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Global Energy and Materials Outlook 2026

Modeling growth, build rates, and resource constraints helps shed light on the opportunities and risks ahead.

By Alasdair Robbie, Grant Dougans, Brian Murphy, Dayle Nel, Kate Ramsey, Peter Meijer, and James Nixon

At a Glance

- Three scenarios for 2040, grounded in economic, physical, and engineering realities, help executives identify risks, opportunities, and no-regrets moves.
- Bain's Intersect℠ model shows electricity demand and renewables rise while fossil fuels persist. The world warms 2.1 degrees Celsius to 2.9 degrees Celsius by 2100.
- Supply of gas/liquefied natural gas, nuclear, minerals, and sustainable fuels will depend on region, policy, and cost, with big swings possible.
- Understanding local markets, planning for adaptability, and building resilience will help companies find opportunities and navigate with conviction in an uncertain future.

The fundamentals endure

The past five years have tested assumptions about global energy and materials markets. Supply chain shocks, a shifting ESG movement, and two wars with significant impact on energy flows have heightened uncertainty for executives: How fast are markets growing, and how is policy shaping them? Where are demand and margin pools moving? What supply bottlenecks will shape new developments? Where to invest, and when?

That uncertainty only reaffirms Bain's long-standing view of the fundamentals: Energy demand rises with GDP, population growth, and industrial activity. The system's ability to meet demand is constrained by the physical and engineering realities of what can be built, how fast it can be built, and the availability of materials, capital, and energy resources. Policymakers aim to improve standards of living, but lowest cost remains the deciding factor, making sustained investment more difficult.

Those fundamentals mean efforts to solve the dual challenge—the world needs more energy even as it transitions to a lower carbon footprint—will be uneven and, in some scenarios, messy. Across industries, the best decisions about energy transition pathways and value creation will be based on plausible outcomes that are grounded in market data, physical realities, technology development, and trade dynamics.

2040: Three futures for the transition

We maintain three standing global scenarios through 2040, modeled and refreshed regularly using Intersect℠, Bain's proprietary economic modeling capability. Each scenario describes a realistic and distinct path from today, excluding the still-unfolding effects from the war in Iran.

Perpetuate present dynamics

Geopolitics harden and nations double down on domestic energy security. Established energy and industrial policies persist with limited ambition toward low-carbon systems.

Divergent pathways

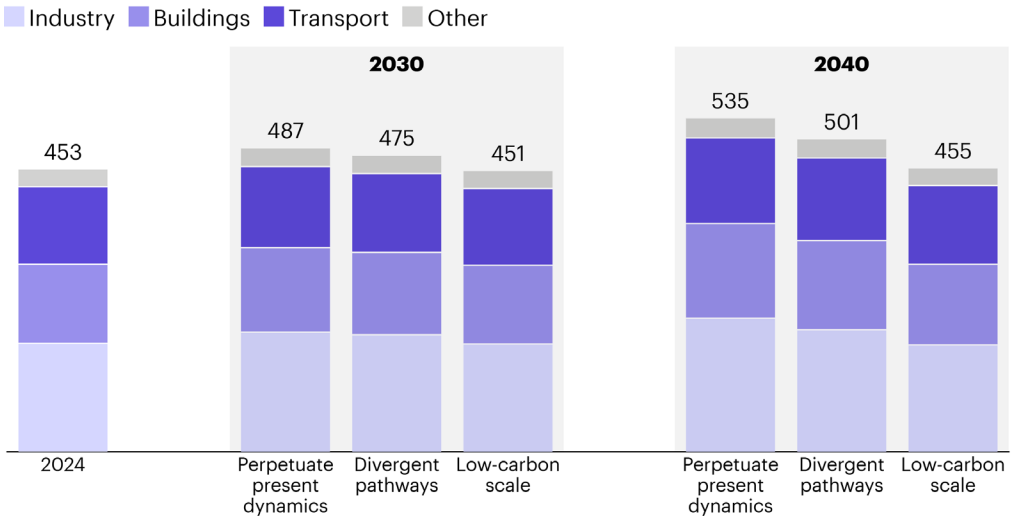
Energy and industrial policies diverge across regions, with uneven effects on trade and the scaling of low-carbon technologies.

Low-carbon scale

Greater global alignment on trade, standards, and investment, supported by additional cost reductions for low-carbon technologies.

Total energy demand in 2040 and the most pragmatic supply mix that can deliver it offer a first read on each of these three futures. Beyond that, a closer look shows what remains consistent across scenarios and where the paths diverge, sometimes sharply, shaping where opportunity and risk will concentrate.

Global final consumption for 2024–2040, in exajoules



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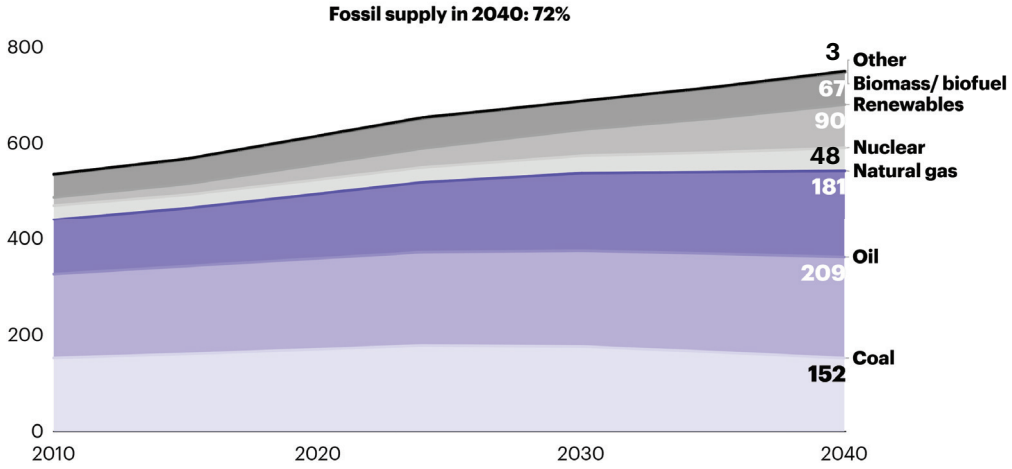
Across all three scenarios, industry and buildings account for more than 60% of the total demand through 2040. Primary energy supply continues to grow to meet this demand under the first two scenarios, but it stalls in the low-carbon scale scenario.

Perpetuate present dynamics

Global primary energy supply for 2010–2040, in exajoules



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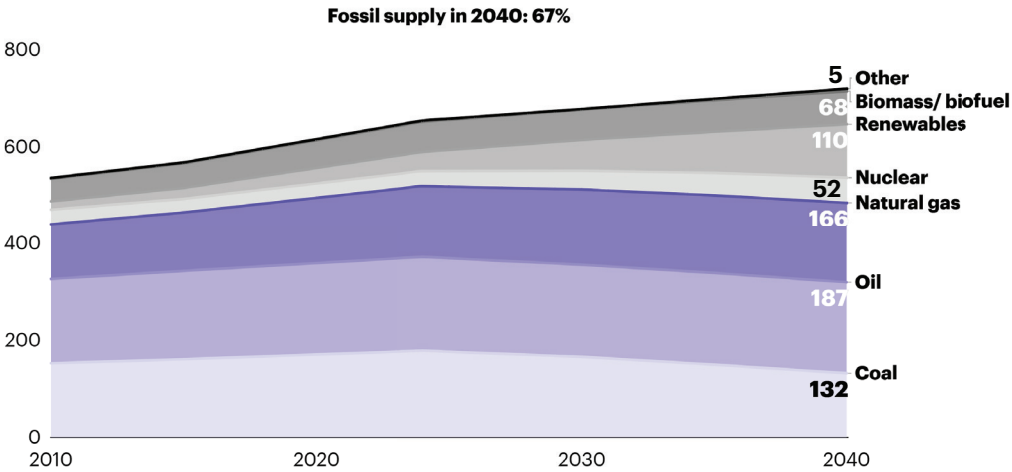
Perpetuate present dynamics: Fossil supply remains 72% of global energy supply by 2040.

Divergent pathways

Global primary energy supply for 2010–2040, in exajoules



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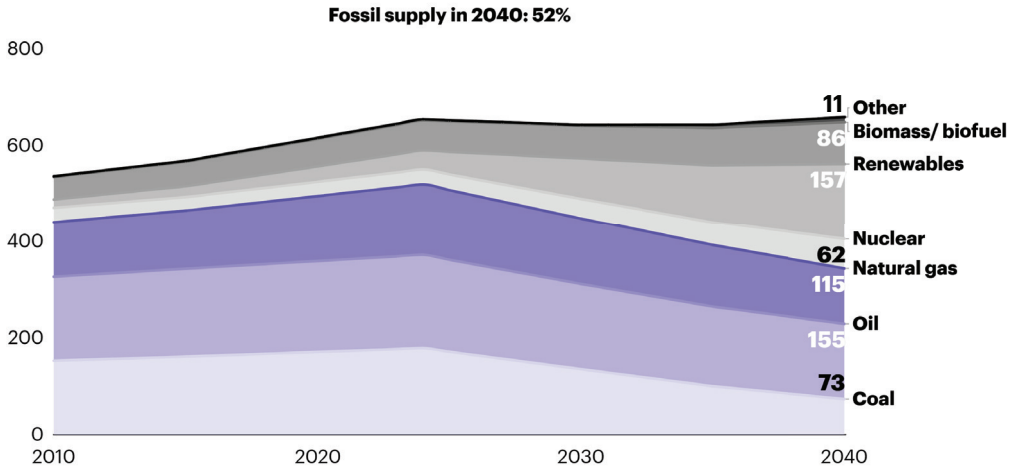
Divergent pathways: Fossil supply declines to 67% by 2040.

Low-carbon scale

Global primary energy supply for 2010–2040, in exajoules



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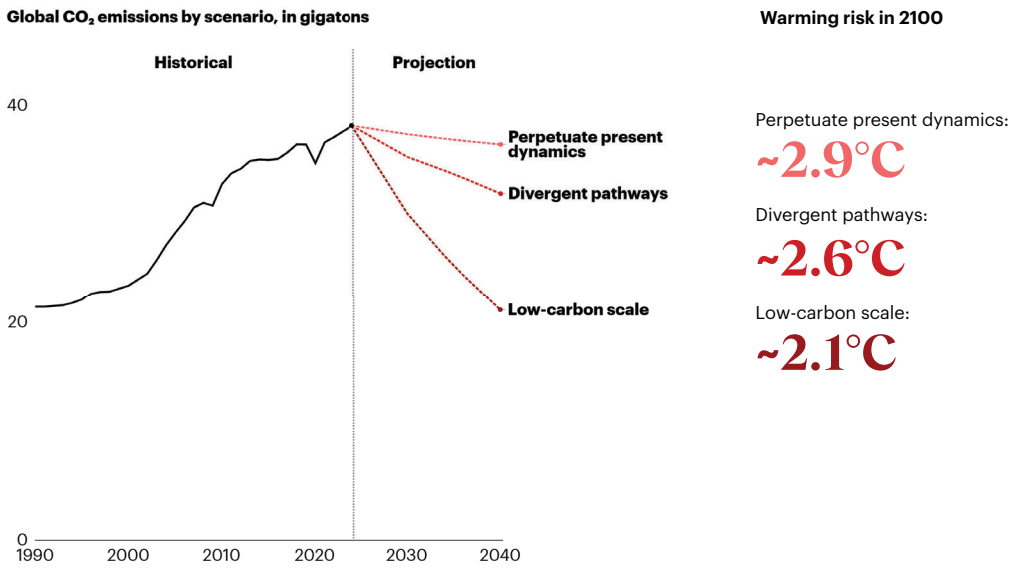
Low-carbon scale: Fossil supply falls to 52% by 2040.

In every case, fossil supply remains a significant share of total supply, growing under the perpetuate present dynamics and divergent pathways scenarios. Its share of total supply declines sharply only in the low-carbon scale scenario as a result of greater electrification and higher levels of efficiency.

Areas of conviction

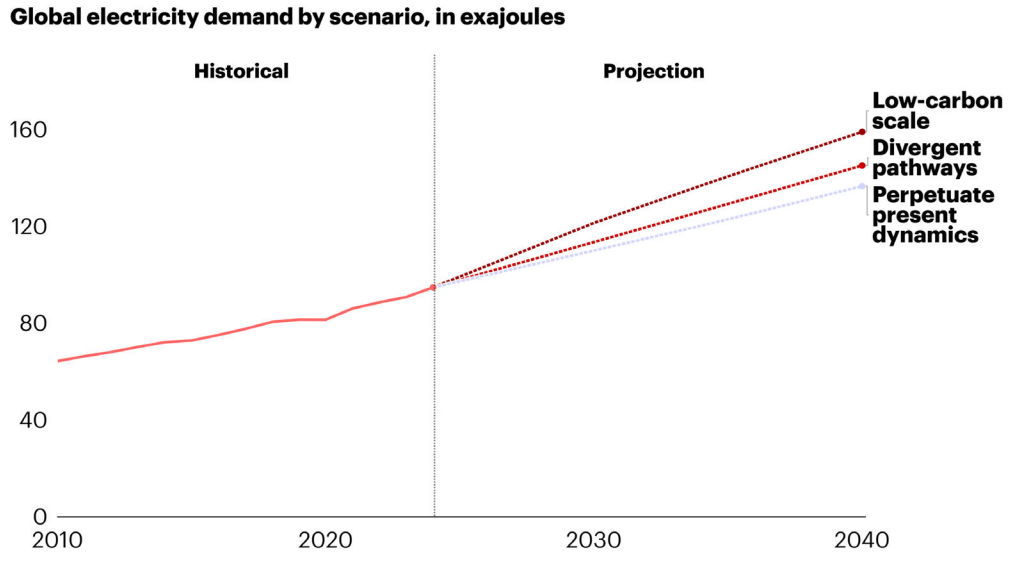
Our analysis finds that certain outcomes hold in every scenario: continued warming, surging electricity demand, and resilient fossil fuel demand even as renewables gain share. For executives, these consistencies point to no-regrets moves that should pay off regardless of which version of the future materializes.

World warms 2.1 degrees Celsius to 2.9 degrees Celsius by 2100. Even in the most coordinated decarbonization scenario, climate impacts are severe and demand that companies allocate capital to resilience strategies. The economic and physical consequences in every case are serious: higher frequency of extreme heat, peak load stress on transmission and distribution systems during those periods, increased water stress, infrastructure exposure, and damage to human health and quality of life.



Notes: Carbon dioxide (CO2) emissions include emissions from fossil fuel combustion, industrial processes, and flaring; warming estimate is a directional indication of the global rise in temperature by 2100 vs. preindustrial levels
Sources: Projection data based on Bain Intersect scenarios, IPCC Sixth Assessment Report; historical data based on IEA data from the IEA (2025) World Energy Outlook and World Energy Balances, https://www.iea.org/data-and-statistics, all rights reserved, as modified by Bain & Company

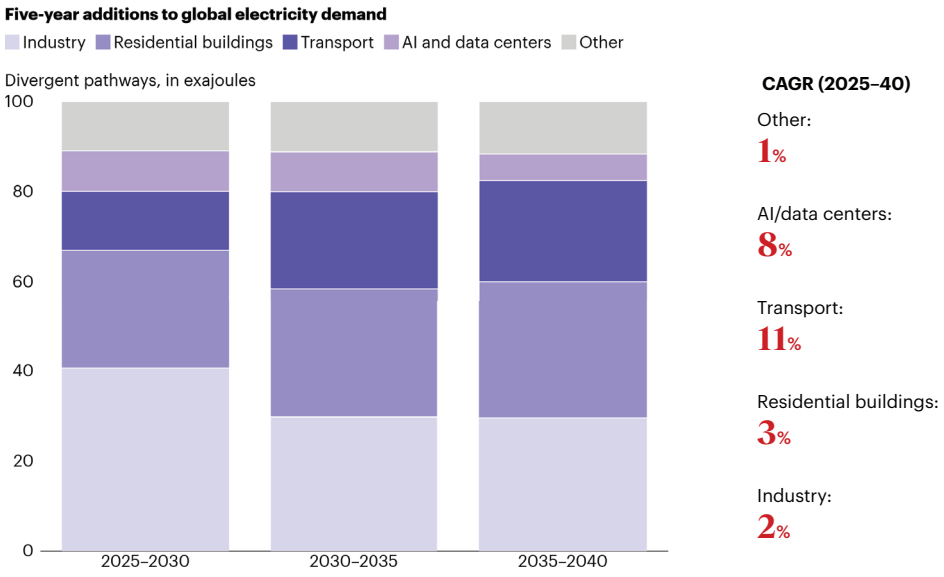
Electricity demand surges. Under all three scenarios, electricity demand rises 40% to 70% by 2040, and electricity becomes a larger share of final energy consumption. System efficiency improves, but total electricity demand still rises substantially with population and GDP growth.



Note: Electricity demand refers to total final consumption
Sources: Projection data based on Bain Intersect scenarios; historical data based on IEA data from the IEA (2025) World Energy Outlook and World Energy Balances, https://www.iea.org/data-and-statistics, all rights reserved, as modified by Bain & Company

AI and data centers are attracting attention today as a rapidly growing source of electricity demand, but they represent only a small portion of total demand growth over this period. Transport electrification also grows quickly, from less than 3% of current global demand today to 7% to 9% by 2040, depending on the scenario.

But the largest cumulative increase in electricity consumption across sectors won't come from servers or cars; it will come from homes. Air-conditioning load in residential buildings will rise sharply as cooling expands in developing countries, while heat pumps replace gas heating. Residential buildings—along with steady, similar increases in industrial demand—account for the largest share of overall growth.



Note: Electricity demand refers to total final consumption
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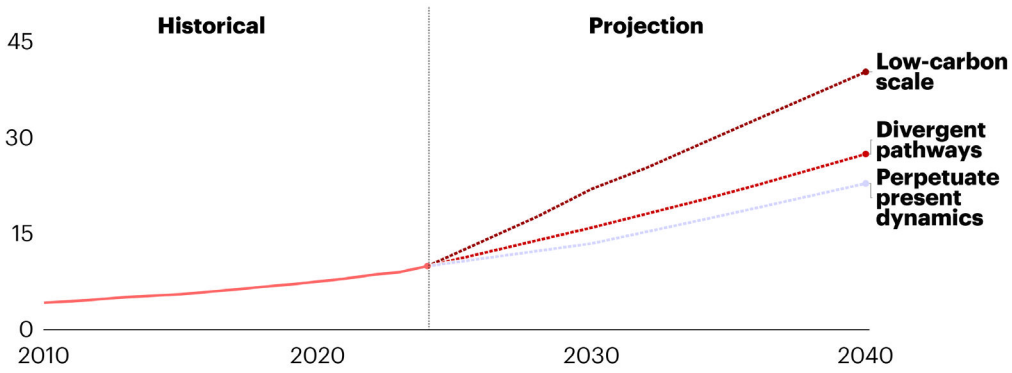
Renewables continue to scale. Across all three scenarios, solar and wind increase their share of the generation mix by three times to seven times, growing much faster than all other sources and becoming the lowest-cost option in many markets. In all three scenarios, solar makes up most of the increase in renewable electricity generation.

Renewables already are likely to overtake coal by the end of this year as the largest source of electricity generation, and in the divergent pathways scenario, renewable generation will make up more than 50% of all power by 2036.

The cost of renewables and firming technologies such as battery storage will continue to decline. Where renewables are constrained from scaling further or faster, the primary barriers are not technological viability but interconnection delays, dispatchability requirements, transformer and transmission lead times, mineral supply chains, capital mobilization, and shortages of skilled labor.

Global renewable generation by scenario, in thousands of terawatt-hours



Note: Renewable generation includes solar, wind, hydropower, bioenergy, and geothermal energy
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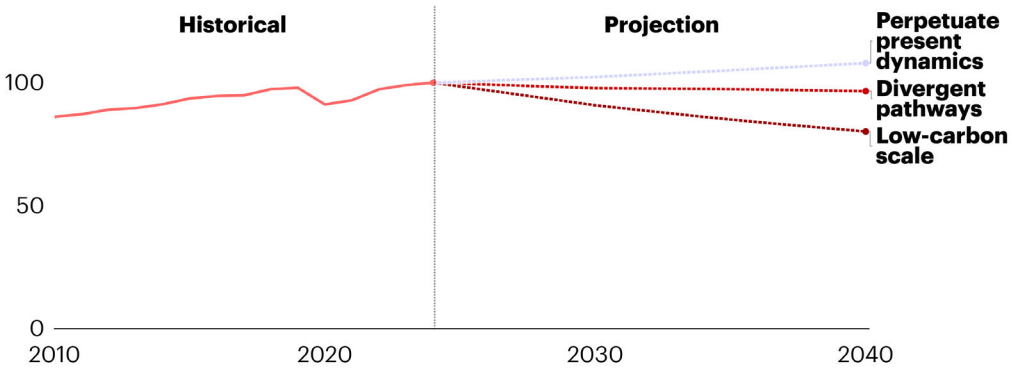
Oil demand holds. None of our scenarios suggest an end to oil demand as we know it today. It grows to 108 million barrels per day (Mb/d) by 2040 in our perpetuate present dynamics scenario and plateaus at 97 Mb/d in divergent pathways. Only in our low-carbon scale scenario does it decline to 80 Mb/d. As electric vehicles flatten or slow road fuel demand, the long-term trajectory of oil demand will depend on petrochemicals and heavy transport: petrochemical feedstocks (16 Mb/d to 19 Mb/d), aviation (8 Mb/d to 10 Mb/d), shipping (2 Mb/d to 6 Mb/d), and freight.

Global oil demand by scenario, in million barrels per day



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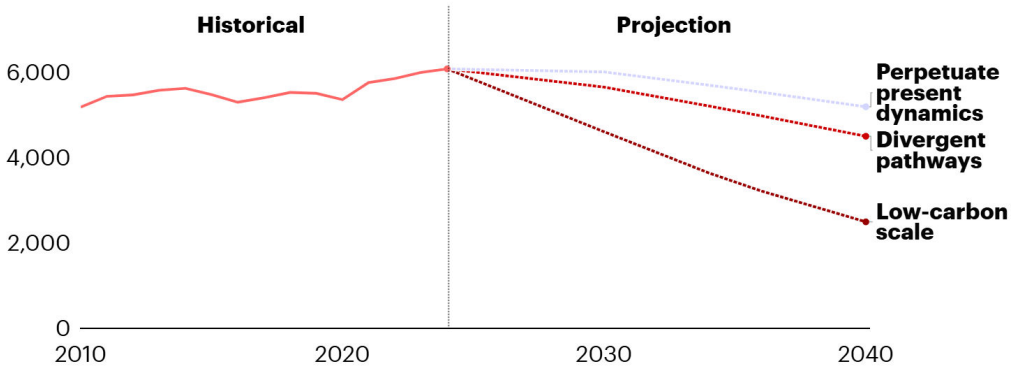
Coal declines. As cheaper alternatives displace aging coal power facilities, thermal coal demand declines across all three of our scenarios. It continues to play a role in key regions such as China and India. Demand for metallurgical coal for industrial iron and steel production persists into the longer term. China, currently the world's largest coal consumer, leads the reduction in coal use as it works to improve air quality and meet emissions goals. It will account for more than 60% of the global decline in coal use by 2040.

Global coal demand by scenario, in million tons of coal equivalent



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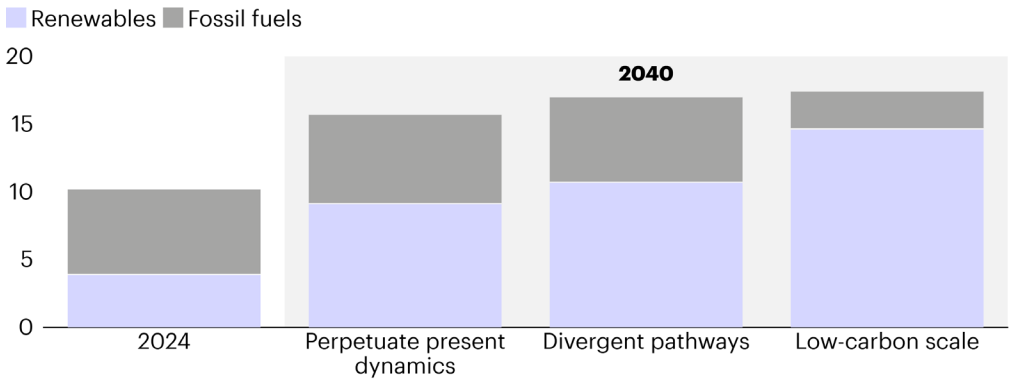
China sets the stage. The world's largest emitter of greenhouse gases is also its single largest decarbonization engine, propelled by energy security, industrial strategy, and execution speed as much as by climate ambition. China leads in lowest-cost production of renewables, and although its coal emissions will remain significant, it is likely to account for more than 30% of global solar and wind generation by 2040.

China power generation, in thousands of terawatt-hours



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Areas of uncertainty

Our model also reveals inconsistencies, depending on how each scenario balances policy, costs, macroeconomic assumptions, and trade dynamics. For strategic decision makers, these uncertainties reveal where the biggest opportunities (or risks) may be concentrated.

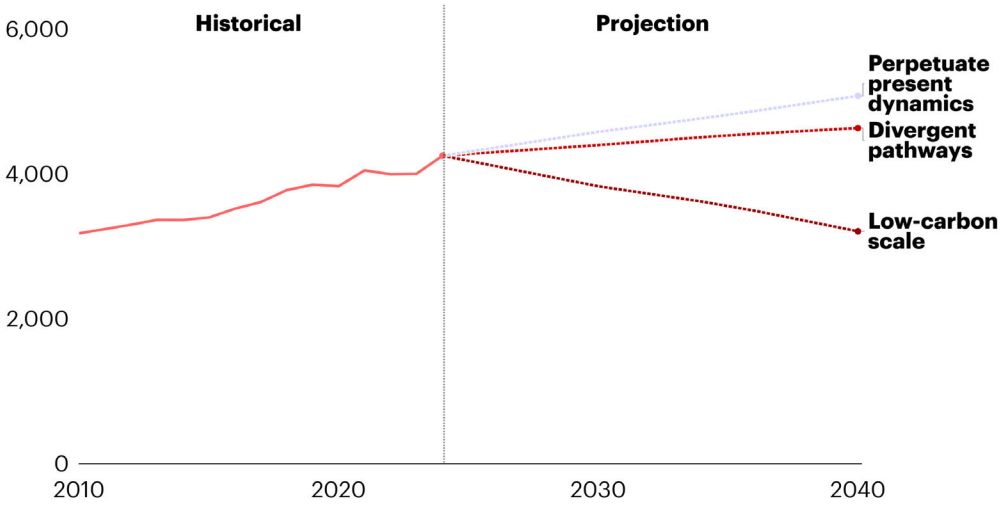
Nuclear maintains or grows share. Nuclear capacity grows across all of our scenarios and competes with other grid firming technologies (batteries, pumped hydro storage, gas). For most countries, existing nuclear is the least expensive source of power. New nuclear construction, by contrast, is among the most expensive, yet it still compares favorably with more variable renewables when their system expenses are factored into total electricity cost. In a world with growing intermittent renewables, nuclear offers the grid a dispatchable, low-carbon baseload.

Here again, the fundamentals of regional economics, policy prioritization, technology development, and lowest cost will determine how much is built. If small and advanced modular reactors become less expensive, nuclear could take share from other firm power sources. More than 30 countries have pledged to triple nuclear capacity by 2050, and global nuclear investment is forecast to reach $2.2 trillion over the next 25 years, according to Morgan Stanley Research.

If small and advanced modular reactors become less expensive, nuclear could take share from other firm power sources.

Natural gas is not a guaranteed winner. Gas sits at the heart of several trade-offs: as a flexible power source, an industrial fuel and feedstock, and, for countries dependent on liquefied natural gas (LNG), a growing security exposure. That makes gas highly sensitive to macro conditions, national policy choices, and the cost of alternatives such as storage-enabled renewables or nuclear. In our modeling, gas demand swings by roughly 20% in both directions across scenarios. Gas demand grows in perpetuate present dynamics and divergent pathways, in which grids rely more on gas for flexibility as renewables plus storage scale slowly. In low-carbon scale, it tapers sooner as clean firm options expand and policy tightens. Stricter policy also increases the risk of stranded or underutilized assets by widening the spread between lower-cost, lower-emissions gas and higher-cost supply.

Global primary natural gas by scenario, in billion cubic meters



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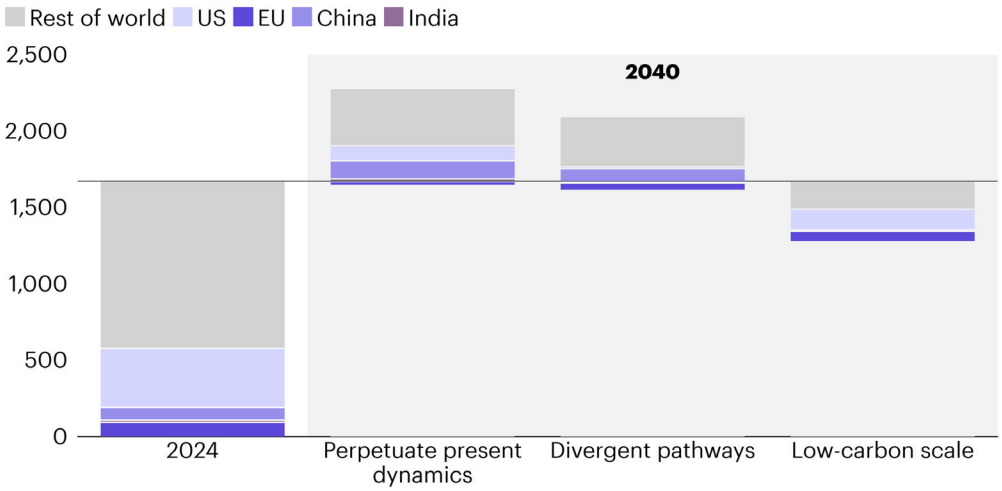
Natural gas final consumption in power sector net change to 2040 by scenario, in billion cubic meters



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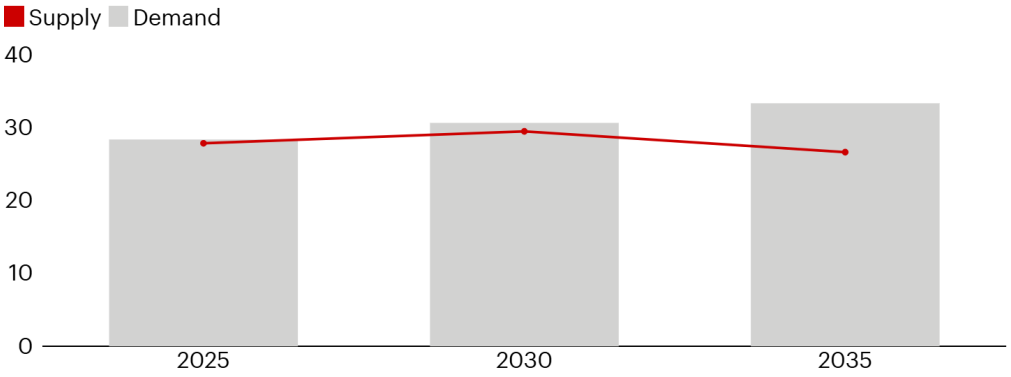
Critical minerals create supply chain risk. Clean energy, electric vehicles, and defense systems all depend on many of the same critical minerals. While copper, iron, lithium, manganese, cobalt, graphite, and aluminum are plentiful, they are highly concentrated geographically. As a result, refining, processing, and manufacturing become choke points, and supply chains become national security, trade, and industrial policy flash points, especially in the perpetuate present dynamics or divergent pathways scenarios. Under our divergent pathways scenario in particular, gaps between supply and demand emerge in the coming decade.

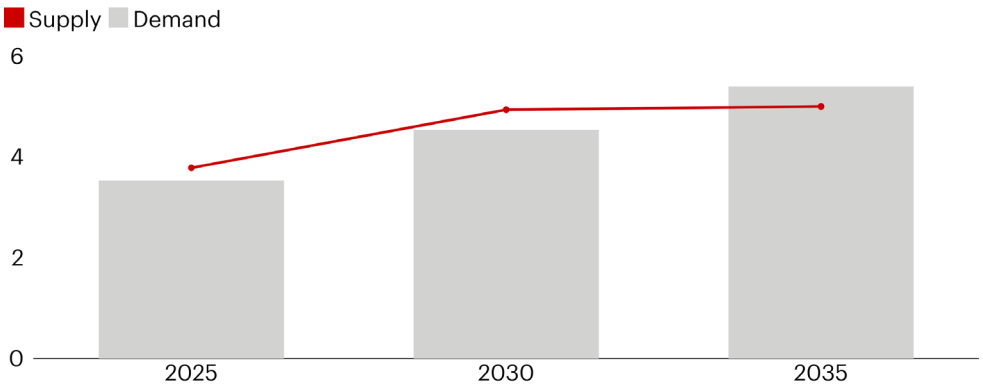
Global copper, divergent pathways, in metric tons



Sources: Projection data based on Bain Intersect scenarios, Bain Mining Practice; historical data based on IEA data from the IEA (2025) World Energy Outlook and World Energy Balances, https://www.iea.org/data-and-statistics, all rights reserved, as modified by Bain & Company

Global copper demand grows steadily, but supply could fall after 2030, creating risk of gaps.

Global nickel, divergent pathways, in metric tons



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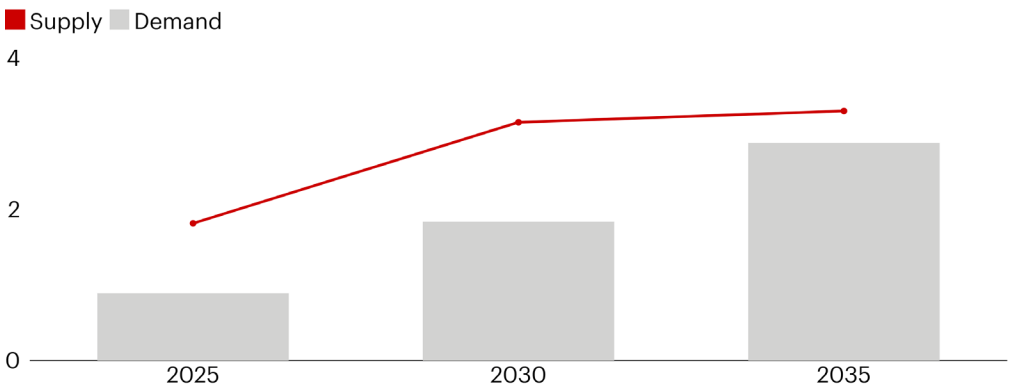
Short-term growth in nickel limits supply risk until battery demand accelerates after 2030.

Global lithium, divergent pathways, in metric tons



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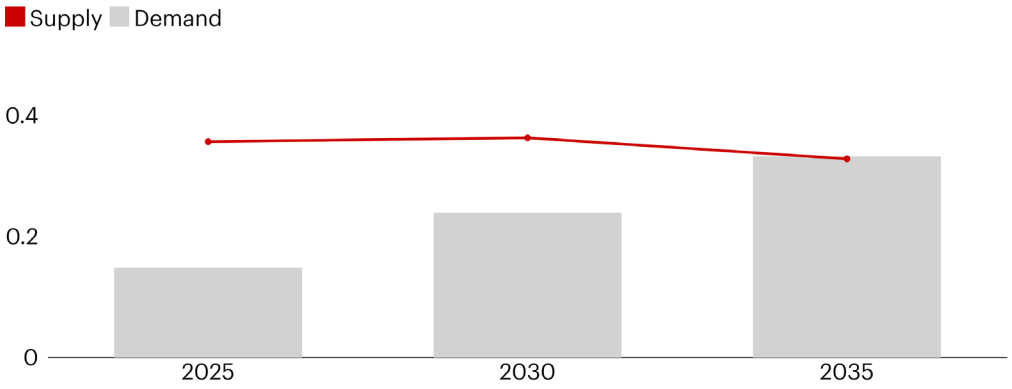
With lithium, rapid supply growth minimizes risk but is likely to plateau, while electric vehicles create a long-term demand shift.

Global cobalt, divergent pathways, in metric tons



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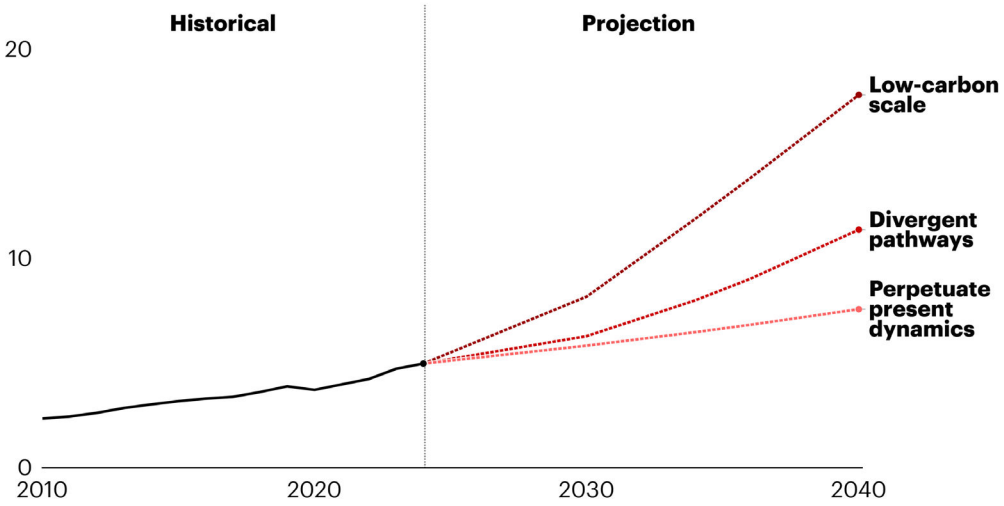
Flat growth and strong demand in cobalt create supply risks that may be offset as geopolitical uncertainty and evolving battery chemistry limit use.

Sustainable fuels will prevail in some regions. E-fuel targets in the EU and short-term biofuel mandates in India are providing tailwinds for sustainable fuel adoption. Yet e-fuels and bio-based fuels are likely to scale more narrowly than expected as electrification moves faster in road transport. They remain critical for decarbonizing aviation and maritime shipping, in which electrification potential is limited, but still require significant development to reach scale in those sectors.

Global sustainable fuels by scenario, in exajoules



Note: Historical sustainable fuels demand for transportation reflects biofuel and wood given H2's nascency
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Prepare now, keep testing

Even small shifts in policy, capital costs, trade rules, and technology adoption can change which companies grow and which assets get built, get used, and pay off. Each company needs to continuously test its own predictions against multiple futures. But across the three scenarios we modeled, five lessons emerge.

Even small shifts in policy, capital costs, trade rules, and technology adoption can change which companies grow and which assets get built, get used, and pay off.

Get ready for the build. Power demand will rise, and electrification will reshape end-use demand. The grid needs more wires, more transformers, and more storage. Clean, firm power (nuclear in some places, gas in others) will matter most where reliability is tight. And the mines, refineries, and plants behind critical minerals and low-carbon fuels will be bottlenecks. Plan to move in stages, with room to adapt.

Don't bet on weak assets. As fossil fuel demand plateaus, the market will separate winners and losers across energy suppliers, infrastructure operators, materials providers, and refiners. Low-cost, low-emissions assets will stay profitable; marginal assets will struggle. Investors will reward companies that exhibit capital discipline and generate cash.

Think regionally. Even before the current retreat from globalization, the energy system was fragmented by regulatory regimes, prices, generation types, grid connections, and supply chains. Build your strategy by country, not global averages.

Invest in climate resilience. The risk rises in every future we modeled. Hotter days push up peak load; drought and floods hit mines and power plants. Hardening sites and networks is not a side project; it's part of running the business. And it can be a source of growth.

Plan for the uncertain. The points above are no-regrets moves grounded in firm conviction about what holds across scenarios. But competitive advantage will go to the companies that place smart bets on the least predictable parts of the system (nuclear, gas and LNG, minerals, sustainable fuels, and other areas where costs and policy can shift the path) and align strategy, capital allocation, and investment decisions accordingly.

The shocks will keep coming. The fundamentals will hold. The question is whether your portfolio, your supply chains, and your operating model are built to evolve with the system. The edge will go to companies that keep testing decisions as conditions shift, seize opportunities early when change is slow, and adapt quickly when it is not.

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