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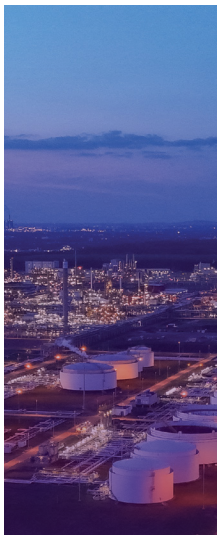
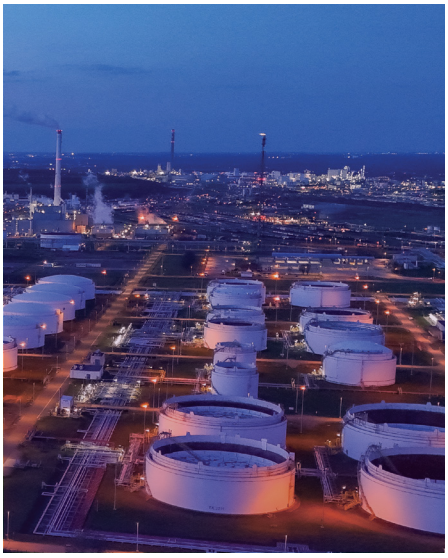
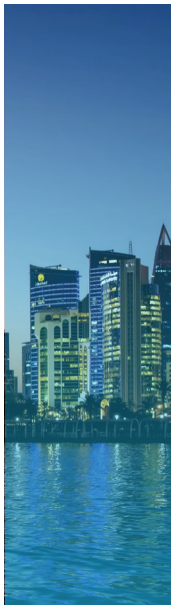
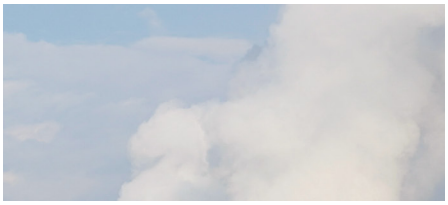



THE 2026 GLOBAL ENERGY AGENDA

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The Atlantic Council Global Energy Center develops and promotes pragmatic and nonpartisan policy solutions designed to advance global energy security, drive economic opportunity, and foster a sustainable energy future.

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The editors would also like to thank Kate Burnett and Kevin Li for their research and writing support.

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THE 2026 GLOBAL ENERGY AGENDA

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FOREWORD

The Atlantic Council's sixth *Global* *Energy Agenda,* launched this year alongside the tenth Atlantic Council Global Energy Forum, represents our efforts to capture the outlook of a global community of energy experts, policymakers, and industry leaders for the future. Through each year of the *Agenda's* survey and collection of essays, the challenges and opportunities of building a more secure, sustainable, and prosperous energy system have shone through. From the reemergence of great power competition, to the promise of technological innovation, to economic transformation, this product has offered an annual reflection of the inextricable role energy plays in our daily lives, our ambitions for tomorrow, and our strategies for the future.

Yet this year's *Agenda* launches during one of the most challenging moments the energy system has ever experienced. Crisis in the Middle East and subsequent closure of the Strait of Hormuz has thrust a long-dreaded upheaval upon the global energy system. As of this writing, passage through the Strait remains negligible, removing the world's most important source of oil and gas supply from the market for the foreseeable future.

Our survey was launched in the month prior to the start of the conflict, yet our respondents were already reflecting anxiety about the ways in which geopolitics and conflict were shaping the world's energy future. Amid disruptions such as the capture of Venezuelan President Nicolás Maduro, Russia's full-scale invasion of Ukraine, or the increasing tenor of great power competition between the United States and China, it's clear that even amid an energy transformation, geopolitics continue to rule supreme.

What's concerning from an energy perspective is the degree to which this geopolitical environment raises the stakes of managing a transforming energy system. Energy demand continues to grow, while the infrastructure needed to deliver that energy affordably and securely struggles to keep pace. New energy technologies and rapidly advancing economies have increased strain on natural resource supply chains, with access to critical minerals an emergent strategic imperative. Many—including myself—remain hopeful that artificial intelligence may open new doors to build a better energy system. But building the energy systems needed to realize the potential of the artificial intelligence (AI) era has proven difficult for even the most advanced economies to manage, further stressing the affordability of energy for everyday consumers.

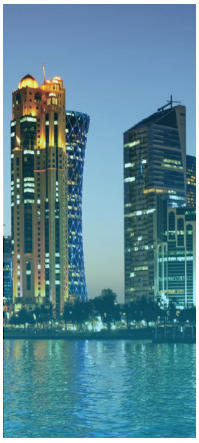
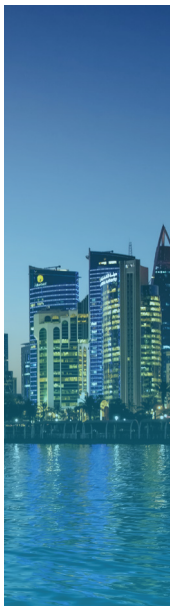
The 2026 *Global Energy Agenda* reflects the many questions ahead. Can we match demand for new infrastructure with the political capital needed to turn rhetoric into action? Will we respond to geopolitical risk through diversification and strategic interdependence, or through autarky? Can we seize the potential of technological innovation to build a better energy system, or will we leave next-generation opportunities on the table? For many of our respondents, these questions have persisted since we launched the *Agenda* in 2021, and the current geopolitical environment has only made them harder to answer.

In an environment of such disruption and disorder, it can be tempting for the energy community to respond to these challenges with short-term solutions. However, in a year where the Atlantic Council celebrates the 10th Global Energy Forum, the 65th anniversary of the Council's creation, and the 250th year of the United States' independence, I'm struck by the reminder that our greatest accomplishments are underpinned by long-term, strategic vision. Responding to the disruptive forces of energy evolution with policies that have strategic depth, investments that are durable, and ambition that is resilient in its collective vision will allow us to not only meet the moment, but also shape an energy system that provides enduring security, sustainability, and prosperity.

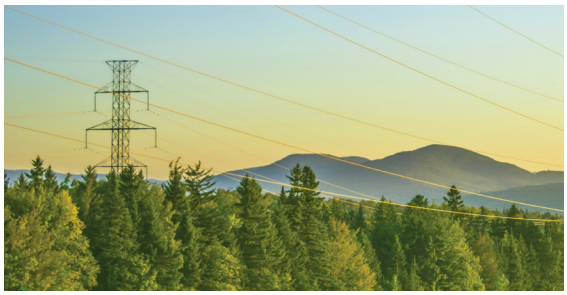
Last year, I wrote that the global energy system has been more difficult to navigate. This year, geopolitical headwinds have made traversing the contours of the global energy landscape all the more difficult. Within disruptive moments, however, there is opportunity to not just recover, but to build an energy legacy. Given the wisdom of the community reflected in this *Agenda*, I am optimistic that by the time we reach the 20th Global Energy Forum, we'll have set the foundation for that legacy.

Frederick Kempe
President and Chief Executive Officer
Atlantic Council








INTRODUCTION

ENTERING 2026, THE *GLOBAL ENERGY AGENDA* appeared to be on a clear trajectory toward a growing debate over energy affordability and access. Rising retail energy prices in the United States and Europe were expected to collide with increasing demand from data centers, alongside renewed efforts to expand domestic manufacturing—issues sure to take on greater importance in a pivotal election year. Instead, domestic energy strategies are being confronted by a rapid escalation in geopolitical uncertainty. From a political shake-up in Venezuela following a US-led raid to capture Nicolás Maduro to continued instability in the Middle East, where a widening Gulf conflict threatens global trade through disruption of the Strait of Hormuz, developments across multiple regions have decisively shifted the world's energy priorities toward backfilling a massive drought of oil and natural gas supply worldwide.

The war in Iran, launched at the end of February 2026, has rapidly seized global attention. For the energy sector, the implications are immediate and at a scale the world has not witnessed in generations given the central role of the broader Middle East in supplying global oil and natural gas markets. Yet, while the risks posed, or intensified, by this conflict are substantial, they represent only a fraction of a wider and increasingly complex set of challenges confronting energy leaders.

Amid these global events, the Atlantic Council is pleased to present its sixth *Global Energy Agenda*. In crisis, the urgency to secure reliable and sustainable energy elevates to the highest echelon of global leadership, making this year's report all the timelier. Building on a long legacy of leadership essays, this year's publication includes essays by Bob McNally, the founder and president of Rapidan Energy Group, who assesses the successes and missteps of US energy

policy decisions amid the Iran conflict; Mike Sommers, president and CEO of the American Petroleum Institute, who outlines the importance of comprehensive bipartisan permitting reform to ensure that US energy infrastructure can meet surging demand, and Heather Zichal, the global head of sustainability at JPMorgan Chase, who explores the potential for batteries, grid build-outs, and nuclear energy to strengthen resilience and economic competitiveness. The publication also features prominent international leaders including Greek Energy Minister Stavros Papastavrou, who highlights his country's pragmatic energy security and transition strategy, and Tatsuya Terazawa, the chairman and CEO of the Institute of Energy Economics, Japan, who analyzes the strengths and vulnerabilities of Japan's responses to the Iran war energy shock.

Consistent with prior years, this collection of essays is published alongside the results of the Atlantic Council Global Energy Center's annual global energy survey, which was conducted between January 12 and February 12, 2026, and captures a snapshot of the perspectives formed prior to the escalation of this new conflict. While recent events may have reshaped views on some issues, the survey's timing provides a useful baseline of the many structural and often longer-term issues facing the energy sector, without the distorting effects of the immediate crisis.

These insights are particularly valuable as they rely on the largest survey in the Atlantic Council series so far, with 1,051 respondents from ninety-seven countries (see Appendix B for full details). This breadth enables more granular analysis, including differences by geography, nationality, and professions within key segments of the energy industry. Such insights, in turn, give a more nuanced view of how perspectives across the sector diverge and where they align.

Insights from the survey appear throughout this analysis. First, however, is a summary of the key findings:

Considerations related to geopolitical conflict and tension already dominated worries about risk and volatility in 2025; they were also expected to do so well into the future, even before the current fighting in the Middle East began.

When assessing 2025, half of survey respondents called geopolitical conflict the factor with the greatest impact on the global energy system, more than three times the number naming national energy policy, the next most common choice. A growing number of respondents, over a third, also said such conflict would be the leading driver of energy-market volatility in the decade ahead. This was more than double the number of those naming any other single factor.

Similarly, when asked about the top risk facing the energy system in the coming five years, respondents pointed to geopolitical conflict more than any other issue. On this question, however, insufficient infrastructure investment was the next most common response and close behind the first in frequency. Among respondents from parts of the sector which produce energy, the latter was the more common choice, which suggests concerns about their ability to deliver the energy which the world needs.

The specific geopolitical conflict or tension forecast to have the greatest impact on energy, though, was expected to shift. When considering 2025, nearly half of respondents said that Russia-Ukraine fighting had played this role. In the coming five years, US-China tensions were expected to predominate instead. Consistent with such bipolar competition, around seven in ten said that both North America and China would be among the regions with the most influence on energy trends to 2030.

In contrast, only about one in eight named Middle East frictions as the conflict or tension likely to have the biggest impact on the energy field up to 2030. Also, just 34 percent forecast that the Middle East would be among the most influential regions in the coming year. In retrospect, these respondents showed prescience.

The energy sector as a whole continues to expect a healthy medium- to long-term future for fossil fuels and nuclear power, with those in the oil, gas, and nuclear fields especially confident in the outlooks for their industries.

This year, respondents' mean forecast for the timing of peak oil is late 2038, only a few months later than last year's mid-2038 forecast. If anything, consensus is growing around that estimate. Compared to the previous survey, the average prediction of respondents in specific geographic regions and industries for the most part converged toward late 2038. Meanwhile, as in the past two surveys, around half of respondents believe that natural gas will have a long-term future as a complementary fuel to renewables, and a further quarter that it will be a destination fuel. As for nuclear power, around half expect that by 2050 it will be a primary energy source in developed countries, and another quarter expect it will be one in both developed and emerging markets.

The most notable variations from these overall survey findings are among respondents from specific industries. Of those in oil and gas, 46 percent said that gas will be a destination fuel. Among those working in renewable energy, only 12 percent had that view. Although few of those surveyed work in nuclear power, their level of agreement is striking, with 62 percent saying that nuclear energy will be a primary one in developed and emerging markets, with all the rest believing that it will at least be the case in richer countries. Few, then, see their industries declining anytime soon.

In aggregate, thinking about net-zero emissions and what its wider impact would be remains largely the same as in the past year. A closer look, though, reveals a growing divide between the developed world and the Global South.

Only a minority in the energy field (29 percent) think that net zero will be reached globally by 2050. The mean projected year is 2066, the same as in our previous survey. Meanwhile, around six in ten respondents think that efforts toward this goal will enhance global energy access and security, with only about a quarter saying the opposite.

Slightly fewer, but still just over half, say the same about the effect on world gross domestic product (GDP); one-third disagree. Data from a similar GDP-related question in the previous survey found that a larger majority (62 percent) believed that reaching net zero would help the economy.

> **"When assessing 2025, half of survey respondents called geopolitical conflict the factor with the greatest impact on the global energy system."**

Digging into the data indicates that the similarity of these overall figures hides increasing divergence between the views of those from the Global South and the largely developed countries in the rest of the world.

The median date for net zero is 2057 among respondents in the Global South and 2073 for the others. This gap is twice as large as the one between these groups in the previous survey.

Similarly, insofar as it is possible to compare slightly different questions, belief in the economic benefits of pursuing net zero appears to have become less common in developed countries while staying about as widespread in the Global South. Because some correlation exists between opinions on the economic, security, and access benefits arising from this pursuit, this shift may presage a drop in levels of confidence outside of the Global South regarding the wider gains likely to flow from net zero.

Our survey included several individual questions that each yield their own particular insights.

- **Lack of political will and inadequate energy infrastructure are the leading obstacles to energy access.** In almost every region, and among every economic group, these two factors were the leading choices among respondents asked to name the biggest challenge in this area. They varied slightly depending on local conditions: those from less wealthy countries were more likely to put infrastructure matters first, while those from wealthier economies prioritized political will.
- **Overall, most expect the greatest increase in energy investment to focus on storing and moving power around the grid. The aggregate figures, though, cover a huge variation.** In short, respondents involved in energy production were most likely to see higher investment in their areas; those in given countries in technologies best suited to their particular needs (such as biofuels or solar in certain developing countries and nuclear in the US market). An important general observation is a drop in confidence that hydrogen will see significant investment growth.
- **Generative AI will bring benefits and difficulties for the energy field**. Overall, respondents expect artificial intelligence to improve technological innovation and energy efficiency. On the other hand, they worry that it will also bring increased cyber risks and, because of the technology's own power needs, higher energy prices. A small majority in the Global South expect AI to bring greater global energy cooperation; those in developed countries are more likely to disagree with this view.

CHAPTER I

Geopolitics and energy security

ENERGY SECURITY, LONG AN ENDURING feature of the global energy system, is once again the central organizing principle shaping decisions for both policymakers and industry. Escalating geopolitical instability—from Venezuela to the Middle East—is rapidly shifting global energy priorities toward accessing affordable energy supplies, including through greater supply-chain diversification and increased reliance on domestic energy resources. The significance of this moment lies less in the number of crises than in how they are altering perceptions of risk across the global energy system.

Even before the war in Iran, which occurred after this survey's fieldwork had concluded, ongoing conflicts and the prospect of broader military escalation were already shaping thinking among those concerned about the global energy system. Recent developments have almost certainly reinforced these views, underscoring the degree to which the interplay between geopolitics and energy defines both near- and medium-term risk.

At the same time, this resurgence of geopolitical pressure is unfolding alongside longer-term structural change in the energy system. Demand growth associated with digitalization and the expansion of artificial intelligence, for example, is placing new strain on electricity systems. Meeting that demand will require sustained investment in new generation capacity and grid expansion, while increasing the importance of harden-

US Air Force

An F-16 supporting Operation Epic Fury in the Middle East.

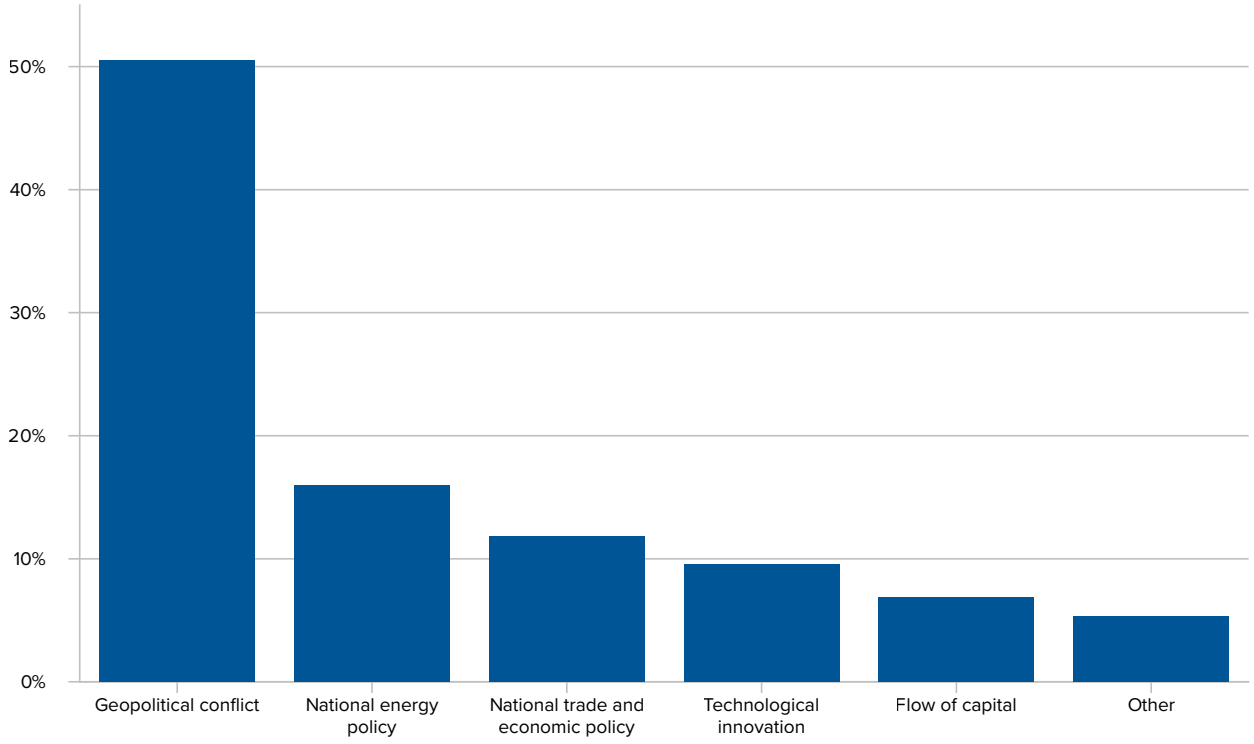
ing supply chains and further diversifying the energy mix. The result is a persistent tension between immediate security needs and the investments required to build a more competitive and resilient energy future.

Australia showcases the need to manage these tensions. The country's growing renewable capacity, strong privacy protections, and stable governance have made it a leading destination for data center investment.[1] However, fossil fuels still dominate Australia's energy system, accounting for more than 90 percent of the primary energy mix.[2] Unsurprisingly, the war in Iran is exposing the tensions in Australia's pursuit of the energy transition, highlighting the constraints of an energy system that remains highly reliant on imported conventional fuels. Having shuttered all but two domestic refineries, Australia now

1 Tim Ayres, Chris Bown, and Andrew Charlton, "Joint Media Release: An Australian Approach to AI: Expectations for Data Centres that Deliver for Australians," Department of Climate Change, Energy, the Environment and Water, March 23, 2026, https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-australian-approach-ai-expectations-data-centres-deliver-australians.

2 "Australian Energy Statistics - Update Report 2025," Department of Climate Change, Energy, the Environment and Water, August 2025, https://www.energy.gov.au/sites/default/files/2025-08/australian_energy_update_2025.pdf.

Figure 1. In 2025, which of the following factors had the greatest impact on the global energy system?



imports roughly 80 percen of its refined fuel.[3] As supply from key regional hubs such as Singapore tighten and other East Asian exporters impose export restrictions, Australia has been forced to extend its supply chains well beyond traditional markets.[4] In response, Australia has moved to reinforce domestic energy security, with renewables supplying a record 47 percent of national grid electricity in the first quarter of 2026, driven by solar and battery capacity, as the government accelerates its clean energy build-out to reduce exposure to global fuel-market volatility.[5]

Decisions taken in response to near-term disruptions are likely to carry lasting consequences. While it remains too early to fully assess the impact of the war in Iran (as current policy decisions in Australia demonstrate), policy responses already point toward a greater premium on resilience through diversification. This shift is likely to place greater emphasis on domestic production, geographic proximity, and the avoidance of critical choke points—reflecting a broader reassessment of the stability of global energy transit routes in an era of heightened asymmetric risk.

Taken together, these developments provide context for interpreting this year's survey findings. While the war in Iran has intensified uncertainty, it largely reinforces existing patterns in how respondents assess geopolitical risk. The results that follow therefore offer a snapshot of how energy leaders view the interaction between geopolitics and broader energy dynamics, even as global conditions continue to evolve in near real time.

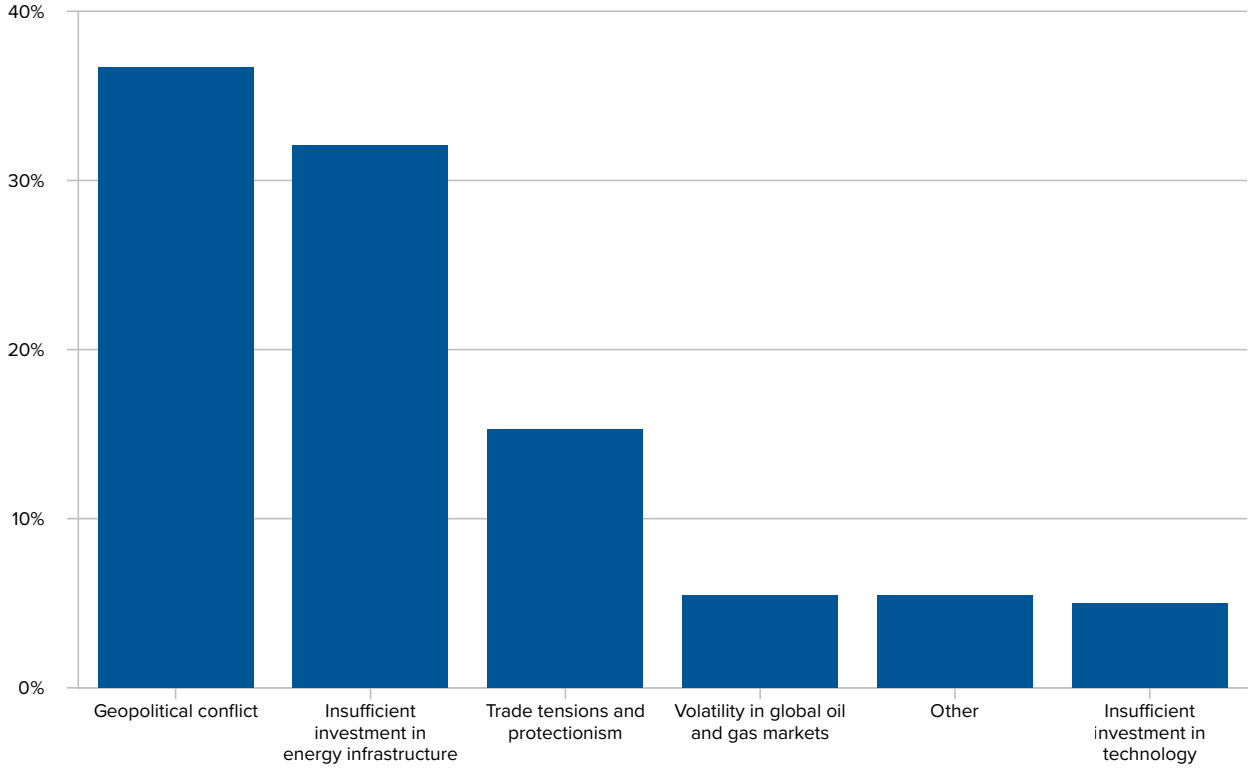
The most recent events, importantly, are not the only source of focus for our respondents. As many made clear, the war between Russia and Ukraine

3 Norman Hermant, "Australia's Oil Refineries Will Need Government Support to Avoid a Reliance on Fuel Imports," ABC News, December 3, 2025, https://www.abc.net.au/news/2025-12-03/australias-oil-refineries-need-government-support-to-compete/106095796?utm; and Lyndal Rowlands, "Australia Scrambles to Secure Energy as War on Iran Fuels Uncertainty," *Al Jazeera*, April 17, 2026, https://www.aljazeera.com/features/2026/4/17/australia-scrambles-to-secure-energy-as-war-on-iran-fuels-uncertainty.

4 Nick Toscano, "Australia Scoured the World for Fuel Supplies. It's Working," *Sydney Morning Herald*, April 3, 2026, https://www.smh.com.au/business/markets/australia-scoured-the-world-for-fuel-supplies-it-s-working-20260403-p5zl5h.html.

5 "Australia's Energy Transition Gathers Pace," Department of Climate Change, Energy, the Environment and Water of Australia, April 30, 2026, https://minister.dcceew.gov.au/bowen/media-releases/australias-energy-transition-gathers-pace.

Figure 2. Looking ahead to 2030, which factor will pose the biggest risk to the global energy system?



remains a central concern. At the same time, its prominence is beginning to be displaced at the top of the agenda as survey respondents grow uneasy with the trajectory of relations between the United States and China.

When asked to consider the past year only, half of respondents identified geopolitical conflict as the single greatest influence on the global energy system—well ahead of any other factor. Policy-related drivers trailed at a distance, including those specifically related to energy (cited by 16 percent) and those covering broader trade and economic dynamics (12 percent).

Interestingly, geography also plays a meaningful role in participant responses to this question. Participants from the United States were more likely to cite geopolitical conflict as the most impactful factor, though only 32 percent selected this option; 25 percent chose national energy policy and 19 percent selected national trade and economic policy. By contrast, respondents from South Asia were the most likely to identify geopolitical conflict as the leading factor, with 70 percent selecting this option.

Looking ahead, respondents expect recent trends to persist. A plurality flagged geopolitical conflict, the dominant issue of 2025, as the top risk facing the energy sector through 2030 (37 percent). Close behind as the dominant issue, however, is insufficient investment in energy infrastructure (32 percent). Both were selected more than twice as often as trade tensions and protectionism (15 percent). While the emergence of a new conflict may shift these relative weightings, systemic challenges such as underinvestment and long-term trade fragmentation are likely issues that will remain relevant irrespective of the evolution of current hostilities.

As with the previous question, these answers reflect a broad degree of consensus across the energy sector. Regardless of how respondents are segmented, geopolitical conflict and insufficient infrastructure investment consistently emerge as the top

LEADERSHIP INSIGHT

The future of US energy security: Building on lessons from the Iran war

By Bob McNally

Bob McNally is the founder and president of Rapidan Energy Group, a Washington, DC-based energy market, policy, and geopolitical risk firm. He served as White House energy adviser to President George W. Bush on the National Security and National Economic Councils.

The Iran war has produced the largest energy disruption in history and is still unfolding. While its ultimate impact will depend mainly on how it ends, the record already reveals some US energy policy decisions that proved wise and others that did not. Assessing successful strategies along with missteps will help the United States build a more energy-secure world in the future.

The positive side of the ledger

At the top of the list of prescient decisions belongs the US embrace of the shale revolution. When shale began transforming American oil and gas production in the late 2000s, US policy largely adopted an "all of the above" approach rather than "keep it in the ground." The result was the transformation of the United States from a net oil importer into the world's leading producer and, eventually, a net exporter.[1]

The energy security benefits are real. Since February 28, the United States has become an "arsenal of energy," exporting oil and liquefied natural gas (LNG) to beleaguered importers across Asia and Europe.

Net oil export status, however, has not insulated US consumers from global price spikes—oil is a fungible commodity, and a Hormuz disruption drives prices higher everywhere. Motorists pay more at the pump, and rising prices for diesel (for trucking, farming, and shipping), jet fuel, plastics, fertilizers, and heating spread through supply chains to consumer goods broadly. But being a net exporter permits higher export revenues to flow to domestic producers, supporting gross domestic product (GDP) and the current account, partially offsetting what consumers lose. Net importers enjoy no such cushion—for them, a price spike is a pure wealth transfer to foreign exporters.

Natural gas is an even clearer win for the United States. Massive US production has kept Henry Hub prices[2] structurally low relative to global benchmarks—even as LNG exports have grown and global prices have surged.[3] European consumers paying spot LNG prices enjoy no such cushion.

The United States' single best bipartisan policy step of the modern era was the December 2015 lifting of the forty-year crude oil export ban by Congress and the Obama administration.[4] Without export access, the shale industry would have faced structural oversupply and collapsed. Subsequent liberalization of LNG export licensing reinforced that foundation. The 2024 elec-

1 "Oil and Petroleum Products Explained," US Energy Information Administration, last updated January 19, 2024, https://www.eia.gov/energyexplained/oil-and-petroleum-products/imports-and-exports.php.

2 Henry Hub refers to a natural gas trading point in Louisiana and serves as the "standard delivery point for the NYMEX natural gas futures contract." See "Our Price Explained: What Is Henry Hub?," S&P, n.d., https://www.spglobal.com/energy/en/pricing-benchmarks/assessments/natural-gas/henry-hub-natural-gas-price-explained.

3 Mike Soraghan, "Why Natural Gas Bills Aren't Rising Like Prices at the Pump," *E&E News*, March 30, 2026, https://www.eenews.net/articles/why-natural-gas-bills-arent-rising-like-prices-at-the-pump.

4 "Crude Oil Markets: Effects of the Repeal of the Crude Export Ban," US Government Accountability Office, October 2020, https://www.gao.gov/assets/gao-21-118.pdf.

US oil and gas exports have been key to allied energy security.

REUTERS/Eli Hartman

tion reversed the Biden administration's attempt to slow-walk new LNG export approvals.

At the outbreak of the Iran conflict, the Trump administration responded with targeted, technically sound measures. Fuel waivers to dampen price volatility expanded the pool of usable "blendstocks" for finished motor-vehicle fuel. A Jones Act waiver and its extension enabled faster, lower-cost movement of refined products from Gulf Coast refineries to East Coast markets facing supply constraints.[5]

Equally important was what the administration chose not to do. It said no to a federal gasoline tax holiday, no to export restrictions on crude or refined products, and no to intervention in futures markets. Export restrictions would have suppressed domestic refinery margins, reduced throughput incentives, and ultimately tightened the very supply they purported to protect.

The regrettable decisions

Against these successes stand three significant mistakes whose costs are still accumulating.

The biggest unforced error of Operation Epic Fury was leaving the Strait of Hormuz unprotected at the outset. The military had spent decades preparing to engage Iran and limit any disruption to the strait, but when the moment came, the president rejected that option.[6] The strait has been nearly shut since February 28. Strategic stocks, commercial storage, and rerouted tankers initially bought time, but those buffers have now disappeared, and the supply gap continues to widen. Nearly two months in, the job remains unfinished—and the coming weeks could well bring the full reckoning: cratering inventories and surging prices.

A second energy security misstep: By permitting Iran to take Hormuz hostage for two months and counting, the United States effectively toppled a load-bearing assumption in global energy security. Since the Carter Doctrine and its Reagan

5 Jarrett Renshaw, "Trump Grants 90-day Jones Act Waiver Extension to Curb Energy Costs," Reuters, updated April 26, 2026, https://www.reuters.com/business/autos-transportation/trump-grants-90-day-jones-act-waiver-extension-curb-energy-costs-2026-04-24/.

6 Alexander Ward et al., "Trump Knew the Risk of Iran Blocking the Strait of Hormuz. He Still Went to War," *Wall Street Journal*, March 13, 2026, https://www.wsj.com/politics/national-security/iran-oil-hormuz-blockade-trump-f96bdd53.

> **"While the war's ultimate impact will depend mainly on how it ends, the record already reveals some US energy policy decisions that proved wise and others that did not."**

Corollary, the United States has acted as guarantor of security in the Gulf, including the free flow of oil and gas. Iran has now demonstrated it can strangle the world's most important energy choke point indefinitely.

Finally, the conflict underscores the folly of drawing down strategic stocks for nonemergency purposes. The Strategic Petroleum Reserve (SPR) entered this conflict with only 415 million barrels, about 60 percent of its capacity.[7] Congress repeatedly raided the SPR for budget revenue, not supply emergencies.[8] The Biden administration compounded the error by releasing approximately 180 million barrels, even though the feared loss of Russian supplies—the stated pretext—never fully materialized.[9]

The ledger's balance, incomplete

Washington's embrace of the shale revolution fostered genuine structural resilience, positioning the United States as the energy exporter of last resort. But the conflict witnessed a shocking lack of contingency planning to protect the strait, deepening the commodity crisis and exposing the folly of frittering away strategic oil stocks. Regardless of the outcome of this ongoing war, policymakers should consider both columns when formulating new energy security policies.

7 Petroleum & Other Liquids, "Weekly U.S. Ending Stocks of Crude Oil in SPR," US Energy Information Administration, last viewed May 4, 2026, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCSSTUS1&f=W.

8 "Strategic Petroleum Reserve: Inventory Outlook and Policy Considerations," Congress.gov, April 11, 2025, https://www.congress.gov/crs-product/IN12542.

9 "2022 Energy Crisis: Frequently Asked Questions," International Energy Agency, November 16, 2022, https://www.iea.org/articles/2022-energy-crisis-frequently-asked-questions.

LEADERSHIP INSIGHT

A connected threat needs a connected framework

By Omran Al-Kuwari

Omran Al-Kuwari is a nonresident senior fellow at the Atlantic Council Global Energy Center, CEO of FORTA Advisors, and an honorary senior research fellow at University College London's Bartlett School of Environment, Energy, and Resources.

Nothing that has happened in the extremely tense weeks since the April 8 ceasefire in the US–Iran conflict has persuaded me that this is a global crisis the world can confidently put behind it.

As a Qatari with years of experience in the energy sector that included establishing Qatar Petroleum's first liquefied natural gas (LNG) trading venture, I understand well that whether or not the ceasefire holds, the structural conditions that produced this crisis remain in place. The Strait of Hormuz is still a single choke point. There is still no strategic LNG reserve and no pipeline bypass. Civilian energy infrastructure still sits outside protected status. The next disruption, when it comes, will travel the same channels as this one—and the institutions meant to govern those channels will still not be configured to act together. That is the problem a settlement cannot solve.

Sooner or later, this fragile veneer will crack and the question we all face—in the Gulf and around the world—is what are we doing to prepare for permacrisis? What frameworks are we putting in place to limit and mitigate the impact of a scenario that energy professionals and policymakers had dreaded for years?

In early March, the Gulf's Achilles heel snapped. The Strait of Hormuz closed and Ras Laffan was hit. By April, there was a tenuous ceasefire. As I write in May, the strait remains impaired and the damage at Ras Laffan will take three to five years to repair. As world powers work to create a patchwork of post-conflict agreements, what's really needed is a connected framework of international agencies to mitigate future threats and close the policy gaps that have allowed the current cracks in global protections.

The bystanders' response cannot be to file this away as an accident of geopolitics, an extreme event, badly handled and eventually contained. The past two and a half months were not an accident. They were the predictable consequence of governing the world's most critical infrastructure as if it were significantly less important.

The crisis was connected to the global economy in a way energy professionals had long warned about. Within days, pressure applied at the choke point propagated across markets with no formal connection: maritime insurance, sanctions enforcement, fertilizer feedstocks, helium for semiconductor fabrication, and LNG offtake in countries whose entire electricity generation mix depends on it. Demand from large emerging consumers kept sanctioned flows commercially viable; the shadow fleet carried them because the legal maritime system could not. Each market sits within a different governance regime—the International Maritime Organisation (IMO) for maritime conduct, the Financial Action Task Force (FATF) for financial flows, the International Atomic Energy Agency (IAEA) for proliferation, and international humanitarian law for civilian infrastructure. Each is mature in its own remit. None is configured to act on the others. This is not drift but design: each regime was built for a different shock, and the focused remit that made each work is what now keeps them apart. The space between them is where this crisis operated and where the post conflict Connected Framework must do its work.

> **"As world powers work to create a patchwork of post-conflict agreements, what's really needed is a connected framework of international agencies to mitigate future threats and close the policy gaps that have allowed the current cracks in global protections."**

I have been making this argument, in print and at security conferences, since the beginning of the conflict because I believe it is critical to learning this conflict's lessons. The Connected Framework is not a new institution; it is connective tissue between institutions that already exist.

Five gaps need closing to protect the market from future shocks. This requires

- a standing coordination function across the IMO, the FATF, the IAEA, and the sanctions architecture that is able to act when stress crosses multiple domains;
- joint response protocols integrating maritime, financial, and proliferation responses to chokepoint events;
- protected status for civilian energy infrastructure under international humanitarian law, meaning refineries, terminals, and gas plants should not be treated as conventional military targets;
- shared maritime domain awareness across the relevant regimes; and
- a producer–consumer forum bridging the institutional divide between the Organization of Petroleum Exporting Countries and others (OPEC+) and the International Energy Agency.

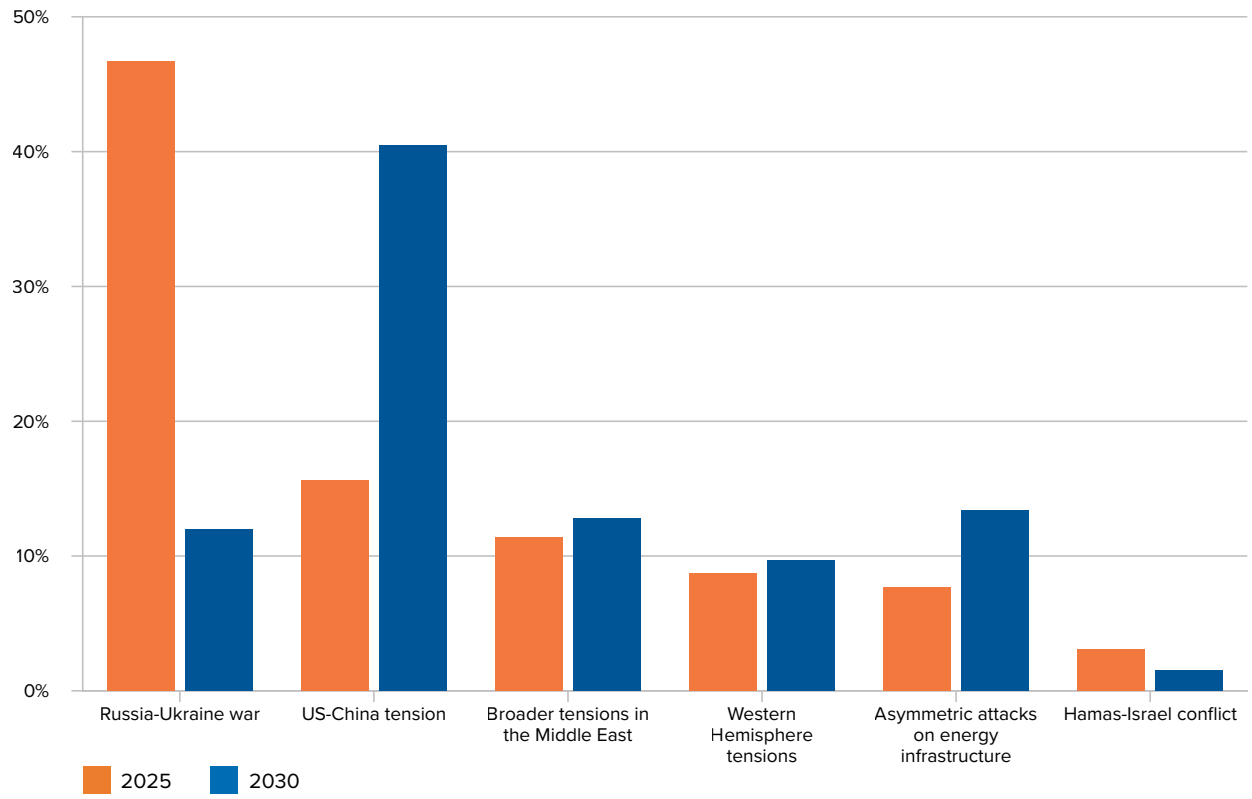
What will bind them is a coordinating instrument under which the existing regimes commit to joint action when stress crosses their domains. Built properly, it will let a chip fab in Hsinchu, Taiwan, a fertilizer plant in Jorf Lasfar, Morocco, and a household in Dhaka, Bangladesh, keep functioning when a missile is fired in the Gulf.

None of this can be built by any single state. The framework must be globally built from the start—not as a matter of legitimacy but because the system it must govern is itself global. The Gulf states as producers; the European Union as the largest single demand bloc; the United States as the principal underwriter of present maritime security; Japan, Korea, India, and China as co architects. The four largest LNG importing nations all sit east of Suez. Any future framework that treats the Asian demand bloc as a late addition will reproduce the gap it is meant to close.

Qatar has had a difficult spring; two of its LNG trains and a gas to liquids facility at Ras Laffan are out of service and will take years to bring back. But this is not a Qatari argument. Countries cannot allow the strait to be weaponized against any producer. Qatar sits in an unusual position across the regimes the framework would connect, making credible an otherwise abstract point: a producer state can be a co-architect of the system that governs its infrastructure, not only a supplier into it. The point applies to any producer or consumer willing to commit.

Such a connected framework would achieve a long-elusive aspiration: readiness. Readiness, properly understood, is not a posture adopted in response to one conflict. It is the architecture in place before one. Even in the unlikely event that the current ceasefire holds, the temptation when this war is declared over will be to regard the danger as past and to let the system relax back into the assumptions that produced the crisis. That would be a grave error. This war was foreseeable. The next is too. A settlement will end the war. A framework is what protects us all by breaking the pattern of repetition.

Figure 3. Which conflicts or tensions had the greatest impact on geopolitics in 2025 and will likely have the greatest impact through 2030?



risks across all regions and industry groupings, with only limited variation in relative ranking.[6]

That said, differences do appear across specific sectors. Respondents working in the upstream and midstream energy business, whether from oil and gas, refining, renewable energy, nuclear power, or electricity transmission and distribution, as well as those in finance, are more likely to identify insufficient infrastructure investment as the foremost risk.

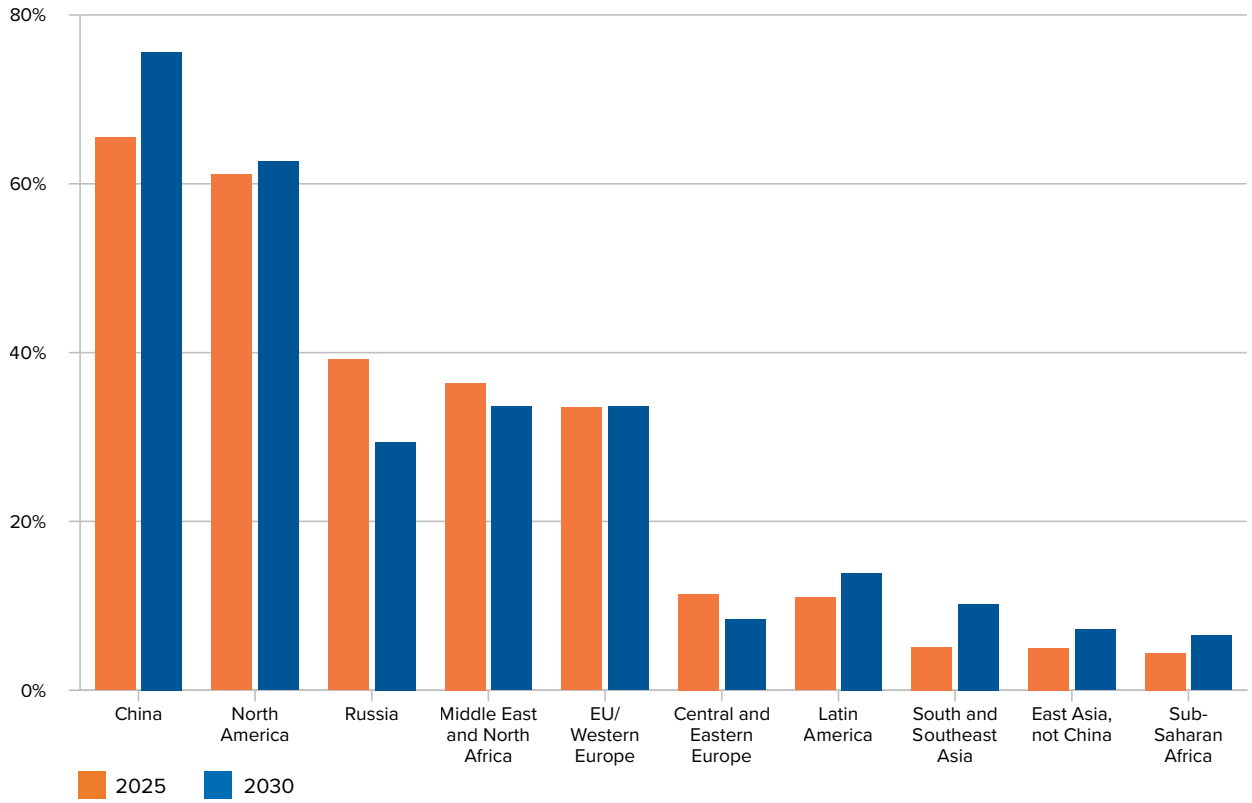
The difference, however, is nuanced. Within these groups, 39 percent see a lack of funding for infrastructure as the primary concern, compared with 31 percent who rank geopolitical conflict as the leading risk. Among other respondents, this balance is broadly reversed (31 percent to 38 percent respectively). While the evolving situation in Iran may alter these assessments, the fact that those most involved in generating and delivering energy over the coming years place greater weight on infrastructure constraints points to a potential area of underappreciated risk requiring more attention.

Geographic differences are more limited. In only two regions do respondents identifying insufficient infrastructure investment outnumber those citing geopolitical conflict as the leading risk. One is the Middle East and North Africa (MENA) region, where 31 percent underscored infrastructure constraints compared with 26 percent selecting geopolitical conflict—reasonably reflecting the region's high share of individuals working in oil and gas and renewables.

The other outlier is the United States, where 39 percent of respondents cite insufficient infrastructure investment compared to 27 percent focusing on geopolitical conflict. This likely reflects growing concerns about the capacity of the US electricity system—both generation and transmission—to meet rising demand. Projections for increased electricity consumption, driven in large part by the expansion of data

6 This occurs in MENA where geopolitical conflict and tariffs are both the choice of 26 percent, and in finance, where the same choices each get 25 percent. Meanwhile, 20 percent of respondents in South Asia pointed both to insufficient investment and trade tensions.

Figure 4. Which countries/regions had the greatest influence on global energy trends in 2025 and will likely have the greatest influence through 2030? (Three selections allowed.)



centers and broader trends in electrifying the economy, suggest a potential doubling of 2022 demand figures by 2030. Consistent with these concerns, the American Society of Civil Engineers has assigned current US energy infrastructure a failing grade, estimating a funding gap of $578 billion to elevate the system to the standards needed to meet these benchmarks.[7]

These variations, while important, do not alter the broader message: Across the energy sector, respondents see conflict and underinvestment as the primary risks over the coming five years.

The specific sources of geopolitical risk, however, are expected to transform markedly over time.

The conflict most frequently identified as having the greatest impact in 2025 is the war between Russia and Ukraine, an answer cited by nearly half of respondents (47 percent). A distant second is US-China tensions (16 percent), with focus on other geopolitical events rapidly dropping off the radar of respondents.

Geography contributes significantly in defining perceptions of risk. Consistent with prior annual surveys, European respondents are considerably more likely to point to the Russia-Ukraine war as the leading concern (61 percent, compared with 43 percent in the rest of the world). Nonetheless, across most regions, this conflict remains the dominant one; the one exception is in East Asia, where US-China tensions are the most frequently identified option (31 percent).

Other geographic groups within the survey give answers in proportions close to the overall average. However, a notable variation appears in the Western Hemisphere. Here, 13 percent of respondents in the United States and Latin American list regional tensions as their leading concern—more than twice the average among respondents from elsewhere. The survey took place in January, soon after the capture of Maduro. It is plausible that US intervention in Venezuela helps explain this response.

7 "2025 Report Card for America's Infrastructure: Energy," American Society of Civil Engineers, 2025, https://infrastructurereportcard.org/cat-item/energy-infrastructure/.

LEADERSHIP INSIGHT

The impacts of the Iranian crisis on Japan's energy strategy

By Tatsuya Terazawa

Tatsuya Terazawa is the chairman and CEO of the Institute of Energy Economics, Japan.

The crisis triggered by the US-Israeli attack on Iran on February 28 has impacted the world in a serious manner. Japan is certainly not insulated from the crisis, especially in terms of the rising cost of energy. But despite its heavy dependence on imported energy, Japan has managed the crisis relatively well compared with most of its Asian neighbors.

Five factors have helped Japan manage the crisis so far. The first is the high level of crude oil reserves. Japan had 254 days' worth of reserves at the time of the attack.[1] This level is much higher than those of other Asian countries, with the possible exception of China.

The second factor is the diversification of liquefied natural gas (LNG) sources and the high ratio of long-term contracts for LNG. Japan's dependence on LNG passing through the Strait of Hormuz at the time of the attack was just 6 percent.[2] Japan was procuring 80 percent of its LNG through long-term contracts, ensuring stability of supply and avoiding the price hike in the LNG spot market.

The third factor is the diversification of liquefied petroleum gas (LPG) sources. Japan's dependence on Middle East LPG was just 3 percent. In addition, Japan had ninety days' worth of reserves for LPG.

The fourth factor is the maintenance of domestic refining capacity. Japan has kept sufficient refining capacity to meet the domestic demand for gasoline, diesel fuel, jet fuel, and most other oil products.

The fifth factor is the diversification of Japan's power sources. In addition to promoting renewable energies, especially solar photovoltaics (PV), Japan has kept its more efficient coal-fired power plants and its fleet of nuclear power plants despite strong headwinds after the 2011 Fukushima nuclear accident. Japan has the means to deal with a modest loss of LNG supply by utilizing other power sources.

Japan's energy security policies deserve credit for the country's relative success in managing the crisis. They could also be a model for other Asian countries determined to enhance their energy security.

But Japan's energy policies have not been perfect. Several weaknesses have been exposed through the crisis, and Japan needs to address them. Japan's dependence on the Middle East for 94 percent of its crude oil was certainly too high, and Japan must diversify its sources.[3] While blending crude oil from non-Middle East sources is possible to some extent, further use of such crude oil requires modification of refining facilities in Japan. Policy support should be considered to enable the investment and make Japan's refining capacity more flexible.

1 Itsuo Tokubo, "Japan Retains 254 Days' Worth of Oil Reserves Amid Strait of Hormuz Closure: PM Takaichi," *The Mainichi*, March 2, 2026, https://mainichi.jp/english/articles/20260302/p2a/00m/0na/011000c.

2 Katya Golubkova, "Japan's Middle East Energy Dependency - and How It Mitigates Shocks," Reuters, March 4, 2026, https://www.reuters.com/sustainability/boards-policy-regulation/japans-middle-east-energy-dependency-how-it-mitigates-shocks-2026-03-04/.

3 Kristi Govella and Jane Nakano, "What Are the Implications of the Iran Conflict for Japan?" Center for Strategic and International Studies, March 20, 2026, https://www.csis.org/analysis/what-are-implications-iran-conflict-japan.

> **"Japan's energy security policies deserve credit for the country's relative success in managing the crisis. They could also be a model for other Asian countries determined to enhance their energy security."**

The reserve level of LNG was just three weeks.[4] While it is difficult to store LNG for long, three weeks of reserves is too low. Policies to raise the reserve level of LNG must be considered. During a crisis, the absence of insurance coverage can also impede shipping. Today the coverage of insurance is ultimately determined by the reinsurers in London. Japan must consider having its own means to provide reinsurance if it is not available from London.

While Japan had sufficient refining capacity for most oil products, it was dependent on the Middle East for 40 percent of its naphtha.[5] As naphtha is a key feedstock for various chemical industries, concerns are rising about the possible shortage of a broad range of essential chemical products. Japan must incorporate naphtha as an integral part of its energy security strategy and should consider establishing a reserve system for naphtha and diversifying its sources.

These actions could help enhance security of fossil fuel supplies. While these are necessary steps, Japan should also expand its non-fossil fuel energies and deal with the energy demand side as well.

Japan must also pursue promotion of renewable energies. As competition with other land uses and opposition from local communities are impeding the acceleration of mega-solar projects, Japan will need to strengthen its policies to promote rooftop solar PV. Offshore wind power is also an important option. To expand offshore wind power, Japan will need to develop comprehensive policies to lower its cost, which is substantially higher in Japan than on the global market.

The restart of closed nuclear power plants must be pushed further. While fifteen units have come back online, eighteen units are still offline.[6] Japan must also explore construction of new nuclear power plants.

Energy efficiency must be further enhanced. Considering the rising demand for power from artificial intelligence (AI), the energy efficiency of AI must be promoted while the technology itself should be used to enhance the energy efficiency of various activities.

These strategies are well aligned with the Seventh Strategic Energy Plan finalized by the Japanese government in February 2025. Japan needs to fully implement its Strategic Energy Plan in parallel with strengthening the security of its fossil fuel supplies.

4 Katya Golubkova and Yuka Obayashi, "Japanese Utilities Boost LNG Reserves, METI Sees No Calls for Emergency Supply Yet," Reuters, March 4, 2026, https://www.reuters.com/business/energy/japanese-utilities-boost-lng-reserves-meti-sees-no-calls-emergency-supply-yet-2026-03-04/.

5 "Confusion Over Naphtha Supply Hits Industries and Households," *The Japan Times*, April 11, 2026, https://www.japantimes.co.jp/business/2026/04/11/economy/confusion-naphtha-supply-industries-households/.

6 "Nuclear Power in Japan," World Nuclear Association, Last updated April 21, 2026, https://world-nuclear.org/information-library/country-profiles/countries-g-n/japan-nuclear-power.

> **"China and North America are most frequently identified as the leading centers of influence impacting the energy system."**

Turning to the next four years, the survey pool shifted its focus from the war between Russia and Ukraine to tensions between the United States and China. Forty percent identified US-China relations as the most likely to dominate the energy landscape. Concerns about the Russia-Ukraine conflict, meanwhile, fell to levels commensurate with several other risks. While perceptions of Middle East tensions would be higher if the survey were taken today, it remains unclear whether they would surpass the emphasis that survey respondents placed on great-power rivalry.

Geographic variation in these answers, while still present, is less pronounced than in assessments of 2025. Respondents in certain regions are more likely than average to select US-China tensions as the leading concern, particularly in East Asia (52 percent) and Latin America (47 percent). By contrast, the share of respondents in the United States selecting this option aligns with the survey average (40 percent).

Differences between geographic groups are therefore best understood as a matter of degree, rather than substance. US-China tensions emerge as the most common answer across all regions.

While such limited divergences may offer localized insight, the more striking finding is the degree of underlying consensus. Across the survey pool, respondents indicated that although events in Ukraine have dominated energy geopolitics in recent years, attention is increasingly shifting toward the relationship between the United States and China.

Beyond conflicts and rivalries, the survey asked respondents to identify the three countries or regions with the greatest influence on global energy in 2025 and in the years ahead. Responses show a high degree of continuity between reflections over the past year and expectations through 2030. Consistent with levels of concern about the impact of China-US tensions in the coming years, China and North America are most frequently identified as the leading centers of influence impacting the energy system. A secondary cluster of perceived influence consists of Russia (39 percent), MENA (36 percent), and Western Europe (33 percent), while other regions are perceived as having comparatively less impactful roles in shaping global energy dynamics.

Some variation reflects a tendency among respondents to identify their own region as highly influential. In Latin America, for example, 25 percent of respondents believe their region is influential—more than double the global average (11 percent). Similarly, 13 percent of respondents from sub-Saharan Africa rank their region among the most important in 2025, compared to the global average of 4 percent. While such responses point to a degree of regional bias, they do not materially alter the broader tiered structure of perceived influence outlined above.

Turning to expectations for influence through 2030, responses remain broadly consistent with those for 2025. The only material difference at the aggregate level is that 11 percent more people say China will be among those most affecting energy trends to 2030, which offsets the 10 percent fewer who answer Russia. Despite this adjustment, the overall tiered structure remains unchanged. China (76 percent) and North America (62 percent) continue to form the top tier, followed by a second group comprising MENA and Western Europe (both at 34 percent), along with Russia (29 percent).

Regional patterns similarly mirror those observed in the assessment of 2025. An examination of the data divided by sector or demographic attribute reveals little additional variation of note. As with the preceding findings, responses to this set of questions point to a high degree of consensus across the energy field.

LEADERSHIP INSIGHT

Ukraine's legacy grid and wartime agility could help answer Europe's energy problem

By Lana Zerkal

Lana Zerkal is a member of the Ukraine Facility Platform's Coordination Council and Ambassador Extraordinary and Plenipotentiary.

Europe's electricity grids were not built for the demands now being placed on them. The proliferation of large-scale data centers has fundamentally altered the continent's energy arithmetic. This energy demand growth has exposed a structural power deficit that European policymakers have yet to adequately address. The bloc's planning and permitting system has been widely criticized as fragmented and ill-suited to the pace now required. Meanwhile, Ukraine, whose infrastructure was designed expressly to export energy, has the potential to more quickly close part of Europe's energy gap—despite four years of systematic attacks on its grid by Russia.

Aiding this position, Ukraine's parliament passed a legislative package in the spring to integrate Ukraine's spot electricity market with Europe's and replace a system driven by favors with one governed by transparent rules. Not only will the transformation bolster European supply security, but it also marks a significant pivot as Ukraine's Soviet-built energy infrastructure will soon be poised to serve as a counterweight to Russian influence rather than a pillar of it.

The architecture of control

Ukraine's strong position as a potential supplier of European energy is rooted in its history and geography. More than half a century ago, Ukraine was the westernmost Soviet republic and was assigned the role of energy hub. Three nuclear stations in the west and southwest were designed to push electricity westward to its European neighbors. A sprawling, high-capacity transmission network was built to match. By 1990, Soviet Ukraine was generating around 300 billion kilowatt-hours annually—among the largest outputs in Europe—and supplying the bulk of the Soviet Union's electricity exports to the continent.[1]

After the Soviet collapse, Ukraine's grid remained synchronized with Russia and Belarus for three decades. But Russia's occupation of Crimea and eastern Ukraine in 2014 upended the status quo. By 2017, Ukraine had begun formal preparations to disconnect from the old Soviet grid and synchronize with the European network.

On the morning of February 24, 2022, hours before the first missiles fell, Ukraine disconnected from the Russian power grid. Three weeks later, it synchronized with the European Network of Transmission System Operators for Electricity, known as ENTSO-E. The move became one of the key factors enabling Ukraine's energy sector to hold under sustained Russian attack—through electricity imports from Europe and technical support from EU member states.

Russia's war scattered Ukraine's power generation capacity with a thoroughness that was anything but accidental. It went after major power plants to try to weaken Ukraine's ability and will to fight back. Instead, Ukraine responded with systematic physical decentralization of energy: replacing lost generation capacities with small, dispersed units that are harder to find, harder to hit, and more compatible with the decentralized logic of the European grid as Ukraine integrates into ENTSO-E.

Wartime strategy, however, has its limits: distributed micro generation cannot restore the vol-

1 "Chapter V.6 Energy". In A Study of the Soviet Economy. 3-volume set. (USA: International Monetary Fund, 1991). Last visited May 28, 2026, https://doi.org/10.5089/9789264134683.071.ch021.

umes Ukraine has lost. The underlying grid infrastructure, however, remains, creating a long-term opening to re-tap its potential to not only meet domestic demand but also support the energy needs of its European neighbors.

A new answer for new European demand

Europe's ability to meet its own energy demand from within will not come quickly. AI infrastructure alone is pushing electricity demand to levels that legacy grids in Frankfurt, Amsterdam, and Dublin were never built to handle, with connection queues stretching up to thirteen years in some markets.[2] Central and Eastern European countries will require stronger supply security and additional generating capacity over the next decade.[3] Even before the Strait of Hormuz closure triggered an energy crisis, Poland alone was already estimating a need for nearly 15 percent more new generation capacity.[4]

That demand is where Ukraine's advantage sits. The same infrastructure Soviet planners built to pull Europe eastward has already been carrying electricity in both directions: Ukraine exports power when it has a surplus and imports when it needs to. But to become a reliable partner in European energy security, what Ukraine needs more of is large-scale generation.

The financial architecture to fill the power-generation gap is already taking shape. The Ukraine Facility—the EU's principal instrument for financing Ukraine's recovery—covers public and private projects alike and is already funding decentralized energy initiatives on the ground in partnership with the European Bank for Reconstruction and Development. Additionally, the Ukraine-US Resource and Defense Framework Agreement signed in 2025 established a US-Ukraine Reconstruction Investment Fund and extended political risk and war-risk coverage to American businesses entering critical sectors of the Ukrainian economy, including energy.[5] The agreement creates a channel for companies that have already signed memoranda with Energoatom, Ukraine's national nuclear power company, as well as for the broader field of US firms and technologies looking for a market where the investment case holds.

For new generation capacity, Ukraine can accommodate a broad technology mix: gas and biomass cogeneration, wind, solar, and gas peaker plants. Each of these fits within a grid built to carry significantly more than domestic demand has ever required. After market integration, whatever Ukraine generates beyond its own consumption level can flow into the continental market. The April 2026 law that connects Ukraine's spot electricity market to Europe's laid a path to enable this flow, and within two to three years, Ukraine will be part of a pan-European market. The country has the potential to add between 5 and 10 percent in additional volumes to the shared European market, depending on the pace of recovery and new generation coming online.

Large-scale generation in Ukraine remains, for now, a matter of investment pipelines and planning horizons. What has already been built—forced into existence by four years of Russian attacks—makes a separate and more immediate case for a system ready for the energy challenge of the future. Thousands of small, distributed units feeding independent load pockets have produced a grid architecture that happens to be exactly what modern AI infrastructure would have specified from scratch. Meanwhile, Europe's centralized hubs strain at nodes never designed to carry the concentrated loads they're managing today. What emerged from necessity makes Ukraine's system inherently resilient—and keeps it free of the connection backlogs that now define European capacity markets.

This may one day make for a triumphant tale in economic history: an energy system that rose from Soviet ash, was half-destroyed by Russia, and, by rebuilding capacity and integrating with Europe's grid, made the clearest possible argument against Russian control of the continent's energy future.

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2 Elisabeth Cremona and Pawel Czyzak, "Grids for Data Centres: Ambitious Grid Planning Can Win Europe's AI Race," Ember, June 19, 2025, https://ember-energy.org/latest-insights/grids-for-data-centres-ambitious-grid-planning-can-win-europes-ai-race.

3 ERAA 2025 Edition, ENTSO-E, https://www.entsoe.eu/eraa/2025/.

4 "Ocena Wystarczalności Zasobów Na Poziomie Krajowym 2025-2040," Polskie Sieci Elektroenergetyczne, 2024, https://acrobat.adobe.com/id/urn:aaid:sc:VA6C2:aec75e4b-c045-497c-9d86-bd277634b0dd.

5 "DFC Kickstarts US-Ukraine Reconstruction Investment Fund with $75 Million Seed Capital Equity Investment," US Embassy in Ukraine, September 18, 2025, https://ua.usembassy.gov/dfc-kickstarts-us-ukraine-reconstruction-investment-fund-with-75-million-seed-capital-equity-investment/.

CHAPTER II

Energy markets and affordability

Prior editions of the *Global Energy* *Agenda* have rightly emphasized the market implications of reliable access to conventional energy resources. The world still relies on hydrocarbons for over 85 percent of its total energy needs.[8] What distinguished the past year, however, was the growing emergence of power markets as a consequential force in international affairs. This shift does not diminish the enduring importance of affordable retail petroleum prices; rather, it underscores that electricity affordability and reliability are achieving greater prominence in the minds of policymakers and the public alike.

This past year, however, marked a significant shift in how energy markets are viewed. The rise of artificial intelligence has introduced a new dimension to great-power competition, effectively converting energy demand—measured in British thermal units (BTUs)—into computational capacity measured in graphics processing units (GPUs).[9] In doing so, AI has elevated

8 "2025 Statistical Review of World Energy" Energy Institute, 2025, https://www.energyinst.org/statistical-review.

9 Raffaele Huang and Brian Spegele, "China's AI Power Play: Cheap Electricity from World's Biggest Grid," *Wall Street Journal*, December 10, 2025, https://www.wsj.com/tech/china-ai-electricity-data-centers-d2a86935; Casey Crownhart and Pilita Clark, "The State of AI: Here Comes the Energy Crunch," *Financial Times*, November 10, 2025, https://www.ft.com/content/fecd5860-97c4-44be-a2a2-4127388abbc1?syn-25a6b1a6=1; and Valerie Volcovici and Jarrett Renshaw, "Exclusive: Trump Plans Executive Orders to Power AI Growth in Race with China," Reuters, June 27, 2025, https://www.reuters.com/legal/government/trump-plans-executive-orders-power-ai-growth-race-with-china-2025-06-27/.

Energy supply plays an important role in market volatility.

REUTERS/ Brendan McDermid

electricity infrastructure from a largely domestic policy issue to a strategic national priority.[10] Data center energy demand is emerging as a fulcrum in a modern technological "arms race" between the United States and China, with both nations seeking to scale electricity generation rapidly, affordably, and reliably. While power markets remain far less fungible and internationally integrated than oil and gas markets, developments in 2025 demonstrated that electricity systems can no longer be viewed solely through a domestic policy lens.

This evolution differs in important ways from the growing geopolitical attention paid to clean energy supply chains over the past decade. China's dominance in the mining and processing of critical minerals used in batteries, magnets, and other advanced technologies has long captured the attention of policymakers and analysts. And the COVID-19 pandemic further elevated concerns surrounding supply chain resilience and strategic dependence. Yet these developments primarily intensified focus on manufacturing capacity and resource security rather than on consumer electricity prices or power market affordability. Clean technologies added a new geopolitical dimension to energy discussions, but largely through supply chains and industrial policy rather than their abil-

10 Volcovici and Renshaw, "Exclusive: Trump Plans Executive Orders."

LEADERSHIP INSIGHT

The missing link in the US energy advantage: Connecting supply to demand

By Mike Sommers

Mike Sommers is the president and CEO of the American Petroleum Institute, the largest trade association representing all segments of America's oil and natural gas industry. The American Petroleum Institute is a partner of the Global Energy Center.

Recent geopolitical volatility in the Middle East has underscored just how quickly global energy markets can tighten, and how acutely Americans feel those shifts. The disruption to the Strait of Hormuz—one of the world's most critical energy choke points—is a reminder that energy security depends not just on supply but on the ability to move it.

Even before the latest conflict, rising energy costs were shaping both kitchen table conversations and political debates. During New Jersey's statewide elections last November, 87 percent of voters said electricity costs are a problem.[1] A national survey in February of this year found that nearly half of Americans believe that data centers, which require significant amounts of power, are emerging as a major political issue.[2] Energy affordability is now front and center for voters.

The challenge is not supply. The United States is the largest energy producer in the world and is producing oil and natural gas at record highs. In fact, even during the largest energy disruption in a generation, in parts of the Permian Basin, production is so strong that natural gas prices have at times dipped below zero—with producers paying others to take it off their hands.[3]

If supply is not the problem, is demand? Analysts point to artificial intelligence, data centers, and other sectors for ramping up electricity needs.[4] But growing energy demand is a sign of economic strength, not a problem to be constrained. We have entered the Demand Decade—a period in which surging power needs driven by technology, industry, and national ambition should be met with confidence, not anxiety.

The real constraint is our inability to build the infrastructure that connects supply to demand. As Texas and North Dakota broke production records last year, the West Coast imported more than 400 million barrels of oil and upward of 127 million barrels of gasoline, diesel, jet fuel and other petroleum products from as far away as South America and Asia.[5] And instead of sourcing abundant, affordable natural gas (LNG) from the Appalachian basin, every winter, parts of New England import more expensive liquefied natural gas from the Caribbean.[6]

1 "Exit polls: Election 2025," CNN Politics, 2025, https://www.cnn.com/election/2025/exit-polls/new-jersey/general/governor/0

2 Jason Plautz and Christa Marshall, "POLITICO Asked 2,000 People About Data Centers — and Made 5 Charts," Politico, February 17, 2026, https://www.politico.com/news/2026/02/17/data-centers-public-knowledge-5-charts-00769974?nid=0000014f-1646-d88f-a1cf-5f46b7bd0000&nname=playbook&nrid=0000014f-091f-dc50-a77f-2fffb07f0000; Ashley J. Lawson, Martin C. Martin, and Ling Zhu, "Data Centers and Their Energy Consumption: Frequently Asked Questions," Congress.gov, https://www.congress.gov/crs-product/R48646

3 Martha Pskowski, "When Natural Gas Prices Cool, Flares Burn in the Permian Basin," Inside Climate News, March 26, 2024, https://insideclimatenews.org/news/26032024/permian-basin-methane-flaring/#:~:text=Flaring%20also%20releases%20a%20variety,the%20Permian%20Basin%20is%20limited.

4 Kimberly Peterson, "U.S. Electricity Generation in 2025 Hit a Record, Again," US Energy Information Administration, March 5, 2026, https://www.eia.gov/todayinenergy/detail.php?id=67284

5 "Imports by Area of Entry," US Energy Information Administration, April 30, 2026, https://www.eia.gov/dnav/pet/pet_move_imp_dc_R50-Z00_mbbl_m.htm

6 Scott Disavino and Curtis Williams, "US LNG Plants Imported Cargoes During Winter Storm as Natural Gas Prices Hit Records," Reuters, January 28, 2026, https://www.reuters.com/business/energy/us-lng-plants-imported-cargoes-during-winter-storm-natural-gas-prices-hit-2026-01-28/

Permitting delays slowed the construction of Mountain Valley Pipeline. (Elliston, Virginia, US)

REUTERS/Charles Mostoller

The main culprit is our broken federal permitting system—an outdated, unworkable maze of bureaucratic barriers and litigation risks that thwart new projects at every stage.

It took more than a year longer to permit and build the 303-mile Mountain Valley Pipeline than the eight years it took to land a man on the Moon—240,000 miles away.[7] And this is not just a pipeline problem. All energy sources face the same cycle of overlapping reviews, duplicative permits, and prolonged legal challenges.

If we don't fix our permitting system, meeting growing energy demand will be difficult and the consequences will reverberate across our economy. The United States will risk losing its lead in technologies that will define the future—like artificial intelligence and advanced manufacturing—if we are not able to power them. Other countries are moving aggressively to build the infrastructure they need to compete. We can't afford to stand still.

The consequences will extend beyond our borders. Our ability to export oil, fuels, and LNG advances core national interests, strengthens our allies, and helps stabilize the global market. US LNG has become a critical input for economies all over the world, but our ability to deliver it will depend on export infrastructure that can match demand. That stabilizing role has never been more important than it is today.

There is a clear solution—and a rare opportunity for both parties to work together. Comprehensive, technology-neutral permitting reform—made durable through bipartisan legislation—would turn this weakness into a strength.

By passing bipartisan, comprehensive permitting reform, Congress can stop the carousel of endless reviews by forcing regulators to set firm and enforceable deadlines. They can reduce frivolous lawsuits by establishing clear guidelines for legal challenges. And they can streamline the permit-review process by updating old statutes with much needed clarity.

Members of both parties support permitting reform. It's time to get it done. Americans haven't faced an energy moment this consequential in a generation, and every month of delay is a month our competitors build while we debate—and a month American families pay more than they should. The solution is within reach—if Congress chooses to act.

Supply is abundant and demand is growing. Permitting reform is the missing link.

7 Paul W. Parfomak and Adam Vann, "Mountain Valley Pipeline: Past the Finish Line," Congress.gov, June 13, 2024, https://www.congress.gov/crs-product/IN12032; "Apollo 11: The Moon Landing," National Air and Space Museum, n.d., https://airandspace.si.edu/explore/stories/apollo-11-moon-landing#moonshot

ity to connect subnational power markets to broader geopolitical events.

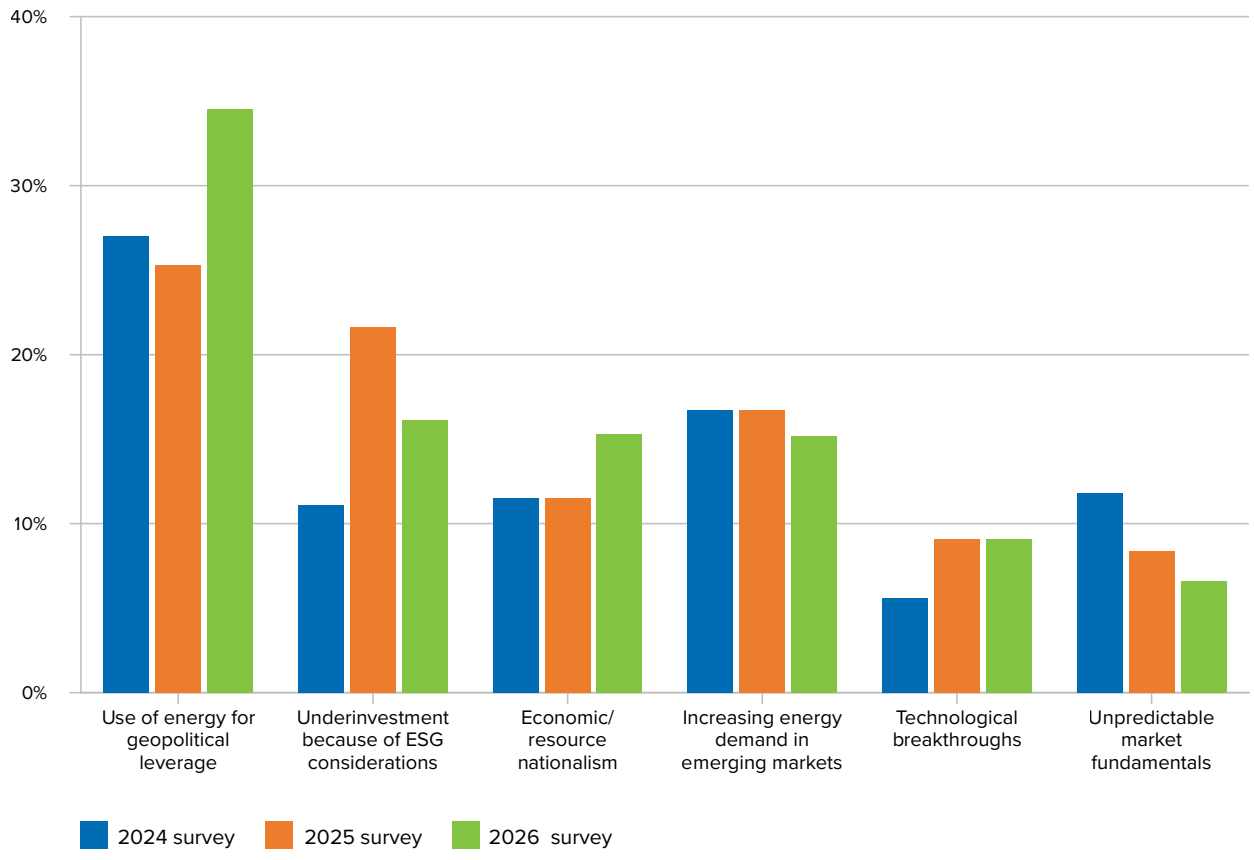
Presumably, these developments are reshaping how our survey respondents conceptualize energy markets. For decades, international energy discussions centered primarily on oil and natural gas because of their fungibility, global trade flows, and sensitivity to geopolitical disruption. As current events illustrate, that framework remains relevant, but it is no longer fully sufficient. The growing strategic importance of electricity systems, grid infrastructure, and critical mineral supply chains requires a more comprehensive understanding of energy security and affordability—one that recognizes the distinct ways different sectors experience reliability, pricing, and security risks. Concerns surrounding maritime choke points, for example, differ fundamentally from those associated with transmission constraints or grid reliability, even as each one carries broader economic and strategic implications.

Accordingly, when asked about the most important drivers of energy market volatility in the coming decade, it is worth considering how this evolving energy landscape may be shaping respondents' perceptions. As in prior years, respondents identified the use of energy for geopolitical leverage (35 percent) more often than any other factor.

Although this has consistently been the top choice over three years, the share citing it this time has risen noticeably from around a quarter of respondents in previous surveys. If the survey were taken today, Iranian efforts to block the Strait of Hormuz would arguably drive that percentage even higher. However, it is increasingly important to ask whether respondents now interpret "energy market volatility" more broadly than in the past.

Three additional factors are closely clustered in a second tier of drivers of market volatility: underinvestment linked to environmental, social, and governance (ESG) (16 percent); economic and resource nationalism (15 percent); and rising energy demand in emerg-

Figure 5. Over the next ten years, what will be the most important cause of energy market volatility?



ing markets (15 percent). While concerns about ESG-related underinvestment rose markedly in last year's results, this year it has moderated, returning closer to levels observed in 2024.

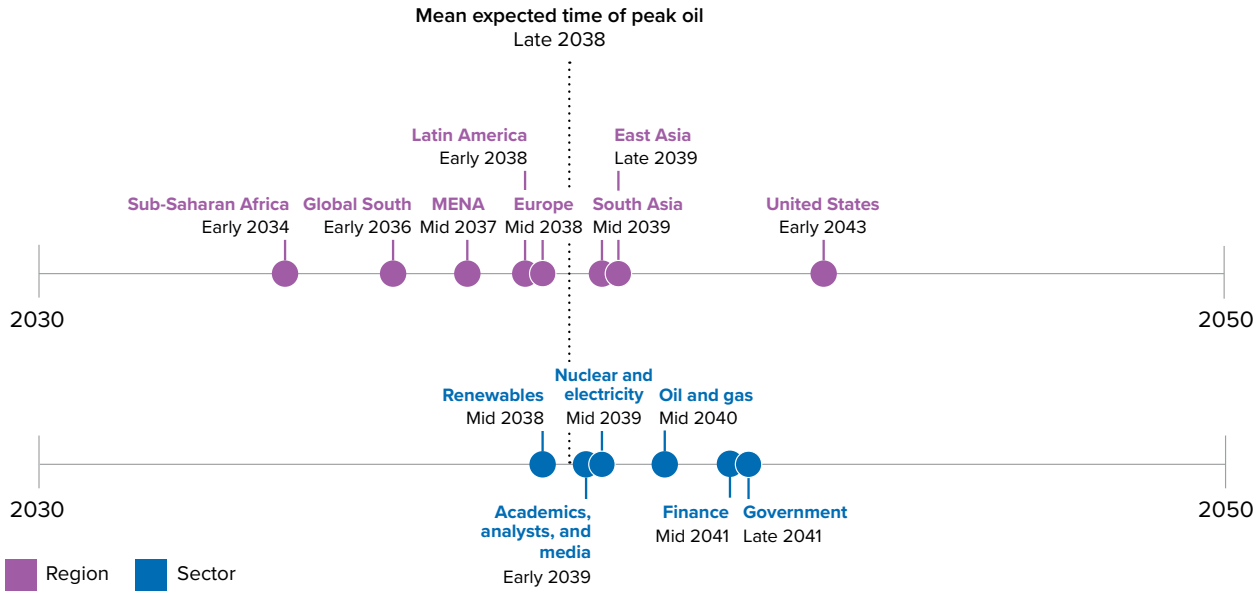
A broadly similar distribution of responses is evident across geographies, with one exception. Respondents in every region—except East Asia—identify the use of energy as a tool of geopolitical leverage as the leading driver of market volatility over the next decade. In East Asia, this factor is tied with economic and resource nationalism as the top response (both at 21 percent), while technological breakthroughs come in close at 19 percent.

The pattern of responses is largely consistent across elements of industry. Differences do emerge, however, when comparing less frequently cited factors across specific elements of the private sector. Among respondents in oil and gas, 26 percent cite ESG-linked underinvestment as the leading source of future volatility—reflecting acute concerns absent in other elements of the energy industry. In contrast, only 10 percent of those in renewables—an industry intuitively more likely to benefit from ESG investment—give this answer. This marks a notable shift from the prior survey, where a slightly larger share of renewables-industry respondents cited ESG-related underinvestment than did those in oil and gas (29 percent vs. 25 percent).

Taken together, responses to the survey's first seven questions underscore the centrality of geopolitical rivalry in shaping the global energy system. And though geopolitical competition is seemingly growing in intensity, this is doing little to shift the trajectory of the global energy mix. Expectations around the future role of fossil fuels remain largely unchanged since the prior survey.

When asked to pinpoint the timing of peak oil demand, respondents place the average estimate in the later part of 2038—little changed from last year's mean projection of mid-2038 and the preceding survey's estimate of early 2039.

Figure 6. Mean expected year of peak oil by region/country and sector



LEADERSHIP INSIGHT

Greece's energy realism: A bridge for transatlantic energy cooperation

By Stavros Papastavrou

Stavros Papastavrou is minister of environment and energy of the Hellenic Republic.

In a world marked by geopolitical uncertainty, economic disruption, and profound technological change, energy policy must be grounded in facts and guided by security, affordability, competitiveness, and social cohesion.

This is the foundation of Greece's energy realism: a policy based on cost-efficiency, technological neutrality, diversification, and a clear understanding that every energy decision affects households, businesses, industries, and national resilience.

The energy transition is essential but must be both environmentally responsible and economically and socially sustainable. Europe must remain firmly committed to its decarbonization goals, while ensuring that the pace and design of the transition do not undermine competitiveness, social cohesion, or security of supply.

For too long, parts of the international debate have underestimated this balance. The maritime sector is a telling example. Although shipping accounts for less than 3 percent of global emissions, it has often been confronted with disproportionately high regulatory costs.[1] This creates risks for international competitiveness without necessarily producing equivalent global environmental benefits.

Greece's position is clear: the destination of the clean energy transition is not in question but the path must be realistic, effective, and fair.

At the same time, Greece has steadily strengthened its role as a strategic energy bridge between regions, markets, and allies. Our close cooperation with the United States, reaffirmed at the recent Partnership for Transatlantic Energy Cooperation (P-TEC) Conference in Athens, reflects a shared commitment to transatlantic energy security, innovation, diversification, and investment.

In this context, Greece is not simply adapting to global developments—it is actively shaping the new energy map of Europe and the Eastern Mediterranean.

Four distinct but complementary initiatives are now driving Greece's energy strategy and reinforcing the country's geopolitical and economic position.

First, accelerating Greece's hydrocarbons sector

Greece is accelerating exploration activities with the participation of leading global energy companies, including ExxonMobil and Chevron. These partnerships signal strong international confidence in Greece's potential. After nearly half a century, exploratory drilling is set to resume in the Ionian Sea, while new seismic surveys are planned in key offshore areas south of Crete.

In April, the drilling contract for Block 2 in the Northwestern Ionian Sea was signed between Energean as operator of the ExxonMobil–Energean–HELLENiQ ENERGY consortium and Stena Drilling, in the presence of the ambassadors of the United States and Sweden. The agreement marked a historic milestone for Greece, advancing Prime Minister Kyriakos Mitsotakis' national strategy to strengthen the country's energy security and accelerate the responsible development of its hydrocarbon potential.

Greece is now counting down to February 2027, when the offshore exploratory drilling operation is scheduled to begin. This effort is not a departure from the energy transition. It reflects a pragmatic

1 Laura Quinones, "A Historic Course Correction: How the World's Shipping Sector is Setting Sail for Net Zero," United Nations, May 14, 2025, https://news.un.org/en/story/2025/05/1163241.

understanding that domestic resources can contribute to energy security, reduce dependency, and support economic growth during the transition period.

Second, diversifying energy sources and transforming Greece's energy mix

Over the past decade, Greece has made remarkable progress. From a power system once heavily dependent on lignite, we are moving decisively toward cleaner alternatives. Lignite's share in electricity generation has declined dramatically while renewable energy sources now represent a central pillar of our energy mix, accounting for more than 50 percent of the country's electricity production.[2]

This transition is strategic. By combining renewables with flexible sources such as natural gas, storage, and stronger grids, we are building a system that is cleaner, more resilient, and more reliable. Sustainability must go hand in hand with security of supply and affordable energy.

Third, advancing the Vertical Gas Corridor

This flagship initiative is transforming Southeast Europe's energy architecture. Greece has evolved from an endpoint for energy imports into a dynamic transit hub, contributing to the European Union's strategic objective of reducing dependence on Russian gas through the expansion of US liquefied natural gas (LNG) imports and enhanced regional interconnectivity. Through significant investments in LNG infrastructure, interconnectors, pipelines, and compressor stations, we are enabling the flow of energy across borders and into new markets.

The Vertical Gas Corridor is much more than a network of infrastructure. It is a strategic artery that strengthens regional cooperation, market integration, and supply security for Europe as a whole. It shows how targeted infrastructure can unlock broader geopolitical and economic value.

Fourth, strengthening regional partnerships, particularly the 3+1 framework of Greece, Cyprus, Israel, and the United States

Energy cooperation in the Eastern Mediterranean is a cornerstone of regional stability. This partnership is promoting dialogue, investment, and projects of common interest. It is a model of how energy can serve as a catalyst for cooperation rather than conflict.

By aligning strategic priorities with trusted partners, Greece is reinforcing its role as a pillar of stability in a complex and volatile region. The 3+1 initiative, reaffirmed during the recent P-TEC meeting in Athens, promotes growth, energy security, and shared prosperity, while strengthening regional stability and reducing the space for unilateral or destabilizing actions.

These four initiatives form a coherent strategy. They reflect the understanding that real energy security is multidimensional. It depends on diversified sources, robust infrastructure, technological flexibility, competitive markets, and strong alliances.

This is also the essence of Mitsotakis's energy realism. Greece supports the clean energy transition but not at any cost. We must take into account competitiveness, affordability, and social cohesion. The prime minister was among the first European leaders to reject the false dilemma that a national energy strategy should embrace either renewables or hydrocarbons. Instead, it should pursue both: accelerating clean energy while using every available tool to strengthen energy security.

Recent attention in Washington, including President Donald Trump's repost of remarks on Greece's energy strategy and transatlantic energy cooperation, reflects the growing recognition of our country as a reliable partner in the new energy map of Europe and the Eastern Mediterranean.

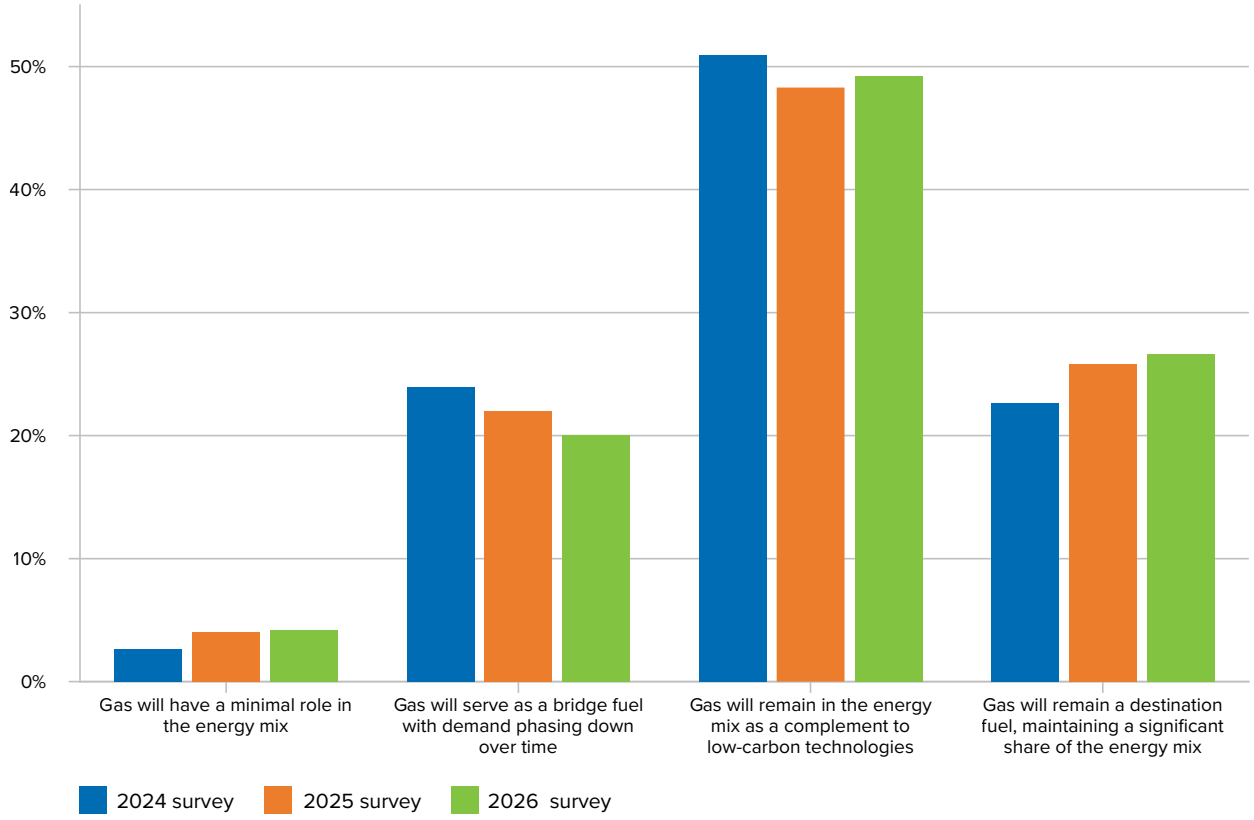
Ultimately, energy policy is about more than supply and demand. It is about sovereignty. It is about resilience. It is about the ability of a nation to make informed choices in an unpredictable world.

In the twenty-first century, energy is geopolitical power. Whoever controls their energy controls their destiny.

Greece stands ready to contribute to Europe's energy future as a driver of solutions. Because in today's geopolitical reality, energy is not just a commodity. Energy is life. And secure energy is power.

2 "Energy System of Greece," International Energy Agency, 2024, https://www.iea.org/countries/greece.

Figure 7. Which of these statements best describes the future of natural gas?



Across most regions, shifts in expectations are relatively modest, typically amounting to changes of one to two years. One noteworthy change is among respondents from the United States. On average, this group now expects peak oil to occur in the early 2040s, approximately three years later than in the previous survey. This change may reflect shifting US policy priorities, including renewed support for oil and gas, coupled with a recalibration of support of some renewable energy sources.[11] Indeed, those political and policy changes led the International Energy Agency to move the date of peak oil in its policy scenario from 2030 in its 2024 report to 2050 in its 2025 *World Energy Outlook*.[12]

Another consistent feature worth noting is the relatively early timing of peak oil demand projected by respondents from sub-Saharan Africa compared to other parts of the world. This aligns with other responses from the region, which tend to place less emphasis on a long-term role for natural gas, anticipate an earlier path for achieving net-zero emissions, and more frequently identify a wider range of benefits associated with that transition.

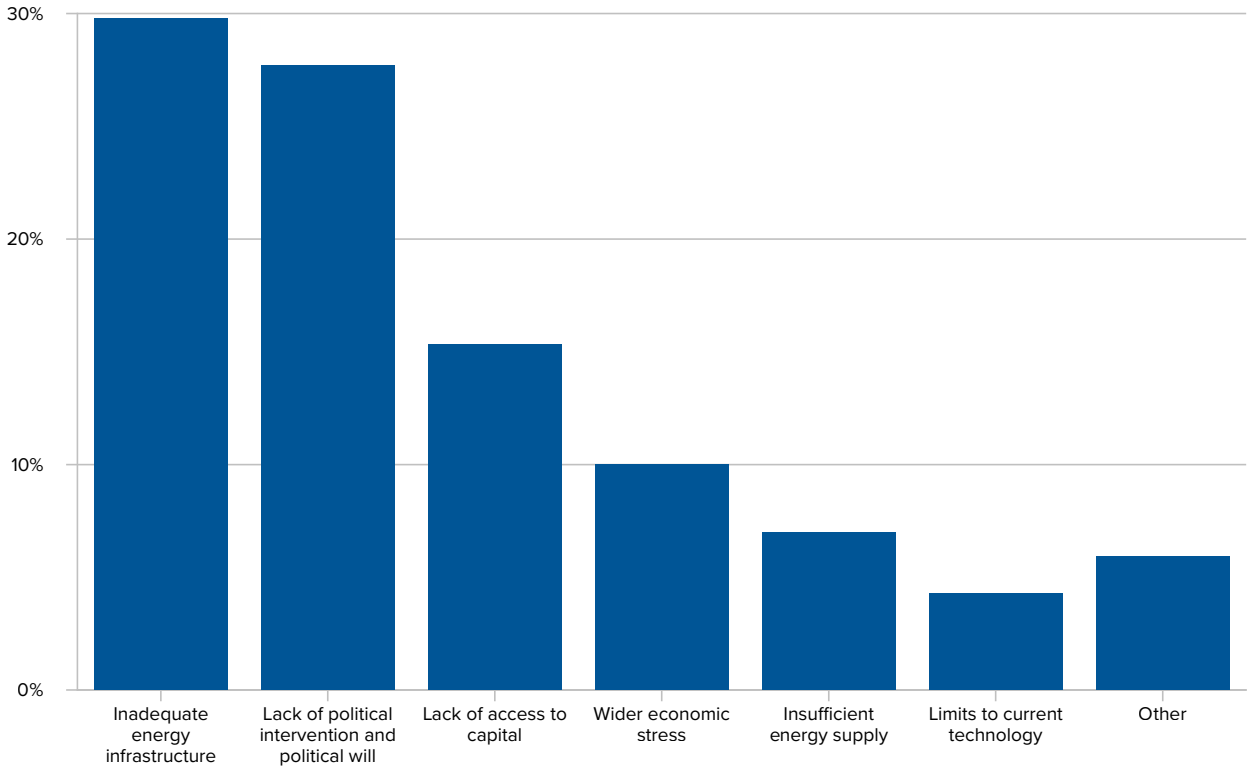
Across economic sectors, views show a high degree of convergence, with responses from those in oil and gas, finance, and renewables all shifting closer to the overall average. A notable divergence emerges among respondents in government, however. In last year's survey, this group placed the timing of peak oil demand at around 2038. In the latest survey, the estimate is more than three years later.

As with oil, the general sentiment about the future of natural gas shows little change from the previous two surveys, despite its often distinct positioning as a comparatively lower-emissions alternative.

11 Jack Andreasen Cavanaugh et al., "Assessing the Energy Impacts of the One Big Beautiful Bill Act," Center on Global Energy Policy, July 14, 2025, https://www.energypolicy.columbia.edu/assessing-the-energy-impacts-of-the-one-big-beautiful-bill-act/.

12 "Current Policy Scenario," International Energy Agency (IEA), 2025, https://www.iea.org/reports/world-energy-outlook-2025/current-policies-scenario.

Figure 8. Which of the following is the primary obstacle to increasing access to affordable energy?



Just over a quarter of respondents (27 percent) now view natural gas as a destination fuel; while nearly half (49 percent) expect it to remain part of the global energy mix as a complement to other technologies. A further 20 percent see it as a bridge fuel, with demand gradually phasing out over time; and only 4 percent anticipate that it will have a minimal role.

Responses are broadly similar across geographies, except for the fossil fuel-rich Middle East. Participants in that region are the most optimistic about the future of gas: 46 percent say it will be a destination fuel; while an additional 38 percent expect it to remain a part of the energy mix as a complement to other technologies. Notably, no respondents in MENA anticipate that natural gas will have a minimal role in the future.

Outside of MENA, East Asian respondents are the most likely to see a long-term future for natural gas. Thirty-one percent view it as a destination fuel, while 57 percent expect it to remain part of the energy mix as a complement to other technologies. This is particularly evident in responses from Japan, a country that is highly dependent on natural gas imports.[13]

Sub-Saharan Africa stands out as the region where respondents are most likely to anticipate a more limited future role for natural gas. Here, 30 percent view natural gas exclusively as a bridge fuel, while 7 percent expect it to have a minimal role. Even so, a clear majority (63 percent) expect the fuel source to have some kind of permanent role. This pattern is driven in part by generational difference. Among those from the region younger than 35 years of age, 42 percent believe that gas will be at most a bridge fuel, compared to 24 percent for both the overall survey pool and sub-Saharan Africans who are 35 or older.

Two sectoral differences stand out in the data. Consistent with last year's results, 46 percent of those surveyed in the oil and gas industry say that natural gas will be a destination fuel and 43 percent think it

13 "Japan Natural Gas Supply," IEA, 2024, https://www.iea.org/countries/japan/natural-gas.

LEADERSHIP INSIGHT

Responsibility is the surest path to resilience in the Minerals Age

By Rohitesh Dhawan

Rohitesh "Ro" Dhawan is the president and CEO of the International Council on Mining and Minerals (ICMM), a role he has held since 2021. He leads the Council of 26 CEOs of the world's largest mining and metals companies in voluntary leadership actions that raise the standards of responsible mining.

In industry, we often talk about minerals as the hidden ingredients of modern life. They are the enablers of technological progress and economic growth, and more recently of national security. But the world's dependence on them is no secret. Throughout history, people have shown a primordial connection to metals and minerals, dating back to the Bronze Age and the Iron Age. Each marked a step forward in human development as each era harnessed the power of these resources.

Now the world is on the cusp of another defining era: the Minerals Age.

Four big transitions are converging at once: the shift from fossil fuels to electrification; from just-in-time globalization to just-in-case economic security; from relative geopolitical stability to strategic rivalry and rearmament; and from the digital age to the age of artificial intelligence. All four are dramatically increasing demand for minerals.

Copper, lithium, nickel, cobalt, graphite, and rare earths have become strategic resources: the "new oil." They're in everything from phones to semiconductors, fighter jets, transmission lines, wind turbines, and data centers. The International Energy Agency (IEA) estimates that demand for critical minerals in clean energy systems alone could double or quadruple by 2040 depending on the pace of the energy transition.[1] Artificial intelligence (AI) will add further pressure through the rapid expansion of energy-intensive digital infrastructure.

But the world is entering this new era with deeply concentrated and increasingly vulnerable supply chains.

China is now the dominant refiner for nineteen of the twenty strategic minerals analyzed by the IEA, with an average market share of around 70 percent. [2] Each represents a potential choke point. Recent export controls on graphite, gallium, germanium, and rare earths have demonstrated how quickly mineral dependencies can become geopolitical leverage.

Structural weaknesses across the mining value chain compound the problem. Bringing a new mine from discovery to production now takes an average of sixteen years. Ore grades are declining in many mature mining regions. Permitting processes are often slow and unpredictable. Infrastructure constraints remain severe across many resource-rich economies. And increasingly, projects face delays or cancellation because they fail to secure long-term support from affected communities.

That last point matters more than many policymakers realize.

Minerals may underpin global supply chains, but mining is ultimately a local business. Mines operate near communities, often on or close to Indigenous lands, and alongside ecosystems

1 "The Role of Critical Minerals in Clean Energy Transitions," International Energy Agency, May 21, 2025, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions.

2 "Global Critical Minerals Outlook 2025: Executive Summary," International Energy Agency, May 21, 2025, https://www.iea.org/reports/global-critical-minerals-outlook-2025/executive-summary.

and water systems that people depend upon. The upside of this is mining often happens in places with limited other economic activity, so a mine can bring hugely significant benefits to communities; but when trust breaks down, vulnerability to disruption and political intervention rises sharply. Without a social license to operate, there is no real resilience at site level, no matter how strategically important the resource is.

This is one of the defining characteristics of the Minerals Age, and there is a growing risk that resilience becomes narrowly defined as access and volume alone. Leaders should resist this temptation.

A mine built without local support will likely face delay. A processing facility built without affordable and reliable power is not viable without state support. Nor is an operation dependent on scarce water resources in regions already under climate stress.

That is why responsible mining should be viewed as the surest path to resilience.

For too long, responsibility has been framed in ethical or reputational terms: important, but secondary to economic and strategic priorities. The reality is much more practical. Responsible mining is as much about whether supply chains can withstand disruption and endure over time.

Take community relationships. Across many jurisdictions, social conflict has become one of the largest causes of project delay. Operations built on meaningful local partnership and shared value are far more likely to maintain stability through political and economic change. For instance, the giant Quellaveco mine in Peru—operated by Anglo American, a member of the International Council on Mining and Minerals (ICMM)—stands out for sustaining local support in a country all too familiar with tensions around mining.

The same principle applies operationally. Companies investing in water efficiency, recycling, and desalination are better prepared for the growing physical impacts of climate change. ICMM members operating in Chile, including the likes of Antofagasta Minerals and Teck Resources, have invested in some of the world's leading desalination and water management practices—including, in some cases, voluntarily handing continental water rights back to the state to redistribute to communities.

Circular supply chains and recycling won't eliminate the need for new mining, but they can become important sources of domestic resilience and reduce exposure to geopolitical coercion.

None of this means sacrificing competitiveness. In many cases, it is precisely the opposite. Increasingly, the jurisdictions and companies most likely to attract long-term capital will be those able to offer stable and responsibly produced supply.

This is also how the debate around environmental, social, and governance (ESG) principles can become more constructive. The language of responsibility has become politically charged in some parts of the world, but resilience is something everyone understands, whether they're allocating capital or drafting legislation. Responsible mining is just the clear-eyed recognition that unstable systems eventually fail.

This is where the industry now has an opportunity to align around a clearer framework for responsible production. Later this year, ICMM, together with The Copper Mark, Mining Association of Canada, and World Gold Council, will launch the Consolidated Mining Standard Initiative (CMSI), a new global standard that reduces complexity and clarifies responsible practices for mining companies of all sizes, across all locations and commodities.

CMSI is by design an ambitious standard, even for those such as ICMM members who are already leading the way. Yet it's also a ladder, providing an opportunity for smaller companies to take their first steps on this journey. It offers a generational opportunity to make an ambition for responsible mining something all mining businesses can and should aspire to.

At a time when governments are racing to secure supply, this opportunity and clarity matter.

History's great material transitions have always reshaped the global balance of power. The Minerals Age will be no different. But the winners will be the ones that build resilient supply chains that endure under pressure. And responsibility is the surest path to achieving it.

will be a complement to other technologies. Those in renewables, by contrast, rarely see natural gas as a destination fuel (12 percent): 31 percent say it will be a bridge fuel, and 51 percent think it will complement other technologies. Taken together, these responses reinforce the point that perspectives on the future role of natural gas remain closely aligned with respondents' positions within the energy system.

Views on nuclear energy show a similar degree of consensus, with most respondents expecting nuclear to remain a major global source of energy in the future. Taken together with expectations for continued growth in overall energy demand, this may point to an "all-of-the-above" orientation within the survey pool. Differences emerge, however, on where nuclear energy will serve as a primary generator.

More than half of respondents (54 percent) believe that nuclear energy will serve as a primary energy source in developed economies, while having a limited role in developing countries. A further quarter (26 percent) anticipate that nuclear power will serve as a primary source of energy in both developed and developing countries.

These responses are largely consistent across geographies, demographics, and sectors, with one notable exception. Among respondents working in renewables, 43 percent say that nuclear will have a minimal role in global energy by 2050—more than twice the survey average. Correspondingly, fewer respondents in this group anticipate a significant role for nuclear power: 33 percent expect it to serve as a primary energy source in developed countries, while 24 percent say that it will do so in developing countries as well. This expectation among respondents in the renewable energy sector may reflect confidence in the scalability and affordability of their own technologies relative to nuclear.

Regardless of where energy comes from, the degree to which trends across oil and gas, renewables, and nuclear energy translate into affordable energy remains uncertain. Respondents point to a range of systemic challenges that policymakers must address to both secure access to energy and make it affordable.

As a group, respondents identify two dominant barriers to affordable energy: inadequate infrastructure (30 percent) and lack of political intervention or political will (28 percent). At 15 percent, lack of capital serves as a second-tier concern.

This is another area where aggregate results closely reflect those found across geographic and industry groups. In the Global South, for example, inadequate infrastructure is identified as the primary barrier (34 percent), followed by a lack of political intervention and political will (24 percent). Limited access to capital ranks third (18 percent) and is cited more frequently than in the survey overall.

Among respondents outside the Global South, the ordering of the top barriers is reversed. A lack of political intervention and will is identified as the top obstacle for increasing access to affordable energy (31 percent), followed by inadequate infrastructure (27 percent). Insufficient access to capital is listed by 13 percent of respondents. These differences likely reflect underlying economic disparities between emerging and developed economies. Countries that are economically poorer generally have a comparative lack of energy infrastructure and greater challenges in accessing capital necessary to build it.[14]

Digging further into the data reveals variations within the Global South. In sub-Saharan Africa, 39 percent of respondents claim inadequate energy infrastructure is the primary barrier to affordable energy, while 20 percent cite limited access to capital. In Latin America, the corresponding figures are 30 percent and 25 percent, respectively.

Among developed economies, the most interesting departure from an overall trend is observed in Japan, a high-income country that relies heavily on imported fossil fuels.[15] Only 17 percent of respondents from Japan identify inadequate infrastructure as the leading barrier to affordable energy, and just 3 percent cite limited access to capital—both are well below the global average of 30 percent and 15 percent, respectively.

By contrast, concern about supply constraints and policy are more pronounced. Of the Japanese respondents, 17 percent cite insufficient energy supply as a key challenge, more than double the global average (7 percent), while 41 percent cite a lack of political will as the top impediment to improving energy access, compared to 28 percent globally. As the Institute of Energy Economics' Terazawa wrote in his essay, "Japan's energy policies have not been perfect. Several weak-

14 "The Grid Gap: Why the Emerging Markets Energy Transition Will Be Decided by Infrastructure, not Ideology," Economist Impact, 2026, https://impact.economist.com/energy-environment/grid-infrastructure-economic-growth-energy.

15 "Japan Energy Supply," IEA, 2024, https://www.iea.org/countries/japan/energy-mix.

REUTERS/Megan Varner

Nuclear energy is expected remain a major source of energy in the future. (Vogtle Plant, Georgia, US)

nesses have been exposed through the (Iran) crisis, and Japan needs to address them." He also notes that the new Japanese government has issued a revised national energy plan that aims to maximize nuclear energy and expand renewables, signaling that these dynamics may be well understood in Tokyo.[16]

Across industry groups, responses are broadly aligned, with only minor variation. The most notable break from the norm is among respondents from finance. While their top concern mirrors the global average—lack of political intervention and will (32 percent)—they place greater emphasis on limited access to capital (20 percent), ahead of inadequate infrastructure (18 percent).

A further, though limited, distinction occurs among conventional energy-producing sectors. Among respondents from oil and gas, nuclear energy, and the electricity industry, 14 percent cite lack of supply as a leading barrier, twice the overall survey average. By contrast, only 2 percent of those in renewables give this answer, while 36 percent cite inadequate infrastructure as a primary obstacle. This focus of the renewables group could reflect the industry's conviction that power grids need to expand to shift from centralized to decentralized systems that accommodate renewable generators.[17] At the same time, the view among the respondents in the renewables sector that insufficient energy supply is not a major barrier to affordable energy could reflect the lack of a conventional "fuel" supply in renewables.

16 "Japan's 2026 Elections Redefine the Country's Energy Landscape," *Forbes*, February 16, 2026, https://www.forbes.com/sites/arielcohen/2026/02/16/japans-2026-elections-redefine-the-countrys-energy-landscape/; and "Japan's Energy Plan: New Policy Shifts Nuclear Power Stance from Reduction to Maximization," Nippon Communications Foundation, February 25, 2026, https://www.nippon.com/en/in-depth/d01195/.

17 Ken Berlin and Frank Willey, "Expanding Transmission Infrastructure to Achieve Low-Cost, Reliable, and Abundant Energy," Atlantic Council, March 3, 2026, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/expanding-transmission-infrastructure-for-low-cost-reliable-abundant-energy/.

CHAPTER III

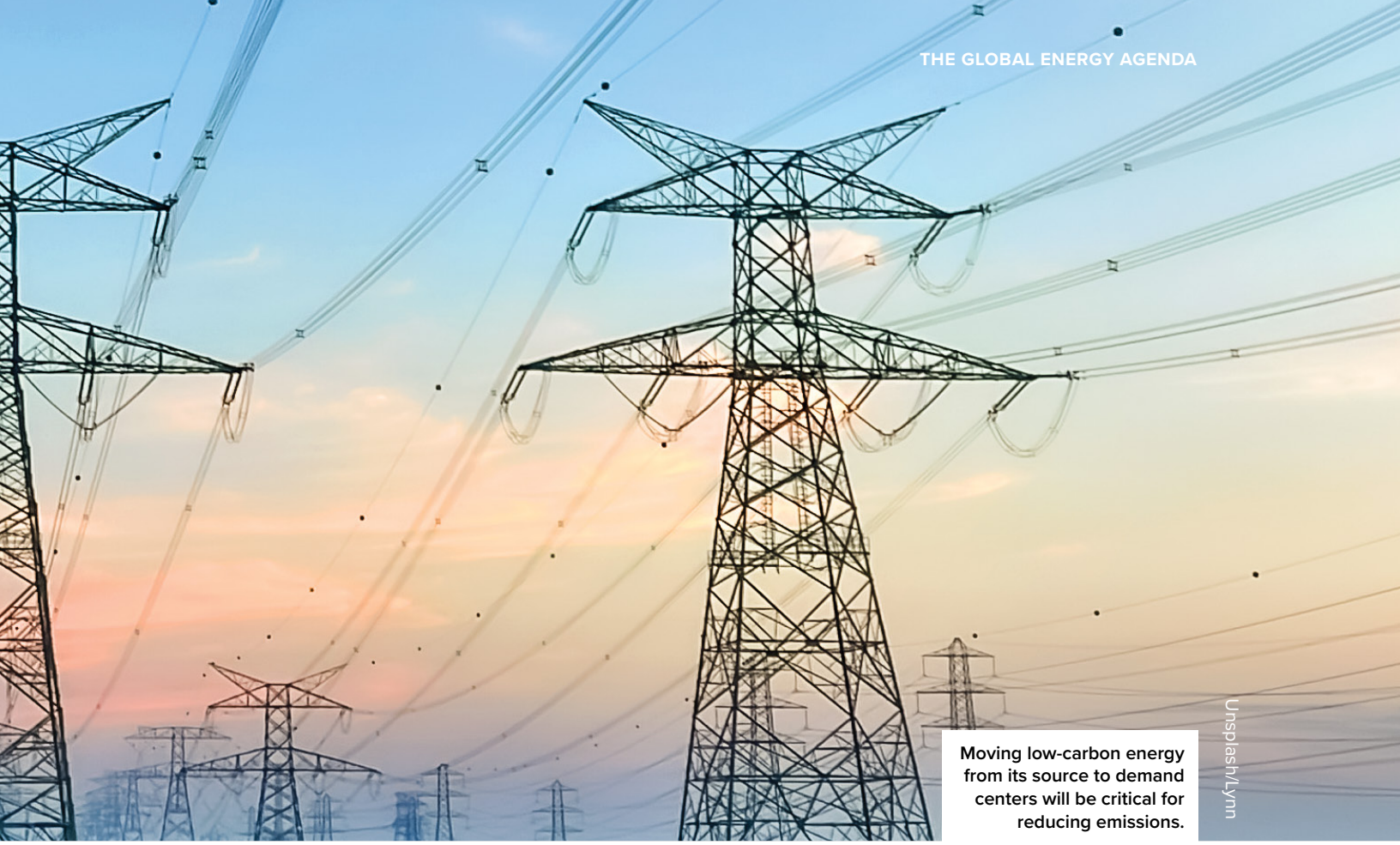
Views on net-zero emissions

IN STARK CONTRAST TO THE OPTIMISM surrounding the United Nations Climate Change Conference (COP28) in the United Arab Emirates in 2023, global discourse on climate action and the energy transition appeared markedly fragmented in 2025. Brazil's leadership of COP30, hosted in the heart of the Amazon in Belém in November 2025, delivered "real impact" on adaptation finance for developing economies and small island states, yet left climate advocates disappointed by the lack of stronger commitments to phase out oil, gas, and coal.[18] These dynamics unfolded against a backdrop of weakening international cooperation on climate change, as the Trump administration once again withdrew the United States from the Paris Agreement before later signaling its intent to leave the UN Framework Convention on Climate Change (UNFCCC) altogether.[19]

Overall, however, expectations regarding the timing of net-zero emissions have changed little since the previous survey. Fewer than one-third or respondents anticipate achieving net zero by 2050, while the mean projected date remains 2066.

18 Jorge Gastelumendi, "Dispatch from COP30: In the Brazilian Jungle, the Private Sector Takes Center Stage," *New Atlanticist*, Atlantic Council blog, November 20, 2025, https://www.atlanticcouncil.org/blogs/new-atlanticist/dispatch-from-cop30-in-the-brazilian-jungle-the-private-sector-takes-center-stage/; and Sara Schonhardt et al., "Deal or 'Meh' Deal? Climate Summit Ends on a Deflating Note," *Politico*, November 22, 2025, https://www.politico.com/news/2025/11/22/deal-or-meh-deal-climate-summit-ends-on-a-deflating-note-00665990.

19 Nate Perez and Rachel Waldholz, "Trump Is Withdrawing from the Paris Agreement (Again), Reversing U.S. Climate Policy," NPR, January 21, 2025, https://www.npr.org/2025/01/21/nx-s1-5266207/trump-paris-agreement-biden-climate-change; and "Withdrawing the United States from International Organizations, Conventions, and Treaties That Are Contrary to the Interests of the United States," White House, January 7, 2026, https://www.whitehouse.gov/presidential-actions/2026/01/withdrawing-the-united-states-from-international-organizations-conventions-and-treaties-that-are-contrary-to-the-interests-of-the-united-states/.



Moving low-carbon energy from its source to demand centers will be critical for reducing emissions.

Unsplash/Lynn

A growing split is emerging between developed and developing economies, with respondents in the former generally expecting a longer time horizon for achieving net zero. Meanwhile, majorities across both groups see the pursuit of net zero as beneficial for energy access and security. Views diverge more sharply on the broader economic implications, with those from developing countries viewing net zero positively, while those in developed countries remaining more divided. This gap is wider than in last year's survey, potentially revealing growing skepticism about the impact of net-zero pathways in higher-income countries.

Beneath this apparent stability, however, a growing geographic split is evident.

Notably, several advanced economies are forecasting a later date for the arrival of net-zero emissions. The most significant regional shift is observed in East Asia, where the median view is now that this milestone will be passed in 2079, up from 2066 in the previous survey. This change is largely driven by Japan, the largest East Asian cohort in both years. In last year's survey, the median Japanese estimate aligned with the global average: 2066. In the latest results, it is markedly later: 2088.

Less dramatic, but still substantial, is the change from European respondents. In aggregate, the region's median prediction for achieving net-zero emissions is now 2072—eight years later than in the previous survey.

While the median response among those from sub-Saharan Africa remains unchanged, this year's data reveals a notable generational divide. For those under the age of 35, the median expected year for achieving net-zero emissions is 2044. Respondents from the region aged 35 and above, alternatively, anticipate 2056 as the realistic target date—closely aligning with the broader average for the Global

LEADERSHIP INSIGHT

Community trust powers energy growth in the United States

By Harry Sideris

Harry Sideris is president and CEO of Duke Energy, one of the nation's largest energy holding companies. Duke Energy is a sponsor of the Atlantic Council Global Energy Forum.

The United States is undergoing rapid economic and technological change, driven by a resurgence in manufacturing and advances in artificial intelligence.[1] And population growth continues to accelerate in states that offer opportunity and a high quality of life. Duke Energy serves families and businesses across the Southeast and Midwest—in some of the fastest-growing states in the country.[2] The growth is not theoretical. It is already showing up on our energy system, and the opportunity is being felt directly in the communities we serve and across the nation.[3]

Utilities must step up to meet historic energy demand by being better and faster, and always looking for the lowest-cost path to serve this growth. Duke Energy is deploying the industry's largest regulated capital investment plan—$103 billion over the next five years—to maximize current assets while adding new generation capacity.[4] Deploying these investments at speed is important. But to truly deliver, speed must be paired with discipline, trust, and transparency, ensuring new infrastructure strengthens and delivers real value for customers over the long term.

For utility leaders, this starts with being active members of our communities and being engaged in the discussions around kitchen tables and local hearings where projects ultimately take shape. As the United States celebrates its 250th anniversary, I reflect on the fact that for nearly half that time—over 120 years—Duke Energy employees have lived and worked alongside the communities we serve. Trust is built by showing up early, listening carefully, and giving local stakeholders a meaningful voice in decisions that affect them. That trust is foundational to durable growth at speed.

This commitment to communities matters, especially in moments like this when the growth we are serving is broad, sustained, and accelerating. Utilities must support significant customer commitments tied to population growth, manufacturing expansion, and new industries in our respective regions. This is not about any single sector. It is about powering long-term economic growth across regions that consistently rank among the most competitive places to live and do business.

As demand accelerates, this model for early and sustained community engagement is increasingly important for large infrastructure customers, including data centers. These large customers bring innovation and capital, but many have limited experience navigating local jurisdictions and engaging the wide range of stakeholders involved in siting long-lived infrastructure. When those conversations occur late—or not at all—

1 John Coykendall, et al., "Accelerating the Resurgence of American Manufacturing," Deloitte, March 26, 2025, https://www.deloitte.com/us/en/insights/industry/government-public-sector-services/american-manufacturing-renaissance.html#increasing-manufacturing-competitiveness.

2 "U.S. Population Growth Slows Due to Historic Decline in Net International Migration," US Census Bureau, January 27, 2026, https://www.census.gov/newsroom/press-releases/2026/population-growth-slows.html.

3 Jordan Blum, "U.S. Utilities are Planning a $1.4 Trillion Spending Spree, up 30%, Over the Next Five Years Amid the AI Construction Boom," Fortune, April 14, 2026, https://fortune.com/2026/04/14/us-utility-spending-jumps-to-1-4-trillion-amid-ai-construction-boom.

4 Emma Penrod, "At $103B, Duke Claims Largest Spending Plan of any Regulated US Utility," Utility Dive, February 12, 2026, https://www.utilitydive.com/news/103-billion-duke-claims-largest-spending-plan-of-any-regulated-us-utility/812047/.

Stakeholder collaboration across cities shape long-term development. (North Carolina, US)

Unsplash/Daniel Weiss

projects can face opposition that delays or derails development altogether.

Utilities play a critical bridging role. Developers are seeking partners who not only deliver reliable power, but who also bring long-standing trust within the communities where projects are proposed. That trust, earned over generations, helps create conditions where data centers and other large facilities can be developed responsibly and at pace.

Customers and communities benefit directly from this approach. Duke Energy and a number of other utilities have designed contract provisions to ensure that large customers pay the costs of serving their sites. Long-term commitments, including minimum bills and termination penalties, ensure infrastructure investments are borne by the customers driving new demand, even if projects change or do not proceed as planned. Over time, these large customers will also help lower costs for everyone by sharing the expense of infrastructure that all customers rely on.

Projects such as Amazon's ten billion dollar investment to build a data center in rural Richmond County, North Carolina, which will be powered by Duke Energy, can also create high-paying jobs, fund critical infrastructure upgrades, including wastewater treatment, and generate tax revenue that can support the local school system and other local initiatives.[5] These investments are strengthening communities today.

Doing this work at scale will help more communities thrive, support the United States' competitiveness in artificial intelligence, and drive sustainable, long-term economic growth across the regions we serve.

Other nations may build faster by cutting corners, but that speed often comes at the expense of transparency, safety, or public trust. The United States has always competed differently. To power the next chapter of American growth—from artificial intelligence to advanced manufacturing—speed alone is not enough. Lasting progress depends on trust, alignment, and execution that delivers better outcomes, faster timelines, and better value for the people and places we serve.

5 "Richmond County Celebrates Historic $10 Billion Investment from Amazon Web Services," Richmond County North Carolina, June 4, 2025, https://www.richmondnc.com/m/newsflash/Home/Detail/168?arc=669

LEADERSHIP INSIGHT

The infrastructure that will drive energy innovation and competitiveness

By Amy M. Brachio

Amy Brachio is the CEO of Carbon Measures. Carbon Measures is a global business coalition committed to accelerate innovation by developing a globally adopted framework for product-level carbon accounting, and advocating for mandatory product carbon intensity standards. Together, these efforts are designed to unlock durable market demand for lower-carbon products, and reduce emissions at scale.

The global economy is being rewritten. For decades, companies and economies found that transparent, well-functioning markets rewarded performance, drove innovation, and created global prosperity. However, prosperity now depends on adaptability: identifying where new shared infrastructure is genuinely necessary and building it with precision. Carbon measurement is one of those critical systems. It is arguably one of the most consequential drivers of economic competitiveness, but leaders are not yet treating it as such.

The infrastructure needed to unleash markets for low-carbon production is a globally accepted, product-level carbon accounting framework, paired with government-mandated carbon intensity standards. A rigorous common foundation that any company, regulator, or trading partner can trust—one that builds on existing frameworks and ensures competition and innovation are incentivized across supply chains.

The key to unlocking markets

I say this not as an idealist, but as a certified public accountant and pragmatist. Global carbon emissions are not declining at the pace or scale necessary to make a meaningful impact. The primary reason is not a lack of ambition or a lack of will, but a lack of the right market incentives. Companies across industries are investing in lower-carbon production, but the market has no reliable way to recognize it. Without credible, comparable data at the product level, those investments can't be differentiated, rewarded, or replicated at scale.

Markets are powerful engines of innovation and efficiency, but only when buyers can compare and competition can function. When the relevant information is visible and verifiable, markets allocate capital efficiently and drive improvement over time. Carbon intensity should function the same way. Right now, it cannot.

Existing disclosure frameworks have done important work. Corporate sustainability reporting has brought a degree of transparency to how companies calculate and disclose their emissions. That progress is real and should be preserved. But transparency alone, no matter if through voluntary or mandatory disclosure frameworks, will not drive emissions reductions at the scale that is needed for meaningful change.

Competition is what will incentivize the corporate sector, activating its core strength: innovation. And the way to achieve that competition is to enable accurate product differentiation and comparability. This path runs through establishing product-level carbon intensity data—the granular, comparable information that markets need to identify and reward lower-carbon performance. Without it, buyers can't confidently differentiate products, investors can't fully assess transition risk, and governments can't design effective policies. Disclosure got us visibility. Product-level data is what turns visibility into competition and innovation. And it's what will drive meaningful action.

Product-level carbon intensity standards could transform value chains. (Dar es Salaam, Tanzania)

Unsplash/Ali Mkumbwa

The missing layer

Data alone, however, is not enough. The full potential of product-level carbon accounting will be achieved when it enables governments to set effective policies that drive economic prosperity and market growth. With decision-grade, product-level emissions data in hand, regulators could set national targets for carbon intensity. This mandatory, performance-based tool would set the maximum permitted carbon intensity of a product to be traded into a market.

Government-mandated, product-level intensity standards, underpinned by accurate, verifiable, and comparable carbon emissions data, would be transformative across the entire value chain. It is a system that would make competition on carbon intensity possible and improve economic performance. Aligning market dynamics with public policy goals helps ensure prosperity is both sustainable and economically viable.

Fueling innovation and progress

There is a reason the world's most innovative industries have consistently outperformed expectations: When rules are clear and applied equally, companies face real competitive pressure—and competition drives progress.

Companies that have invested in lower-carbon production deserve to realize benefits from that investment by differentiating their products and competing on the merit of their performance. When those conditions exist, innovation accelerates, capital flows toward results, and the market drives emissions reductions at a pace that disclosure or policy alone have not yet achieved.

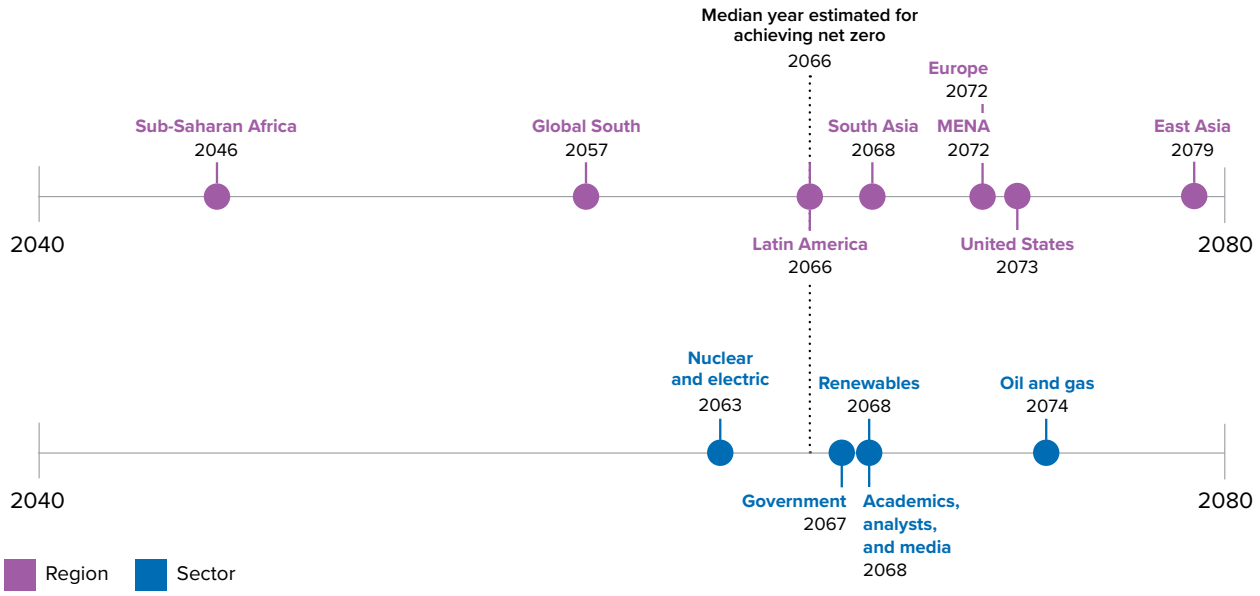
The underlying principle is not new: Open systems that are built on common information serve everyone's interests precisely because they level the playing field. The goal was never to tilt the field—it was to build one.

The path forward

The case for a global economic and market infrastructure that is precise, science-based, and built where it is genuinely needed is as strong as ever. Next-generation systems will be sparser than what came before, but they must be more precise.

Carbon accounting is the catalyst. Governments will set standards. And competition will do the rest.

Figure 9. Median year estimated for achieving net zero by region/country and sector



South. This generational divide may partly reflect the influence of younger populations in rapidly growing, globally connected economies such as Nigeria and Kenya, where exposure to international climate discourse and development trends may shape more optimistic expectations around net-zero targets.

While these represent the biggest regional shifts, the widening gap is also apparent at the global level. In this year's survey, respondents from the Global South collectively project a median net-zero year of 2057, compared with 2073 for those in the rest of the world—a difference of sixteen years. Last year's survey, by contrast, showcased a gap of just eight years: 2061 to 2069.

Taken together, these results suggest growing confidence in the pace of progress toward net-zero emissions in developing countries, while those from developed economies, particularly older respondents, anticipate a slower path toward net zero.

At the sectoral level, the only notable adjustment appears among respondents from the oil and gas industry, whose median forecast for achieving net-zero emissions is now 2074, a delay of seven years compared to last year's results. This is consistent with broader survey findings suggesting increased confidence within the sector in the continued relevance of their product.

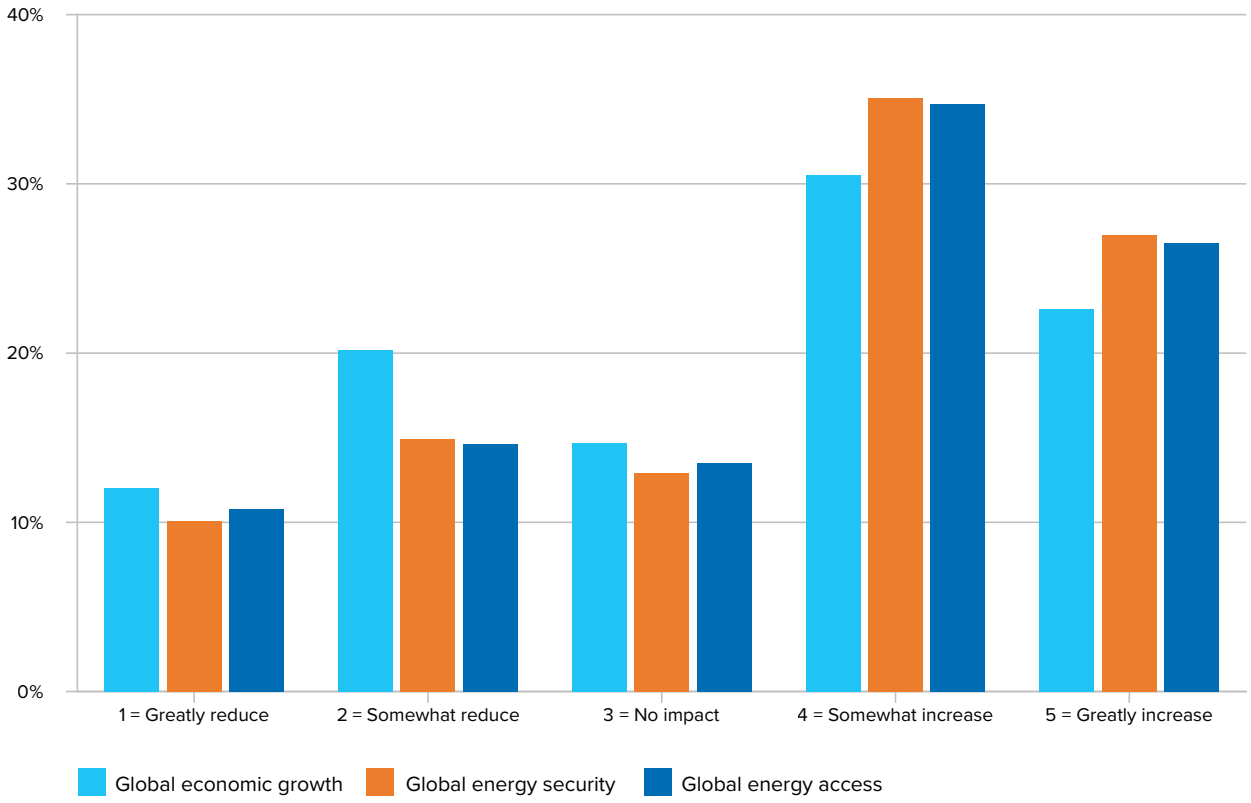
Despite the view that the world will not achieve net-zero emissions until well past 2050, respondents generally believe that policies aimed at accelerating this timeline would have a positive impact on energy security and access, as well as economic growth. Answers were highly aligned on the first two issues, while views on the economic consequence were more mixed, warranting closer examination.

With respect to global energy security and access, most respondents believe that efforts to achieve net-zero emissions will have a positive impact on both. Over six in ten expect these efforts will increase security (62 percent) and expand access (61 percent), while only around a quarter anticipate negative effects in each case.

Variation in the strength of these opinions emerges when responses are disaggregated by level of economic development. Respondents from the Global South are more likely to view net zero as beneficial, with 69 percent believing it will improve energy security and access. In the rest of the world, the equivalent figures are 57 percent and 55 percent, respectively. Regional patterns broadly reflect this divide between developing and advanced economies.

Across industry sectors, responses largely align with overall averages, save for two exceptions. Respondents in the renewable space are significantly more likely to view net zero as beneficial, with 78 percent expecting improvements to global energy security and 72 percent anticipating expanded energy access. By contrast, those in oil and gas are more

Figure 10. What impact would pursuing net-zero emissions by 2050 have on global economic growth, energy security, and energy access?



evenly divided. A slightly larger share thinks that progress toward net zero will reduce energy security (45 percent to 40 percent). Views on energy access follow a similar pattern, but in reverse, with 45 percent projecting greater access and 41 percent projecting a decline.

This question also reveals the first notable gender divide in this year's survey. Among female respondents, 73 percent expect progress toward net-zero emissions to enhance energy security, compared with 59 percent of male respondents. A similar gap is evident on energy access, with 69 percent of women versus 59 percent of men anticipating improvements.

As noted above, views on the economic impact of net-zero efforts diverge more sharply than those on energy security and access. Overall, a narrower majority (53 percent) expect the pursuit of net zero to support economic growth, while nearly one-third anticipate a negative impact.

Important variations merit discussion. In the Global South, for example, 64 percent of respondents expect the pursuit of net zero will boost economic growth, a result that is closely aligned with the response on energy security and access. In the rest of the world, however, this share falls to well under half (44 percent), only slightly ahead of the 39 percent in this group who said that pursuit of net zero would reduce economic growth.

Once more, regional figures largely reflect divergence between developing and developed economies. It is worth mentioning, however, that in Europe—a region whose countries have actively sought to serve as net-zero leaders—respondents are evenly distributed, at 42 percent each, on whether pursuit of this goal helps or harms the global economy.

Opinion within economic sectors generally reflects the overall average, with the same outliers as on security and access. Respondents in renewables are more optimistic, with 69 percent expecting the pursuit of net zero to aid economic growth, compared with 19 percent who anticipate a negative outcome. Alternatively, respondents in oil and gas take a more pessimistic view, with half expecting the net-zero drive will constrain growth and just 37 percent believing it will lead to an economic boost. On this issue, respondents in finance take an even harsher view of the economic

> **"The full potential of product-level carbon accounting will be achieved when it enables governments to set effective policies that drive economic prosperity and market growth."**

repercussions of net zero; 42 percent say that net zero will be a drag on the economy, while 35 percent anticipate a positive effect.

Finally, the gender differences on economic growth mirror those on security and access: 60 percent of female respondents think that net-zero efforts will accelerate economic growth, while 25 percent say that it will impede it; for men, the equivalent numbers are 51 percent and 34 percent, respectively.

The differences across subsectors of the survey pool are not only interesting in themselves, but comparison with last year's survey suggests that they may reflect uneven declines in the proportion of respondents expecting efforts to achieve net zero to support economic growth. Last year's survey focused on the economic impact of achieving net zero, rather than pursuing it—a nuance that might adjust how respondents allocate associated costs. Nevertheless, in the prior year's survey, 62 percent of respondents said that reaching net zero would lead to increased economic growth, while only 23 percent anticipated that it would do the opposite. This gap is 18 percent points wider than observed in the current survey.

While variations across industry sectors do not reveal a consistent pattern, responses by geography paint a clearer picture of this shift. In the Global South, views on the relationship between net-zero efforts and economic growth have remained relatively stable. Elsewhere, however, confidence has sharply declined. Specifically, last year, 68 percent respondents from the Global South expected achieving net zero to bring economic benefits, compared to 58 percent in the rest of the world. In the current survey, those figures are 64 percent and 44 percent, respectively—effectively doubling the gap between developing and developed economies.

The change is particularly pronounced in Europe. In the previous survey, 64 percent of European respondents anticipated that achieving net-zero emissions would support the economy, while 22 percent expected it would have the opposite effect. In the latest results, views are evenly split, with responses tied at 42 percent between those positive and negative impacts.

Views about the economic impact of achieving net-zero emissions are strongly correlated with those related to energy security and access. Among respondents who believe net-zero efforts will support economic growth, 84 percent also anticipate improvements in security and access. For those who view the pursuit of net-zero policies as an economic drag, only 31 percent say that they will improve security and 30 percent energy access.

Perceptions in these areas appear mutually reinforcing. Tepid expectations for the economic benefits of net zero could also signal a wider erosion of confidence in potential gains for energy security and access. Should the view that pursuing net zero would yield less economic benefit become a more systemic trend, it would have significant policy implications. If sustained, these trends may lead some governments to reconsider or even scale back net-zero policies.

LEADERSHIP INSIGHT

A demand-driven energy transition

By Katie Hall

Katie Hall is the CEO and co-chair of Galvanize, a global asset manager investing at the intersection of energy innovation, resilience, and intelligence.

In many markets, clean energy is now the lowest-cost form of new power generation, while demand for electricity is rising in ways few anticipated even a few years ago.[1] By many measures, it is a strong moment for the energy transition. But progress has changed the nature of the challenge.

From where we sit as investors across venture, growth equity, credit, real assets, and public markets, the constraint has shifted from capital to infrastructure, interconnection, and the institutions responsible for building and operating them. Capital is available, but the infrastructure required to deploy it is under strain.

In the United States alone, more than a terawatt of generation capacity, much of it renewable, is waiting in interconnection queues.[2] At the same time, the entities responsible for building and operating critical infrastructure are being asked to expand far beyond their historical pace.

Three reinforcing dynamics are driving this shift: accelerating demand, changing buyer behavior, and a reordering of where value accrues across the energy value chain.

First, demand is rising faster than the system was built to accommodate. After decades of relative stability, electricity demand is increasing. The expansion of data centers and artificial intelligence—alongside the electrification of transport, buildings, and industry—is driving a step change in load growth.

Artificial intelligence is accelerating this shift but did not create it. The broader electrification of the economy was already under way, from vehicles to industrial automation to modern defense systems. What's different is that the pace has changed. Timelines that once unfolded over decades are now being compressed into investment cycles measured in years.

As a result, power demand is becoming less predictable—more volatile, more concentrated, and more difficult to plan for—placing stress on systems designed for steady, linear expansion. Access to large volumes of dependable electricity is emerging as a prerequisite for economic expansion.

Second, buyer behavior is changing in response. The first wave of the energy transition was driven largely by climate ambition—corporate commitments, policy targets, and the search for lower-carbon alternatives. That work mattered because it built the foundation of today's energy system.

But the underlying driver has changed, and we see it directly in conversations with corporate leaders. Companies are increasingly investing in energy efficiency and clean power to reduce operating costs, secure supply, and improve competitiveness. From airlines modernizing fleets to cut fuel costs, to shipping companies lowering operating expenses through more efficient vessels, to retailers investing in self-generation for

1 Saied Dardour, Deborah Ayres, and Lourdes Zamora, "24/7 Renewables: The Economics of Firm Solar and Wind," International Renewable Energy Agency, May 2026, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2026/May/IRENA_TEC_24-7_renewables_2026.pdf.

2 "Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection," Lawrence Berkeley National Laboratory, December 2025, https://emp.lbl.gov/queues.

Automotive assembly plant in Alliston, Ontario, Canada.

REUTERS/Carlos Osorio

price stability and resilience, the logic is shifting from aspiration to economics.

We are seeing the same dynamic play out in real assets, where tenants are placing increasing value on access to reliable, cost-predictable power, shaping where they locate, how they lease, and what they are willing to pay for. Energy is becoming a core driver of occupancy and asset value.

This same shift is reshaping how energy is procured. Renewables are now a means of securing the power required to operate and grow. When access to power becomes business critical, buyers move faster, adopt new contracting and deployment models, and place greater value on certainty of supply. Power procurement is shifting from finding the lowest-cost electricity to securing reliable access first and then managing cost within those constraints.

In practical terms, we see this leading to longer-term agreements, more flexible deal structures, and a greater willingness to engage with solutions that would have been considered too early or too expensive in a lower-demand environment, creating new pathways for capital deployment. In effect, large energy buyers are beginning to act more like infrastructure investors—locking in supply, shaping project development, and, in some cases, directly underwriting new capacity.

Taken together, these dynamics are redirecting capital away from standalone generation and toward the infrastructure required to connect, move, and deliver power to where it's needed.

This is driven by the fact that, for the first time in decades, electricity has become a scarce and strategic asset. As that happens, the value of power rises in both price and access. When power becomes scarce, value migrates from stand-alone generation toward the systems that enable delivery, like interconnection, flexibility, and proximity to demand.

We are already seeing this play out across the system. A much-needed nuclear renaissance, while increasingly likely, will depend on whether utilities and governments can modernize how large-scale infrastructure is financed and delivered. At the same time, geothermal is advancing faster than many policymakers and grid planners have fully incorporated into their outlooks.

This trend extends beyond generation. Utility-scale renewables remain essential, but the most critical opportunities increasingly sit in the infra-

> **"As electricity becomes the defining input to economic growth, the transition will be shaped less by targets and more by who can deliver electrons reliably and at scale."**

structure around generation: storage, distributed energy, grid-enhancing technologies, flexible load, advanced procurement models, and software that can manage growing complexity.

While demand growth is widening the aperture of viable solutions, it is also exposing trade-offs. Wind and solar are fast to deploy and cost competitive, but on their own, they do not fully meet the needs of an electrified economy. Storage can help, but the scale required for continuous coverage can be costly. Transmission would unlock enormous value but remains slow to build in many markets. As a result, capital is moving toward solutions that can operate within these constraints: assets that can be deployed quickly, located closer to demand, and integrated flexibly into existing systems.

The transition will continue to unfold unevenly. In some markets, rising demand is leading to delays rather than acceleration. Projects are stalled by lack of grid access, customers are forced into suboptimal solutions, and there is a widening disparity in who can secure power and who cannot. The result is a widening gap between regions that can secure reliable power and those that face growing constraints.

In summary, the opportunity in this next phase of the transition lies in building the capabilities required for an electrified economy: generation, flexibility, reliability, intelligence, and speed. It requires identifying where demand is most acute, where infrastructure is most constrained, and where new solutions can unlock both decarbonization and growth.

It follows that the next phase of capital deployment should back the companies and assets that can meet rapidly growing demand for power while making the system cleaner, more resilient, and more productive.

The era of climate ambition built the foundation, but the era of demand will determine what scales.

CHAPTER IV

Technological transformations

IT IS DIFFICULT TO OVERSTATE THE ROLE OF policy in shaping respondents' views on technology deployment. On July 4, 2025, President Trump signed into law the One Big Beautiful Bill Act (OBBBA), marking a rapid shift in US energy policy. Less than three years earlier, the Biden administration had become the envy of clean-energy advocates worldwide after enacting the Inflation Reduction Act (IRA), which ultimately directed more than $800 billion toward clean energy technologies and industrial decarbonization. The OBBBA reversed course on many of those priorities, rolling back a range of IRA-era incentives for renewable energy, electric vehicles, and home electrification, while preserving support for select technologies such as nuclear, geothermal, battery storage, and carbon capture and storage (CCS).

Unsurprisingly, policy volatility of this magnitude shapes how respondents assess the relative momentum of different technologies and it also helps explain incremental shifts in survey sentiment year to year. Yet focusing too narrowly on the policy cycle risks missing the potential for deeper structural shifts in the global energy system. Like the 1973 oil embargo, today's energy crisis is likely to drive long-term shifts in energy security, industrial policy, and technology investment that will shape the global energy system for decades.

Yet with few exceptions, respondents' expectations regarding the focus of new investments across the energy sector are little changed across the three surveys (2024–2026). Downward trends in expectations for carbon capture and hydrogen investment, for example, persist, while interest in nuclear energy and transmission continues to grow incrementally.

Despite this overall stability, one notable exception stands out: fluctuations in expectations related to grid investment, which declined in one survey before rebounding in the next. While this pattern is difficult

REUTERS/Jean-Paul Pelissier

Urbasolar photovoltaic park in Gardanne, France.

to interpret with certainty, it appears to coincide with shifts in interest in nuclear, solar, and energy storage between 2024 and 2025, followed by a relative decline in solar and hydrogen in the latest survey. At the same time, the renewed emphasis on grid investment aligns with earlier findings highlighting concerns that insufficient infrastructure investment is constraining energy affordability.

The second notable change, a decline in the share of respondents selecting hydrogen, is more straight forward. Just 5 percent now expect hydrogen to see the greatest growth in investment in the coming year, a notable decline from previous years. This likely reflects the difficulties the hydrogen sector faced in 2025, including delays and cancellations across a range of major projects, particularly in the United States, Europe, and Australia. Hydrogen developers pulled back funding due to the prohibitively high costs of deploying this technology at scale, combined with regulatory uncertainty and a lack of demand for green hydrogen compared to initial expectations.[20]

Overall, this year's investment predictions reflect a sustained and growing focus on addressing imbalances between energy generation and consumer markets. While the intermittent nature of renewables generation has brought this challenge into sharper focus, it is relevant across all forms of power production. Reflecting this reality, nearly half of respondents (45 percent) expect increased investment in energy storage and grid transmission, up from 34 percent two surveys ago and 35 percent last year.

The aggregate responses, however, tell only a part of the story. A closer look at variations in answers by geography and economic sector reveal more.

20 IEA, *Global Hydrogen Review 2025*, September 12, 2025, https://www.iea.org/reports/global-hydrogen-review-2025/executive-summary.

LEADERSHIP INSIGHT

US global leadership depends on a reliable, modern energy system

By Heather Zichal

Heather Zichal is the global head of sustainability at JPMorganChase. JPMorganChase is a partner of the Atlantic Council Global Energy Forum.

The US race for leadership in artificial intelligence, quantum computing, and advanced manufacturing will be won—or lost—on the foundation of resilient, diversified energy systems.

Today, we are asking our power system to do more, from enabling electrification to meeting rapidly growing demand to power AI innovation. Resiliency is needed in the form of diversified energy supplies, more robust infrastructure, and secure supply chains.

That's the logic behind major private-sector investment strategies, such as JPMorganChase's Security and Resiliency Initiative—a $1.5 trillion, ten-year commitment to facilitate, finance, and invest in industries critical to national economic security and competitiveness. A key focus area for the initiative is energy independence and resiliency. The opportunity is significant precisely because the constraints are significant—interconnection queues, equipment shortages, and outdated market structures are all slowing power deployment, but they're also driving demand for the solutions that can break through them. When we look at where the momentum is building, the real bright spots are batteries, the grid, and nuclear energy.

The grid

Built for an era of low demand and local energy delivery, our electric grid and its regulatory ecosystem are increasingly fragile and in urgent need of modernization.

Comprehensive policy and regulatory reforms are needed across the complicated network of regulations that oversee the power system. This includes permitting reform that will make it easier to build infrastructure, especially transmission lines and new generation capacity regardless of technology. However, permitting alone will not be enough to solve the grid's challenges; further action will be needed from federal, state, and regional energy regulators and grid operators to address the grid's broader challenges.

Mobilizing investment will also be necessary to upgrade our aging grid. Today, a shortage of high-voltage transformers and switchgears has led to waits of two to five years just to get the parts needed to build or upgrade the system. It will be very challenging to modernize with speed unless investment also expands the industrial capacity behind the grid—manufacturing for long-lead equipment, the skilled workforce to install it, and the supply chains that keep projects moving. In parallel, investment should scale near-term solutions that unlock capacity faster, like grid-enhancing technologies and advanced controls, while larger transmission projects work through the pipeline.

Batteries

Fueled by innovation and supportive policy, battery prices are falling and deployment is skyrocketing. Battery energy storage prices in 2025 are one-third of 2020 levels.[1] And US grid battery installations surged to a record last year, reaching the highest-ever level of annual added capacity despite tariffs and federal policy headwinds.[2]

As costs continue to decline—and as recycling and circular supply chains mature—storage is moving from a specialized solution to a mainstream reliability tool, improving project economics and expanding where batteries can compete.

This bears tangible benefits to the grid: It shifts energy to when it's needed most, manages peaks, smooths volatility, and provides fast, flexible capacity that supports reliability as demand rises. Where the grid is congested, new battery capacity can provide additional flexibility that can speed load interconnection.

A major challenge for batteries is supply-chain concentration. China dominates global clean energy supply chains. It controls over 80 percent of manufacturing for solar, wind, and battery technologies—and dominates supply chains for critical minerals and other upstream components.[3]

This dependency can be reduced through reshoring and innovation—but will require action from both the public and private sectors. On reshoring, there have been efforts to fortify supply of critical minerals, but there is still work to be done on battery components. Innovation is just as critical (if not more so) as reshoring. Investment in next-generation battery technologies, especially long-duration storage, can position the United States and partners to lead on the battery technologies of tomorrow.

Nuclear energy

As electricity demand rises from AI, electrification, and reindustrialization, the value of firm, dispatchable generation will increase. Nuclear energy sits in a unique place in that mix: It can deliver large-scale, around-the-clock, low-carbon power that supports reliability and steadies the system when other resources are constrained.

Scaling nuclear in the United States is ultimately a policy-and-market execution challenge. On the policy side, deployment can be accelerated at no cost by establishing a clearer, faster pathway that rewards performance and safety: predictable licensing timelines, streamlined reviews where appropriate, and permitting and siting processes that are transparent and durable across political cycles. Fiscal incentives, especially that address cost overruns, have the potential to unlock billions of dollars in investment. On the market side, structures that value what nuclear projects provide—reliability, resilience, and long-duration capacity—can attract capital with confidence rather than relying on one-off fixes.

Done right, nuclear energy becomes not just a generation choice but a competitive advantage—firm power that strengthens reliability, affordability, and energy security at the same time.

Battery, grid, and nuclear projects each address a different dimension of the same challenge. Together, batteries bring flexibility; a modernized grid ensures delivery; and nuclear energy provides the firm, round-the-clock power that a high-demand economy cannot do without.

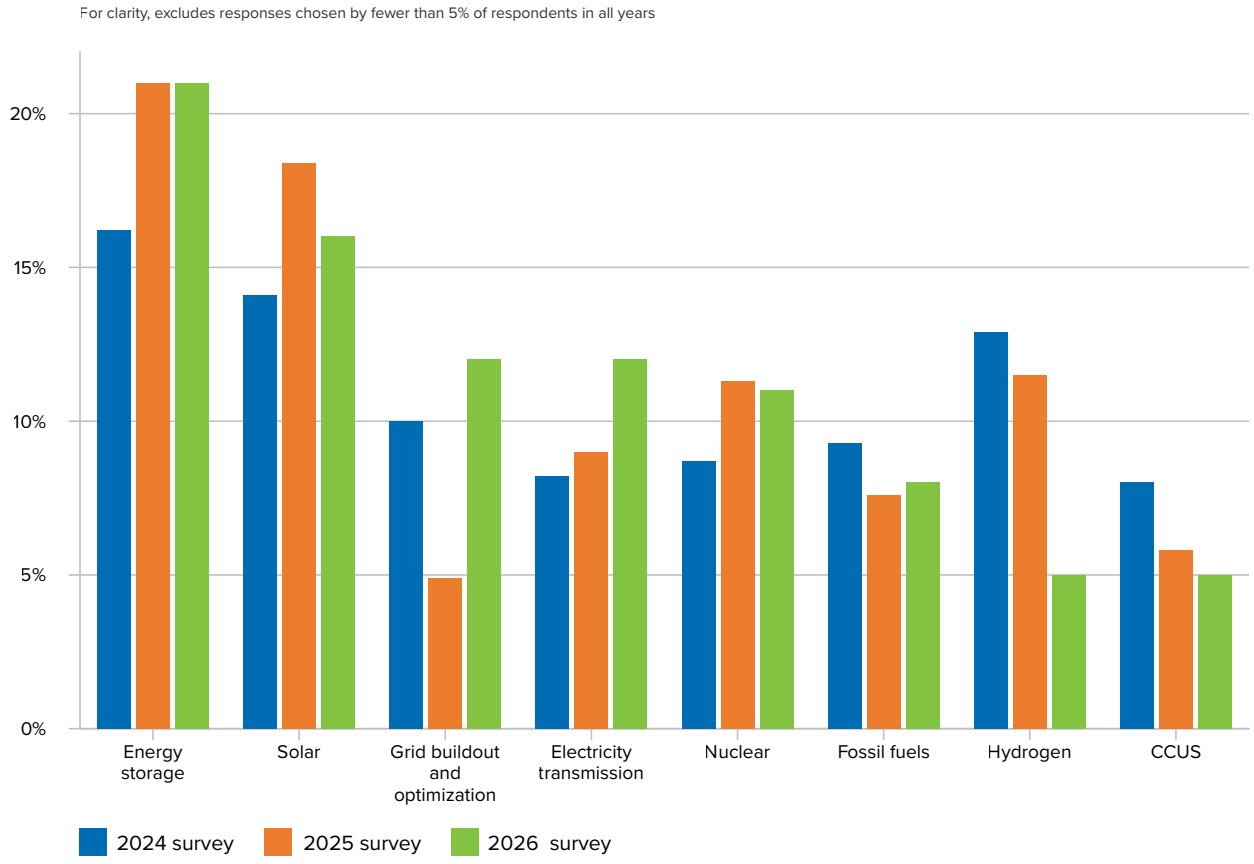
None of these solutions stands alone. Each requires sustained investment, stable policy, a skilled workforce, and market structures that value reliability. But the direction of travel is clear: Countries that deliver reliable, affordable power at scale will attract the factories, data centers, and jobs that define the twenty-first-century economy.

1 Teo Lomrado et al., "Global Battery Markets Are Growing Strongly—and So Are the Supply Risks," International Energy Agency, February 13, 2026, https://www.iea.org/commentaries/global-battery-markets-are-growing-strongly-and-so-are-the-supply-risks.

2 "U.S. Adds 58 GWh of New Energy Storage Capacity in 2025, Largest Single Year of New Battery Capacity on Record," Solar Energy Industries Association, February 23, 2026, https://seia.org/news/united-states-installs-58-gwh-of-new-energy-storage-in-2025.

3 Josh Cartin et al., "Should the US Restrict Chinese Investment in Clean Energy?," Commentary, Brookings Institution, April 16, 2026, https://www.brookings.edu/articles/should-the-us-restrict-chinese-investment-in-clean-energy.

Figure 11. Which segment of the energy sector will see the greatest growth in investment in 2026? (by survey year)



To begin with, clear differences emerge between the survey pool from the Global South and other respondents. For clarity, the accompanying chart highlights the most relevant answers.

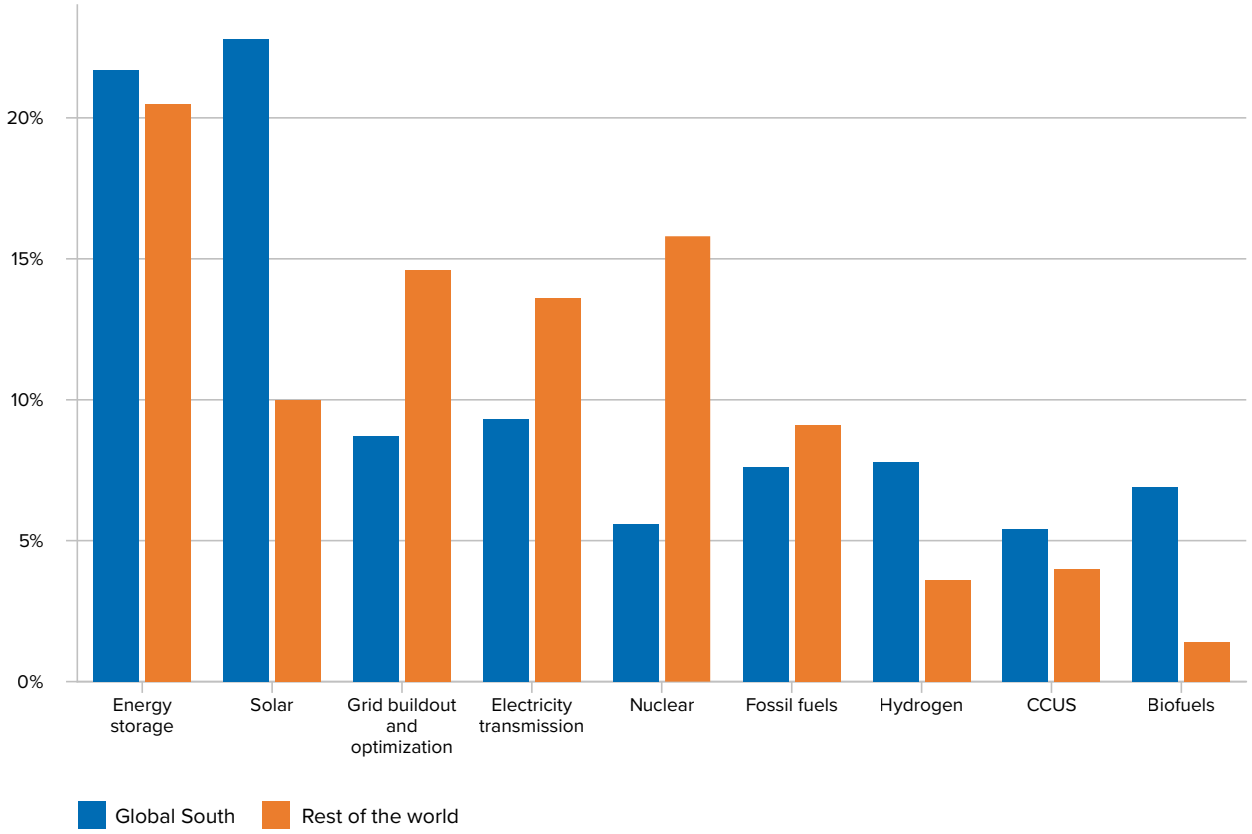
There is a remarkable degree of alignment in expectations for increased investment in energy storage, with roughly one-fifth of respondents in both the Global South and the rest of the world selecting this response. Beyond this matter, however, responses diverge. Respondents in the Global South are more likely to anticipate increased investment in solar (23 percent of the Global South group compared to just 10 percent of their peers elsewhere), hydrogen (8 percent to 4 percent), and biofuels (7 percent to 1 percent).

Breaking this data down further, regional variations emerge. Respondents in sub-Saharan Africa (28 percent) and South Asia (23 percent) are most likely to point to solar power. In sub-Saharan Africa, it is the single most frequently cited option. This likely reflects the region's strong solar resource base and the flexibility of the technology, which can be deployed at both utility scale and in decentralized systems, making it particularly well suited to markets with a mix of grid-connected and off-grid demand.

The divergence between the Global South and the rest of the world on hydrogen investment is consistent with the geographic distribution of project delays and cancellations noted earlier. Even so, the 8 percent share in the Global South represents a meaningful decline on a year-to-year basis, dropping from 18 percent in the previous survey. Further regional breakdowns suggest that expectations for hydrogen are concentrated in specific pockets of the survey pool found in Latin America (15 percent) and South Asia (13 percent).

The divergence between the Global South and the rest of the world on the attractiveness of biofuels investment is also worth noting. Demand for biofuels has increased in several major emerging economies, including Brazil, Indonesia, and India. In regions with large swaths of rural lands reliant on liquid fuels rather than electricity networks, biofuels are an important

Figure 12. Which segment of the energy sector will see the greatest growth in investment in 2026? (by development level)



alternative to fossil-based fuels.[21] This helps explain why sub-Saharan Africa (9 percent), South Asia (8 percent), and Latin America (4 percent) rank among the regions with the highest share of respondents anticipating that biofuels will see the greatest investment growth.

Outside of the Global South, those surveyed in developed countries are more likely to foresee investment growth in grid infrastructure, reflecting a focus on ensuring that generated and stored electricity can reliably reach demand. A larger share of this group also expects growth in investment in nuclear power. This trend is particularly evident in the United States, where 20 percent of surveyed respondents identify nuclear as the area likely to see the greatest increase in investment. In Europe, interest is also rising, potentially bolstered by the dual energy security and climate benefits provided by nuclear technology. Of respondents from Europe, 12 percent say nuclear energy will receive the biggest increase in investment, up from 9 percent last year.

A final noteworthy geographic insight is a shift in expectations from MENA respondents, where 18 percent now expect that fossil fuels will attract the greatest increase in investment—by far the highest for any geography. Importantly, this view preceded the ongoing conflict with Iran; while this may seem predictable, it marks a significant change from the prior year, when only 8 percent held this view and 29 percent identified hydrogen as the leading area of the year ahead. The shift is also consistent with evolving perspectives among respondents in the oil and gas sector, discussed below.

From the perspective of economic sectors analyzed in the survey, most differ little from the overall averages on this question. The principal exceptions

21 Anit Mukherjee and Caroline Arkalji, "Energy Transition and Global South Cooperation: Case of Biofuels," Background Paper 33, Observer Research Foundation (ORF) America, June 2025, https://static1.squarespace.com/static/5ca0ec9b809d8e4c67c27b3a/t/684f3db37505ce724cbd04d8/1750023606991/ORF-Paper-33_DIGITAL.pdf.

LEADERSHIP INSIGHT

Nuclear energy for an era of rising demand and strategic risk

By Maria Korsnick

Maria Korsnick is president and CEO of the Nuclear Energy Institute, the nuclear industry's policy organization in Washington, DC, a role she has held since January 2017.

Countries today face a dual challenge: meeting fast-growing electricity demand while building energy systems that are less vulnerable to disruption, coercion, and volatility.

That is the backdrop for nuclear energy's renewed importance. Around the world, governments are planning for stronger economic growth, more digital infrastructure, expanded manufacturing, and broader electrification. All of that requires dependable power on a larger scale. At the same time, energy security has become more urgent. Geopolitical tensions, fuel-market instability, and supply-chain disruption have reminded policymakers that energy systems must do more than produce electricity at the lowest apparent cost. They must also support resilience, continuity, and confidence over time. Nuclear energy matters more than ever because it speaks to both sides of this challenge at once: It helps meet rising demand and strengthens energy security.

This is why nuclear energy is moving back toward the center of serious energy planning. Countries are looking for power sources that can support modern industry, data infrastructure, and rising living standards without exposing the economy to avoidable risk. They want electricity that is available when needed, at scale, and over many decades. They want systems that can help meet clean energy goals without compromising reliability. Nuclear energy stands out in that setting because it provides large-scale, around-the-clock power and does so in a way that can anchor long-term industrial development. For many countries, the attraction of nuclear energy is no longer theoretical. It is practical. It is about how to build a more secure and more capable economy.

The United States offers one example of why this moment is different. America's existing nuclear fleet remains one of the country's most valuable infrastructure assets. Today, ninety-four reactors in twenty-eight states provide nearly one-fifth of US electricity and almost half of its clean generation. That fleet has operated at high levels of safety and reliability for decades. It also anchors an industrial base of utilities, engineering firms, manufacturers, fuel suppliers, skilled workers, and technology developers. For countries assessing the long-term value of nuclear energy, that kind of operating depth matters. It reflects not only a crucial energy technology but an ecosystem capable of sustaining that technology over time.

What is especially notable now is that the US nuclear sector is not only relying on past achievement. It is moving on several fronts at once. Vogtle Units 3 and 4 entered commercial operation in 2023 and 2024, adding new large-scale nuclear capacity to the US grid. Across the existing fleet, plant owners are pursuing license renewals and power uprates that can add significant output from plants already connected to the grid. US nuclear utilities are pursuing license renewals at twenty-six units and uprates at twenty-nine units, with more than eight gigawatts of additional capacity expected from fuller use of existing assets over the next decade. At the same time, advanced reactor projects are moving ahead, including designs that are smaller and simpler and may prove better suited to a wider range of grids, industrial uses, and national circumstances.

That combination of continuity and innovation is important internationally as well as domestically. Countries considering nuclear energy want to see that it is being used, extended, improved, and built in the supplier country itself. They want confidence that the technology rests on real operating experience and durable institutional support. They also want options. Not every country needs the same reactor type, the same financing structure, or the same pace of deployment. A broader range of technologies can make nuclear energy more adaptable to national circumstances and more accessible to countries whose grids or industrial needs do not fit a single model. Here, the United States is well positioned: It has the benefit of an operating fleet with momentum behind uprates and life extensions, and a growing portfolio of advanced technologies coming toward market.

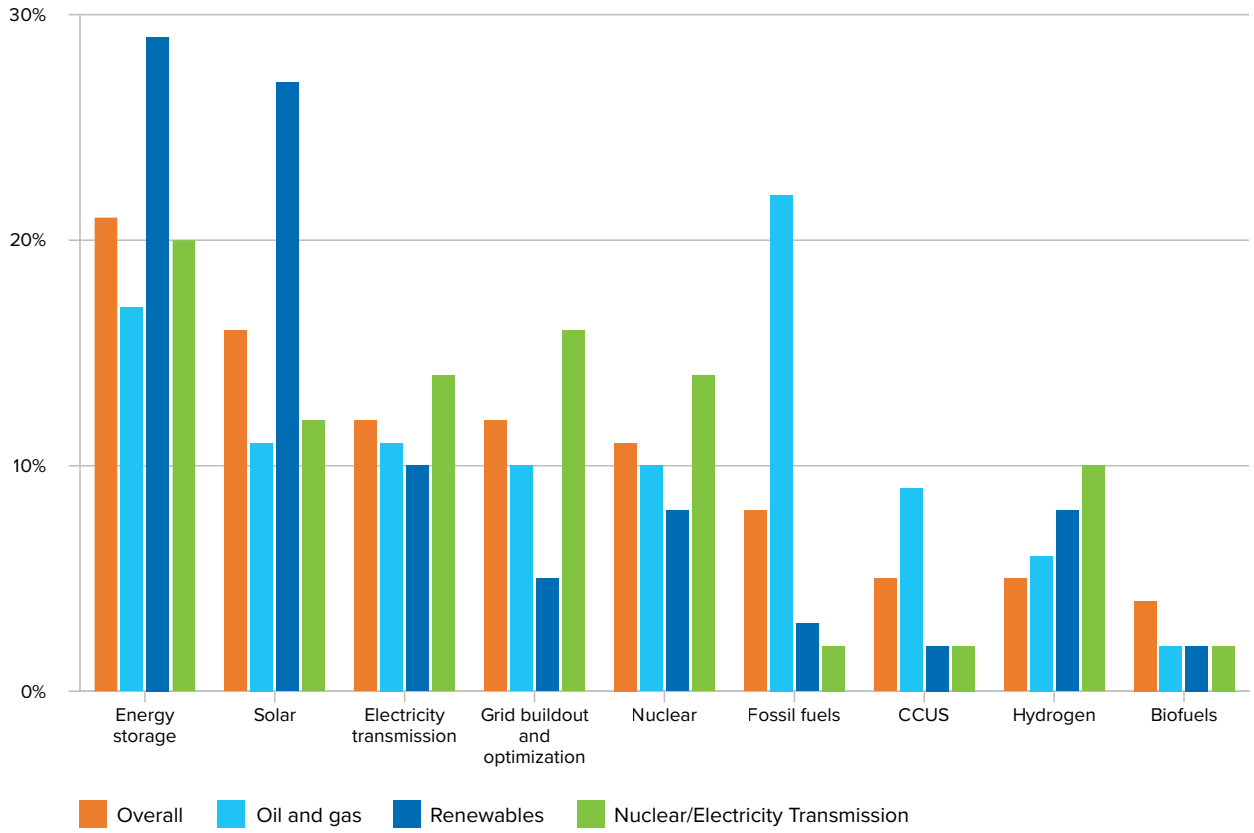
This momentum rests in part on something international partners also notice: broad political support. Nuclear energy in the United States has proved unusually durable across party lines because it advances many interests at once. It supports grid reliability and industrial competitiveness. It creates skilled employment. It strengthens energy security. It helps meet clean energy goals. That is why policy support for nuclear energy has endured across different administrations and changes in control of Congress. The ADVANCE Act, passed with bipartisan support and signed into law in 2024 to develop and deploy advanced nuclear fuel, is one recent example of that continuity. For countries seeking infrastructure partnerships measured not in years but in generations, political durability matters.

The same is true of US nuclear cooperation abroad. Since President Dwight Eisenhower began peaceful international nuclear energy cooperation, the United States has built a record of partnership that reaches well beyond the export of equipment. US cooperation has helped partner countries develop institutions, train workforces, localize parts of the supply chain, and connect those capabilities to broader global networks. Just as important, the United States and its partners have worked together for decades on nuclear safety, security, and nonproliferation, helping make the peaceful expansion of nuclear energy possible on a wider scale. That remains true today. Recent agreements and frameworks involving partners such as Saudi Arabia, Armenia, the Philippines, Singapore, and Thailand show that civil nuclear cooperation remains an active and bipartisan feature of US engagement with allies and partners.

This is one reason the quality of partnership matters so much in nuclear energy. Countries embarking on nuclear programs are not only choosing reactors but also making long-term decisions about industrial development, workforce formation, regulatory confidence, supply-chain participation, and strategic alignment. They want safety and security standards that will endure. They want a relationship that can help build local capability over time. They want confidence that the institutions behind the technology are strong enough to provide life-cycle support for their projects. In nuclear energy, the strength of the partnership is part of the value proposition.

The larger point is straightforward. In a world of rising electricity demand and strategic risk, nuclear energy is becoming harder to overlook. It can support economic growth, strengthen energy security, and provide clean and reliable power for decades. Countries looking seriously at nuclear energy will weigh many factors, as they should. But among the considerations that will matter most are operating experience, technological depth, institutional strength, and a demonstrated capacity for long-term industrial partnership. Those qualities will shape the next phase of nuclear growth.

Figure 13. Which segment of the energy sector will see the greatest growth in investment in 2026? (by sector)



are those that are involved in energy production and distribution. As in last year's survey, respondents in these sectors tend to expect increased investment flows toward their own industries.

Among those surveyed working in oil and gas, 22 percent believe that fossil fuels will attract the largest proportional increase in investment of any of the fields covered in the question. This represents a modest rise from last year (19 percent), even as the overall survey share of respondents selecting this option held steady at 8 percent.

A similar pattern is evident within carbon capture, utilization, and storage (CCUS), a field tied to the long-term outlook for oil and gas. Nine percent of respondents from the sector identify CCUS as the field likely to see the greatest relative investment, up slightly higher from 7 percent in the previous survey. Alternatively, the overall average of all respondents making this selection remains steady (5 percent this year, compared with 6 percent last year).

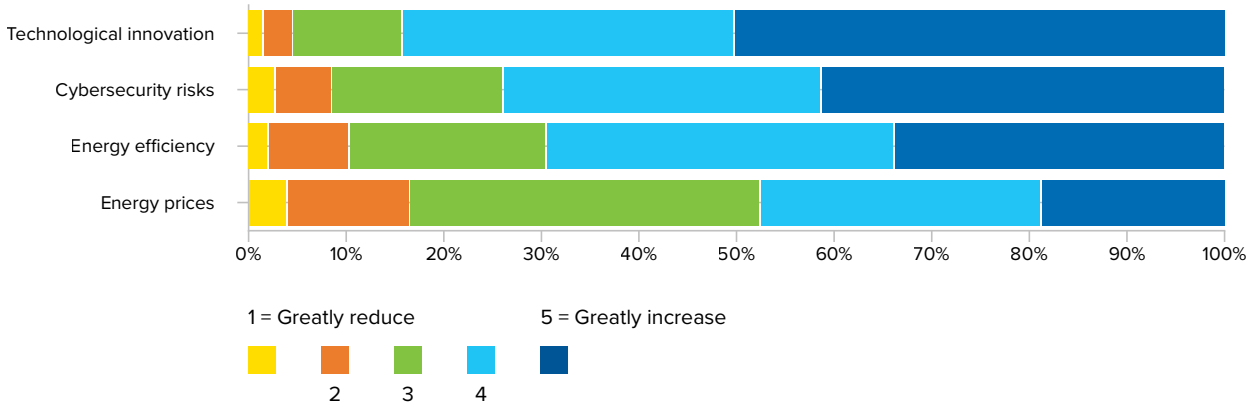
Among respondents working in renewables, solar stands out as the clear priority for future investment, with 27 percent identifying it as the area likely to attract the greatest increase in capital flows—substantially higher than the 17 percent recorded last year. By contrast, wind power and biofuels are only rarely expected to be the primary focus of new investment. The absence of comparable expectations for wind may reflect growing policy and regulatory uncertainty surrounding the sector in key markets, particularly the United States.

Finally, those surveyed from the nuclear and electricity transmission sectors are more likely than average to anticipate increased investment in grid build-out and optimization (16 percent), electricity transmission (14 percent), and nuclear energy (14 percent).

In short, across the energy sector it is commonplace for people to have confidence that the future belongs to them.

As for the technology dominating headlines, generative AI and its importance to the energy sector is indisputable, yet the topic is treated separately in the survey due to its potentially multifaceted impacts.

Figure 14. How will greater artificial intelligence (AI) integration impact the following aspects of the energy system over the next ten years?



Generative AI—as opposed to predictive AI—in the last few years emerged as a viable tool and changed the outlook for the energy sector. Experimentation is likely to lead to changes in the way the energy sector operates.

Certain expectations regarding the impact of AI are widely shared across the survey pool. Notably, half of respondents believe that greater AI integration will greatly increase technological innovation in the coming decade, with a further 34 percent expecting it to contribute somewhat. This view is consistent across demographic, regional, and industry groups.

Another area of broad, though somewhat less pronounced, agreement concerns how the technology will affect energy efficiency. Here, 36 percent of respondents answer that AI will increase energy efficiency somewhat, and a further 34 percent that it will do so greatly.

Not all areas of consensus are positive. Both predictive and generative AI introduce security risks, and most respondents appear skeptical that these challenges will be solved quickly or easily.[22] Overall, 41 percent believe that greater integration of AI into the energy system will greatly increase cybersecurity risk, while an additional 33 percent answer that it will do so somewhat. This concern is consistent across all demographic, regional, and industry groups, with the combined share never lower than 59 percent (in any category) expecting at least some increase in risk.

A second potential downside of AI identified by respondents is upward pressure on energy prices. Overall, 19 percent believe that the introduction of the technology into the energy system will drive up prices greatly, and a further 29 percent somewhat. Only 17 percent say that adoption of AI will reduce prices to any degree. One geographic exception emerges in MENA, where 54 percent expect no change in energy prices due to AI integration, and only 33 percent foresee an increase in energy bills, with 15 percent believing the opposite. Sectoral variation is more limited, although respondents in the combined nuclear and electricity group are somewhat more optimistic: 30 percent say that AI will contribute to lower prices, though this remains below the 47 percent who expect prices to increase.

That AI could drive energy efficiency gains but increase prices appears paradoxical. This could potentially be explained by the rise in electricity demand from data centers. Average prices in US areas experiencing significant data center activity have risen 267 percent over five years.[23]

22 Maia Hamin, Jennifer Lin, and Trey Herr, "AI in Cyber and Software Security: What's Driving Opportunities and Risks?," Atlantic Council, August 19, 2024, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/ai-in-cyber-and-software-security-whats-driving-opportunities-and-risks/.

23 Josh Saul et al., "AI Data Centers Are Sending Power Bills Soaring," Bloomberg, September 29, 2025, https://www.bloomberg.com/graphics/2025-ai-data-centers-electricity-prices/.

LEADERSHIP INSIGHT

Unlocking the next source of US energy dominance

ARPA-E's catalytic role in the fusion industry

By Conner Prochaska

Conner Prochaska is the director of the Advanced Research Projects Agency-Energy (ARPA-E), an agency within the US Department of Energy.

As the global economy develops and the US industrial base expands, demand for energy continues to grow at the fastest rate in a generation.[1] In 2024, the US economy consumed 4,157 terawatt-hours (TWh) of electricity.[2] The expansion of data centers' capacity for compute is key to this transformation.

Analysts predict that global demand for power for data centers could double by 2030, totaling 945 TWh—more electricity than Japan consumes in a year.[3] In the United States, data centers could soon use 10 percent of the country's electricity, up from the current rate of 4.4 percent,[4] and could account for half of the growth in American demand for electricity between now and 2028.[5] Data centers' power consumption drives investment into the grid and enables research that unleashes new ways to generate, transmit, and store energy.

To make power more affordable, propel technological progress, and fuel economic growth, the world needs more energy—and thanks to US leadership, it's getting closer to meeting this need with fusion.

Driving energy innovation

The mission of the US Department of Energy's Advanced Research Projects Agency (ARPA-E) is to ensure that America leads in energy—not just as an exporter, but as an innovator in how we make, distribute, and use it. Our results reflect this commitment.

Since 2009, ARPA-E has allocated $4.2 billion in research and development funding across 1,700 projects. Nearly 270 of these projects have attracted more than $15.2 billion in private sector follow-on funding.[6] Thirty-six ARPA-E-supported companies have attained valuations totaling $22.3 billion.[7]

In the past year, ARPA-E stewarded $180 million to launch the Department of Energy's first projects in applied quantum informatics, advance processing of used nuclear fuel, pioneer superhot geothermal systems, design superior permanent magnets, validate industrial catalysts and characterize deposits of critical minerals exponentially faster than industry currently is able to, and develop novel materials for fusion power plants.

1 Electrical demand and growth of the grid was flat between 2007 and 2023. See "U.S. Electricity Generation in 2025 Hit a Record, Again," Analysis, *Today in Energy*, US Energy Information Administration (EIA), March 5, 2026, https://www.eia.gov/todayinenergy/detail.php?id=67284.

2 Monthly Energy Review, US EIA, Table 7.1, February 2026, 133.

3 International Energy Agency, *Energy and AI*, World Energy Outlook Special Report, April 10, 2025, 14, https://www.iea.org/reports/energy-and-ai. CC BY 4.0.

4 Arman Shehabi et al., *2024 United States Data Center Energy Usage Report*, Lawrence Berkeley National Laboratory, December 20, 2024, 5, https://doi.org/10.71468/P1WC7Q.

5 Shehabi et al., *2024 United States Data Center*, Figure 5.5, 52.

6 The "follow-on funding" value includes any commercial funding committed or received from other sources after the effective date of the ARPA-E award.

7 The total enterprise valuation number for public listing transactions, acquisitions, and company sales is reported separately from the "follow-on funding" number. This "acquired, merged, and made an IPO" number includes development capital and equity valuation minus cash on hand.

Realizing fusion's potential

ARPA-E considers harnessing fusion as an energy source as one of the most consequential achievements the energy industry has yet to accomplish. Fusion, the atomic process that powers the sun, has astonishing energy density: A deuterium-tritium (DT) fusion power plant has an energy density of 340 million megajoules per kilogram, which is 4.3 times greater than that of uranium-235, the fuel used in nuclear power plants, 6.2 million times greater than the energy density of natural gas, and twelve million times greater than coal. One gram of DT fuel has the energy equivalent of 320 billion BTUs of natural gas.

When ARPA-E entered the fusion discussion, the scientific understanding of the technology's challenges was mature, but the ability to instantiate it through engineering was not yet viable. This discrepancy delayed investment and deployment. We wanted to de-risk methods, prove performance, and attract private capital to drive progress. Though there is still much to be done, ARPA-E's fusion portfolio has already delivered results.

In 2014, there were twelve commercial firms dedicated to fielding fusion power. Six of these were based in the United States and had raised $382 million. Today, there are over forty-five firms pursuing fusion, most of which began operations after 2017,[8] and they are backed by $10 billion in investment. Twenty-five of these are American and have garnered 70 percent of the $10 billion the industry has raised thus far.

From analysis to action

What happened between 2014 and now that supercharged the fusion industry?

ARPA-E catalyzed the commercial fusion industry.

Before 2014, ARPA-E had never funded research into fusion energy. The prevailing view was that fusion was only suitable for "big science." ARPA-E challenged that assumption and asked: are there new or existing approaches that warrant revisiting that could now work with private investment? The resounding answer: "Yes!"

In 2014, ARPA-E accelerated the US fusion industry by launching the ALPHA (Accelerating Low-cost Plasma Heating and Assembly) program.[9] ALPHA focused on new pathways, with lower capital expenditure, to achieve fusion power. At the time, fusion research focused on two approaches to confining plasmas, which is the technology's key challenge. One approach is magnetic confinement, which uses magnetic fields and lower-than-air ion densities. The other is inertial confinement, which uses heating and compression and involves greater-than-solid densities. ALPHA focused on densities in between these two approaches and opened the door to magneto-inertial fusion. From this advance came three more programs, each developing new concepts, materials, and technologies that turn scientific analysis into engineering action.

Our latest fusion program, known as CHADWICK,[10] is developing novel materials for the first wall of a fusion reactor—a barrier that must survive forty years in temperatures hotter than the surface of the sun. ALPHA kick-started the industry, and CHADWICK is solving the problems that the industry will soon confront.

Fusion's promise of abundant power demands action and ARPA-E is ready to take it.

Since 2014, ARPA-E has invested $134 million in fusion and spurred $1.5 billion in private investment. Over the next eighteen months, ARPA-E will invest $135 million to supercharge the development of secure supply chains and technologies for fusion's imminent deployment.

The world needs more power, and the United States will deliver it.

8 Fusion Industry Association, *The Global Fusion Industry in 2025: Fusion Companies Survey by the Fusion Industry Association*, August 2025, 16–17, https://www.fusionindustryassociation.org/wp-content/uploads/2025/07/2025-Global-Fusion-Industry-Report.pdf.

9 "Accelerating Low-cost Plasma Heating and Assembly," ARPA-E.energy.gov.

10 CHADWICK stands for Creating Hardened And Durable fusion first Wall Incorporating Centralized Knowledge, per ARPA-E.energy.gov.

CONCLUSION

THE LAST TIME THE WORLD EXPERIENCED an energy crisis comparable in scale and geopolitical consequence to the one unfolding today fundamentally transformed how nations thought about energy security, technology investment, and industrial strategy. The oil embargo following the Yom Kippur War in 1973 catalyzed decades of investment and innovation that continue to shape today's energy landscape. It accelerated the global expansion of nuclear power, laid important groundwork for the modern renewable energy industry, and encouraged early-stage research and development efforts around hydraulic fracturing that would later underpin the shale revolution. Many of the technologies debated in this report are, in some form, the products of that earlier era of strategic energy realignment.

For that reason, while the policy shifts of 2025 undoubtedly influenced respondents' reactions in this year's survey, equal attention should be paid to the longer-term structural outcomes likely to emerge from today's energy security crisis. The most consequential effects may emerge less in current supply and demand figures or annual survey responses than in the investment decisions, industrial policies, and technological priorities now being set in motion in capitals around the world.

The survey findings and essays throughout this report provide an early indication of how the future energy system is likely to transform. Geopolitical conflict remains the dominant concern across nearly every region and industry represented in the survey, yet respondents also consistently identify insufficient infrastructure investment as one of the defining risks facing the global energy system through 2030. As Katie Hall, CEO of the climate finance firm Galvanize, wrote in her essay, "From where we sit as investors across venture [capital], growth equity, credit, real assets, and public markets, the constraint has shifted from capital to infrastructure, interconnection, and the institutions responsible for building and operating them. Capital is available, but the infrastructure required to deploy it is

Oil storage facilities at the Leuna Chemical Complex in Germany.

REUTERS/Annegret Hilse

under strain." Together, these concerns reflect a growing recognition that affordability, reliability, and security depend as much on the ability to generate, transmit, store, and distribute energy amid increasingly complex geopolitical and economic conditions as they do on access to conventional fuel.

This more expansive understanding of energy security is reshaping how energy markets themselves are understood. For decades, international energy discussions have centered primarily on oil and natural gas because of their fungibility, global trade flows, and sensitivity to geopolitical disruption. As current events illustrate, that framework remains relevant, but it is no longer fully sufficient. The growing strategic importance of electricity systems, grid infrastructure, and critical mineral supply chains requires a more comprehensive understanding of energy security and affordability that recognizes the distinct ways different sectors experience risk. Concerns surrounding maritime choke points, for example, differ fundamentally from those associated with transmission constraints or grid reliability, even as each carry broader economic and strategic implications.

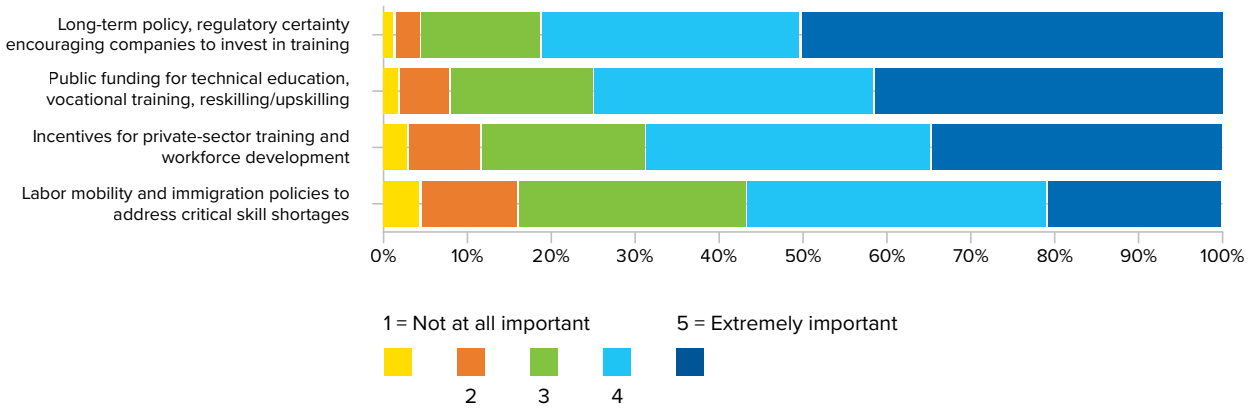
Like clockwork, each edition of *The Global Energy Agenda* reflects the forces shaping the global energy system at a given moment in time. Previous editions of this report often focused on how geopolitical risk, technological change, and market transformation would shape the pace and direction of the energy transition. The 2026 survey instead captures a geopolitical environment marked by infrastructure vulnerability and mounting strain on long-standing alliances and economic relationships.

In that sense, the defining feature this year is uncertainty. Specifically, the uncertainty surrounding conflict, alliances, and the broader trajectory of the international energy system. Yet history suggests that periods of disruption can also serve as catalysts for technological innovation, industrial transformation, and strategic realignment. As in the decades that followed the energy crises of the 1970s, today's geopolitical and economic pressures may ultimately accelerate the emergence of a more expansive understanding of energy security—one capable of shaping the next generation of energy innovation and progress.

APPENDIX A:
The energy workforce

This year's *Global Energy Agenda* survey is the first edition to capture respondents' views on the future of the energy workforce, a key issue across energy sectors and for the broader economy. The results do not shape the primary narrative of this report, but given the criticality of this issue to the deployment, maintenance, and operations of energy technologies, we are including the question and its responses in this appendix, and will revisit this topic next year.

Figure 15. How important are each of the following policy interventions for ensuring the development of the future energy workforce?



When asked about policies related to workforce development, respondents strongly support all four categories examined. The category of long-term policy and regulatory certainty ranks as the top priority (81 percent). Public funding for teaching and training comes in second (74 percent), while providing incentives for private-sector training is third (69 percent). The category of labor mobility and immigration policies ranks lowest among the options presented, though a majority of respondents (57 percent) still view the two aspects of this category as important in addressing critical skill shortages.

There is broad agreement among geographies and sectors, with notable exceptions. In MENA, fewer consider private training (49 percent) and mobility policies (48 percent) to be as important to workforce development as publicly funded teaching and training. The other striking divergence is in East Asia, where only 29 percent think labor mobility is very or extremely important, although 50 percent say it is somewhat so.

APPENDIX B:
About the survey pool

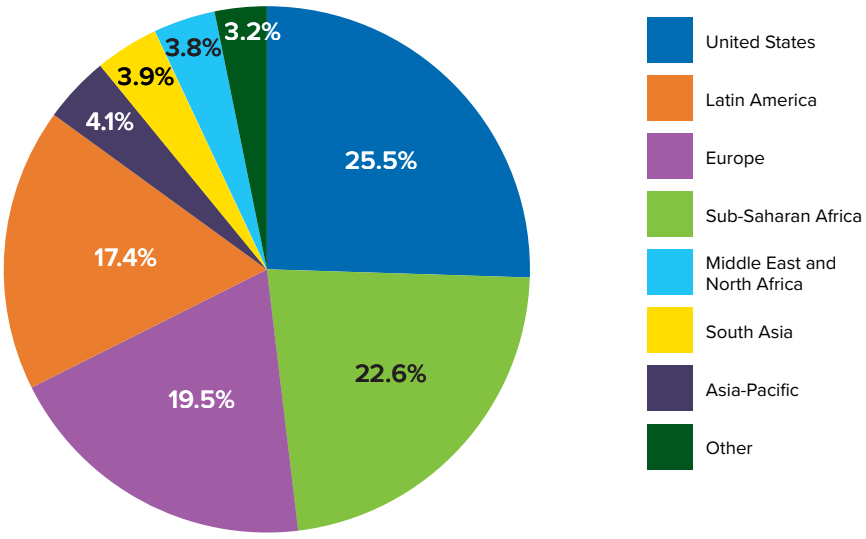
This year's Atlantic Council global energy survey is its largest, with 1,051 respondents from a total of ninety-seven countries. The wealth of answers yields deep insights and allows us to conduct meaningful analysis of numerous geographic regions and economic sectors.

BY GEOGRAPHY

Respondents are spread widely around the world: 25 percent are based in the United States, 23 percent in sub-Saharan Africa; 20 percent in Europe, 17 percent in Latin America (which includes the Caribbean in this analysis), along with 4 percent each in East Asia, South Asia, and the Middle East and North Africa (MENA). The remaining 3 percent are spread across the globe.

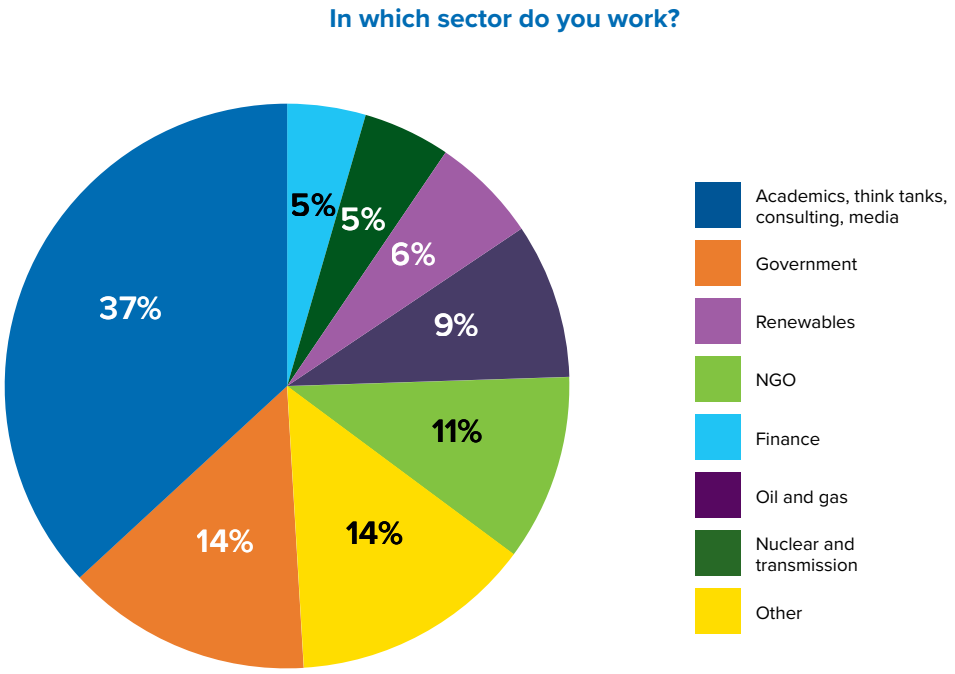
Another geographic category used in this report is the Global South, which is defined here as the Group of Seventy-seven states (G77) and accounts for 45 percent of the survey pool.

In what country do you live in? (Answers from outside the United States grouped by region)



BY SECTOR

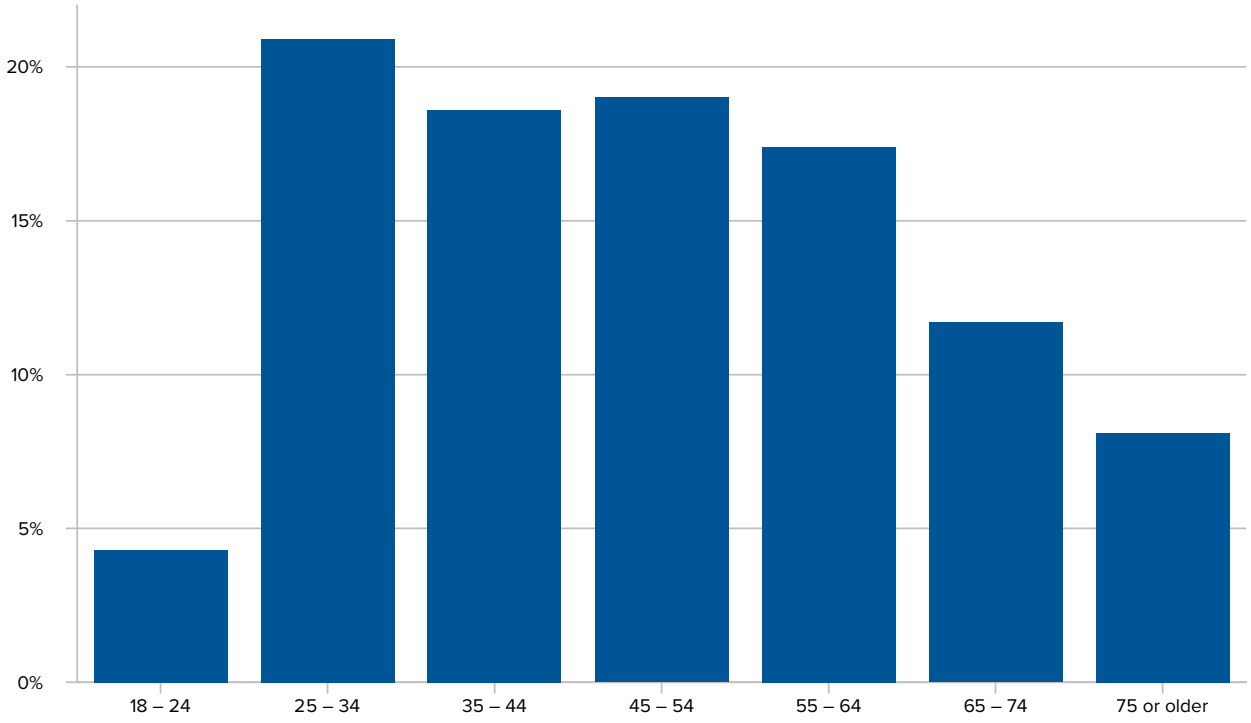
Survey respondents represent several economic sectors. Those in academia, think tanks, consultancies, and media represent 37 percent of respondents; those in government, 14 percent; oil, gas, refining, and petrochemicals, 10 percent; renewables, 6 percent; nuclear power combined with electricity transmission and distribution, 5 percent; and finance, 5 percent.



BY AGE, EXPERIENCE, AND GENDER

Respondents had a median age of forty-eight and a range of experience levels. More than a third have worked on energy issues for more than fifteen years, with a similar number relatively new to energy. Nearly half are in executive leadership or management positions. Just over three-quarters of respondents are men, and less than a quarter are women.

What is your age?



KNOWLEDGE PARTNERS OF THE *2026 GLOBAL ENERGY AGENDA*

The Atlantic Council is deeply appreciative of our knowledge partners, who supported the *Agenda* by disseminating the survey to their communities. This outreach gave us the largest and most geographically diverse audience yet in the five years we have fielded the survey.

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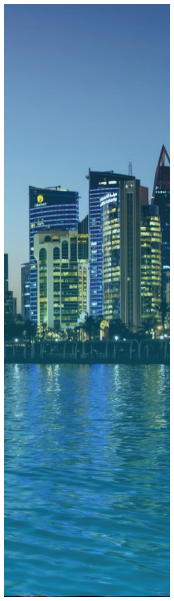

Atlantic Council

The Atlantic Council is a nonpartisan organization that promotes constructive US leadership and engagement in international affairs based on the central role of the Atlantic community in meeting today's global challenges.

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