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Global Energy Perspective 2025

Geopolitical uncertainty, shifting policies, and increasing demand for power are reshaping the energy landscape. This year’s report presents our updated view on what’s to come in the energy system.

October 2025

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Foreword

Ten years of McKinsey's *Global Energy Perspective*

This year marks the tenth anniversary of McKinsey's *Global Energy Perspective*, providing opportunities to reflect on the lessons learned over the past decade and to look ahead to the challenges and opportunities of the next one.

Throughout the years, we have continually refined our global energy model, incorporating dozens of inputs across sectors and regions. Our goal has been to provide a robust, data-driven fact base for all energy stakeholders as the sector evolves. Two key forces have consistently shaped our energy outlook: policy and technology.

Energy policy sets long-term targets, creates incentives, and sends economic signals at both regional and global levels. The 2015 Paris Agreement continues to be the benchmark for many nations and global stakeholders when setting their long-term energy ambitions toward decarbonization. However, as the past decade has made clear, changes in leadership may come with significant policy shifts.

Technology innovations, both incremental and breakthrough, are also shaping the future energy mix. Since 2015, several technologies have exceeded expectations, including batteries, electric vehicles (EVs), liquefied natural gas, shale oil, and solar photovoltaics. Conversely, some technologies are taking longer to mature despite initial enthusiasm, such as carbon capture and storage and clean hydrogen. They remain nascent and currently make up a small share of our forecast energy mix to 2050.

Short-term disruptions have also made their mark on the energy landscape in the past decade. Economic crises, geopolitical turmoil, and the COVID-19 pandemic have all changed the trajectory of the energy system. Such disruptions remind us that the energy system must be flexible, with the ability to adapt to a constantly evolving, unpredictable global context.

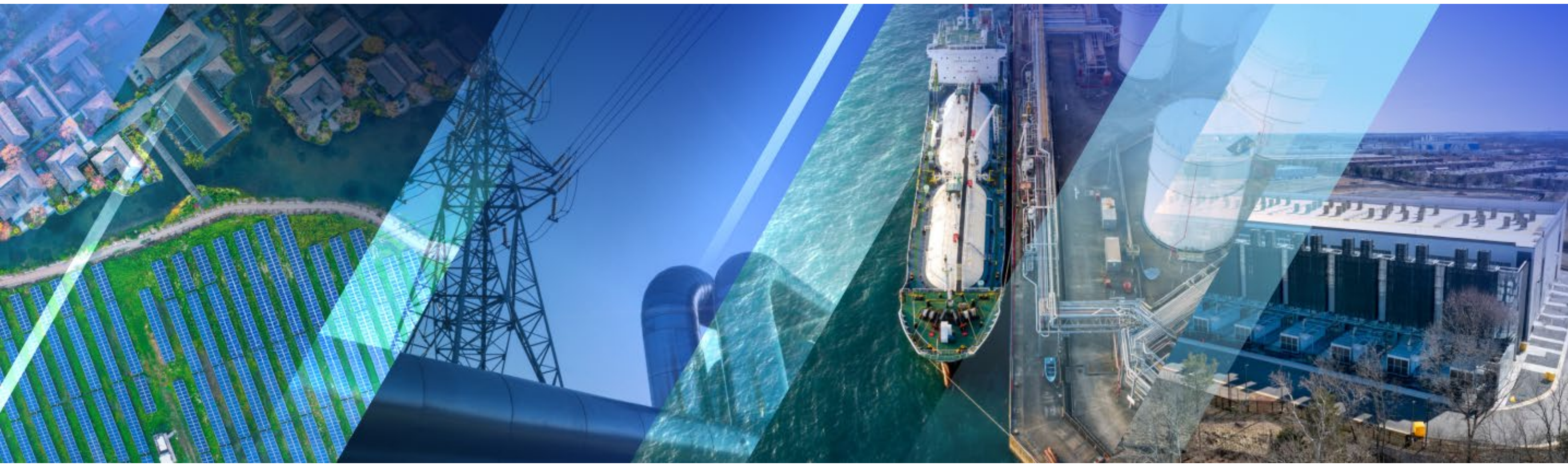
Two overarching themes emerge from this year's outlook. First, cost competitiveness and an economically pragmatic energy transition remain paramount. Energy affordability, reliability (including energy security at the national or regional level), and emission reduction continue to form a trio of priorities that drive energy decision-making. The world is falling short of meeting the Paris Agreement's targets for emission reduction. Without affordability—and bankability—widespread adoption of new low-carbon technologies will not happen.

Second, there is no silver bullet for decarbonization. Countries and regions will follow distinct trajectories based on their local economic conditions, resource endowment, and the realities facing particular industries.

Looking ahead, global energy demand is expected to rise as access to energy expands. The challenge for the industry and policymakers will be to ensure the energy system is affordable, reliable, and resilient to price spikes, outages, and geopolitical instability. While some sectors seem to be making irreversible progress toward decarbonization, others won't move forward without government mandates or substantial cost reductions.

The journey toward decarbonization remains long, but there is still considerable opportunity for energy stakeholders to act now and accelerate progress.

Humayun Tai
Coleader of the Energy & Materials Practice and Senior Partner
New York



Executive summary

The *Global Energy Perspective* is intended to serve as a fact base to help stakeholders navigate the opportunities and challenges of today's energy landscape. Our purpose in the report is to analyze how the forces at work in the energy sector—both the long-term structural forces and the immediate realities—could shape its future. We also aim to highlight the gap between the world's current trajectory and what would be needed to avoid the worst effects of climate change as defined by the Paris Agreement.

Our scenarios and methodology

Our research describes three plausible scenarios for how a transition to a system of lower carbon energy could play out: Slow Evolution, Continued Momentum, and Sustainable Transformation. The scenarios encompass three broad areas that could affect the energy transition's trajectory: policy, technology, and constraints (such as supply chain or grid investment).

In our analysis, we grounded the long-term outlook in near-term reality by incorporating observed data, such as energy projects that are already in operation or have reached final investment decision (FID). The scenarios do not constitute McKinsey's view on what should happen but rather present a range of plausible outcomes. We do not assign probabilities to the scenarios, recognizing the complexity of the energy transition.

Energy and sustainability remain closely intertwined, as carbon emissions from fossil fuel consumption directly affect climate change. Over the past year, emissions reached record highs, further widening the gap between our three modeled scenarios and the pathway that could limit global temperature rise to 1.5°C above preindustrial levels, one of the central goals of the Paris Agreement.

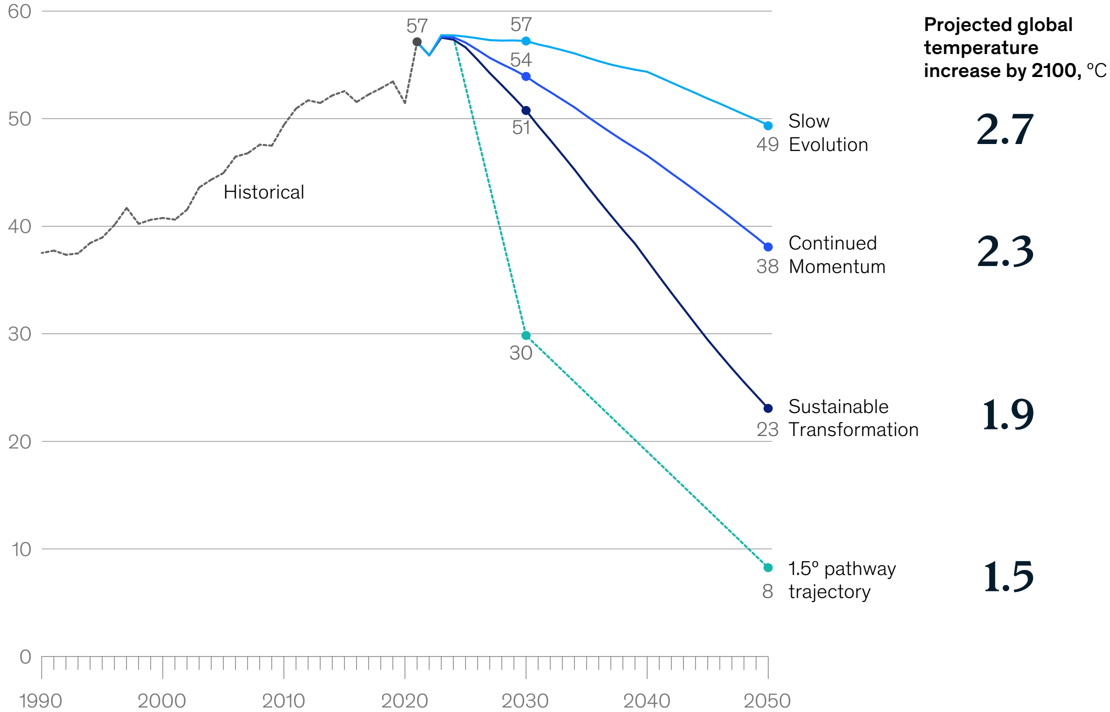
The expected temperature change by 2100 in our scenarios is 1.9°C in Sustainable Transformation, 2.3°C in Continued Momentum, and 2.7°C in Slow Evolution (Exhibit 1). These estimates are higher than in any of our previous projections, and all have risen by approximately 0.1°C compared with our 2024 perspective.

Despite a projected decline in emissions to 2050, emission estimates are still meaningfully above net-zero targets across all scenarios. In the case of the Slow Evolution scenario, they are not predicted to decline substantially until after 2030.

Exhibit 1

Global energy emissions remain above a 1.5 degree pathway in all of our scenarios.

Global greenhouse gas emissions,[1] by scenario, gigatons of CO_2 equivalent per annum



Note: Warming estimate is an indication of global rise in temperature by 2100 versus preindustrial levels, given energy and nonenergy (eg, agriculture, deforestation) emission levels and assuming continuation of trends after 2050 but no net negative emissions. Remaining emissions in 2050 (ie, ~4 gigatons) are compensated by negative emissions from direct air carbon capture and storage, bioenergy with carbon capture and storage, and reforestation. Information sourced to Climate Resource was contributed to by Climate Resource Pty Ltd using MAGICCV7+. Information is used at one's own risk, and neither Climate Resource nor any of its officers, employees, contractors, or affiliates make any warranty or guarantee about the accuracy, completeness, or reliability of the information.
[1]Includes process emissions from cement production, chemical production, and refining of and negative emissions from carbon capture, utilization, and storage.
Source: *Sixth Assessment Report*, Intergovernmental Panel on Climate Change, Mar 20, 2023; World Energy Balances database, IEA, accessed Aug 2025; World Energy Outlook 2022, IEA, Oct 2022; Energy Solutions by McKinsey; McKinsey analysis based on Climate Resource Pty Ltd and MAGICC v7+

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The forces shaping energy in 2025

The *Global Energy Perspective* examines the forces that are currently shaping the energy sector:

— *Macroeconomic uncertainty remains high in the near term,* making global and regional GDP growth difficult to predict.

— *Geopolitical dynamics have evolved,* including global alliances weakening in favor of national or bilateral arrangements in some contexts. This has increased the focus on energy independence and fostered new trade corridors, which could, in turn, affect climate technology costs.

— *Energy affordability and security are increasingly becoming critical policy priorities,* seemingly carrying more weight in decision-making than decarbonization does in some markets and contexts. Policy examples include the European Commission's Clean Industrial Deal, which aims to ramp up European competitiveness while reducing energy cost burdens and decarbonizing industry, and Japan's Seventh Strategic Energy Plan (or Basic Energy Plan), which moves away from the earlier commitment to lessen the country's dependence on nuclear energy.

— *Global energy demand[1] continues to grow,* driven by two main forces: increasing consumption in emerging markets (such as Africa, Association of Southeast Asian Nations [ASEAN] countries, and India) and the rise of new demand sources (particularly EU and US data centers, which have become the sector's largest drivers of both upside and uncertainty).

— *Costs of equipment continue to increase,* partly because of supply chain constraints temporarily slowing or reversing declines in the levelized cost of energy (LCOE), which puts short-term uptake of clean technology at risk. Long-term uptake will likely be unaffected.

The 2025 energy outlook

Our analysis forecasts both energy demand and the supply mix across a range of fuel types and regions to 2050, with several key insights this year:

— *Fossil fuels are projected to retain a large share of the energy mix beyond 2050.* Demand will likely plateau between 2030 and 2035 in the Continued Momentum and Slow Evolution scenarios. Natural gas could see the strongest growth in use, displacing higher-emission fuels in many cases. Coal use may also persist at higher levels than seen in previous McKinsey outlooks, depending on the scenario.

— *Crucial alternative fuels are not likely to achieve broad adoption before 2040 unless mandated.* The current emphasis on affordability means that some alternative sources, such as green hydrogen and some other sustainable fuels, may not be competitive with traditional fuels in the near term.

— *Regional dynamics play a large role in scenario outcomes.* For example, China is expected to continue to lead in electrification, followed by North America and India, and coal consumption is expected to be driven by heavy industry in ASEAN countries and China.

— *Global power demand is expected to increase, driven by electrification.* Data centers could contribute a transformative new share of demand in the near term, especially in OECD countries. As a result, energy efficiency gains may no longer offset demand growth in these regions.

— *Variable-renewable-energy sources and gas-powered generation will likely dominate new power supply.* However, local market dynamics will influence the uptake of clean technologies and lead to varied decarbonization pathways. In places where gas largely replaces coal, the power-sector-emission intensity will decrease.

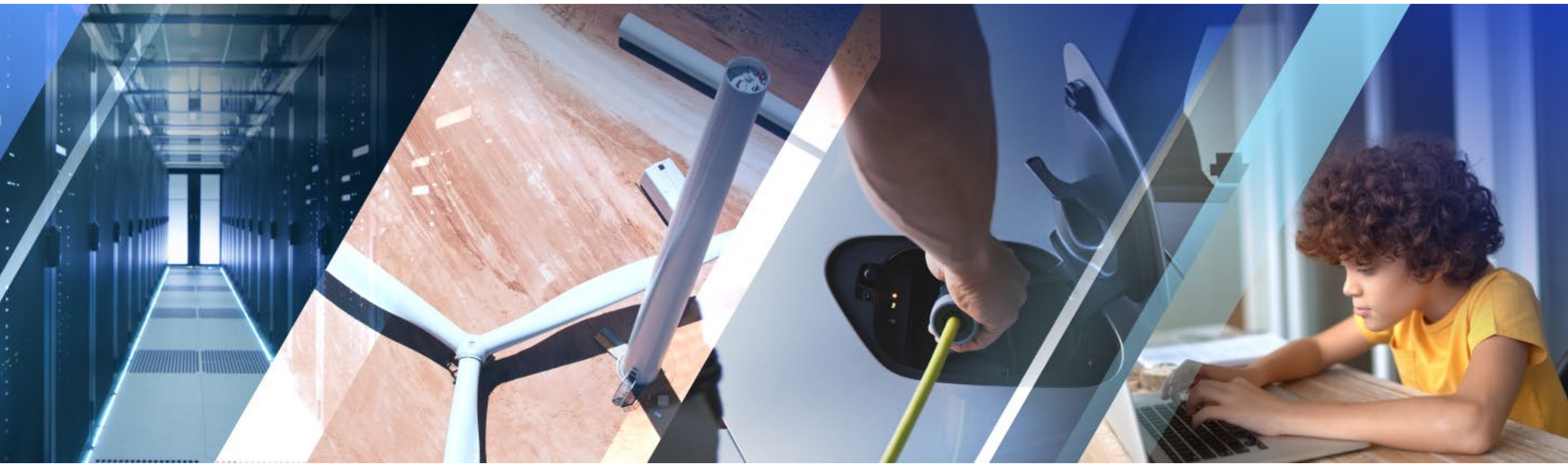
— *Clean, firm power sources and renewable storage technologies are likely to expand.* Such power sources include nuclear energy, geothermal power, and hydropower, and storage technologies include batteries and pumped hydroelectric energy storage. Although their new deployment at scale is still years away, these power and storage technologies will act as important complements to intermittent renewable energy sources (such as solar power and wind) and offer cost-competitive, resilient power.

— *A system-wide view could offer a faster and more cost-effective path to emission reduction.* For example, investment dollars for decarbonizing the energy system could potentially go further if, rather than pursuing the final few percentage in the power sector, they were instead applied to decarbonization in other sectors. This would avoid the higher costs of the final share of power sector decarbonization without compromising the Paris Agreement temperature targets.

Looking ahead

Ten years after the inaugural *Global Energy Perspective,* our view of the energy transition has matured. While the urgency remains, the pathways to meet the Paris Agreement targets are now more complex and must be grounded in economic and geopolitical realities. Global greenhouse gas emissions are still rising, and the journey toward decarbonization remains long. But with resilience and agility, energy sector leaders can prepare for and navigate the challenges.

[1] "Demand" refers to the total primary energy demand, which is the energy required to fulfill the total final energy consumption, including losses (for example, final gas-powered electricity consumed requires more natural gas demand to account for losses in electricity generation).



Our scenarios and methodology

Global Energy Perspective 2025 presents three bottom-up scenarios that represent possible energy transition pathways: Slow Evolution, Continued Momentum, and Sustainable Transformation (Exhibit 2). They are built on credible input assumptions and the extrapolation of current trends, reflecting the complexity of the many factors influencing the energy transition. The scenarios provide a baseline for modeling additional forces acting on the system, such as tariffs, GDP shifts, technology breakthroughs, and supply chain disruptions.

Each scenario reflects a different balance among affordability (including varying assumptions about technology learning curves and costs), decarbonization (including varying assumptions about carbon price and policy), and supply security. They differ based on the assumed speed of the energy transition to 2050. The Slow Evolution scenario assumes the slowest decline in clean-technology costs and the least policy ambition. In contrast, the Sustainable Transformation scenario assumes the highest learning rates, cost declines, CO_2 prices, and policy incentives. The security-of-supply variable changes across scenarios and regions, depending on local circumstances, including regional resource endowments. For example, the European Union's focus on renewables supports security of supply because it reduces dependence on fossil fuel imports, whereas countries with substantial fossil resources would not treat renewables as secure supply.

We don't assign probability to our scenarios but consider all three as plausible. Many of the analyses presented throughout this report are based on the Continued Momentum scenario because it represents the middle ground between a slower and faster pace of change, not because it is seen as more likely. Unless otherwise indicated, the information in exhibits reflects the Continued Momentum scenario.

Exhibit 2

Three energy transition scenarios provide a comprehensive overview of the energy system's potential pathways.

Energy transition scenarios

Slow Evolution

Pace of change

Local energy decisions **prioritize affordability and supply security,** investment in low carbon stall, and CO_2 price doesn't change

Cross-regional **clean-energy financing declines,** and emerging economies opt for cheaper energy sources

Decarbonization targets are missed, innovation slows down, and **energy transition relies completely on mature technologies**

There are **persistent bottlenecks** (grid delays, resource shortages, labor gaps)

Projected global temperature increase by 2100:

2.7°C

Continued Momentum

Pace of change

Nations **balance affordability, supply security, and sustainability,** CO_2 price gradually increases, and new schemes are introduced

Cross-regional **clean-energy financing expands,** and mature economies support emerging economies' decarbonization

Decarbonization targets are met with a delay or only for individual sectors in specific countries, innovation continues at historically high rates, and **pilot-stage technologies reach maturity**

Bottlenecks ease, and grid expansion and infrastructure improvement progress to meet rising electricity demand

Projected global temperature increase by 2100:

2.3°C

Sustainable Transformation

Pace of change

Nations **prioritize sustainability** and accelerate decarbonization efforts, while ensuring that affordability and supply security remain balanced; CO_2 price and social cost align; and global energy trade is fully liberalized

Cross-regional **clean-energy financing expands,** fostering collaboration among mature and emerging economies

Decarbonization targets are met, investment drives major efficiency and tech gains, and **advanced solutions are widely adopted**

Bottlenecks are fully resolved, and grid expansion aligns with demand

Projected global temperature increase by 2100:

1.9°C

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Continuing our annual practice of updating our projections, this year, we refined our scenarios to reflect an observed shift in the balance between energy affordability, supply security, and decarbonization commitments. All of the scenarios correspond to higher expected 2100 global temperature increases than in previous years.

The scenarios are built on nine dimensions, and each depends on how three underlying drivers play out (Exhibit 3):

— *Macrolevel conditions and constraints:* The global economy is expected to continue to grow, driven by AI and efficiency gains. Local variation in the speed of economic growth is anticipated.

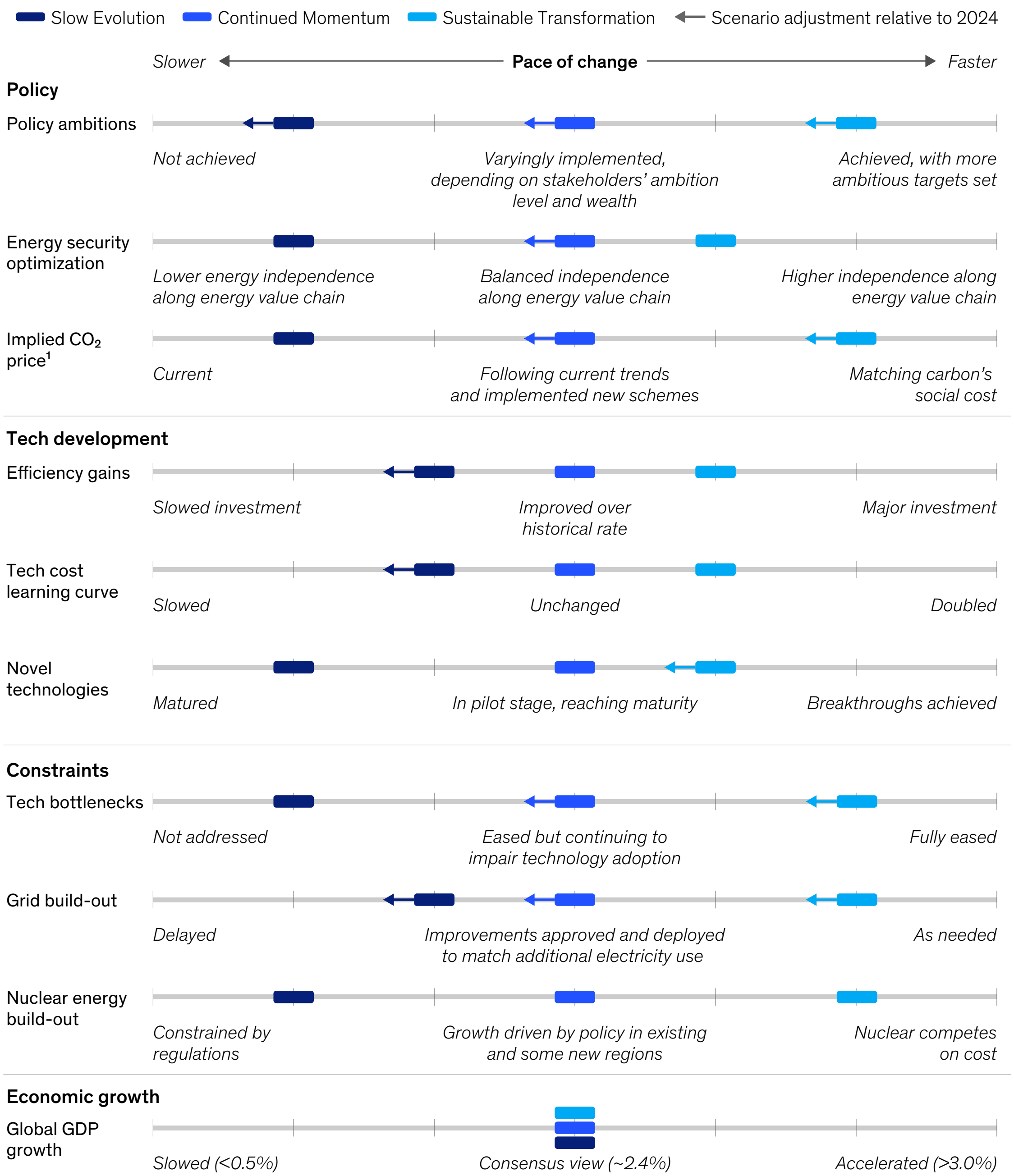
— *Policy ambition:* National decarbonization targets may be upheld, and new countries may emerge as front-runners in reducing emissions.

— *Technology evolution:* Learning curves in batteries, solar power, and other technologies could continue to improve exponentially. Innovations could reach market readiness within their window of opportunity from basic research to commercialization.

Exhibit 3

The three energy transition scenarios are shaped by policy, tech developments, and constraints, all of which affect the transition pace.

Key variables effect on pace of energy transition, by scenario



[1]Includes both a carbon price (emission-trading system or tax) and implied CO_2 prices from subsidies.

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Our updates are based on observations of energy markets, including the adoption of new technologies such as electric-arc furnaces in steelmaking and the growing production capacity of EVs. We also considered how future technology might evolve, based on cost trends and policy commitments. Consumption data for fossil fuels, including coal, shows steady growth, and we updated our outlook accordingly. In all three scenarios, we assumed reduced adherence to decarbonization policies, reflecting the current gap between stated policy and actual implementation.[2] These adjustments had the largest effect on the Continued Momentum scenario in the short and middle terms.

[2] Data for these scenarios come from a variety of sources, including Energy Institute, Eurostat, IEA, the Intergovernmental Panel on Climate Change, Oxford Economics, United Nations, US Department of Agriculture, and US Energy Information Administration, among others.

The forces shaping energy in 2025

Geopolitical uncertainty is a meaningful factor shaping this year's global energy outlook, alongside energy-supply-security concerns, evolving climate policies, recession risks, rising energy costs, tariffs, and technology innovation.

Increasingly, governments and policymakers are prioritizing energy affordability and security over meeting Paris Agreement targets—a trend that could pivot again in the future. Importantly, the greater emphasis on supply security does not necessarily come at the cost of decarbonization. In many regions, the two are interlinked, with supply security driving more policy for renewables. For example, the European Commission's Clean Industrial Deal aims to improve industrial resilience with clean technology, and Japan's Seventh Strategic Energy Plan (or Basic Energy Plan) aims for achieving a cleaner energy system while improving security and stability.

Geopolitical and policy volatility has added uncertainty to the near-term evolution of energy systems, resulting in a slower energy transition across all our scenarios. One example of this uncertainty is the potential influence of tariffs on clean-energy uptake.

In this section, we look more deeply at the trends that are shaping the energy sector, including growing global energy demand, broken down by region; potential changes to GDP; and supply chain bottlenecks.

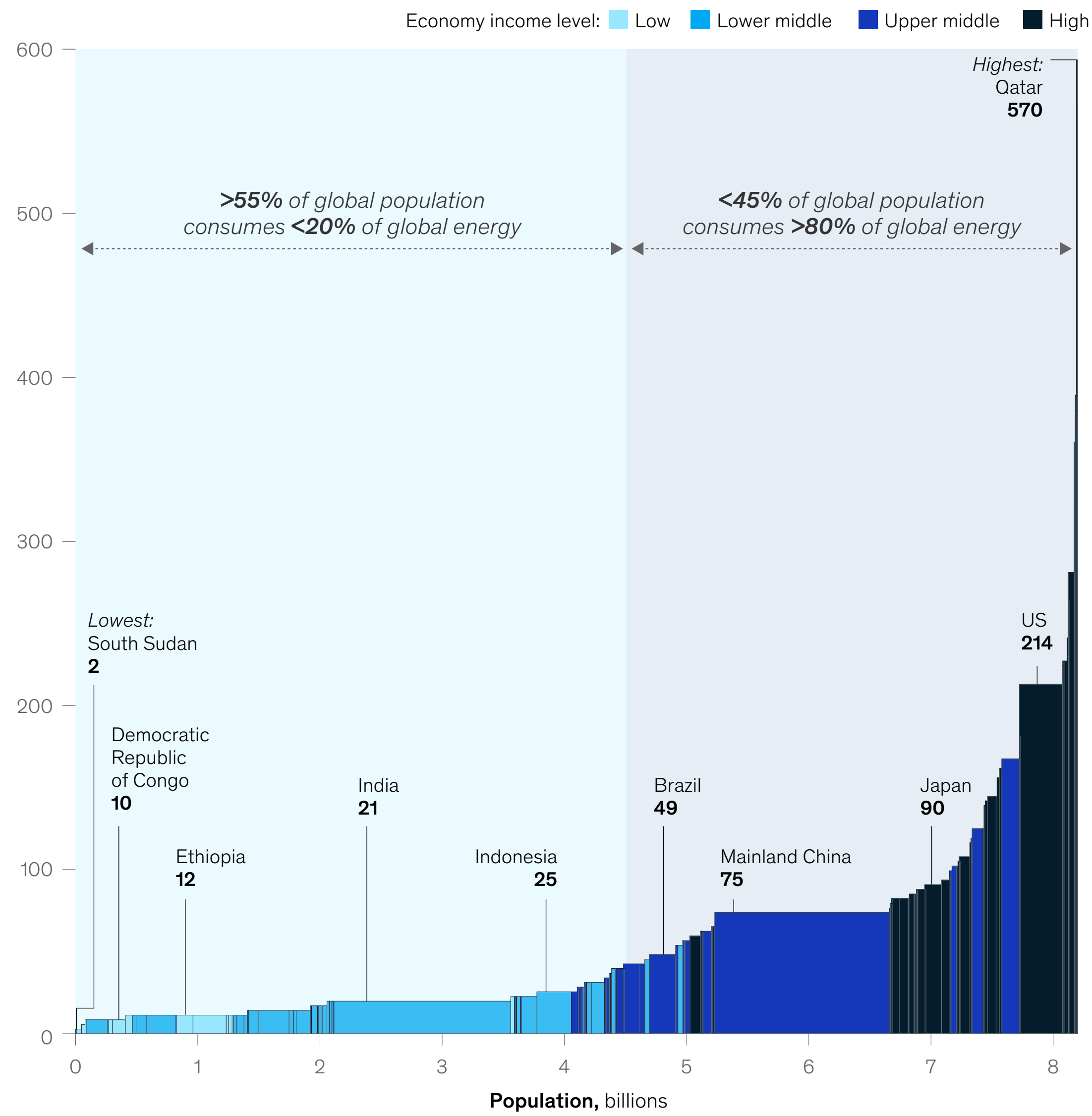
Growing global energy demand

Global energy demand continues to increase, driven in part by rapid economic growth and rising living standards in many populous low- and middle-income countries, such as India and Indonesia, whose GDPs could double in the next 25 years. Today, less than 45 percent of the global population consumes more than 80 percent of the global energy supply (Exhibit 4). However, the balance is expected to shift as energy use per capita increases. This means that populous countries that currently have low energy consumption rates will have the greatest influence on future energy demand growth.

Exhibit 4

Less than 45 percent of the global population consumes more than 80 percent of global energy.

Per capita final energy consumption in 2024, by economy income level,[1] gigajoules per capita



[1]Per classification from FY 2019.
Source: *Data Blog*, "New country classifications by income level: 2018–2019," World Bank, Jul 1, 2018; Data Catalog, World Bank, accessed Aug 2025; McKinsey analysis

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What is not clear is whether the shift toward electrification and its associated efficiency gains will offset the overall growth in energy demand. Our perspectives and broader market views could be underestimating long-term electricity demand growth if both electrification and GDP grow faster than currently assumed, especially in low- and middle-income countries. While our macroeconomic assumptions are the same across all scenarios, GDP growth may differ by country, which would lead to variations in energy demand, especially in the short term (see sidebar "Sensitivity analysis: What if a global recession comes in 2027?").[3]

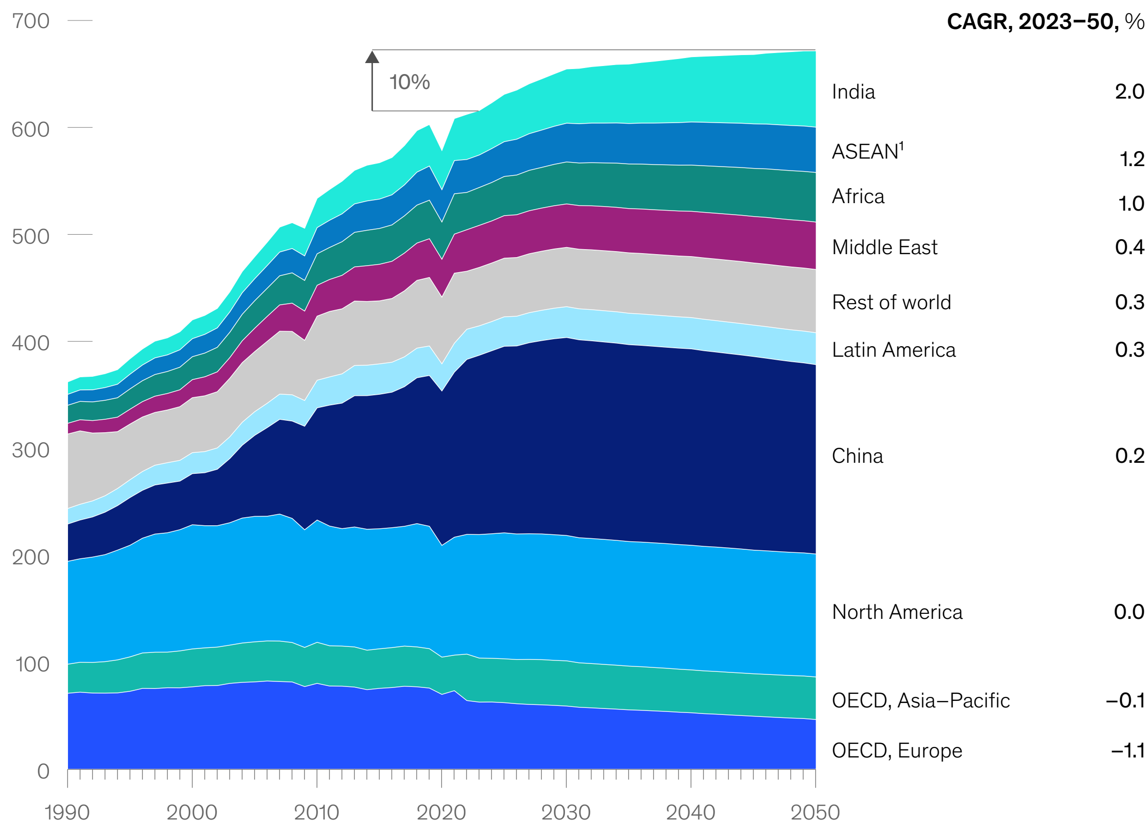
Global primary energy demand is projected to grow by about 10 percent by 2050 in the Continued Momentum scenario. Most of this growth is expected to come from India, ASEAN countries, and Africa (Exhibit 5). In these regions, population and GDP per capita are increasing, as is energy demand per capita.

[3] We also recognize the increasing disconnection between energy demand growth and GDP growth, and we underscore that our fundamental technoeconomic models consider GDP as one of several hundred inputs used to produce our outlook.

Exhibit 5

The increase in energy demand by 2050 will likely be greatest in India, the Association of Southeast Asian Nations, and Africa.

Primary energy demand in Continued Momentum scenario, millions of terajoules



[1]Association of Southeast Asian Nations.

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Sensitivity analysis: What if a global recession comes in 2027?

A key variable in this year's *Global Energy Perspective* is macroeconomic uncertainty. According to McKinsey's forecast in partnership with Oxford Economics, macroeconomic forces, such as international trade and interest rates, could trigger a global recession.[1] For example, Germany's economy, the world's third-largest, has contracted over the past two years because of such forces.

To better understand how the global energy system might respond to such a shift, we tested the effect of a steep decline in global GDP growth on global energy demand by modeling global GDP growth dipping to zero in 2027 (Exhibit A). We found that, relative to a baseline 2.5 percent CAGR GDP trajectory, such a recession situation could lower global GDP by up to 6 percent in 2035 in our Continued Momentum energy transition scenario. For reference, global GDP contracted by over 6 percent during the 2008 financial crisis, as annualized in the fourth quarter of 2008 and the first quarter of 2009.

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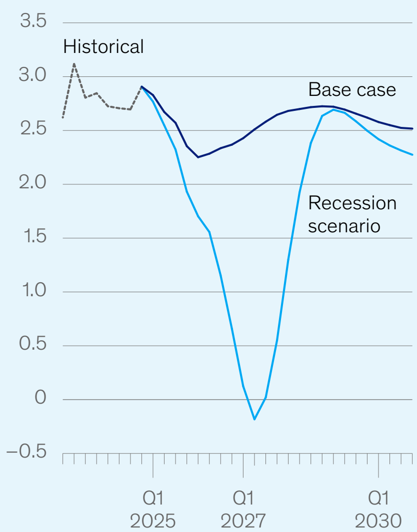
[1] "In a moment of tariffs, can the world find balance and trust to thrive?" McKinsey, May 2, 2025.

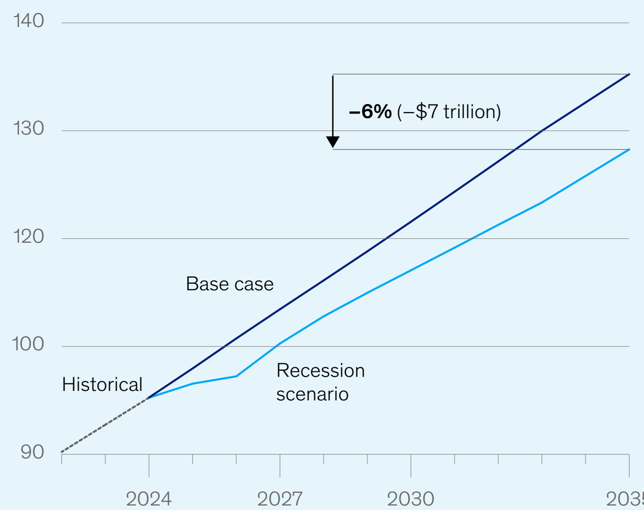
Exhibit A

Scenarios show that a 2027 recession could result in a 6 percent decrease in global GDP in 2035.

Yearly growth of global GDP, by scenario, %[1]



Global GDP, by scenario, $ trillion (2015 values)



Note: McKinsey integrated scenarios.
[1]Rolling 4-quarterly average.
Source: Oxford Economics; McKinsey analysis; McKinsey Value Intelligence

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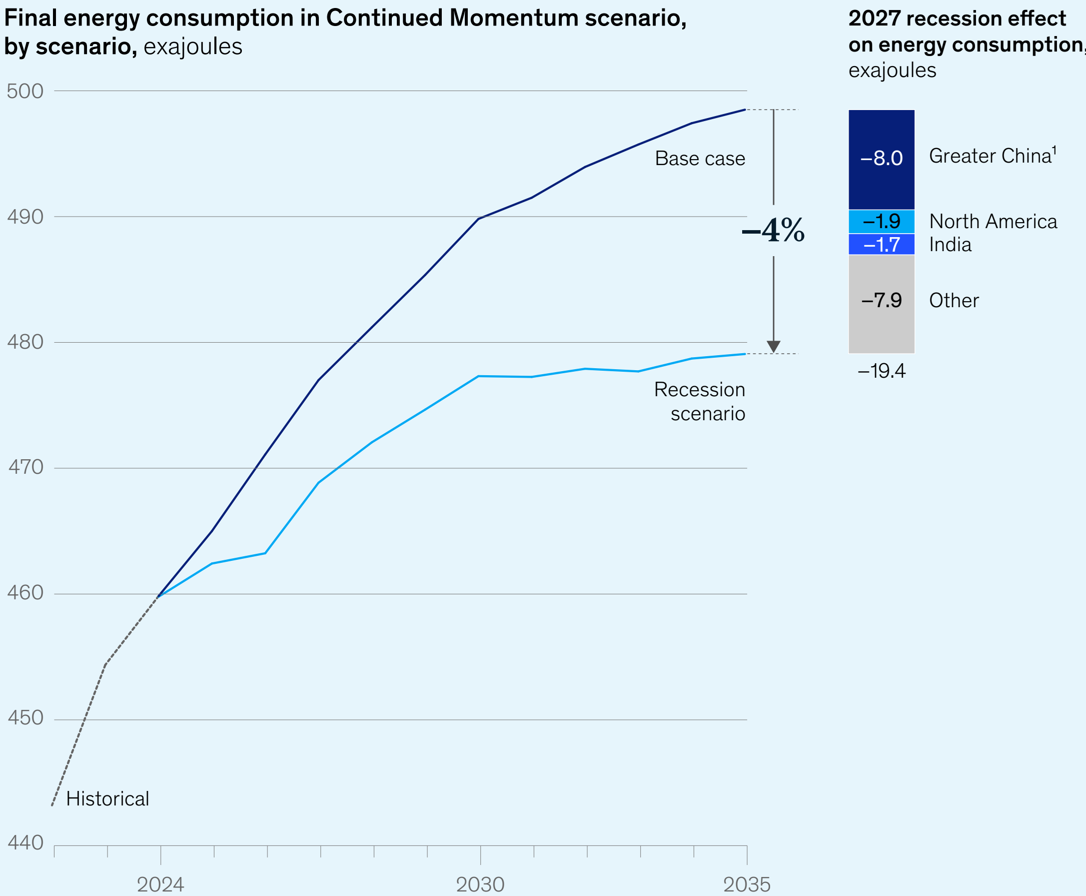
In the modeled scenario, we also found that such a recession could lower total global energy consumption by up to 4 percent in 2035 (Exhibit B). The road transport, iron and steel, and aviation and maritime sectors would have the largest effect on energy consumption in this recession scenario. Of the regions considered, China would experience the greatest absolute and percentage decrease in energy consumption—eight exajoules—relative to the nonrecession scenario in 2035.

Exhibit B

A 2027 recession could result in a 4 percent decrease in final energy consumption in 2035, mainly driven by China.



Note: Figures do not sum, because of rounding.
[1]Mainland China, Hong Kong, and Taiwan economies.

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As countries develop, the energy demand from their industrial sectors increases first. As an economy evolves and shifts to a service-based one, power demand increases too. For example, in ASEAN countries, industrial demand is expected to grow 57 percent and power demand by more than 50 percent by 2050 in the Continued Momentum scenario.

Potential changes to GDP

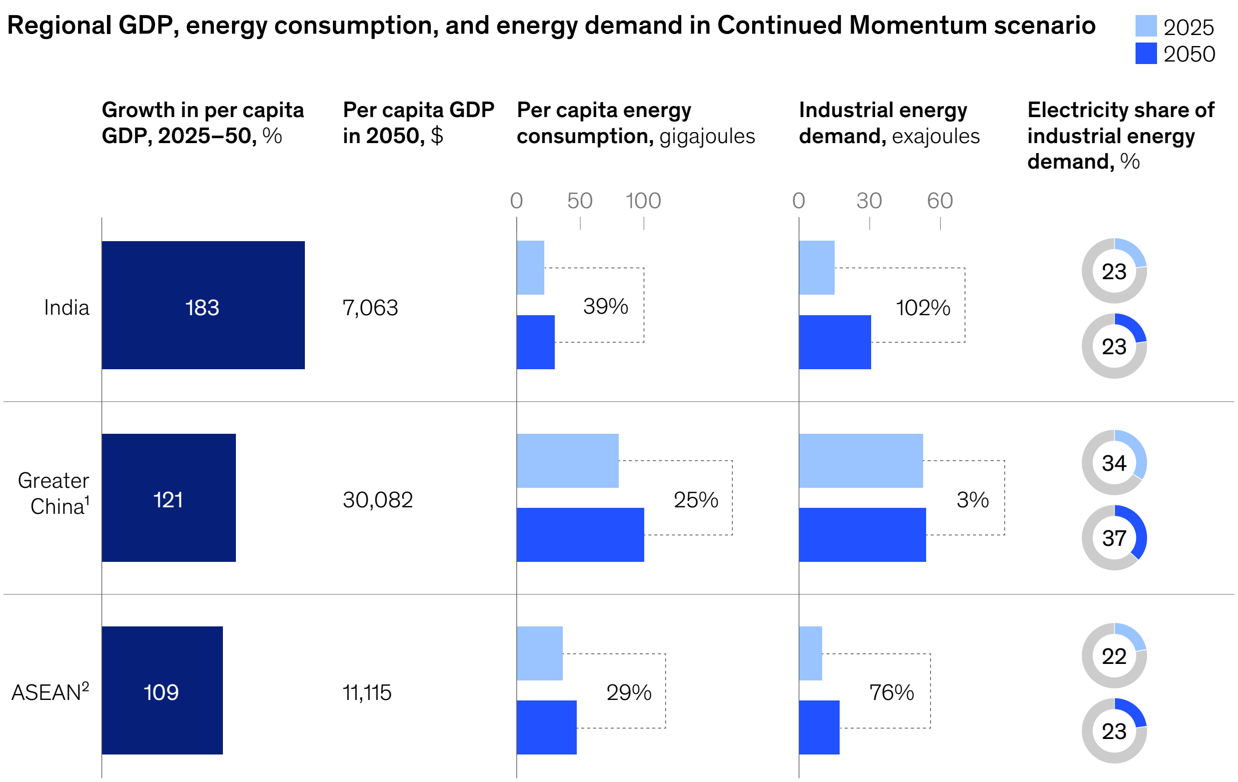
China continues to be the world's largest consumer of energy. However, energy demand in China, as well as in Europe and North America, is projected to remain nearly flat through 2050. Overall, AI and cloud-computing workloads are growing, negating energy efficiency gains and making a small but meaningful single-digit percentage contribution to overall energy demand. This is especially notable in Europe and North America.

Of all regions considered, India could see the fastest growth in both GDP per capita and energy consumption per capita as its primary energy demand increases, which would result in dramatically increased final energy demand[4] (Exhibit 6) (see sidebar "Sensitivity analysis: What if India's 2050 GDP per capita matches China's current GDP per capita?"). ASEAN countries and China may also see energy consumption per capita rise by at least 25 percent by 2050.

[4] "Final energy demand" refers to the energy consumed by end users, after losses.

Exhibit 6

India could outpace China's energy consumption growth per capita in the next 25 years.



[1]Mainland China, Hong Kong, and Taiwan economies.
[2]Association of Southeast Asian Nations.
Source: Oxford Economics; Energy Solutions by McKinsey

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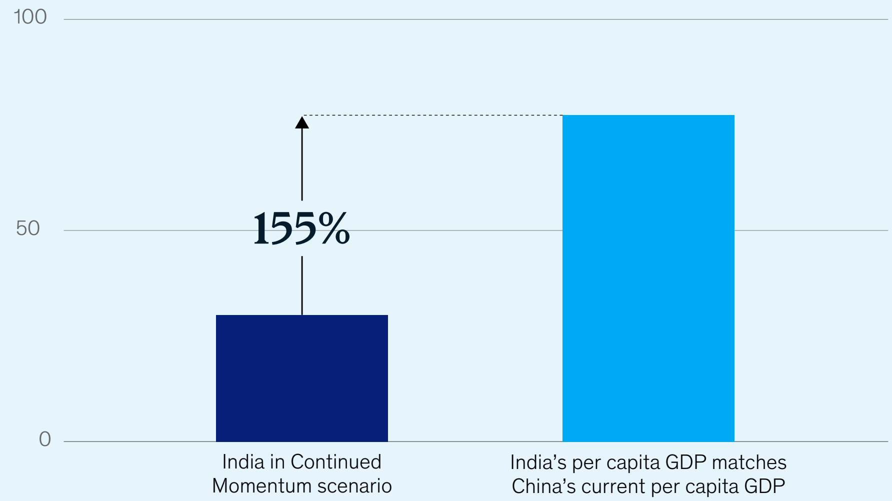
Sensitivity analysis: What if India's 2050 GDP per capita matches China's current GDP per capita?

Even as projections place India at the top of the list for energy demand growth in the coming years (with it becoming the third largest in the world by 2050), the assumptions in our model represent moderate estimations for India's growth. To better understand the sensitivity of global energy demand to India's GDP growth, we considered a situation in which India matched China's 2025 GDP per capita in 2050. In this case, global energy demand could be 16 percent higher than otherwise estimated in the Continued Momentum energy transition scenario (exhibit).

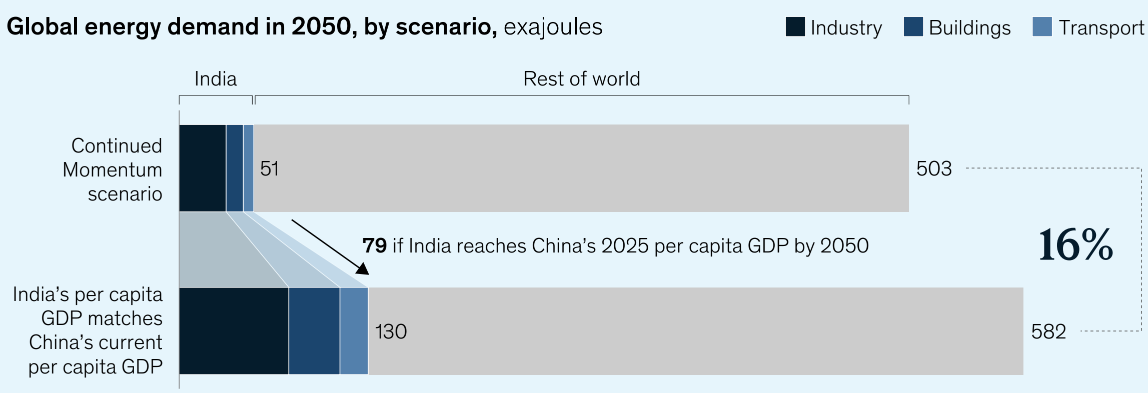
Exhibit

Global energy demand would increase by approximately 16 percent if India's per capita GDP in 2050 reached China's current level.

Per capita energy consumption in 2050, by scenario, gigajoules



Global energy demand in 2050, by scenario, exajoules



[1]Association of Southeast Asian Nations.

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Our analysis showed that most of the growth in energy per capita would come from industry—especially energy-intensive industries, such as iron, steel, and chemicals—followed by buildings and transport. That growth, combined with India's expected population increase between now and 2050, could more than double the country's energy consumption in 2050 relative to the Continued Momentum scenario.

The growth of energy demand in India's industrial sector is expected to be driven mostly by increases in the chemical, food, and iron and steel sectors. Demand in each sector could experience a CAGR of 3 to 4 percent through 2050.

Supply chain bottlenecks

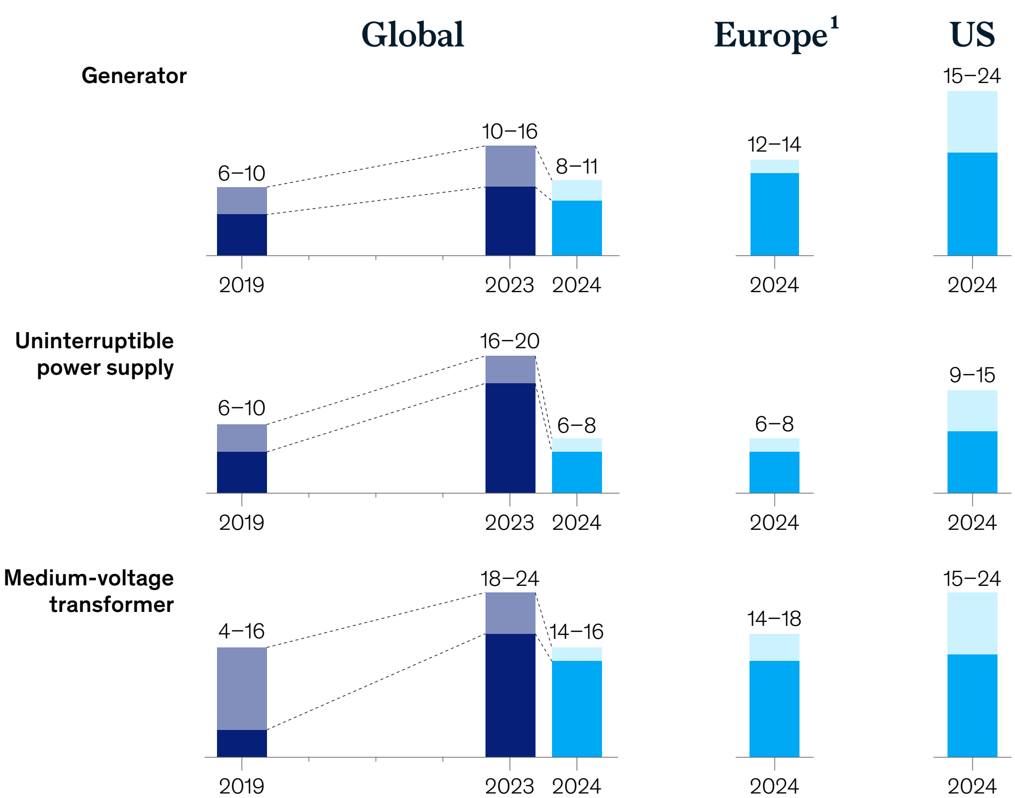
A factor that could constrain the energy transition in Europe and the United States is the bottlenecking of the supply chains for clean-technology equipment. We have already seen cost increases of two- to threefold for high-voltage transformers since 2020, for example. Lead times for many important clean-energy-tech components are six months to two years for some markets (Exhibit 7). The upper range of lead times in 2024 came down from a 2023 peak with the easing of disruptions related to the COVID-19 pandemic and additional supply chain capacity becoming available. However, the shortest lead times are still considerably longer than they were before the pandemic.

Such equipment's lead times are generally longer in the United States than in Europe because the United States historically has been reliant on imports, especially for transformers. As a result, a component's lead time in the United States is in part driven by US-specific import-related regulations. Data-center-related electrical equipment in the United States has been particularly susceptible to longer lead times because supply chains for these goods tend to be regionally fragmented, and manufacturing capacity is largely constrained to what's available nearby.

Exhibit 7

Supply chain bottlenecks for clean-energy-technology components hinder the energy transition.

Clean-energy-technology supply chain lead time, by component, number of months



[1]EU-27.
Source: Expert interviews; McKinsey Platform for Industrial Electrification

The 2025 energy outlook

Affordability, supply security, and decarbonization are priorities in the energy sector. However, the observed slowdown in progress toward net zero suggests that some stakeholders are currently prioritizing affordability and supply security over decarbonization. What has also become clear over the past decade is that the journey to decarbonization will not be linear, in part because multiple competing technologies are vying to fill the same roles.

To explore this insight, we modeled alternative transition scenarios across sectors and compared them with our Continued Momentum scenario. We asked several questions: What if biodiesel and bioliquefied natural gas compete as clean fuels in the maritime segment? What if carbon capture, utilization, and storage (CCUS) technology becomes more affordable? What if the global number of vehicles declines? Our tests affirmed what we already see happening: The most likely decarbonization pathway is the one that's most cost effective in any given region or market.

In this section, we present the core findings of our analysis: projections through 2050 for global energy demand; electrification, including the role of data centers in electricity demand; and fuel demand. We also share our projections for future energy supply by source and the share of low-carbon power by region. We present a cost analysis for decarbonization of the final 5 percent of the global power system, and we revisit our analysis of where the world is in its investments for low-carbon power. Together these provide a comprehensive outlook of the energy landscape in 2025 and beyond.

Projected energy demand

Our three energy transition scenarios point to markedly different momentum in energy demand by 2030. The Slow Evolution scenario shows substantial demand growth through 2050. The Continued Momentum scenario puts the world near an inflection point for final demand growth, with slower growth in demand after 2030. And the Sustainable Transformation scenario suggests a peak around 2030, with demand declining thereafter.

Fossil fuels

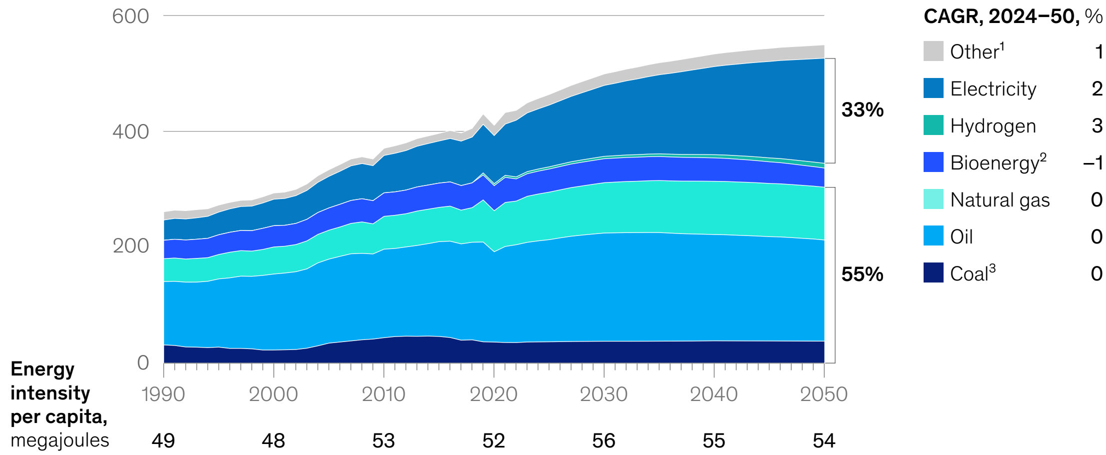
A major finding of this year's analysis is that, depending on the scenario, fossil fuels are expected to account for about 41 to 55 percent of global energy consumption in 2050 (Exhibit 8). While this is a decline from today's 64 percent, it is higher than our previous 2050 projections. The range represents higher absolute amounts of these fuels, given energy demand growth.

Exhibit 8

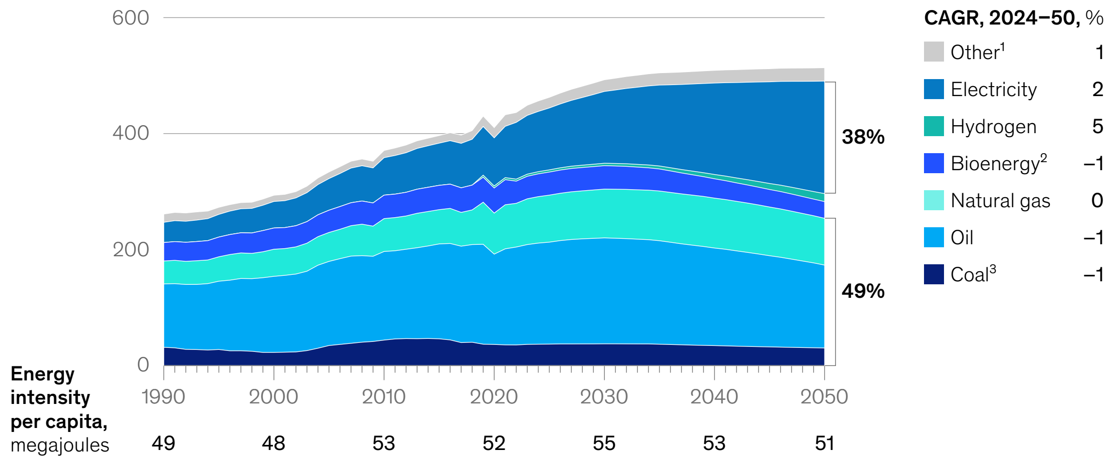
Fossil fuels are expected to make up approximately 41 to 55 percent of global energy consumption by 2050.

Global final energy consumption for scenarios, by fuel, millions of terajoules

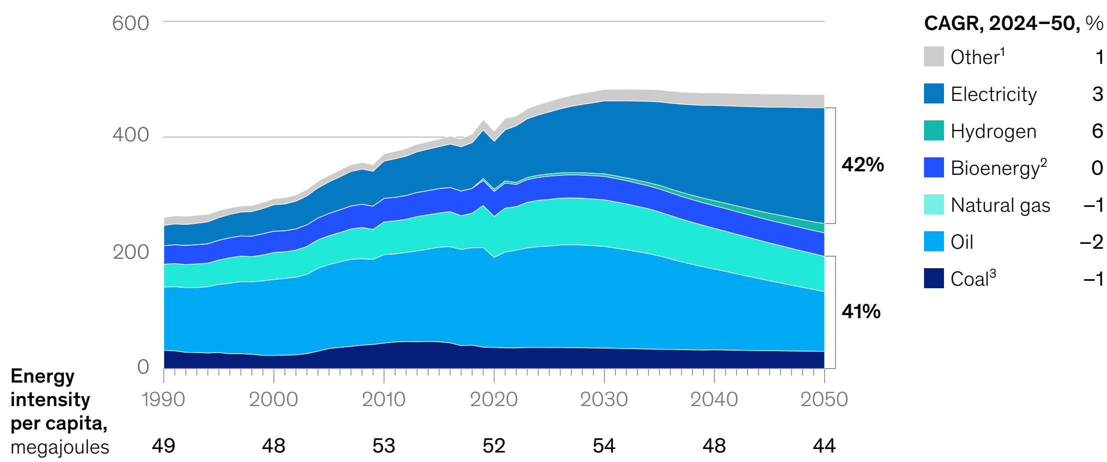
Slow Evolution



Continued Momentum



Sustainable Transformation



[1]Includes heat, geothermal, and solar thermal.
[2]Includes synthetic fuels, biofuels, and other biomass fuels.
[3]Includes both metallurgical coal for steel-making and thermal coal for heat generation.
Source: IEA; Energy Solutions by McKinsey

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Clean hydrogen

Clean hydrogen is not yet cost competitive at scale, so it is expected to play a limited role in the energy mix across scenarios. Indeed, there is no certainty around the completion of clean-hydrogen projects in the next ten years. At-scale uptake will likely begin in transportation (heavy-duty trucks or aviation) and in iron and steel manufacturing, particularly in regions with carbon-pricing and local-production incentives.

Other sustainable fuels

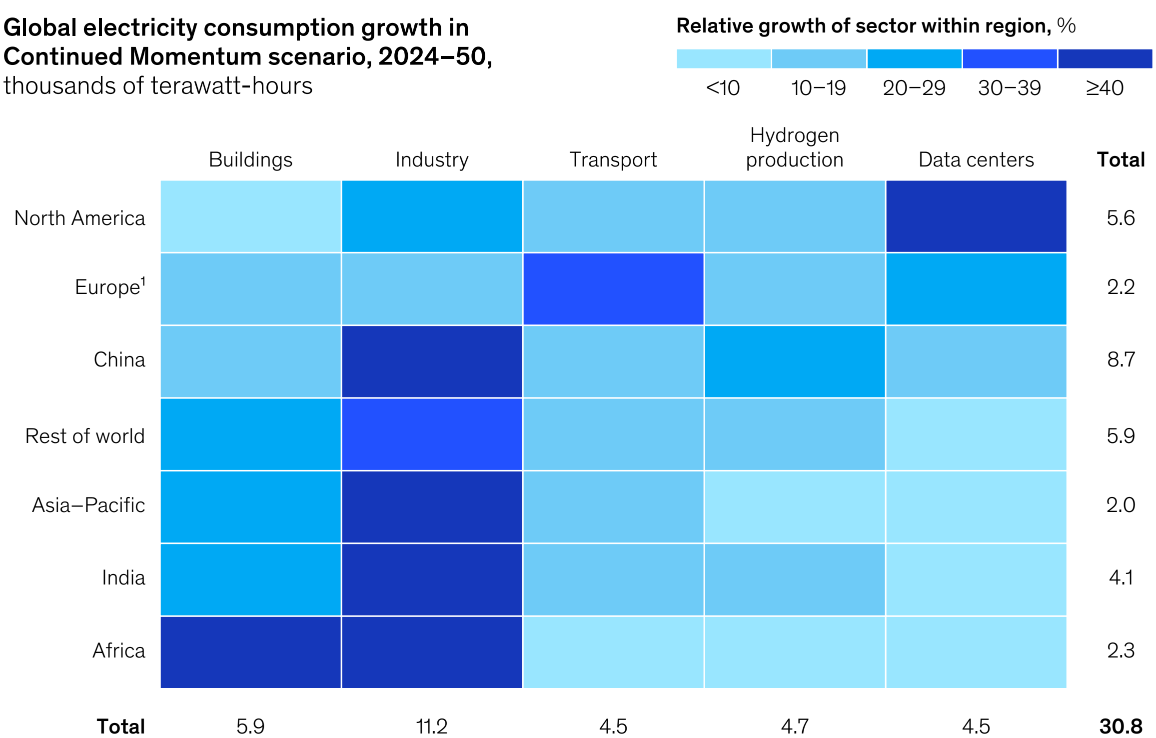
Different types of sustainable fuels, both biobased and synthetic, will compete based on cost. Sustainable-fuel demand is expected to grow to approximately 600 million tons per annum by 2050, driven by regulatory measures—for example, the amended Renewable Energy Directive, FuelEU Maritime Regulation, and US Renewable Identification Number program. Growth would drive a major shift in the fuel mix: demand for fatty acid methyl ester (FAME) and ethanol will increase in Asia–Pacific countries and Latin America. Advanced drop-in fuels will be necessary to decarbonize the internal-combustion-engine-based legacy fleet and will replace fossil fuels in aviation, industry, and maritime sectors. However, without mandates, sustainable fuels are not likely to achieve broad adoption before 2040.

Expected electrification trends

In every region we examined and all our energy transition scenarios, electrification is poised to grow through 2050 (Exhibit 9).

Exhibit 9

Industry and buildings are the leading source of electricity demand growth in most regions, while in North America, data centers are the main driver.



[1]EU-27 and UK.
Source: Energy Solutions by McKinsey

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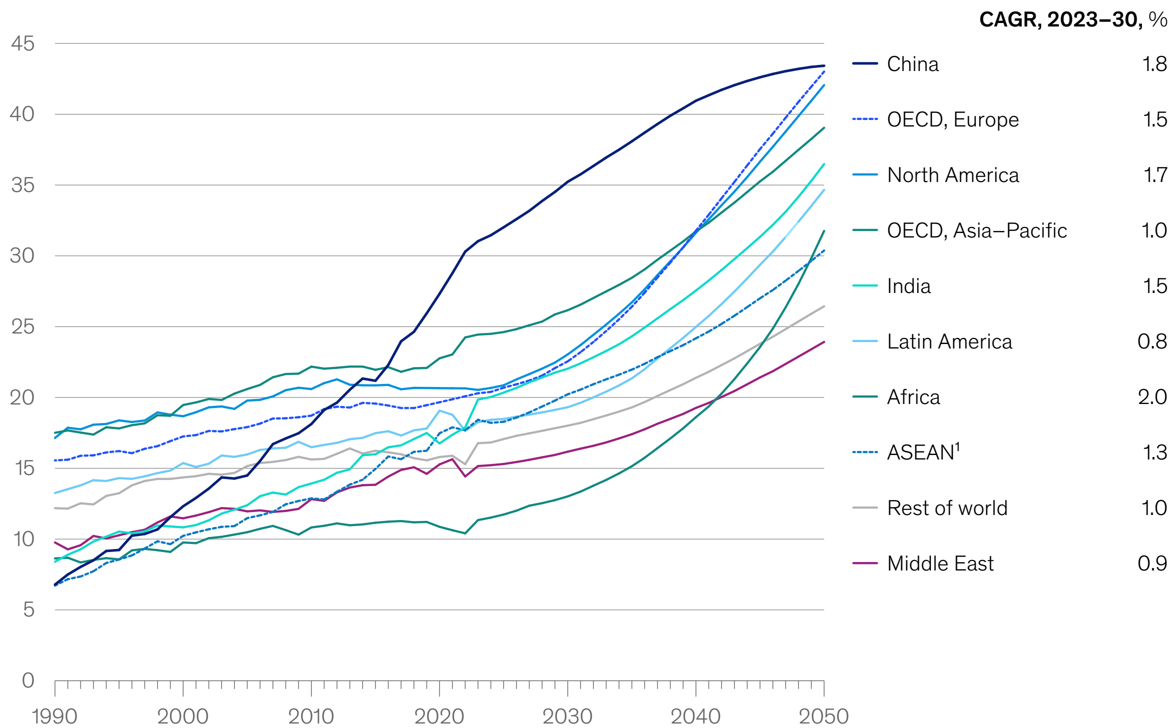
Across regions, electricity demand growth is still mainly driven by the industry and building sectors, which are projected to grow 20 to 40 percent from today's levels by 2050. Only in North America are data centers expected to be the largest driver of electricity demand over that period. In absolute terms, China has the largest electricity demand today, in part because of its high level of electrification. In all regions but China, electrification is expected to accelerate after 2030, with Europe and North America possibly reaching similar levels as China by 2050 (Exhibit 10).

In assessing the growing demand for electricity, it is important to disaggregate the data geographically. In places like Europe and the United States, the average power price differs across local markets, and there is a wide range in the ultimate cost of landed electricity for the different customer segments.

Exhibit 10

China is expected to lead the world in electrification through 2050.

Electricity share of final energy consumption in Continued Momentum scenario, %



[1]Association of Southeast Asian Nations.
Source: IEA; McKinsey Energy Solutions

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Traditional drivers of demand

Historically, rising electricity demand has been driven by buildings and industry, especially as living standards and electricity access improved. This trend is continuing in emerging markets. Electrifying industrial energy use remains difficult around the world because 30 percent of industrial-heat demand comes from high-temperature processes that are hard to electrify.

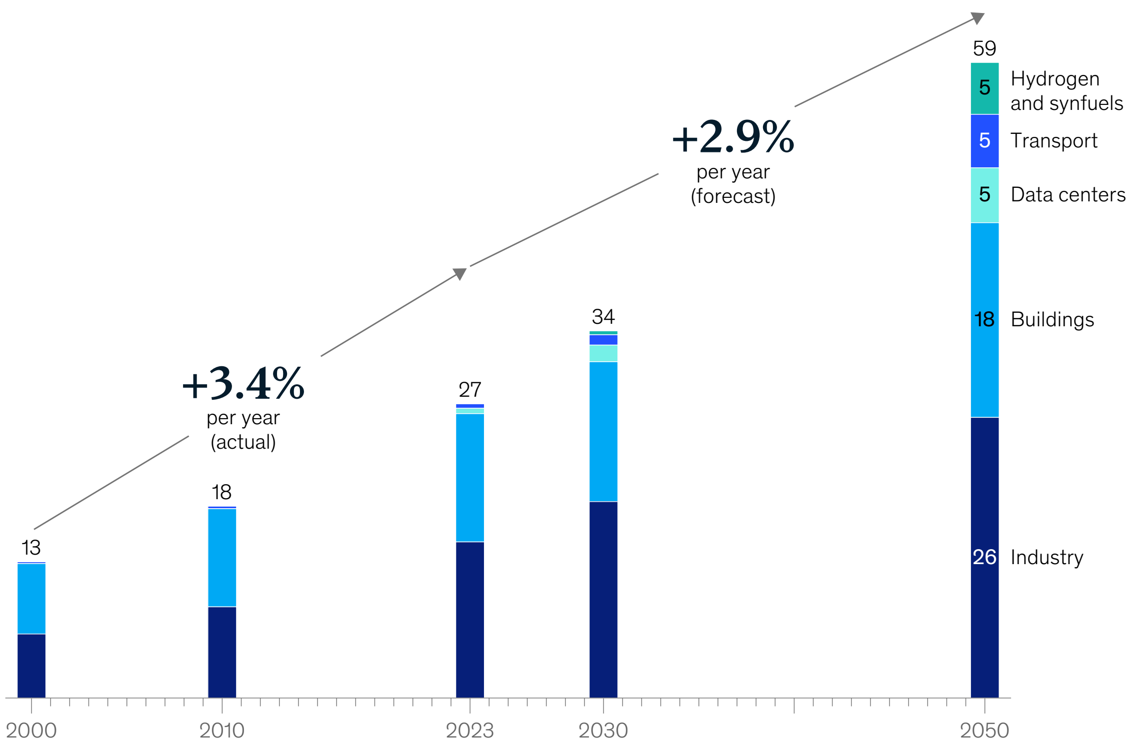
Emerging drivers of demand

In recent years, new demand drivers have emerged (Exhibit 11). Transportation has become a bigger source of electricity consumption, mainly because of the increased uptake of passenger EVs. Data centers are also developing as a growth area for electricity demand, especially in the United States. In part because of these new drivers, electricity demand by 2050 could be double the 2023 level.

Exhibit 11

Global energy consumption is expected to continue to increase as new demand centers emerge.

Global power consumption in Continued Momentum scenario, by sector, thousands of terawatt-hours



Source: IEA; IRENA—International Renewable Energy Agency; Energy Solutions by McKinsey

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Incentives. Government incentives encouraging energy independence and sustainability—such as the electrification of public transport in major Asian cities, subsidies for EVs across continents, and the European Commission's Electrification Action Plan for industrial electrification—have contributed to the growth in electricity demand. However, these incentives have been insufficient to meet decarbonization targets in the majority of regions that have set them (details appear in the "Low-carbon technology investments" section).

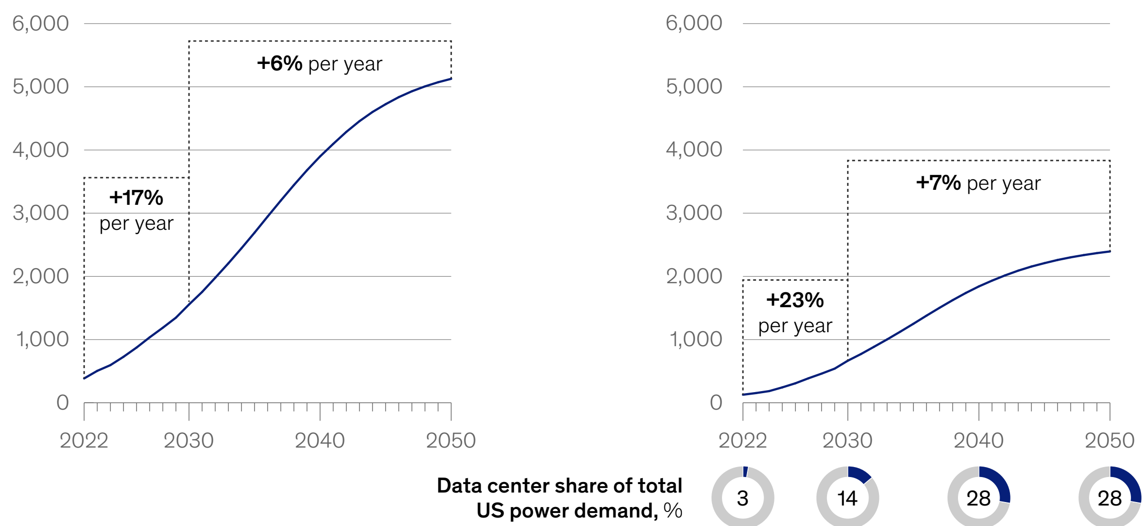
Data centers. Data centers could drive a sharp increase in energy demand. After analyzing a detailed pipeline of data center projects, we predict an average global growth rate of 17 percent per year in data-center-related power demand between 2022 and 2030 (Exhibit 12). Such growth is currently highly concentrated in the United States, western Europe, and China.

Exhibit 12

Data centers are increasing global power demand and could account for 14 percent of US power demand by 2030.

Global power demand for data centers in Continued Momentum (CM) scenario, terawatt-hours

US power demand for data centers in CM scenario, terawatt-hours



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The United States, for instance, is expected to see an average annual growth rate in data-center-related power demand of nearly 25 percent until 2030. If current trends continue, data centers could account for more than 14 percent of US power demand by 2030, even accounting for assumed efficiency gains in computation and data center infrastructure. Beyond 2030, data-center-related energy demand growth is highly uncertain in any region.

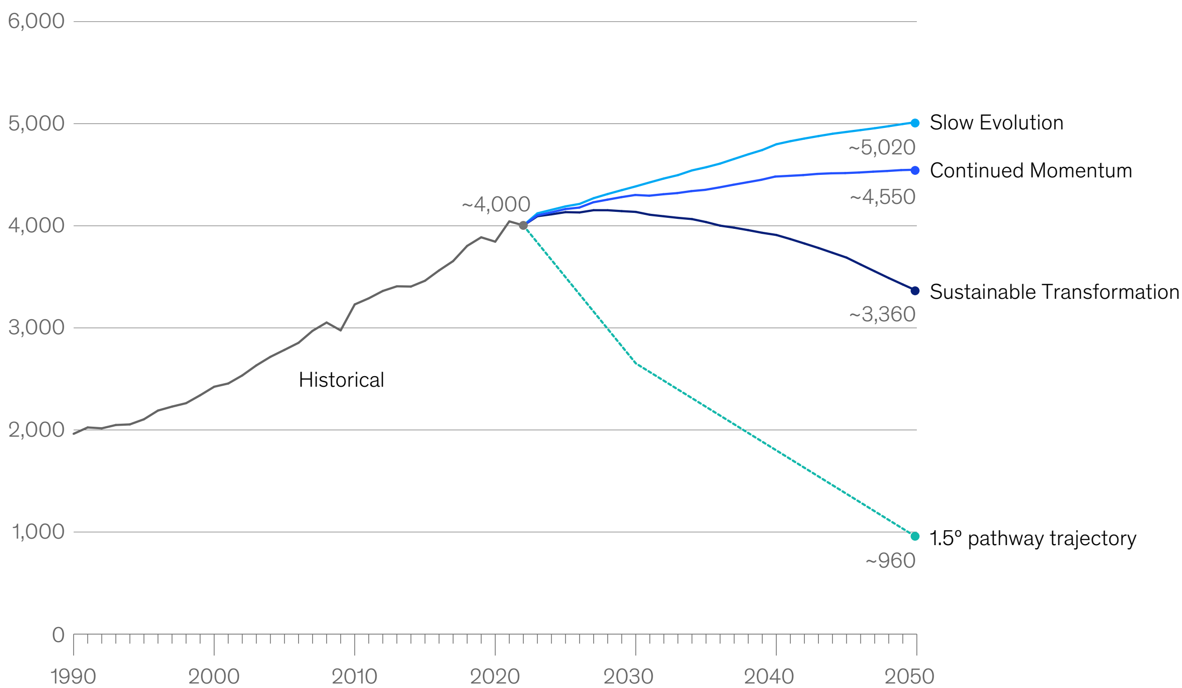
Projected fuel demand

Global *gas demand* has increased this year and is projected to increase by up to 170 billion cubic meters by 2030 in the Continued Momentum energy transition scenario. This growth follows a period of price volatility, peaking in 2022, that kept growth in check. In the Slow Evolution scenario, natural gas demand is expected to rise to approximately 5,020 billion cubic meters by 2050, from just over 4,000 billion cubic meters today (Exhibit 13).

Exhibit 13

Natural gas demand could grow to approximately 5,000 billion cubic meters by 2050 in Slow Evolution scenario.

Global natural gas demand, by scenario, billions of cubic meters



Source: World Energy Balances database, IEA, accessed Aug 2025; Energy Solutions by McKinsey

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In the short term, most of the demand growth for natural gas is expected to come from the power sector, in which combined-cycle gas turbines play a vital role in meeting rising electricity needs. On the other hand, the use of gas is projected to decrease in buildings and industry, especially in Europe, as these sectors electrify and improve efficiency.

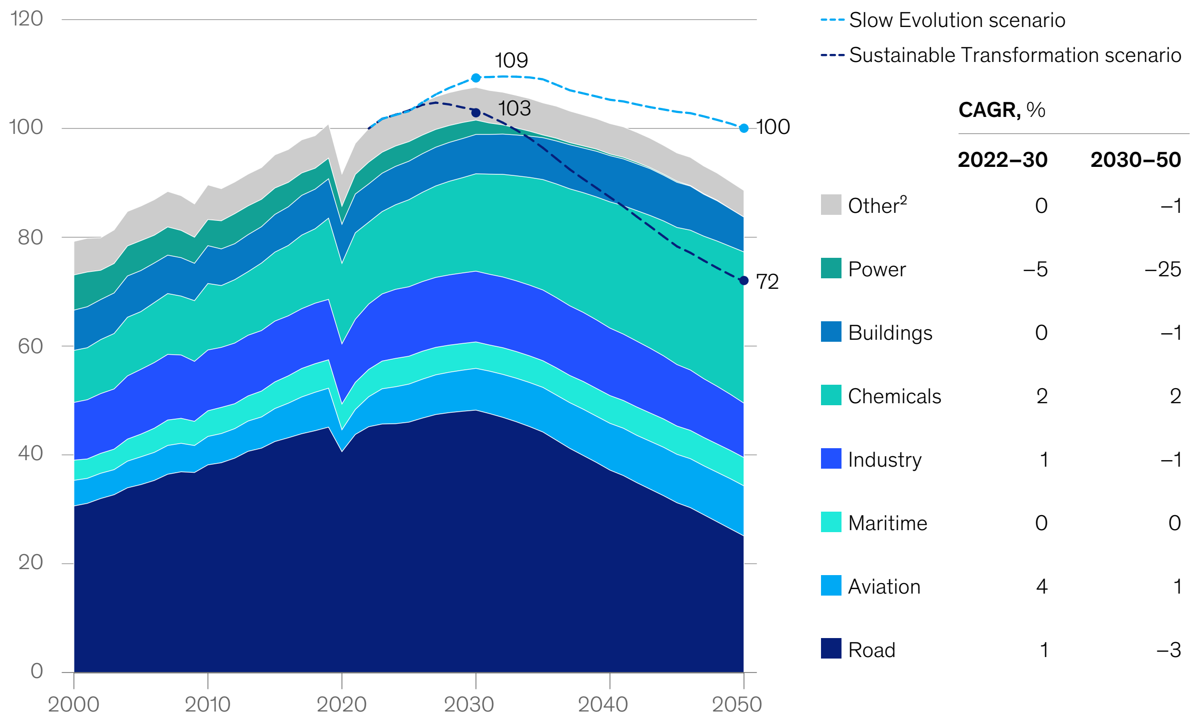
Asia is expected to account for approximately 75 percent of gas demand growth by 2040 in the Continued Momentum scenario. This high demand is mostly because of a cost- and emission-driven coal-to-gas switch in Asia's power sector and the increasing use of gas for heating by building and industry sectors. Gas demand in China is expected to plateau around 2040, while demand plateaus are expected in other Asian countries after 2040.

Global *demand for liquid fuels* could reach a maximum around 2030 at between 103 million and 109 million barrels per day (Exhibit 14). Global oil demand has returned to the levels seen before the COVID-19 pandemic, and growth in demand is projected to return to historical averages of approximately one million barrels per day in the Continued Momentum scenario.

Exhibit 14

Road transport will likely be the largest contributor to keeping global oil demand elevated through 2030.

Global oil demand outlook in Continued Momentum scenario, by sector, millions of barrels/day[1]



[1]Includes biofuels, natural gas liquids, and oil produced through pyrolysis.
[2]Includes refining and rail sectors.
Source: IEA; McKinsey analysis

McKinsey & Company

However, a number of factors (including alternative-fuel-technology development, EV uptake, chemical recycling, fossil-fuel phaseout in power generation, macroeconomic forces, and regulation) could affect the short- and long-term outlooks for liquid-fuel demand. As a result, demand in 2050 could range from 72 million to 100 million barrels per day. Our Slow Evolution scenario predicts relatively flat demand between 2025 and 2050. The road transportation sector continues to be the largest contributor to global demand for liquid fuels, and the biggest driver of divergence across scenarios, because of variance in EV adoption.

Projections for *oil demand* also vary considerably across sectors. Maritime and industrial use of oil is projected to decline as these sectors switch from oil-based fuels to natural gas, sustainable fuels, or electrification after around 2040. Such switches will be primarily driven by regulation. The power sector's oil use will likely continue to decline in accordance with the historical shift toward natural gas, approaching phaseout around 2035.

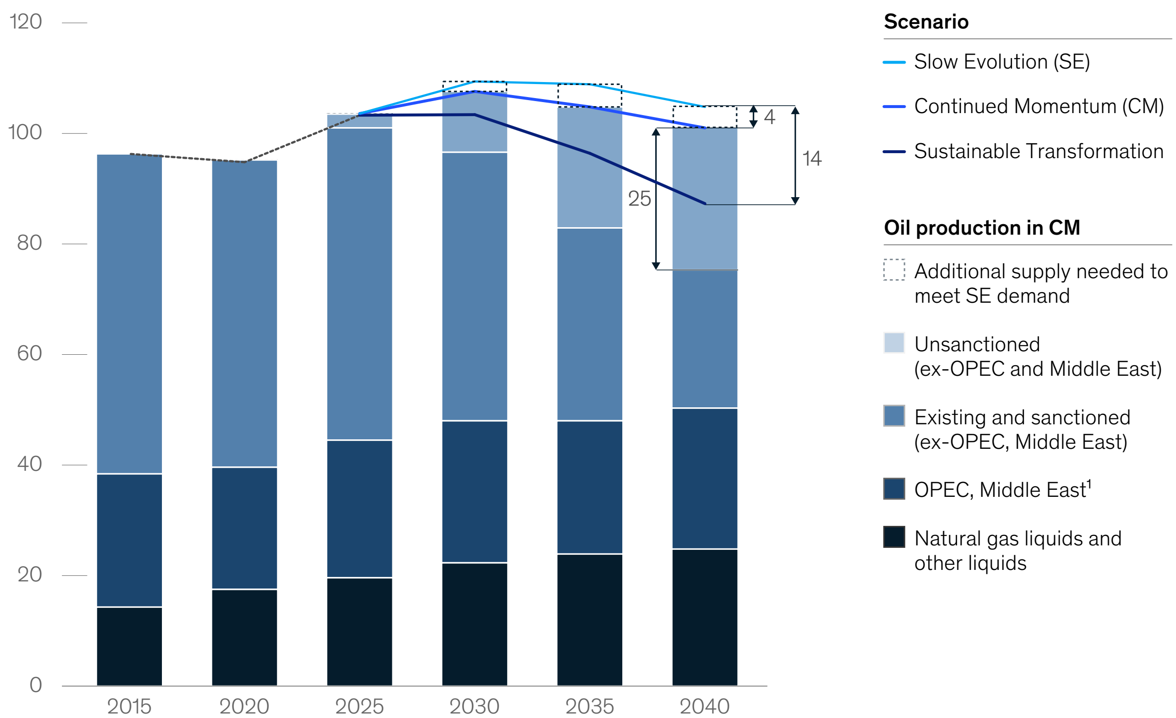
Use of oil-based fuels in buildings will likely be gradually phased out in most regions. In home use, Africa and India are expected to see a transition from bioenergy to liquefied petroleum gas before ultimately electrifying. The chemical sector, meanwhile, is projected to continue to rely on liquid fuels for plastics through 2050. The demand for oil to produce plastics is expected to grow at approximately 2 percent per year, driven by rising global GDP.

Even after oil demand hits a maximum in the next decade, oil supply will require continued development through 2040 (Exhibit 15). Large upstream investments are needed to offset aging legacy production and provide spare capacity against potential shocks. Our scenarios suggest that this capital expenditure will be funneled to the most competitive deepwater and shale basins, jointly providing 33 percent of crude and condensate supply by 2040, up from 25 percent in 2024. OPEC members and the group's allied oil-producing countries are projected to provide 53 percent.

Exhibit 15

By 2040, new upstream developments will be needed to satisfy oil demand, across all scenarios.

Global oil demand and production, by production status, millions of barrels/day



[1]Iran, Iraq, Kuwait, Saudi Arabia, and UAE.
Source: Rystad Energy; Energy Solutions by McKinsey

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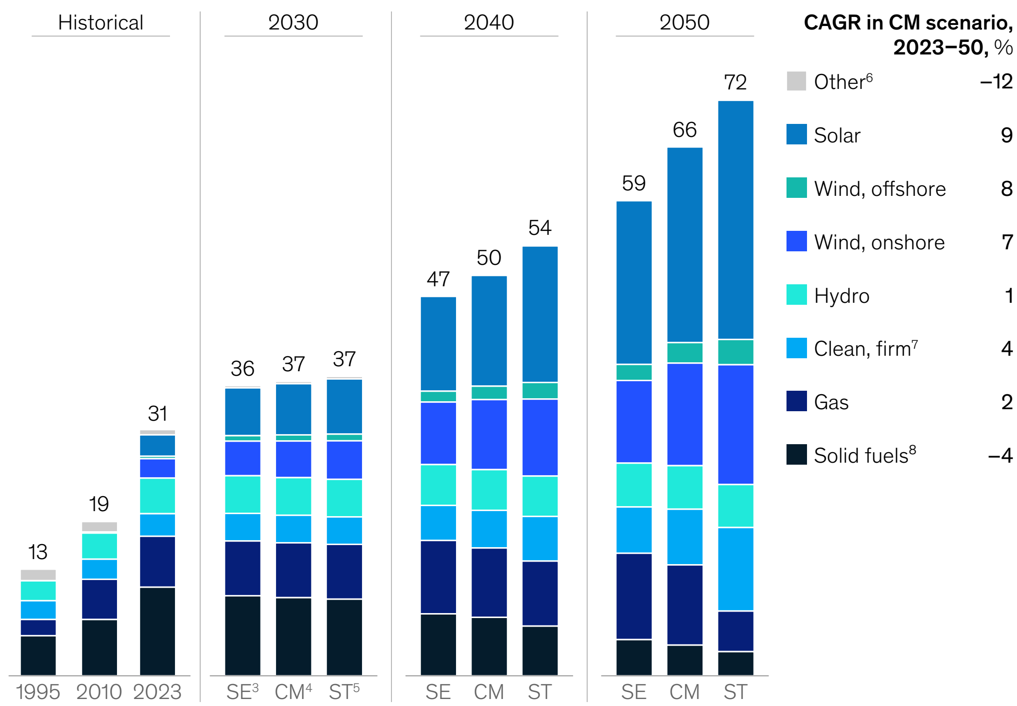
The power mix

Power demand will grow across all scenarios because of electrification and, in some locations, data centers. New power supply will likely be dominated by renewables and gas-powered generation (Exhibit 16).

Exhibit 16

Renewables have the potential to provide 61 to 67 percent of the 2050 global power mix.

Global power generation,[1] thousands of terawatt-hours



	1995	2010	2023	SE[3] 2030	CM[4] 2030	ST[5] 2030	SE 2040	CM 2040	ST 2040	SE 2050	CM 2050	ST 2050
Share of renewables, %[2]	19	18	35	45	46	47	54	57	60	61	63	67
CO_2 emissions, gigatons			10	10	10	10	8	9	7	6	7	3

[1]Excludes generation from storage (batteries, long-duration energy storage, and pumped hydro). [2]Includes bioenergy with carbon capture and storage, geothermal, hydro, hydrogen-fired gas turbines, solar, and wind. [3]Slow Evolution scenario. [4]Continued Momentum scenario. [5]Sustainable Transformation scenario. [6]Includes bioenergy (with and without carbon capture, utilization, and storage) and oil. [7]Includes coal and gas with carbon capture, utilization, and storage; geothermal; hydrogen; and nuclear. [8]Includes thermal coal and biomass.
Source: Energy Solutions by McKinsey

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Renewables

Renewables and energy storage technologies represent cost-competitive decarbonization solutions because of continuing cost declines and increasingly mature and robust supply chains. Solar and wind power are expected to see very strong growth in the next two decades—nearly threefold by 2030 and more than ninefold by 2050, compared with 2023 levels. This means that the share of renewable energy in the power mix could more than double in the next 20 years.

However, because solar and wind energy are intermittent, firm power is essential to building a reliable system cost effectively. Clean, firm power sources (including geothermal power, hydropower, and nuclear power) are expected to grow at 3 percent per year through 2050 in the Continued Momentum scenario.

Nuclear energy has recently regained momentum, backed by governments and industry players. Since the UN Climate Change Conference in November 2024, 31 countries have pledged to triple nuclear capacity by 2050.[5] As an emission-free, firm energy source, nuclear power complements renewables, but the final storage of nuclear waste remains an unsolved problem. Small modular reactors could have several advantages, including cost, scalability, and simplicity of reactor design and construction, over full-scale plants.

Further growth in clean, dispatchable power could come from advanced geothermal energy and new hydropower (if environmental impact, such as methane emissions and threats to water supply or biodiversity can be addressed); most remaining pockets of opportunity for new hydropower are outside of OECD countries.

Battery energy storage systems (BESSs) and long duration energy storage will also increasingly support intermittent renewables. Capacity is expected to grow approximately 15-fold by 2050. BESS uptake will largely be driven by on-site integration with renewables projects, but stand-alone BESSs can do arbitrage, storing low-cost power to sell back at higher-price times; play ancillary service roles (for grid stability, for example); and provide capacity reserve against outages and demand peaks. Asian non-OECD members (China and India) and European OECD members are expected to have the most storage capacity by 2050, followed by the United States.

Natural gas will also likely provide firm, dispatchable power to complement renewables. It can be low emission if paired with CCUS (which we see happening mostly in Japan, the Middle East, and the United States) and by using hydrogen derived from gas and CCUS, as seen in China and Singapore.

Fossil fuels

The scenarios suggest that fossil fuels will remain part of the power mix for longer than we had previously anticipated. In the Continued Momentum scenario, natural gas demand for power generation is expected to continue to grow at 2 percent CAGR through 2050, resulting in a 50 percent increase between now and 2050, led by Russia and the United States. Both countries have an abundant gas supply that could compete on cost with low-carbon resources in the absence of decarbonization commitments and policy support for renewables. This cost-effective supply has increasingly led stakeholders to see gas as a destination fuel that will be a long-term part of the energy system.

Coal-based power generation is expected to decline over time, although it remains present in all our scenarios through 2050 (see sidebar "How could global coal demand evolve?"). In the near term, the scenarios suggest a decline in coal use led by the closure of aging coal power plants in Germany, Poland, and the United States and offset by growth in coal use in China, India, and Indonesia. Demand growth for coal-based power will likely be moderate, even in areas where capacity is increasing, because plant load factors are declining.

All three scenarios show eight gigatons of power sector emissions by 2030—down just two gigatons from 2023 levels—and three to eight gigatons of annual emissions in 2050. Total power generation in 2050 differs by 30 percent across scenarios.

[5] "Six more countries endorse the declaration to triple nuclear energy by 2050 at COP29," World Nuclear Association, November 14, 2024.

How could global coal demand evolve?

The three energy transition scenarios anticipate flat to declining coal demand over the next 25 years, driven by a set of underlying technoeconomic factors. While short-term and local uncertainties could affect this trajectory, current trends suggest robust demand for coal in the near term.

“Coal” refers to both thermal and metallurgical coal, distinguished by their respective end uses. *Thermal coal* is predominantly used for power generation and industrial heat generation, and demand for it is expected to decline over the next 20-plus years for both uses. Power use will decline in favor of low-cost renewables and clean, firm solutions. Industrial use will decline in favor of electricity for low-temperature applications and of gas for high-temperature applications.

Only a handful of regions represent a majority of the thermal-coal market: China, Southeast Asia, India, and South Africa cover over 80 percent of global thermal-coal demand. Renewables are growing faster than coal is in both China and India, but the underlying energy demand growth from GDP and population growth in these regions could cause coal demand to continue to grow. Indonesia relies on coal for about two-thirds of its power generation and is also a top five coal-exporting country. Although much smaller in absolute scale, other Southeast Asian countries (such as the Philippines, Thailand, and Vietnam) have shown annual increases in coal consumption. South Africa and other African countries continue to invest in new coal mines to meet global demand.

The growing focus on energy affordability and supply security creates uncertainty in short-term thermal-coal demand. It may remain somewhat resilient in regions like Southeast Asia because of abundant domestic resources, coal’s role in the local economy, integration into existing infrastructure, and stakeholder support. In these markets, thermal coal could help meet rising energy demand.

Metallurgical coal, on the other hand, is mainly used in blast furnace steelmaking. Demand for it is expected to stay steady or decline slightly as global steel consumption continues to increase. Blast furnace steel production will retain a stable share relative to electric-arc furnaces—especially in Asia, where blast furnace economics are favorable. The seaborne-metallurgical-coal market is expected to grow approximately 10 percent in the coming decade, mostly to supply Southeast Asian blast furnaces.

Coal is a heavily polluting source of fuel and more expensive than renewables in many markets. Alternative energy sources will likely outcompete coal eventually, but there may be near-term coal demand growth. The overall trajectory is that technological advances in energy storage, grid sophistication, and renewables and evolving energy markets portend a future with more clean renewables and a continued retreat of coal from its dominance over the past two centuries. However, it is possible that some of the unforeseen factors discussed here will continue to support coal’s persistence in the next decade.

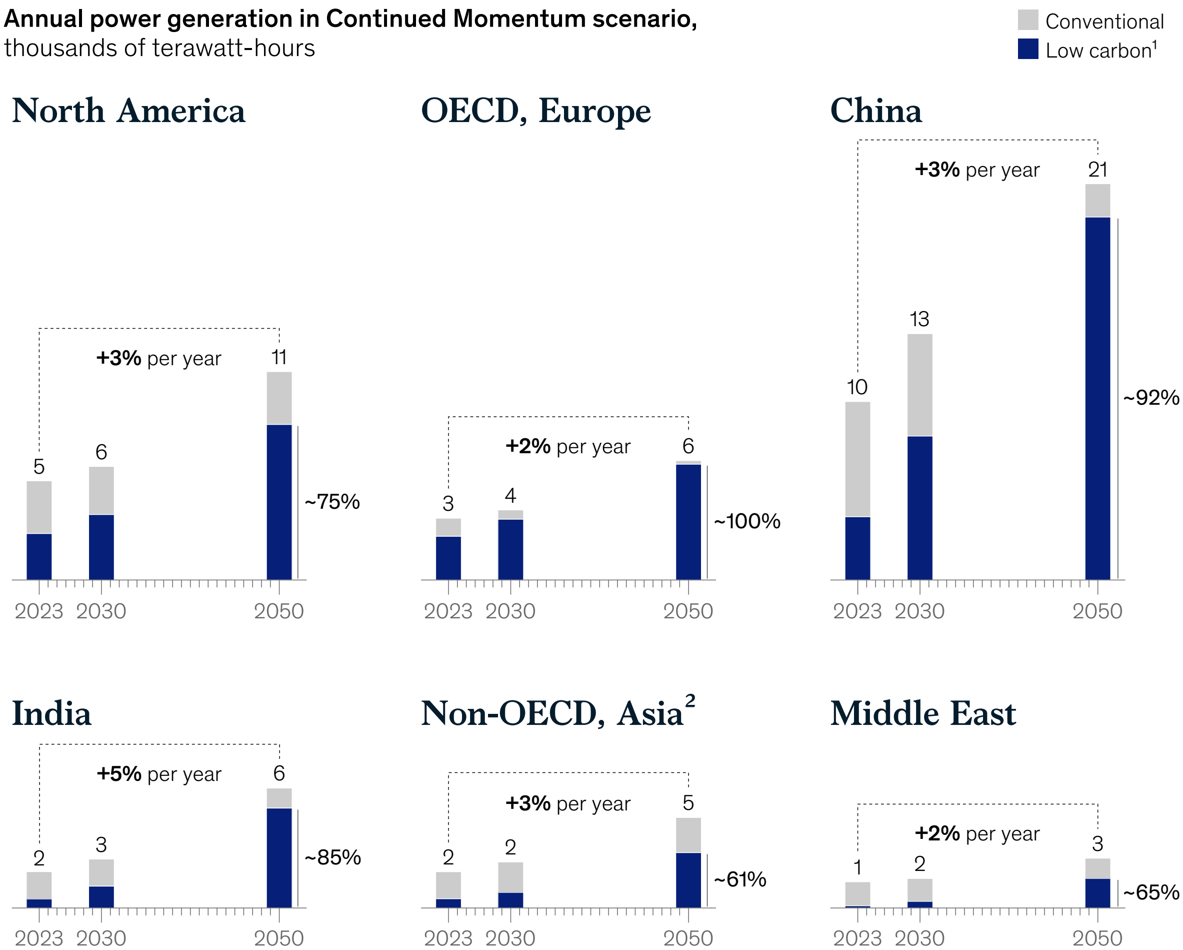
Low-carbon power

Low-carbon power will grow steadily through 2050 and beyond in most regions, with more than 65 percent of power coming from low-carbon sources (Exhibit 17). In India, for instance, low-carbon generation could pick up rapidly after 2030, resulting in 85 percent low-carbon power by 2050, a higher share than in North America. Meanwhile, China is projected to have more than 90 percent low-carbon power by 2050. Both China and India are expected to transition from coal-based generation to a system with more diverse sources, including renewable energy, nuclear power, and hydropower. Abundant land and resources, as well as low-cost labor and equipment, could make the transition more cost effective in these two countries than in other regions.

Exhibit 17

By 2050, low-carbon generation could account for more than 65 percent of total annual power generation in most regions.

Annual power generation in Continued Momentum scenario,
thousands of terawatt-hours



Note: Nonexhaustive.
[1]Biomass, carbon capture and storage, geothermal, hydro, nuclear, solar, and wind.
[2]Includes Central Asia and Association of Southeast Asian Nations; excludes China and India.

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Non-OECD Asian countries have fewer resources and later decarbonization targets than China and India do, which may result in a greater share of gas by 2050 than in other regions. The Middle East and North America have abundant, low-cost gas, which will be a significant factor in efforts to reach net zero by 2050. Even as low-carbon generation increases over time, some gas will likely stay in the system in these regions (see sidebar "What's the cost of complete decarbonization of the power sector?").

What's the cost of complete decarbonization of the power sector?

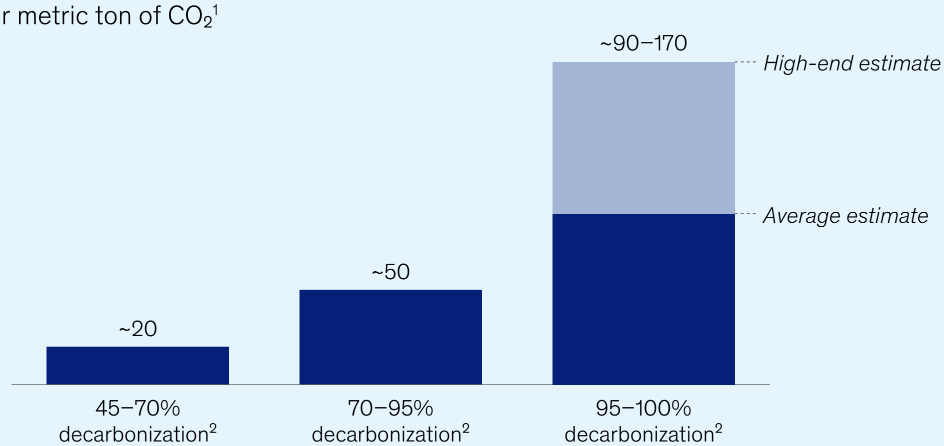
The energy transition is a physical transformation and no easy task. So far, the low-carbon technologies that have been deployed have mostly been in comparatively easy use cases. However, as emission reduction targets rise, the costs of abatement rise, too (exhibit). The final 5 percent decarbonization of the power sector could cost $90 to $170 per metric ton of CO_2, compared with $20 per metric ton for 45 to 70 percent decarbonization. At lower reduction targets, lower-cost renewables can replace high-carbon sources, such as coal. But the last share of the sector requires higher-cost technologies, such as carbon capture, utilization, and storage with biomethane or other clean-fuel generators; direct air capture; and long-duration energy storage.

Therefore, while reaching total decarbonization in power generation is possible, more impact might be had by taking a system-wide view: Investment dollars for decarbonizing the energy system could potentially go further if, rather than pursuing the final few percentage in the power sector, they were instead applied to decarbonization in other sectors. We underscore this point to illustrate trade-offs across affordability and emission reduction, as the world pursues effort to decarbonize.

Exhibit

The average cost of power-generation-emission abatement materially increases with 95 to 100 percent decarbonization.

Average costs of global power-generation-emission abatement in Sustainable Transformation scenario, $ per metric ton of CO_2[1]



[1]Estimated as cumulative capital and operating expenditures for power divided by cumulative abated emissions in 2024–50.
[2]Percentage of power-generation-emission reduction by 2050 compared with that of 2023.

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Low-carbon technology investments

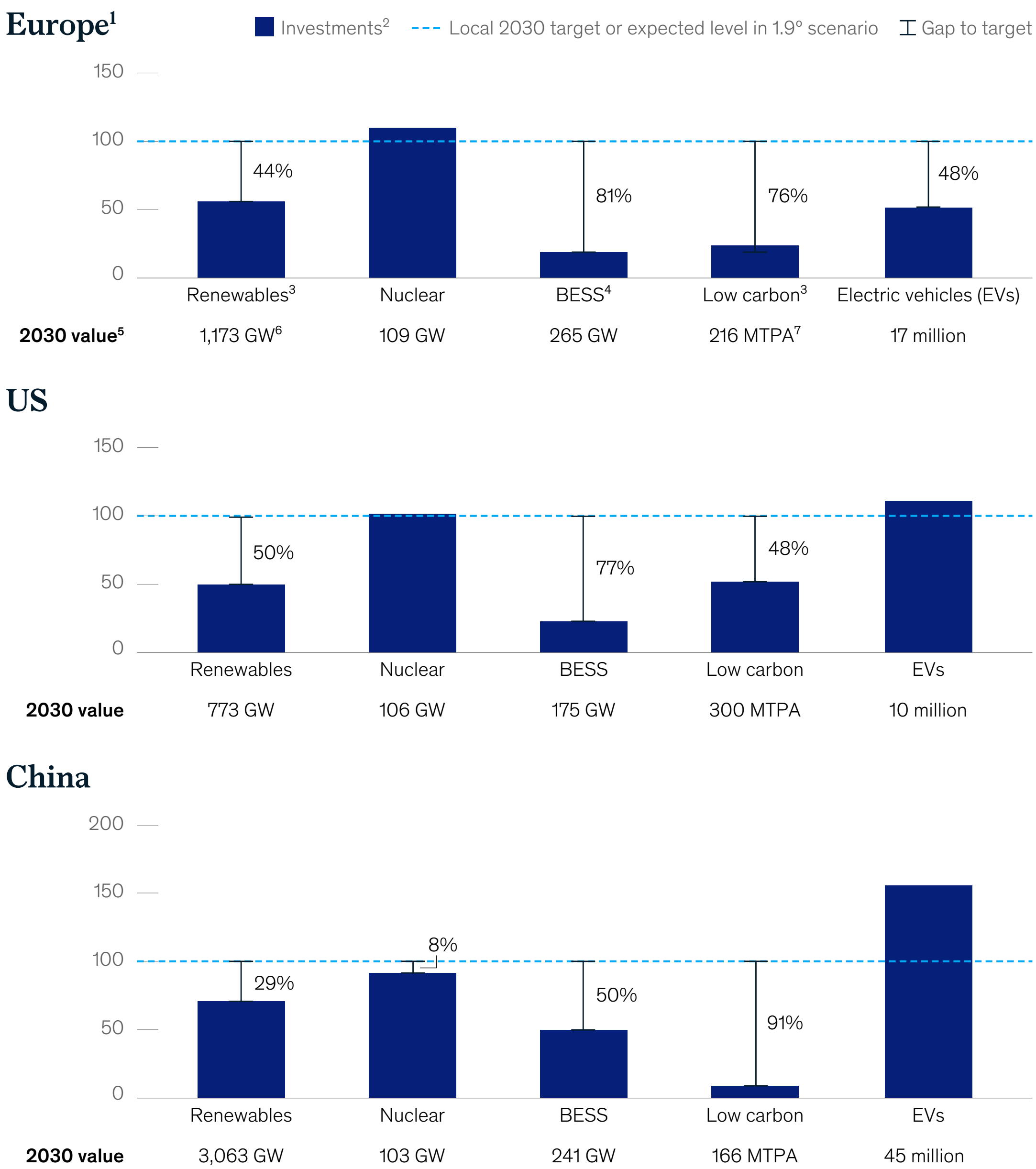
Investments in low-carbon technologies are unlikely to meet 2030 targets (Exhibit 18). In 2024, we compared the actual progress in building infrastructure with decarbonization targets in 2030 for eight low-carbon technologies in Europe and the United States.[6] This year, we updated the analysis and expanded it to include BESS and nuclear energy, as well as a regional look at China.

[6] "European Union" in this context includes the 27 EU countries plus Norway, Switzerland, and the United Kingdom. Targets came directly from official targets set by the respective governments. If those weren't explicitly available, we used implied targets based on the required installed capacity level in the most progressive scenario. "The energy transition: Where are we, really?," McKinsey, August 27, 2024.

Exhibit 18

Investment in low-carbon technologies has been considerable, but key 2030 targets still might not be met across crucial regions.

Technology deployment pipelines vs targets, % of 2030 target (normalized)



[1]EU-27, Norway, Switzerland, and UK. [2]Investments include those that are operational in 2025, under construction, or have final investment decision (FID) taken. [3]Includes solar and wind for renewables, hydrogen and biofuels for low carbon. [4]Battery energy storage systems. [5]Local 2030 target or expected level in 1.9° scenario if target is exceeded. [6]Gigawatts. [7]Million tons of CO_2 abated per annum.

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Our analysis again shows noteworthy progress in the expansion of low-carbon technologies, with many announced projects filling development pipelines. However, only a few areas have enough capacity underway (built, under construction, or with FID taken) to meet 2030 targets: nuclear power in the European Union and United States and EVs in China. Notably, for many other technologies and in most regions, capacity is planned or announced, but FIDs have not yet been made. Without FIDs, these projects remain uncertain and are more likely than others to be delayed.

Although significant progress has been made in the last year, renewable power investments still fall short of 2030 targets in the European Union, United States, and China. Within this category, solar photovoltaic is expected to meet 2030 targets even though the capacity is not yet underway because of its short installation cycle and continued cost declines. Wind energy, however, has seen large cost increases, leading to many project cancellations, especially in offshore wind. Similarly, despite significant progress in deploying BESS in many countries, the BESS pipeline lags regional targets. This is a very nascent industry within the power sector, so completing the necessary buildout in the next five years could be challenging because of supply chain constraints such as raw material shortages.

Looking ahead

The world stands at a pivotal moment in the energy transition. Unless both reliability and affordability are assured, the transition will not happen. With reliability being effectively nonnegotiable to system operators and regulators, affordability will be the decisive factor.

The energy transition is a massive and demanding physical transformation that must extend to all corners of the globe. Compounding the challenge is a dual imperative: Even as the world decarbonizes, energy systems must also expand to serve billions of people who still do not have adequate access. At the same time, they must meet increasing demand from data centers, industrial electrification, and the rise of fundamental energy demand in the largest population centers of the world.

While momentum has been strong and the progress is considerable, it is clear that the world is not on track to reach net zero by 2050. In most areas, deployment of low-emission technologies is only at about 10 percent of the level required by 2050—and that has been in comparatively easy use cases. Even so, there's still considerable opportunity to course correct. Accelerating low-carbon technology build-out will be essential everywhere, but the path forward will look different across regions and industries.

There is no one-size-fits-all or silver bullet solution to decarbonization. Countries and regions can determine their own unique pathways as local conditions shape the energy mix. For example, solar power will have a relatively large role in the Mediterranean and Middle East, as will hydropower in Nordic countries and biofuels in Brazil—patterns driven by natural resources, regulatory environments, and the substantial spread in energy prices across countries and regions. Solutions will likely revolve around optimizing the total system cost of energy, not only the LCOE.

These regional pathways will likely be made up of a mix of emerging technologies and "triple win" technologies—those that provide affordable, low-carbon, and secure energy simultaneously. An example of a triple-win solution is an approach with matched generation and demand, such as captive nuclear plants directly wired to large "demand sinks" (such as data centers).

To get on track, countries can focus on removing system bottlenecks, redesigning policy, and promoting stable long-term investments, such as public investment in energy-transition-enabling infrastructure. Above all, they must focus on an economically pragmatic transition in which the fundamentals work and the discussion focuses on the right path to net zero.

Ten years on from the inaugural *Global Energy Perspective*, our view of the energy transition has matured. The transition is no less urgent, but the pathways to closing the gap to Paris Agreement targets are now more complex. They must be rooted in the economic and geopolitical realities we face.

Over the past decade, greenhouse gas emissions have continued to rise. However, the world has made steady progress toward decarbonization, regardless of the geopolitical or macroeconomic forces of the moment—a trend that will likely persist. Yet every year also brings unforeseen developments, whether breakthroughs in energy technology that allow accelerated scale-up of solar and wind power or innovations like AI that drive rapid growth in power demand. The journey toward decarbonization remains long, but our advice to energy-sector leaders is clear: Although you cannot predict the future, you can prepare for it. Building resilience and agility will be crucial in turning challenges into opportunities.

About this report

This year's *Global Energy Perspective* presents a detailed analysis of 77 demand segments and 76 fuels across the world.

We started by modeling economic activity within sectors—for example, amounts of steel produced, heat used in households, and vehicle miles traveled per mode of transport. We combined this with energy intensity and efficiency levels and projected technology switches based on economics. This allowed us to generate a bottom-up energy demand perspective by region and sector (transportation, industry, and buildings) projected to 2050. Then, we developed a view of the energy supply mix (for example, power, oil and gas, and nuclear) required in each region based on a cost-optimal allocation of resources. Finally, we forecast system costs, which in turn served as a sense check for our demand modeling.

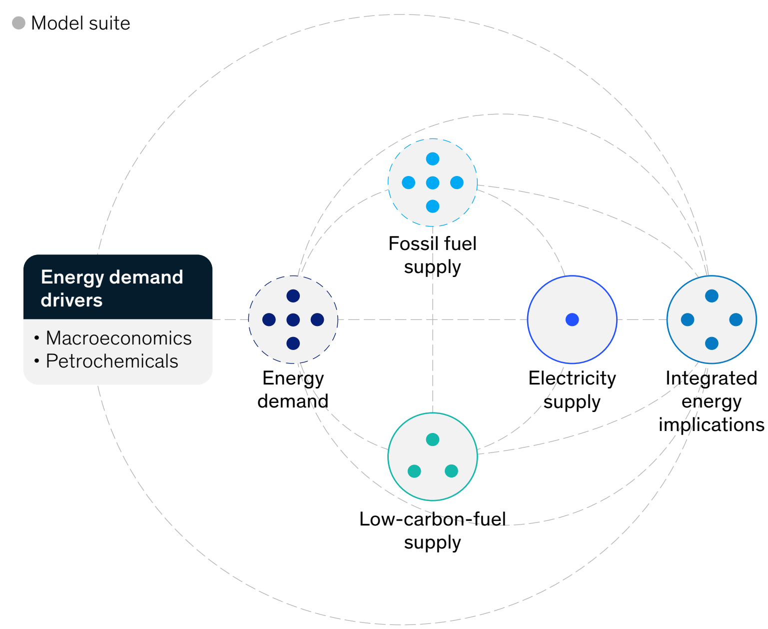
In such a complex, multivariable exercise, it is difficult to isolate the impact of any single driver. Our approach addresses this complexity by combining detailed models of individual systems with insights from industry experts (exhibit).

Exhibit

McKinsey's *Global Energy Perspective 2025* is based on suites of granular, fully integrated models that span the global energy landscape.

Global Energy Perspective **intelligence network**

Fully integrated supply-and-demand perspective incorporates energy demand drivers with market intelligence models for energy and materials



Model suites[1]

Energy demand
- Chemicals
- Industry and buildings
- Maritime and aviation
- Power
- Road transport

Fossil fuel supply
- Gas and liquefied natural gas
- Midstream and services
- North America oil and gas
- Oil and liquid
- Refining activity and margins

Electricity supply
- Power generation and pricing

Low-carbon-fuel supply
- CCUS[2]
- Hydrogen
- Sustainable fuels

Integrated energy implications
- Energy asset decarbonization
- Green-power-procurement optimization
- Industrial electrification
- Metal supply and demand

[1]Nonexhaustive; only major model suites that link to *Global Energy Perspective* are shown.
[2]Carbon capture, utilization, and storage.
Source: McKinsey analysis; McKinsey Global Institute analysis

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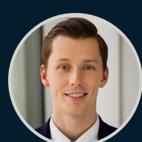
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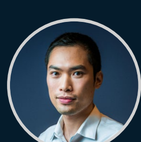
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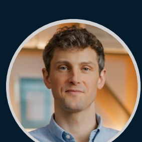
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