- See load flexibility as a promising tool for managing large new energy loads and facilitating investment and growth

DSR programs can help companies reduce operational costs and earn incentives for load reduction

Virtual Power Plants

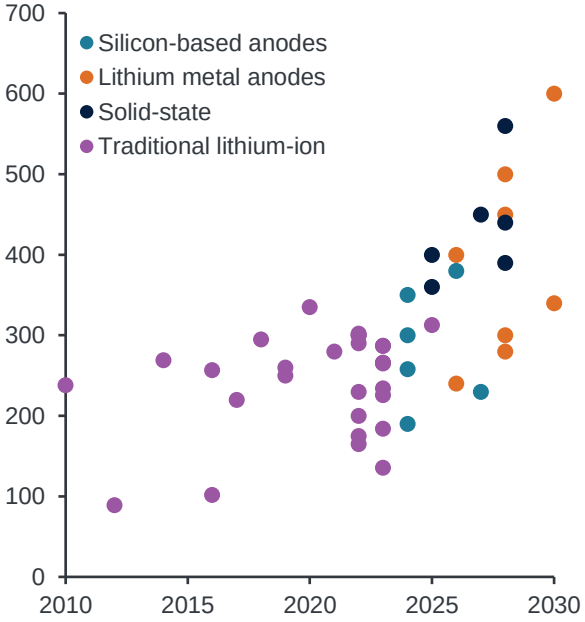
Battery fleet charge (Negative)\ Discharge (Positive) (MW)



Aggregating battery storage capacity in a VPP reduces the demand for storage infrastructure investment and build out

Lithium battery technologies

Selected cell energy density targets from 2010-2030 (WH/kg)



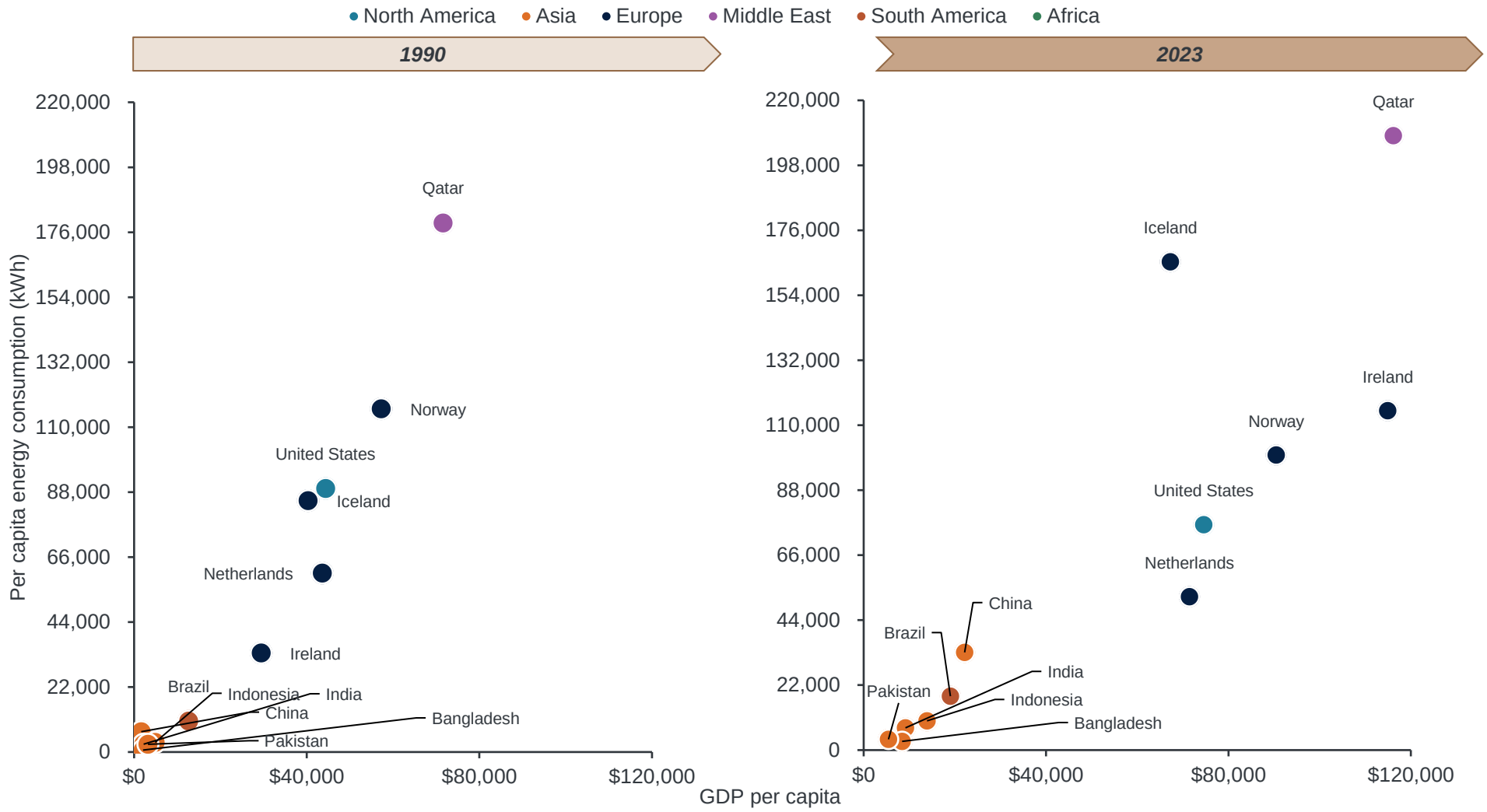
New Lithium battery technologies to boost energy density

Improvements in AI efficiency, grid enhancements, demand response and improved energy storage are key to unlocking lower power costs

Source: Company press release, The Brattle Group, Bloomberg NEF

Reliable, low-cost energy drives global economic growth

ENERGY USE PER PERSON VS. GDP PER CAPITA (1990 AND 2023)



Affordable energy access consistently provides greater economic leverage to consumers, companies and governments

Source: U.S. Energy Information Administration, Energy Institute

To gauge which sectors will benefit the most from sustained declines in energy prices, we developed a 4-factor model

J.P. MORGAN'S FOUR FACTOR LOW-COST ENERGY LEVERAGE MODEL

Sensitivity to market behavior

Commodity price vs share price correlation

Inverse or low correlation | Equity values trade inverse to the performance of energy commodity prices

High positive correlation | Performance of equity values highly dependent on bullish conditions for energy commodities

EBITDA margin vs growth-adjusted EBITDA multiple

High correlation | **High likelihood of being rewarded for margin expansion** as demonstrated by valuation assigned by the market

Low correlation | Limited value creation to be realized from margin improvement caused by declines in energy prices

Flexibility to invest in innovation

Energy intensity (Energy consumed / revenue)

High intensity| **Significant value to be gained** from low energy prices, given **current consumption**, through margin expansion or price cuts

Low intensity | Limited energy consumption translating to limited value to be gained from low energy prices

Energy purchased as % of total energy use

More energy purchased | Higher **dependence on purchased energy** would translate to greater benefit

More energy produced | Cost benefit likely to be lost that previously existed from self-sufficiency

The current value chain across industries is positioned to benefit considerably from significant declines in energy price

Sustained lower energy prices provide the most leverage to industrial sectors

HOW ADVANTAGEOUS WILL LOW ENERGY PRICES BE WITHIN EACH INDUSTRY?

75th percentile or greater | 25th percentile or lower | Neutral

	Industry	Commodity price sensitivity[1]	Energy intensity[2]	Value of margin expansion [3]	Energy use mix [4]	Low-cost energy leverage factor
1	Automobiles & Components	●	●	●	●	●
	Transportation	●	●	●	●	●
	Materials	●	●	●	●	●
	Semiconductors & Semiconductor Equipment	●	●	●	●	●
	Media & Entertainment	●	●	●	●	●
	Software & Services	●	●	●	●	●
	Health Care Equipment & Services	●	●	●	●	●
	Real Estate Management & Development	●	●	●	●	●
	Food, Beverage & Tobacco	●	●	●	●	●
2	Consumer Durables & Apparel	●	●	●	●	●
	Consumer Staples Distribution & Retail	●	●	●	●	●
	Consumer Services	●	●	●	●	●
	Capital Goods	●	●	●	●	●
	Technology Hardware & Equipment	●	●	●	●	●
	Consumer Discretionary Distribution & Retail	●	●	●	●	●
	Commercial & Professional Services	●	●	●	●	●
	Pharma, Biotech & Life Sciences	●	●	●	●	●
3	Utilities	●	●	●	●	●
	Energy	●	●	●	●	●
	Telecommunication Services	●	●	●	●	●
	Household & Personal Products	●	●	●	●	●

How it works

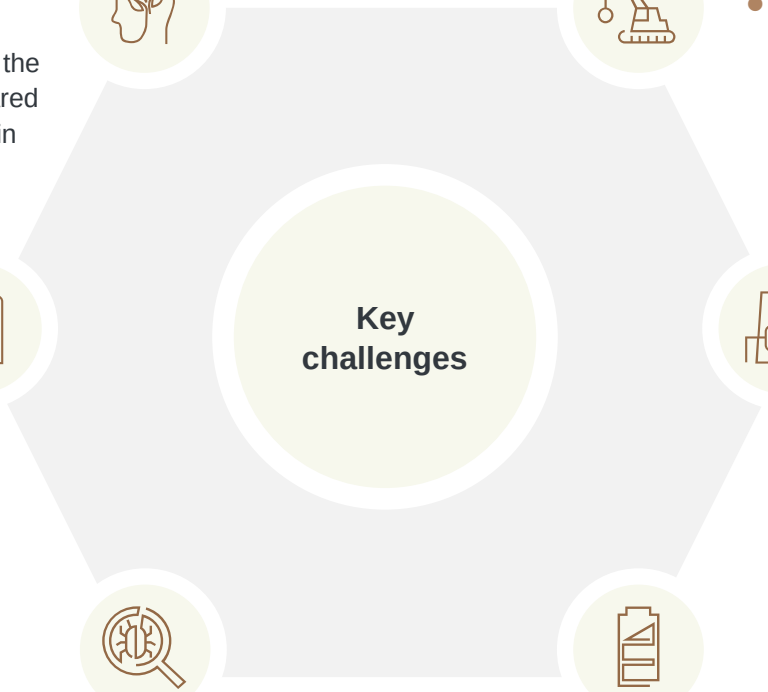
- Using z-scores, assessed individual companies' sensitivity to each metric relative to industry peers
- High score (green) suggests optimal gains from low energy prices; gray and yellow suggest more limited gains

Interpreting the scores

1. **Capital-intensive sectors benefit** the most. Their profit margin improvements are historically rewarded by investors.
   - *Transportation sector*: ***Fuel costs represent up to 50% of total transportation costs[5]****. Appreciable energy price reduction meaningfully* ***improves this sector's margins*** *and result in* ***lower costs to customers***
2. Beyond capital-intensive sectors, the benefit of lower energy prices becomes **negligible** or even a net negative – **particularly for consumer sectors**, where *direct* exposure to energy costs remains limited
3. The expected downsides of sustained low-energy costs to **utilities and energy companies** are somewhat offset by the energy intensity across the value chain of both industries

Source: FactSet, Refinitiv Eikon Note: Based on z-scores using the following metrics: [1] Correlation between GICS industry performance and price of WTI; [2] Company-level gigajoules of energy use divided by total revenue at company level; [3] Company-level correlation between EBITDA margin and growth adjusted EV / EBITDA multiple; [4] Energy purchased as a % of total energy use; [5] EIA

Some technical and geopolitical challenges pose risks to this future of an energy-rich global economy



U.S. Energy investment is outpaced by China and Europe[1]

- Annual energy investment increases from 2019 to 2024:
  - U.S.: + 9%
  - China: +48%
  - Europe: +75%
- Total clean energy investment in the U.S. in 2024 was $300Bn compared to $659Bn in China and $410Bn in the EU

Grid infrastructure construction is labor and materials-intensive

- Labor: Grid construction and maintenance workforce needs to **grow by almost 20%** to meet current policy demands[1]
- Materials: **Tariffs** and **inflation** will continue to increase costs[1]

Built-in end-use solutions remain configured for single fuels

- Nearly **70% of the transport sector's final energy consumption** is expected to be **oil** – even in 2050[6]

Distribution lines remain susceptible to extreme weather

- **80% of U.S. power lines are above ground**, creating increased[2]:
  - Maintenance costs
  - Risk of power loss
- Regardless of generation sources, weatherizing power lines can **cost $20mm-$30mm per mile[3]**

- Cyber attack **magnitude of impact will increase** as dependence on power infrastructure grows

Cybersecurity attacks on power infrastructure are increasing[5]

- **China controls 95%** of the global battery-grade graphite supply – *the largest component by weight in batteries[4]*

Battery storage supply chains are concentrated outside the U.S.

Source: [1] IEA; [2] Lawrence Berkeley National Laboratory for the U.S. Dept of Energy, Grid Deployment Office: *"Undergrounding Transmission and Distribution Lines"* ; [3] Xcel Energy: *"Overhead vs. Underground Transmission"*; [4] Stanford Doerr School of Sustainability: *"Confronting China's grip on graphite for batteries"* ; [5] S&P Global Commodity Insights; [6] ExxonMobil Global Outlook

Healthcare advances have been rapid and significant

THE LAST 5 YEARS HAVE INCLUDED MAJOR LEAPS IN MEDICINE

2020
mRNA successfully used to create Covid-19 vaccines

2021
Universal Hepatitis C treatment introduced

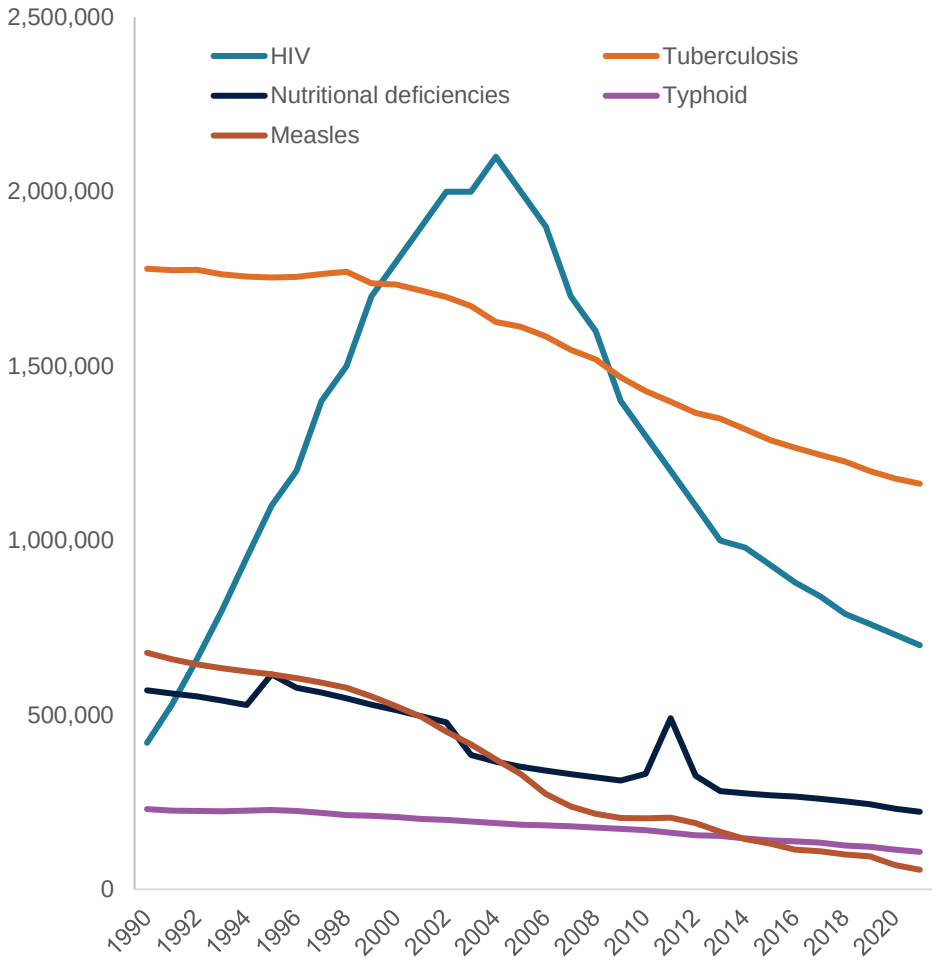
2022
CRISPR therapy for rare blood disorders received 1st drug approval

2023
GLP-1s become the 3rd-most utilized drugs in history

2024
1st successful application of **gene therapy** for hereditary hearing loss

2025
FDA approves 1st injectable **preventative HIV treatment**

DEATHS FROM COMMUNICABLE DISEASES HAVE DECREASED

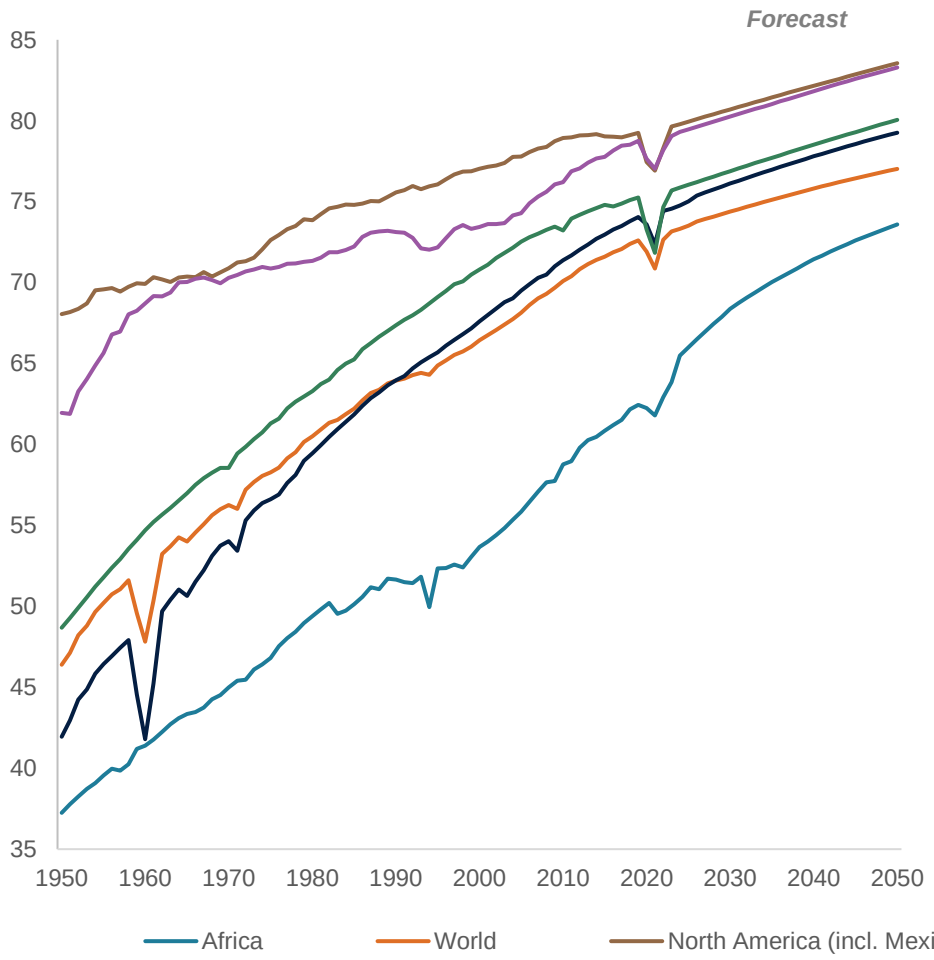


Advances in healthcare and medicine in the last 5 years are enabling a shift in the long-term challenges to be solved

Source: Cleveland Clinic, Medicines and Healthcare Regulatory Agency, Medical University of South Carolina, Children's Hospital of Philadelphia, Food & Drug Administration, World Health Organization

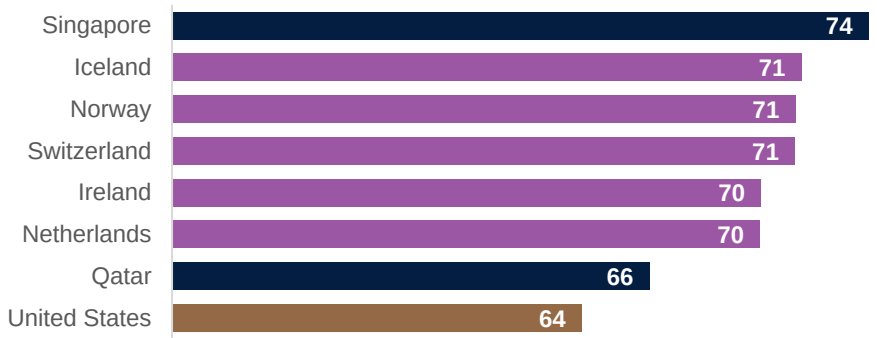
Developing countries still have a lot to gain as advanced economies focus on both extending and improving the quality of lifespans

AVERAGE LIFE EXPECTANCY AT BIRTH (YEARS)[1]

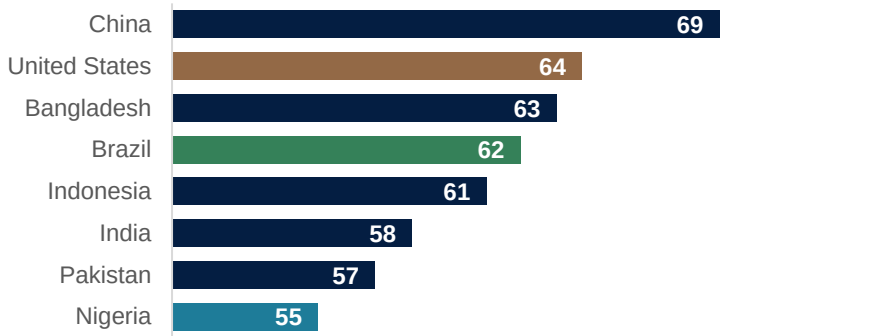


DISEASE-FREE YEARS EXPECTED AT BIRTH IN THE MOST POPULATED COUNTRIES[2]

RICHEST COUNTRIES (GDP PER CAPITA PPP)[3]



MOST POPULOUS COUNTRIES

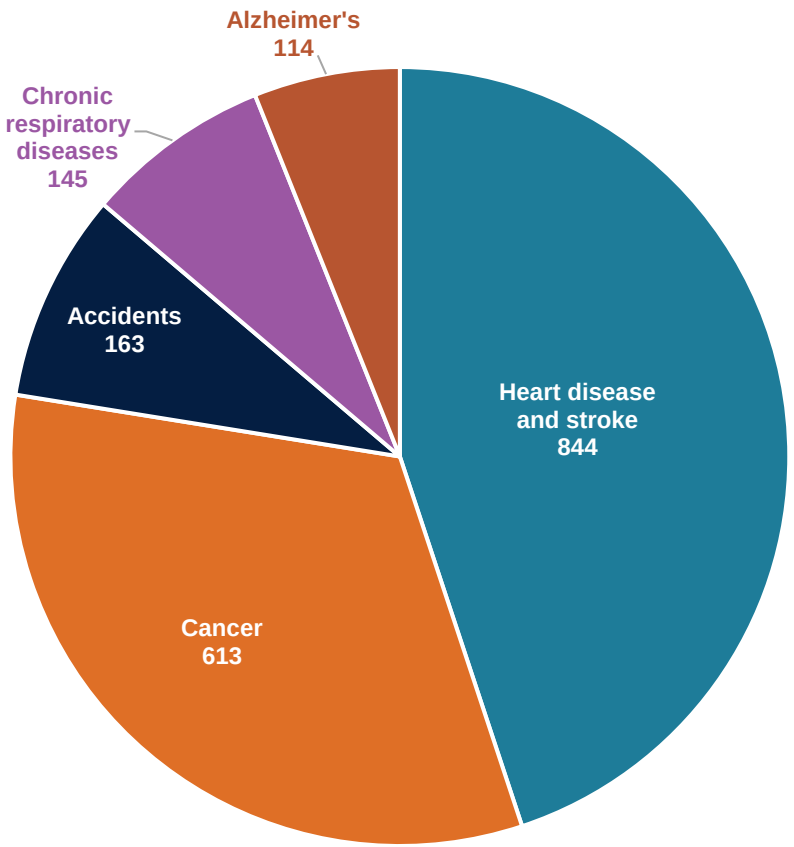


The 12-year gap between U.S. life expectancy and healthy life expectancy means that while we are living longer diseases that ultimately end life also afflict us for longer

Notes: [1]World Global Disease Burden Study (Institute for Health Metrics and Evaluation, 2021) and United Nations; [2] World Health Organization (WHO) defines Health Average Life Expectancy (HALE) as: "Average number of years that a person can expect to live in 'full health' by considering years lived in less than full health due to disease and/or injury, data for year 2021; [3]Excludes countries with populations below 1,000,000 people

In our scenario, treatments like GLP-1s effectively treat or manage conditions that limit longevity and quality of life

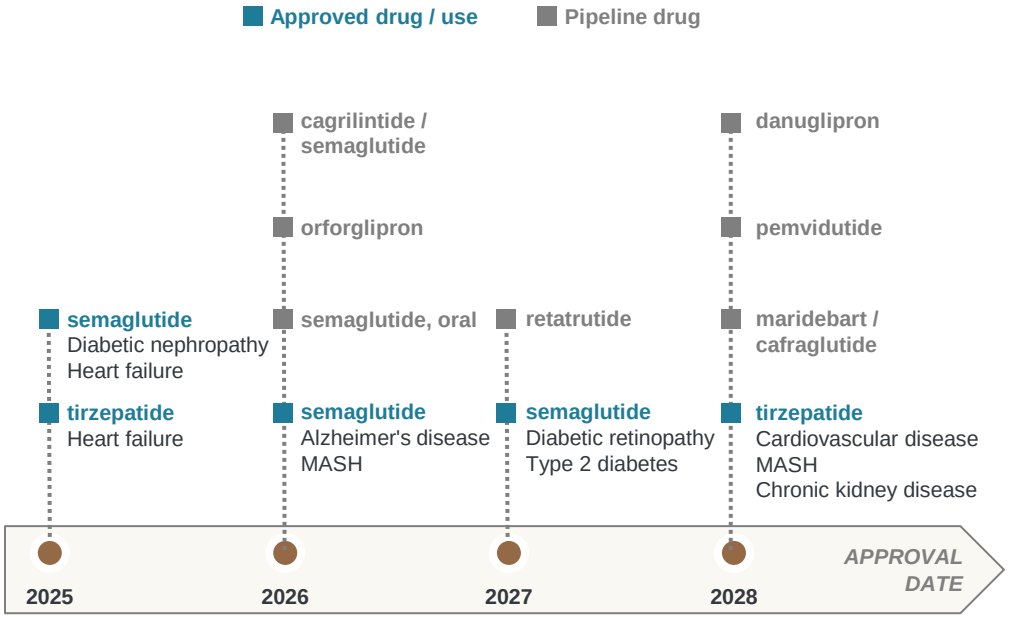
PRIMARY CAUSES OF DEATH IN THE U.S. (THOUSANDS, 2023) [1]



NEW GLP-1 DRUG AND DRUG USE APPROVALS[2]

Glossary of existing GLP-1 brand names

- **semiglutide**: Ozempic (Novo Nordisk), Wegovy (NN), Rybelsus (NN)
- **tirzepatide**: Mounjaro (Lilly), Zepbound (Lilly)



Beyond GLP-1s, targeted gene therapies, advancements in transplant medicine, and other emerging technologies will reduce the burden that patients and their families face as they manage challenging conditions

Source: [1] Centers for Disease Control, [2] Evernorth "Pharmacy In Focus 2025," U.S. only

Improving healthy aging drives significant economic benefits

Decisions about spending and saving, particularly in advanced age, are made based on wages, interest rates, retirement age, expected remaining years of life and future health[1]

Metformin, a drug used to treat type 2 diabetes, is used by an estimated **200 million people globally[2]**.

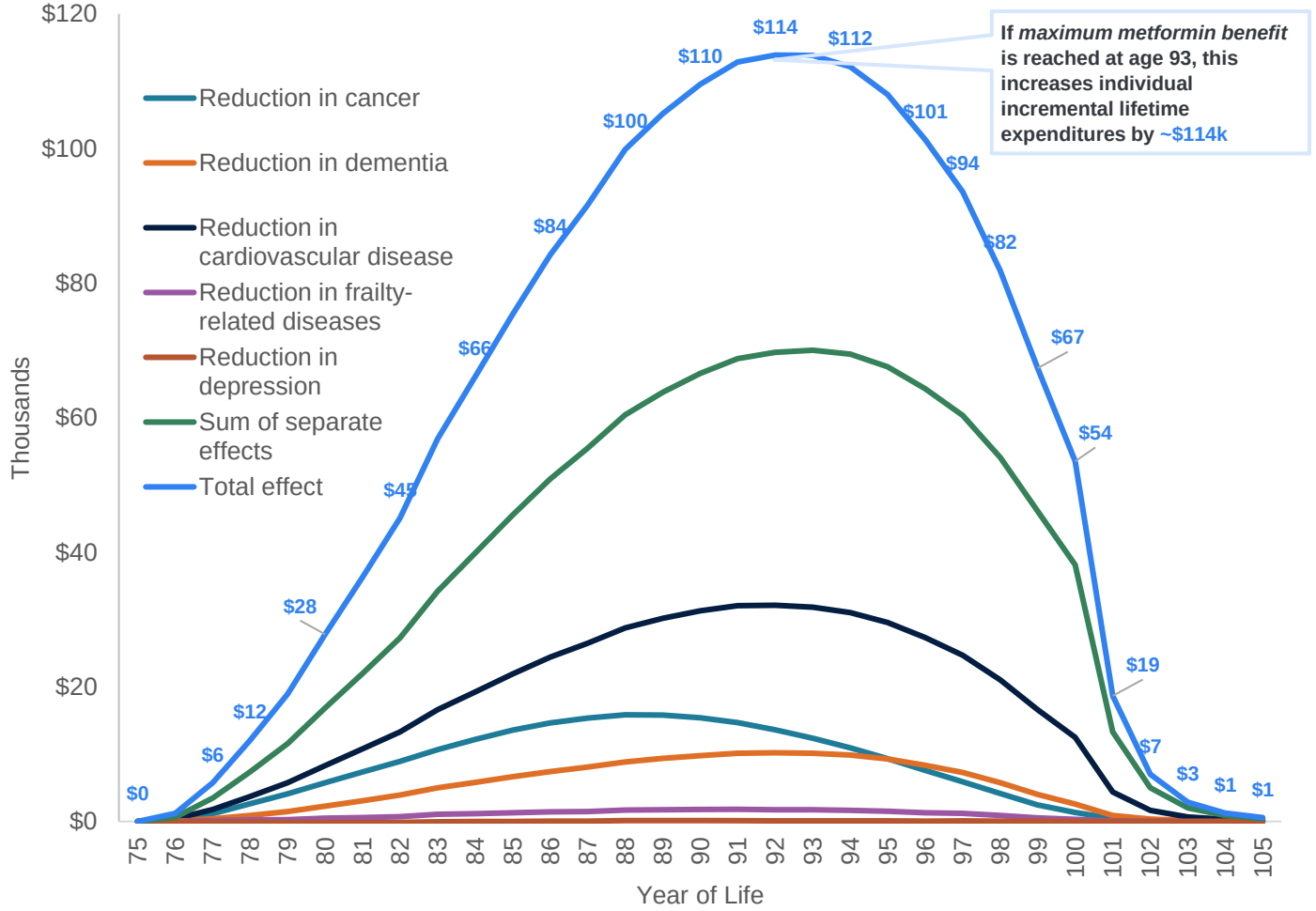
It has also proven effective at **treating or delaying diabetes co-morbidities** like cardiovascular disease, dementia, and other conditions.

A 2021 study in the journal *Nature* demonstrated the economic impact of 75-year-old metformin patients changing consumption patterns as their quality of life improves and they expect to have more years of leisure ahead.

In aggregate, this suggests that **a 2-year increase in life expectancy generates an incremental $7trn - $21trn in U.S. economic gains[3]**.

ECONOMIC VALUE OF 'DELAYING' AGING: "WILLINGNESS TO PAY" (WTP) BY YEAR OF LIFE

Incremental added value of increasing life expectancy by year of life in which optimal benefits of metformin use occur

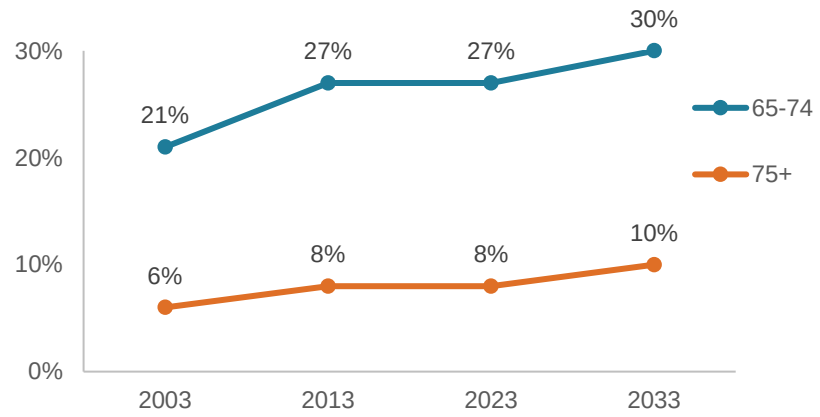


Source: [1] Journal of Political Economy (Ashenfelter & Greenstone, 2004), [2] University of Colorado School of Medicine; [3] The Economic Value of Targeting Aging in *Nature* (Scott, Ellison and Sinclair, 2021), uses Value of Statistical Life (VSL) methodology and assumes average VSL of an adult is $11.5 million.

Increased longevity requires reimagining the way Americans retire and taking steps to manage increased costs

DELAYED RETIREMENTS

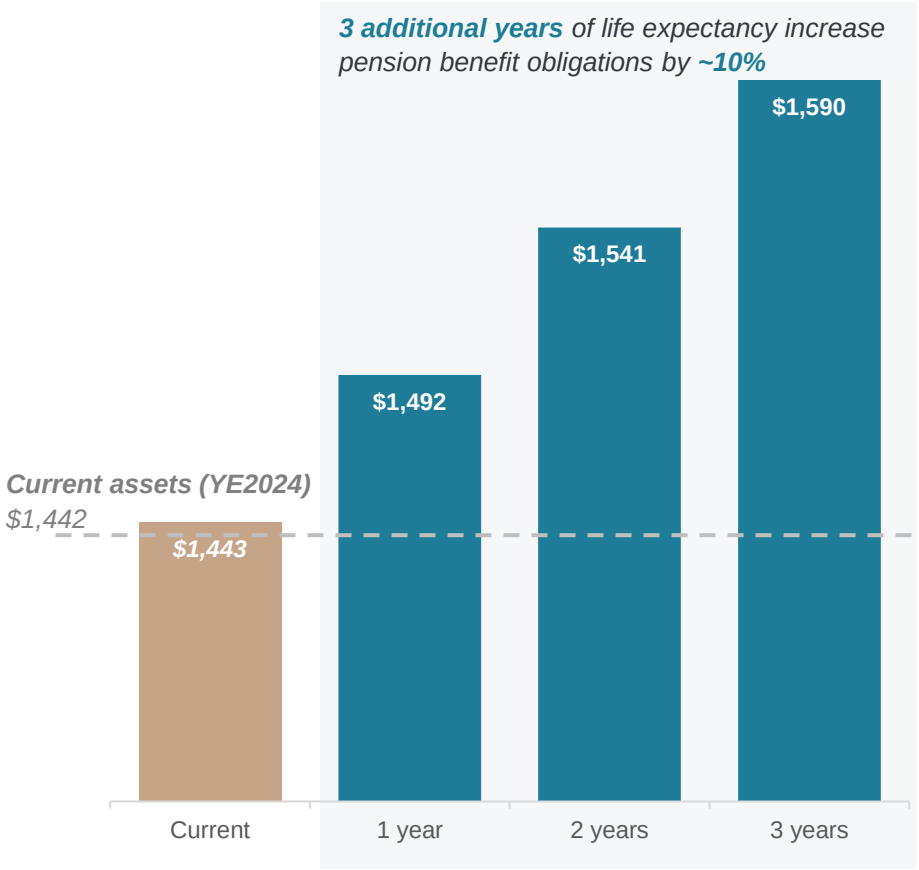
PERCENT OF PEOPLE IN CIVILIAN LABOR FORCE



U.S. RETIREMENT SAVINGS GAP ($ TRN)

ADDED PENSION RISK

S&P 500 PENSION BENEFIT OBLIGATION WITH INCREASED LIFE EXPECTANCY (BN)[1]



Each incremental year of life expectancy increases S&P 500 pension liabilities by 3-4% - representing $148Bn in unfunded liabilities if life expectancy increases 3 years

Notes: J.P. Morgan Asset Management, Mercer, FactSet, International Monetary Fund, Milliman; Aon U.S. Pension Risk Transfer Update (2025); Notes: [1] Assumes discount rate of ~5%

Longer lives provide a significant economic benefit

Expected **benefits** of **2 additional years** of life expectancy

\-

Expected costs of **2 additional years** of life expectancy

=

Net effect

($ Trillions)

Treatment for conditions that improve longevity and quality of life, such as metformin or GLP-1s, not only drive increased consumption patterns but may also reduce overall health expenditures long-term

J.P.Morgan

Source: The Economic Value of Targeting Aging in *Nature* (Scott, Ellison and Sinclair, 2021), FactSet, International Monetary Fund, Milliman; U.S. Census Bureau, CBO, World Bank Group, Pension Rights, National investment Center for Seniors Housing & Care (NIC), Centers for Medicare & Medicaid Services - Office of the Actuary; [1] Corporate Pension uses S&P 500 pension data as a proxy
Notes: For U.S. only, assuming 75% mortality from current life expectancy estimates past 1 year, 50% mortality beyond current life expectancy estimates past 2 years

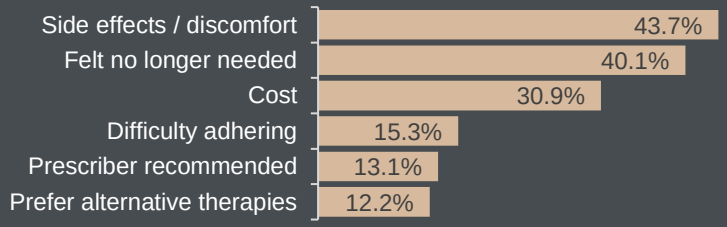
Healthcare costs remain a key hurdle to development and adoption

Medication adherence continues to be a challenge – even for promising drugs

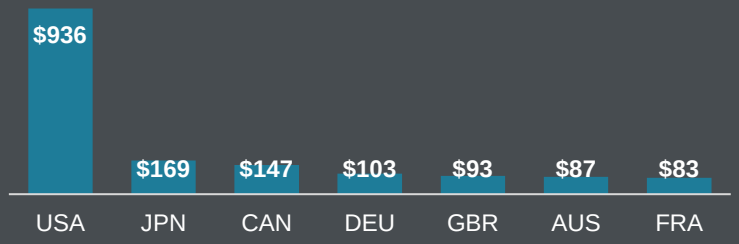
50%

of patients discontinue GLP-1 use within 12 months[1]

PATIENT REASONS FOR DISCONTINUING GLP-1 USE[2]



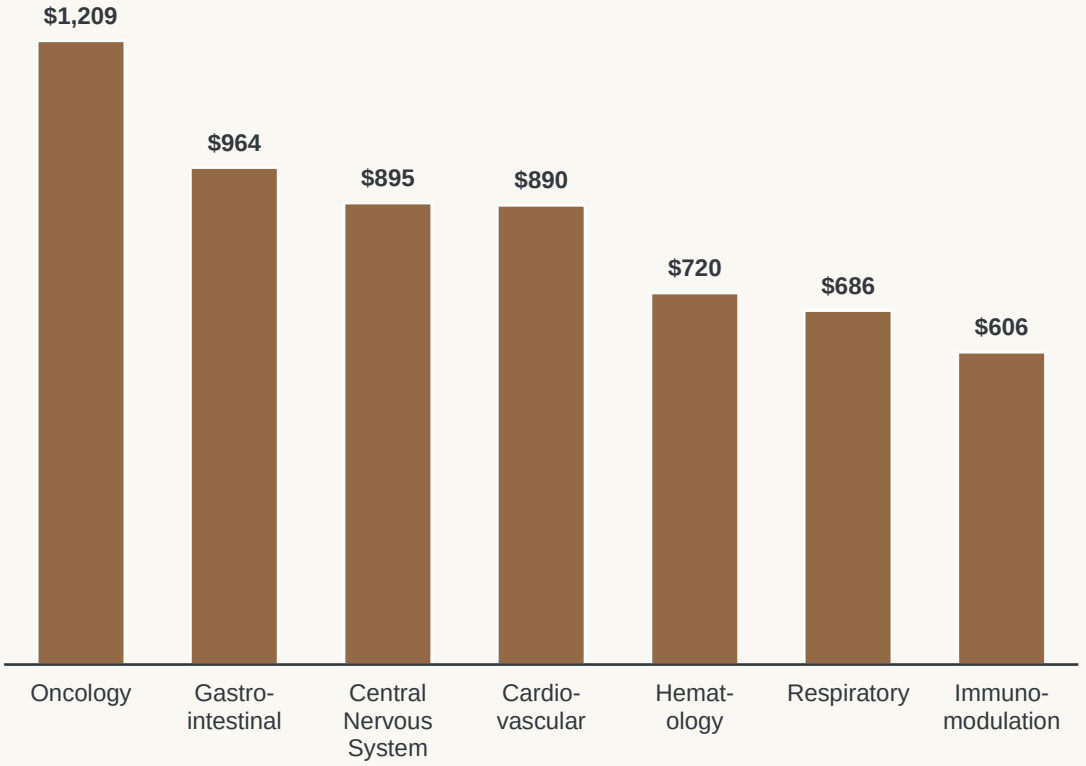
MONTHLY COST BY MONTH (MEDIAN)[3]



The overall expected capitalized cost for developing a new drug[4] is

~$880mm

EXPECTED CAPITALIZED COST OF NEW DRUG DEVELOPMENT BY THERAPEUTIC AREA ($MM)[4]



AI advancements can potentially assist in the efficacy of drug development

Source: [1] JAMA (2024), [2] Evernorth "Pharmacy In Focus 2025," U.S. only; [3] Kasier Family Foundation; [4] "Costs of Drug Development and Research and Development Intensity in the US, 2000-2018" (2024, Sertkaya, Beleche, Jessup, Sommers); 95th Confidence Interval; Estimated mean cost includes costs of capital, R&D, and costs of failure

Key takeaways

Corporate leaders should consider 'sensitizing' for each of these scenarios

- Imagine different states of the world (with or without associated probabilities) and stress test your business model
- Take steps to evaluate not only risk exposure, but also long-term strategic opportunities, within each scenario

Key considerations

Artificial intelligence

- Consider the ways AI could be incorporated in innovation, research, and development processes
  - Think both possibilities for the top line as well as efficiency gains
- Position workforce to operate with optimal efficiencies and resources to independently drive innovation

Energy

- Manage risk of near-term price increases; explore demand response programs and use financial tools as appropriate to hedge against changes
- Prepare for an expanded set of energy sources and re-think business strategy if cost and access to energy are not binding constraints

Health

- Prepare for a world with employees and customers who live longer, better quality lives
  - Re-think workforce management and product offering
- Continue planning for variability in retirement expenses

The pace of change is only increasing. Preparing for the future is more important than ever.

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