



EXECUTIVE INSIGHTS

Energizing the Future: Navigating Investment in a New Era for Energy Transition

Key takeaways

1. Energy security remains a priority, with traditional sources like oil and gas continuing to play a sustained role in meeting global demand.
2. The energy sector is prioritizing proven transition solutions like solar, storage and energy efficiency while selectively advancing emerging technologies.
3. Regional strategies differ, with Europe and Australia focusing on grid modernization, the U.S. emphasizing resilience and emerging markets advancing energy access.
4. Decarbonization progress hinges on pragmatism, collaboration and a focus on near-term initiatives with proven technologies to drive down costs and enable emerging solutions to achieve commercial viability.

The global energy sector stands at a pivotal moment, balancing ambition and pragmatism as the energy transition recalibrates. While decarbonization remains a key consideration, companies are shifting focus toward commercially grounded decisions — prioritizing lower-carbon oil and gas operations and proven transition technologies like solar, storage and energy efficiency advancements while reassessing the viability of emerging solutions. This rebalancing reflects a growing emphasis on economic returns, reliability and system resilience, particularly in regions like the U.S., where infrastructure challenges and economic pressures are reshaping priorities.

The sector is witnessing a move from aspiration to moderation, as investments align more closely with practical outcomes and prioritize measurable results within shorter time horizons. Proven clean energy solutions, such as solar and storage, are advancing rapidly and often outperforming forecasts, while traditional energy sources like natural gas and nuclear are experiencing renewed interest as pillars of global energy security. At the same time, decarbonization remains a key focus, with oil and gas players integrating electrification, emissions reduction and carbon management into their ecosystems to meet climate goals while maximizing operational efficiency.

Clean energy investments reached \$1.8 trillion in 2023, according to the International Energy Agency, highlighting the scale of financial commitment in the transition. However, this coincides with a rising demand for energy and oil and gas production, highlighting a dual reality: The energy sector is evolving strategically, favoring results-driven transformation over unchecked acceleration.

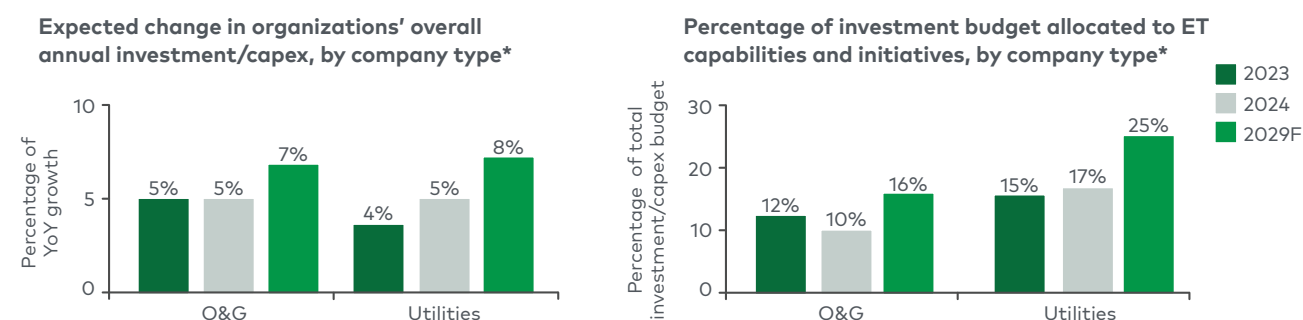
Amid this recalibration, the sector provides a compelling lens through which to understand shifting global priorities. Insights from L.E.K. Consulting's Global Energy Study — capturing perspectives from over 320 executives spanning the oil and gas, utilities, renewables, and investment sectors — illustrate how industry leaders are rebalancing investments and driving actionable pathways for a sustainable, resilient and equitable energy future.

Steady investment amid uncertainty

Capital expenditures across the energy sector are expected to grow to 7% annually by 2029, up from 5% in recent years (see Figure 1). This upward trajectory reflects a measured yet confident approach as companies invest in solutions that are scalable, reliable and commercially grounded. However, as energy transition investments continued to evolve in 2024, the focus has shifted toward stabilizing core operations and prioritizing proven technologies, balancing decarbonization efforts with economic and infrastructure resilience.

Figure 1

Overview of planned investments and share allocated to energy transition



*Survey question: Thinking about your organization's current investment/capex budget, what percentage of this total amount is allocated specifically to decarbonization/ET capabilities and initiatives? What do you expect this percentage to be five years from now?

Note: ET=energy transition; capex=capital expenditure; YoY=year-over-year; O&G=oil and gas

Source: L.E.K. 2023 and 2024 Global Energy Studies

Key investment trends include:

- **Grid modernization:** The growing integration of renewable energy is pushing grids beyond their historical capacity, requiring upgrades to ensure stability and adaptability. Investments in grid modernization encompass enhancing transmission and distribution systems, deploying advanced monitoring technologies, and implementing digital tools to better manage renewable variability. These updates are essential to integrating new energy sources while maintaining grid reliability.
- **Energy storage:** As renewable adoption accelerates, energy storage is playing an increasingly critical role in addressing intermittency and ensuring grid stability. Utilities are ramping up investments in advanced battery technologies to store surplus energy during peak generation and discharge it when demand exceeds supply. Over the next five years, 77% of utilities plan to significantly expand their energy storage capabilities, with a focus on utility-scale projects and innovative long-duration storage solutions.
- **Emissions control:** Companies across industries are deploying advanced methane detection and reduction technologies to lower emissions while improving operational efficiency. Electrification of industrial processes is another priority, with initiatives such as replacing gas-powered systems with electric alternatives helping reduce operational emissions. These efforts reflect a commitment to practical solutions that deliver measurable decarbonization benefits without compromising performance or cost-effectiveness.

By aligning investments with these priorities, the sector is laying the foundation for a

dynamic, interconnected energy ecosystem.

Decarbonization pathways: Balancing stability with sustainability

As the energy sector confronts the demands of the energy transition, decarbonization is no longer a future ambition — it's an immediate priority reshaping strategies across industries. Historically, sectors such as oil and gas, heavy industry, and transportation have been associated with high emissions. Decarbonization efforts in these areas aim to reduce their carbon footprint through targeted strategies and technologies.

While industries navigate this shift, the focus increasingly leans toward implementing proven solutions that offer decarbonization benefits within shorter implementation timelines — without compromising reliability or profitability. Key priorities include:

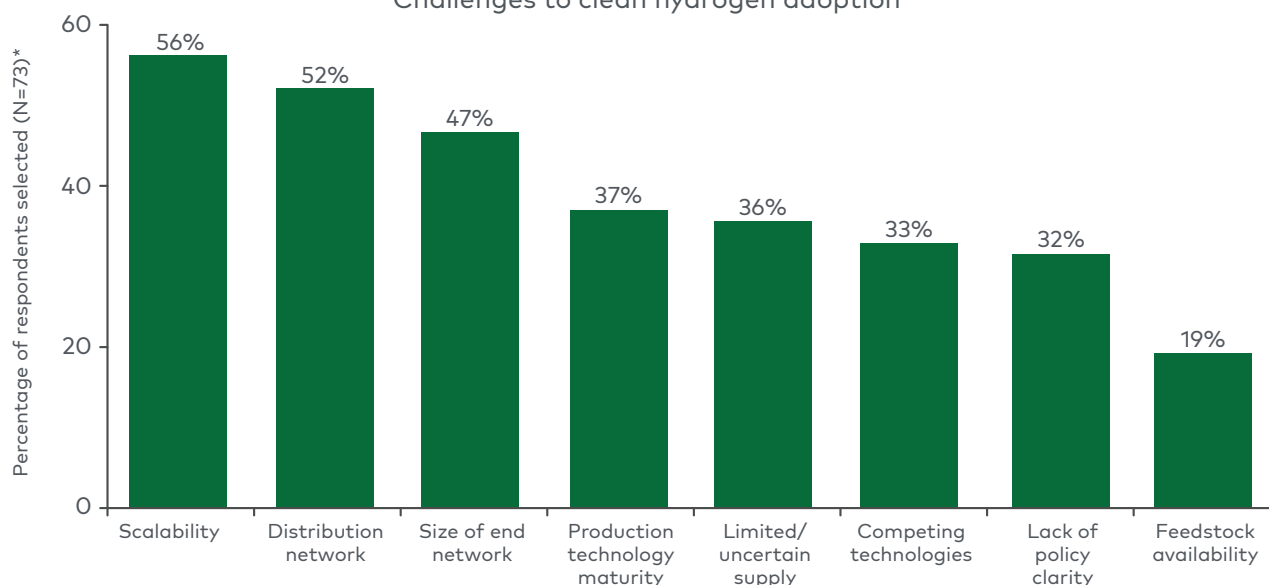
- **Methane detection and reduction:** Advanced technologies are enabling precision in identifying and mitigating leaks, significantly lowering emissions.
- **Electrification of processes:** Onshore, gas compressors as well as drilling and fracking are all being electrified based on higher efficiency and expectations for total-cost-of-ownership savings. Offshore, drilling operations are replacing gas-powered generators with electric systems, reducing operational emissions and boosting efficiency.
- **Carbon capture and storage (CCS):** While CCS holds significant potential for industries where electrification is less feasible, progress remains uneven. Large projects showcase technological feasibility, but many stall before final investment decisions due to commercial hurdles and unclear economic agreements.

At the same time, certain pathways are seeing reduced focus or slower progress:

- **Hydrogen:** Scaling clean hydrogen remains a challenge due to a lack of distribution networks and policy clarity, among other issues (see Figure 2). Despite optimism and the U.S.'s recently revised final Section 45V tax credit ruling, investments are increasingly cautious as players grapple with unresolved infrastructure and cost barriers.
- **Carbon offsets:** Nature-based solutions, while promising, are facing increased scrutiny around measurement and long-term impact.
- **Electric vehicle charging infrastructure:** Deployment, particularly for heavy-duty vehicles, while still growing, has slowed due to limitations in grid readiness and commercial viability.

Figure 2

Challenges to clean hydrogen adoption



*Survey question: In addition to pricing, what are the main challenges to the adoption of clean hydrogen (e.g., as industrial feedstock, energy storage, heating, power generation/fuel, ammonia, fertilizers) today?

Source: DOE; Semafor; L.E.K. 2024 Global Energy Study

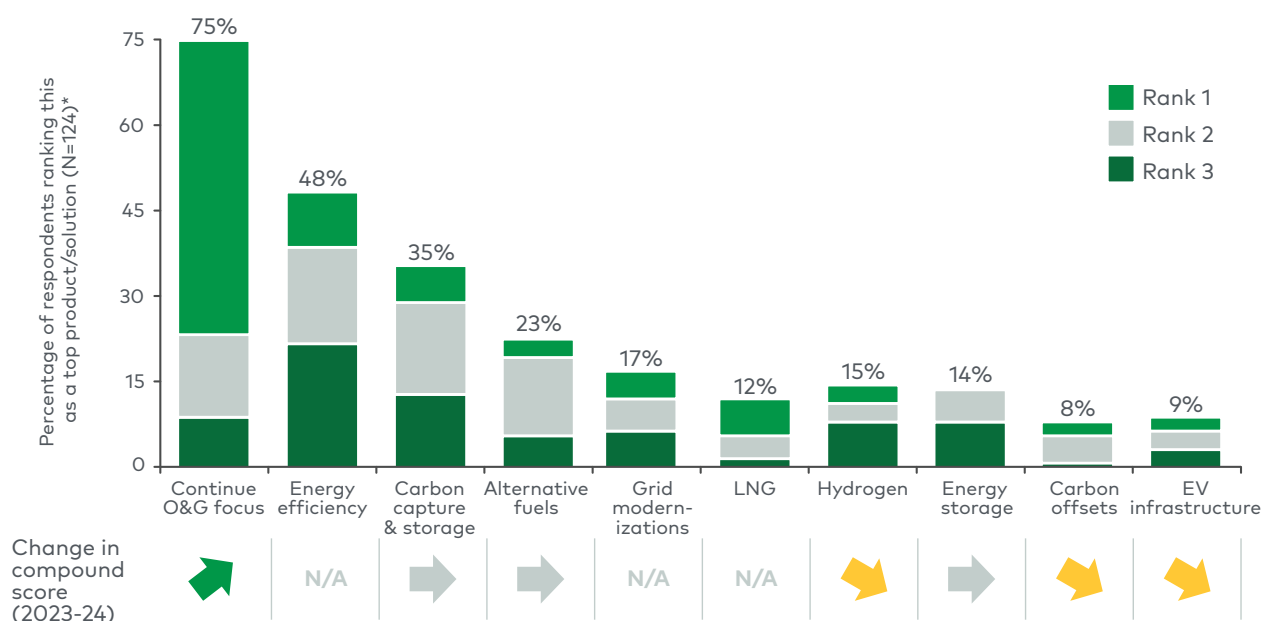
Energy players, industrial leaders and small technology companies continue to evaluate green hydrogen despite these challenges. They present opportunities for breakthroughs in infrastructure and collaboration, which could transform hydrogen into a cornerstone of the global energy transition.

Similarly, sustainable aviation fuel is gaining momentum in the aviation sector, offering a low-carbon alternative to traditional jet fuel. Major airlines are committing to its adoption, signaling progress in decarbonizing one of the hardest-to-abate sectors.

Insights from L.E.K.'s Global Energy Study reveal that companies' decarbonization efforts are in diverse areas. Nearly half (48%) of respondents ranked energy efficiency as a top-three priority, while 35% prioritized CCS. Investments in hydrogen, grid modernization and alternative fuels highlight the breadth of innovation shaping the sector's future (see Figures 3a and 3b).

Figure 3a

Products and solutions organizations are most likely to invest in over the next five years



*Survey question: Which of the following products/solutions is your organization most likely to invest in over the next five years?

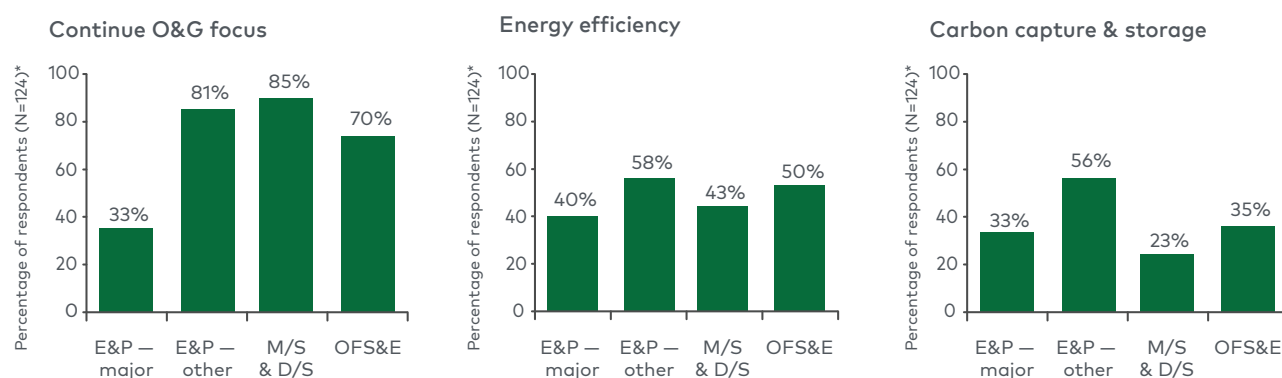
(Please select and rank your top three responses, where 1 indicates the solution most likely to be invested in)

Note: The compound score — made up of scores between 1 and 3 — is based on the percentage of respondents ranking the product/solution first, second or third; green arrows indicate that the product/solution has increased in the rankings relative to 2023 survey results, gray arrows indicate that it has remained the same, yellow arrows indicate it has fallen in the rankings, and N/A indicates that the response option was not included in the prior year's survey

Source: L.E.K. 2023 and 2024 Global Energy Studies

Figure 3b

Organizations are prioritizing oil and gas, energy efficiency, and CCS investments



*Survey question: Which of the following products/solutions is your organization most likely to invest in over the next five years?

Note: E&P=exploration and production; M/S=midstream; D/S=downstream; OFS&E=oilfield services and equipment

Source: L.E.K. 2023 and 2024 Global Energy Studies

This diverse approach underscores the importance of balancing proven solutions, such as energy efficiency and CCS, with emerging technologies. However, the nuance around CCS is critical: While optimism and investment interest remain high, progress is often stymied

by incomplete commercial agreements and economic challenges. Many projects advance to the pilot stage but stall before reaching full-scale implementation.

Utilities, in particular, are at the forefront of decarbonization. While the rapid expansion of renewables has introduced challenges like intermittency, this is now driving advancements in energy storage. Battery systems are now indispensable for stabilizing grids and integrating renewable sources. Meanwhile, investments in solar and wind projects, coupled with infrastructure resilience efforts, further support the energy transition.

However, decarbonization is not just a technological challenge. It demands unprecedented collaboration across industries, governments and geographies. Partnerships, such as carbon capture hubs and hydrogen ecosystems, demonstrate the potential power of collective action in addressing shared challenges.

As the sector advances its decarbonization agenda, these initiatives reveal a path that balances near-term stability with long-term transformation. By aligning operational imperatives with sustainability goals, the energy sector is charting a course toward achieving climate objectives while fostering economic resilience and innovation.

Responding to load growth with a resilient low-carbon grid

Renewable energy is set to double its share of global power generation by 2040, while coal and natural gas are projected to account for less than 40% of power generation by 2029. This shift highlights the critical role of renewables in achieving decarbonization goals while driving economic opportunities. Falling costs, technological advancements and supportive policies are catalyzing this transformation, positioning renewables as indispensable to the energy transition.

However, integrating renewables at scale presents significant challenges. Grids originally designed for centralized fossil fuel generation must now adapt to accommodate the variability of wind and solar power. Energy storage solutions, particularly batteries, are critical for addressing these challenges by storing excess renewable energy during peak generation and releasing it during periods of low production or high demand.

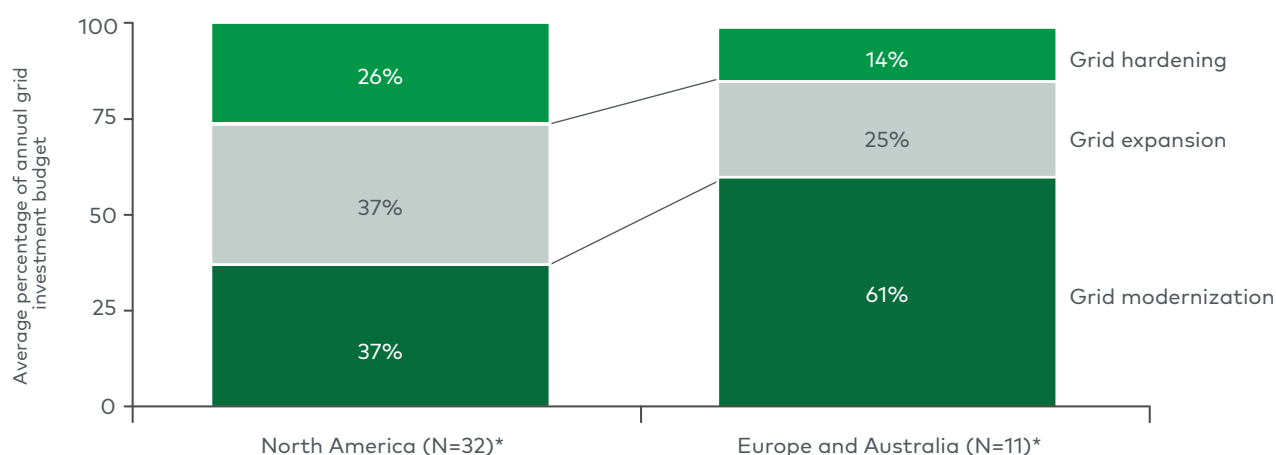
The energy landscape is also witnessing a shift in power demand trends. Historically flat or declining, demand is now rising, fueled by electrification, data center expansion and renewable integration. This shift is amplifying the urgency of investment in grid modernization and resilience measures to ensure reliable energy supply.

These efforts are reflected in shifting investment priorities, with utilities allocating the majority of grid budgets to modernization and expansion (see Figure 4). Grid modernization, which accounts for approximately 60% of planned investments, is a critical

enabler for renewable integration, while grid hardening and expansion address rising load growth and resilience concerns.

Figure 4

Grid investment, by investment area



*Survey questions: Thinking about your organization's current grid investment/capex budget, what percentage of your investment budget is allocated to the following capabilities and initiatives? How does this compare to last year and how do you expect your investment priorities to change five years from now? How much impact do each of the following have on driving changes to your organization's expected grid investment priorities five years from now?

Note: Excludes respondents who selected "no grid investment"; capex=capital expenditure

Source: L.E.K. 2024 Global Energy Study

The industrial sector is accelerating renewable adoption, focusing on cost efficiency and sustainability. On-site renewable installations — particularly solar paired with battery storage — are projected to grow by 60% by 2029, reducing energy costs while advancing decarbonization targets. In emerging markets, localized solutions such as solar-powered microgrids are mitigating grid instability and expanding energy access. For instance, rural India's microgrids have electrified over 10,000 households, demonstrating scalable models for decentralized and equitable energy systems.

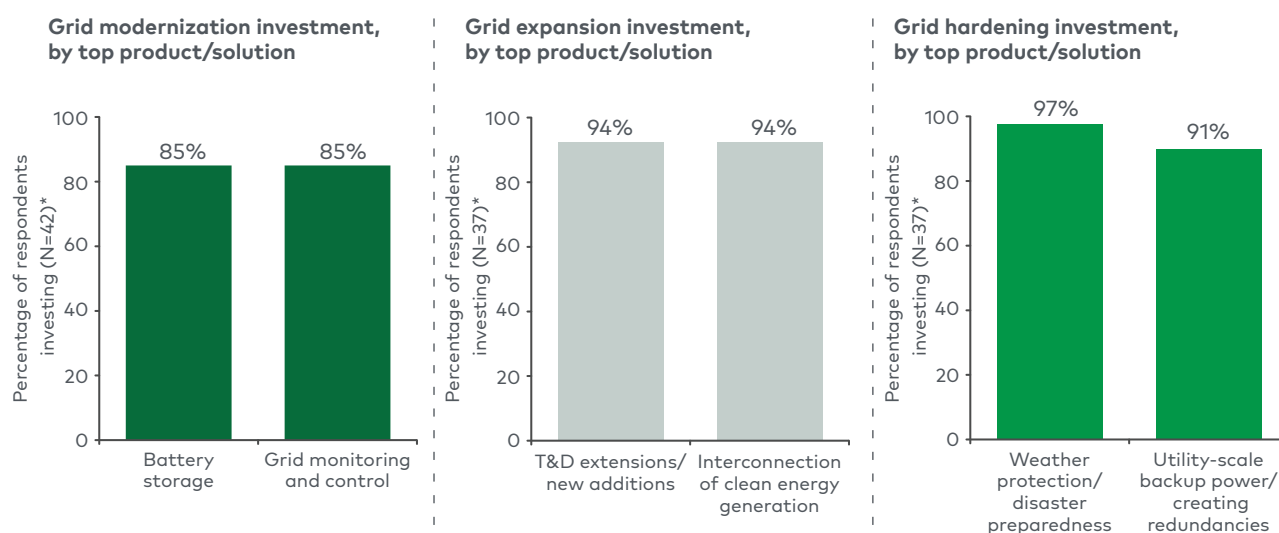
Regional approaches to renewable integration reflect distinct challenges and priorities:

- Europe and Australia:** Investments focus on grid modernization, with over 60% of budgets allocated to transmission and distribution upgrades, renewable interconnections, and advanced grid technologies. For instance, the U.K.'s National Grid has proposed a £35 billion investment to upgrade electricity transmission cables in England and Wales, aiming to meet the U.K.'s 2030 clean energy targets. This plan includes enhancing current infrastructure and developing new projects to connect 35 gigawatts of new generation capacity, ensuring grid reliability and accommodating the growing share of renewable energy.

- United States:** Rising load growth — spurred by electrification trends, data center expansion and renewable integration — has intensified the need for grid expansion and modernization (see Figure 5). One compelling example of U.S. efforts is DTE Energy's smart grid initiative, which has prevented nearly 5,000 power interruptions and saved customers over 1.8 million minutes without power as of August 2024. By integrating advanced automation technologies like reclosers, smart meters and monitoring systems, DTE is addressing grid reliability challenges while enhancing resilience during extreme weather events.
- Emerging markets:** Investments in renewables, microgrids and decentralized systems are improving energy access. For example, India's green energy roadmap, which targets 500 gigawatts of nonfossil energy capacity by 2030, reflects ambitious goals that are already transforming rural energy access through innovations like solar-powered microgrids.

Figure 5

Investments in grid modernization, expansion and hardening



*Survey questions: Thinking about your organization's current grid [modernization/expansion/hardening] investment/capex budget, what percentage of your investment budget is allocated to the following capabilities and initiatives? How does this compare to last year and how do you expect your investment priorities to change five years from now?

Note: Excludes respondents who selected "no grid investment"

Source: L.E.K. 2024 Global Energy Study

At the same time, there is a renaissance in base load solutions, including natural gas reinvestments and efforts to delay nuclear retirements. Projects to bring older nuclear facilities back online are underway, but progress remains slow due to labor shortages and complex regulatory hurdles. Behind-the-meter gas solutions are also gaining traction, serving as either bridge solutions or permanent microgrid applications to stabilize decentralized energy systems.

The remarkable growth of renewable energy depends on advances in grid technology and energy storage solutions. Investments in these areas will transform renewables from an intermittent resource into the backbone of a stable, low-carbon energy system. By pairing modernized infrastructure with innovative storage technologies, the energy sector is addressing variability while enhancing reliability and resilience. These developments are pivotal to decarbonizing global energy and laying the foundation for an equitable, sustainable future.

Driving the energy transition forward

The energy transition is a monumental undertaking, requiring precision, pragmatism and collaboration across industries, regions and governments. While progress continues, the path forward is being defined by commercial rationality and the need to balance proven solutions with emerging innovations.

Energy security and economic priorities are once again taking center stage, with traditional oil and gas playing a critical role in stabilizing global energy systems. Clean energy investments, while significant, are being evaluated with a sharper focus on commercial viability and tangible outcomes. Policies like the Inflation Reduction Act and Infrastructure Investment and Jobs Act in the U.S. remain cornerstones of energy investments in that region, though increased scrutiny may limit funding to initiatives that demonstrate clear pathways to commercial success and social impact.

To navigate this pivotal moment, companies must combine immediate, actionable steps with long-term vision, emphasizing investments with shorter payback periods to ensure progress remains steady while positioning themselves for sustained transformation.

Strategies include:

- Investing in **scalable solutions** such as grid modernization and energy storage to advance decarbonization goals while enhancing infrastructure resilience
- Balancing the role of traditional energy sources with that of clean energy technologies to ensure **stability and sustainability** in energy systems
- Integrating sustainability into core strategies while maintaining a laser focus on **economic returns**

At the same time, addressing geopolitical dynamics will be critical. Shifts in leadership and policy direction, particularly in major economies like the U.S., are already signaling a return to energy security fundamentals, prioritizing oil and gas alongside a more moderated approach to clean energy investments. This recalibration reflects the sector's broader focus: transitioning energy systems in ways that are grounded in reliability, commerciality and long-term value creation.

By acting with pragmatism and fostering shared progress, the energy sector can lay the foundation for a resilient, low-carbon future. The decisions made today will not only shape near-term outcomes but also determine the sector's ability to anticipate and seize tomorrow's opportunities.

How L.E.K. can help

L.E.K. helps corporates and investors navigate the complexities of the energy transition by providing tailored insights into energy technologies, commercial opportunities and strategic priorities. Whether working with companies directly involved in energy supply or those across the broader value chain, we combine deep technical expertise with sound commercial acumen to drive confident decision-making in an evolving landscape.

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