



Generative AI in energy, natural resources, and chemicals

Paving the way for implementation

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Introduction

With the advent of generative artificial intelligence (AI), executives in the energy, natural resources, and chemicals (ENRC) industries see opportunities to improve virtually every facet of their businesses. They envision it automating routine tasks and decision-making processes, predicting when and where their plants and pipelines will need maintenance, and helping with exploration and development of natural resources. But they aren't particularly confident it will help their organizations grow revenue or gain market share, suggesting some view the technology less as a tool for outpacing competitors and more as a way to keep up with them.

Whether it's to forecast hypothetical energy transition scenarios, model a variety of asset portfolios, or determine more sensible ways to manage and extract resources, ENRC companies face undeniable internal and external pressures to embrace generative AI. Given widespread concerns about climate and the environment—and the role that energy, natural resources, and chemicals play in both—ENRC executives are more likely than most to see environmental, regulatory, and political factors influencing the need for the technology at their companies.

These are among the key findings from an exclusive KPMG survey in March 2023 of 300 global executives across a wide range of industries. (Where relevant, we compare these results with findings from our follow-up survey of 200 U.S. executives conducted three months later.) With the survey, KPMG sought to find out what ENRC executives expect from generative AI and what concerns they have about using the technology.

This report highlights where the survey findings differ most for ENRC companies relative to others. It also features insights from KPMG about emerging use cases for generative AI and challenges to adopting it. Finally, the report offers practical tips to get started with deploying generative AI, which allows even non-technical users to quickly and easily generate content and insights based on natural language prompts.

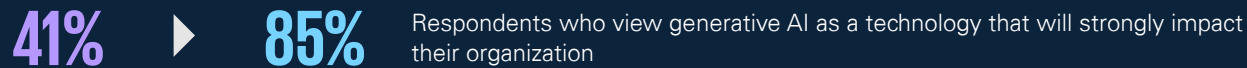
Governance of generative AI is maturing

(March-June 2023)

ENRC respondents see generative AI as having a significant impact and value add, with executives considering partnerships for AI initiatives.

Impact in their organizations

ENRC responses identified generative AI as a top emerging technology in both March and June surveys, and they increasingly believe in its impact across their organization.



Perceived value

ENRC executives see generative AI as a significant opportunity to drive efficiencies and bring value to their organization.

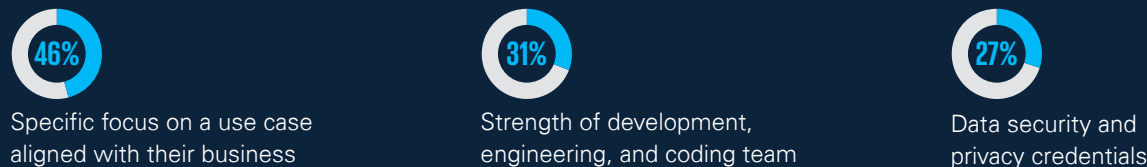


External partnership

ENRC executives seek to collaborate with external partners for their generative AI initiatives.



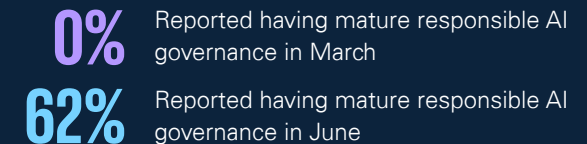
For ENRC executives, the most important characteristics when considering a partnership are:



ENRC executives prioritize researching benefits, implementing responsible AI governance, and mitigating potential risks associated with generative AI.

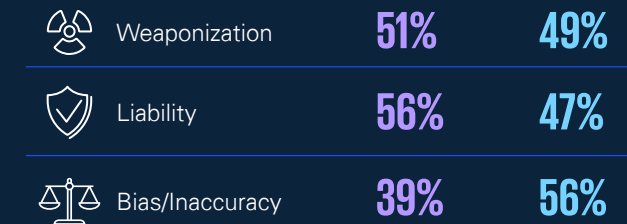
Maturity of generative AI governance

ENRC executives are being very diligent in implementing mature responsible AI governance programs in their organizations.



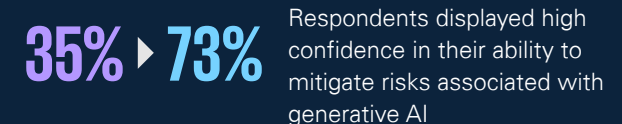
Prioritization of risk management

The following risk management and mitigation areas have received higher priority from ENRC sector respondents in our June survey:



Ability to mitigate risks

ENRC respondents are increasingly confident in their ability to mitigate risks associated with generative AI.



Note: Findings are based on KPMG surveys on generative AI from March and June 2023; the comparative March survey data points are based on 225 U.S. respondents.

■ March survey ■ June survey

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How ENRC companies expect to deploy generative AI

ENRC companies manage complex operations and large asset bases. Therefore it may not be surprising that 73 percent of ENRC executives anticipate their organization will use generative AI for predictive maintenance and asset optimization. Seven in 10 also believe it will automate routine tasks and decision-making processes.

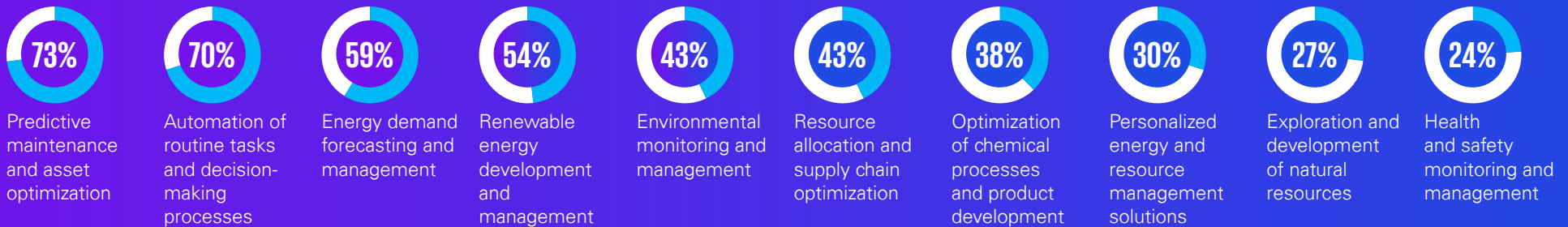
Generative AI also promises to help with developing new energy resources and deploying those resources efficiently. Fifty-four percent of ENRC executives say the

technology will play a role in renewable energy development and management, and 59 percent say it will help with energy demand forecasting and management (Exhibit 1). With generative AI shouldering more of the workload in so many areas, 84 percent of ENRC executives also expect the technology to boost productivity at their organization. That's notably higher than the 73 percent of executives across all industries who feel the same.

Exhibit 1

ENRC executives see generative AI improving vast aspects of their operations

Which of the following areas of generative AI have a likelihood of being applied within your company?



Source: KPMG Generative AI survey, March 2023

Faced with such a broad array of potential applications, many ENRC executives believe that generative AI can be a boon to their business, but 35 percent of them cited reluctance to make significant investments in it until 2024, and 15 percent said they plan to hold off investments indefinitely, suggesting that they want to see a rosier outlook before making any significant decisions. In our June survey, 85 percent of respondents said they are researching and conducting due diligence on generative AI's potential relevance to their business, but only 4 percent said they already implemented it.

A large swath of ENRC executives may be reluctant to invest directly in generative AI solutions, but our recent surveys do suggest enthusiasm to collaborate with external partners on generative AI implementations. In March, 32 percent of respondents said they were interested in partnering with outside firms, while a slightly lower number (27 percent) expressed the same sentiment in June. Additionally, 24 percent of respondents in March reported interest in building strategic partnerships with other firms in their industry to share knowledge, while 27 percent of ENRC executives in our June survey identified acquiring generative AI companies or capabilities as a key strategic investment

priority in the next 12 months. The executives also cited investments in foundational technology and infrastructure as a priority, with 27 percent expressing this sentiment in March and 23 percent in June, as they aim to generate new AI-driven products.

While only 5 percent of their companies have already put their first generative AI application into operation (versus 9 percent all companies represented in the survey), 49 percent plan their first implementation within the next 12 months (versus 38 percent of all). Automation of routine tasks and decision-making processes is seen as an early win, with 27 percent of ENRC executives expecting to see success in that area within the next six months.

Still, ENRC executives are less sanguine than most about the new technology's ability to help with growing revenue or market share. In our June survey results, only 15 percent said they thought that generative AI will create new revenue streams or new business modes. And only 19 percent highly agree that it will help their organization grow, compared to 31 percent of survey respondents across all industry sectors.

Use cases appear nearly limitless



Apart from generic applications such as automating routine tasks and decision-making processes, KPMG sees a wide range of ENRC-specific use cases for generative AI.

Energy

By analyzing historical energy consumption data to predict future demand patterns, generative AI can be used by energy companies to forecast energy demand and support decisions about resource planning and infrastructure investments. Drawing on weather and energy production data, the technology can also be used to simulate the performance and efficiency of renewable energy technologies and to identify optimal energy system configurations. The technology also can be used to optimize energy storage systems and energy grid management systems, spot energy-saving opportunities in buildings, assist with energy trading and market analysis, and identify opportunities to reduce carbon emissions.

Within the energy sector, utility companies could use generative AI to provide better customer service by creating sophisticated chatbots that can assist call center employees or respond directly to customer inquiries. They also might use the technology to dynamically determine the right mix of energy to purchase from various producers and to optimize their asset management schedule. Oil and gas producers might also use the technology to optimize management of their asset bases, including planning and timing plant shutdowns and turnarounds. Young, fast-growing companies in the alternative energy space, meanwhile, may be particularly keen to use generative AI to compensate for a dearth of talent as they struggle to grow their headcount at the same pace as their asset base. At their organizations, generative AI could take over some of the tasks that historically would have to have been assigned to human employees.

Natural resources

Like energy producers, natural resources companies can use generative AI to improve their ability to predict when and where their assets will need preventive maintenance. But they also can use the technology to assist in natural resource exploration and mapping, and to identify potential risks and environmental impacts caused by resource extraction activities. Other uses include optimizing waste disposal strategies, recognizing potential supply chain bottlenecks, and identifying opportunities to save energy and reduce greenhouse gas emissions, all based on modeling of existing data.

Chemicals

Like energy producers and natural resources companies, chemical companies manage complex infrastructures that can benefit from generative AI's abilities around predictive maintenance, asset optimization, and supply chain management. In this industry, though, generative AI also can play a much bigger role in new product development. It can assist, for example, in molecular design for the development of new drugs, chemicals and materials, which could reduce the need for extensive laboratory testing. By using it to analyze process parameters, reaction kinetics, and raw material characteristics, generative AI also can be used to optimize chemical processes and resource utilization in chemicals production. It can help with formulating new products such as cosmetics, coatings, and pharmaceuticals, and with identifying quality control issues during the production process. It also can be used to detect risks around, and ensure compliance with, regulations such as the EU's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) standard and the United Nation's Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

The new demand on electrical grids

While many companies are eager to use generative AI to improve their operations, one group—electric utilities—must also prepare for new demands the technology will impose on them. For years, electric companies have been grappling with massive load growth associated with the proliferation of data centers supporting the digital revolution. Now, the addition of generative AI to digital toolkits promises to dramatically increase power usage by those data centers, potentially leaving electricity distribution networks overwhelmed. In response, utility companies may need to accelerate plans for upgrading those networks, even as they themselves turn to generative AI to sharpen their abilities around energy demand forecasting and management, predictive maintenance, and asset and resource optimization. Data centers could help the cause by using generative AI to identify patterns and correlations in server usage, building temperatures, and other relevant factors, and then using those findings to suggest energy-saving strategies such as optimizing server allocation, adjusting cooling systems, or implementing power management techniques.

Challenges to generative AI adoption in ENRC

In ENRC, challenges to implementing generative AI revolve around people, culture, and understanding of the technology. Finding people with the right skillsets to introduce and implement generative AI has been a hurdle to cross for most industries right now, but it is not particularly worrisome for ENRC executives.

Overall, survey responses from executives across all sectors showed decreased concerns about the challenges surrounding the implementation of generative AI. In our March survey, 13 percent of all executives surveyed cited a lack of skilled talent as a barrier to implementing the technology, and slightly more ENRC executives (14 percent) agreed. However, in June, the number of all respondents who perceived a lack of skilled talent to be a barrier dropped to 9 percent, while only 4 percent of ENRC executives concurred.

Similarly, March's survey responses identified a lack of leadership's understanding of generative AI and a strategy to capitalize on it (11 percent of all respondents, 8 percent of ENRC respondents). By June, these percentages decreased to 7 percent and 6 percent, respectively. The ENRC sector's push into generative AI may need more support from the C-suite—only 16 percent of executives in this sector strongly agree that their executive leadership team has appropriately prioritized generative AI, versus 26 percent of executives across all sectors. In fact, only 40 percent in this sector say their executive leadership is even involved in their organization's response to generative AI, versus 55 percent of all executives.

Over time, all executives—including those from the ENRC sector—have become more comfortable with the potential of generative AI. They are beginning to understand its capabilities and are establishing governance protocols around the technology. In our March survey, only 5 percent of all respondents (0 percent of ENRC executives) reported having a mature, responsible governance program in place. By June, 46 percent of all respondents and 62 percent of ENRC respondents reported implementing such programs.

KPMG insight

At KPMG, we believe the challenges the ENRC sector faces in finding data scientists and engineers to take advantage of generative AI, especially among oil and gas producers, may be exacerbated by their cultural proclivity to hire from within their own industry. Hiring from outside the sector, which can be necessary to implement generative AI, may force them beyond the confines of their comfort zone and might make it harder to close the deal with top talent. ENRC companies also must wrestle with the fact that the industry as a whole is not typically viewed as the most attractive landing zone for data scientists and others who have the skills needed to leverage generative AI.

In addition to struggling to find the right talent, many ENRC companies are wrestling with the broader question of where best to invest their dollars, and whether an investment in generative AI will drive better business outcomes over the near term than investments in other areas.

We believe ENRC companies must look outside their own industry for help, and that work to implement generative AI—or at least pave the way toward implementing it—must begin now.

We further encourage executives in the ENRC sector to become more aggressive in learning about the risk of bias and inaccuracy in generative AI output. Only 30 percent of executives in this sector assign a high priority to that risk, versus 42 percent of all executives.

What to do next

The many challenges to implementing generative AI cited by ENRC executives suggest there may be a significant opportunity to capture first-mover advantages. ENRC executives are hoping generative AI will prove to be a fly wheel for improving efficiency and productivity. However, many are still taking a wait-and-see approach to ensure safe and responsible integration. By utilizing AI for tasks like forecasting, modeling, and projections, we believe that embedding generative AI into daily processes should allow the ENRC sector to move faster.

Early adoption also could make it easier to acquire the talent needed to take advantage of the technology as data engineers and other experts see opportunities to put their skills to use.

We have identified five key steps ENRC companies can take right now to jumpstart their generative AI agendas:

1

Address data and data systems

2

Identify and pursue early use cases

3

Create a strategy for deployment

4

Ready the workforce

5

Look for the right partners

1 Address data and data systems

Generative AI requires high-quality and relevant data for everything from business decisions to training purposes. Identify and address any shortcomings in data availability, data quality, and data integration, ensuring that data is clean, comprehensive, and accessible. As necessary, accelerate the movement of IT systems to a cloud environment, where it is often easier to introduce new capabilities such as generative AI. Closely monitor the proliferation of AI solutions whether they are developed in-house or licensed, and know what you have and where you have it because you can't protect what you're not aware of.

2 Identify and pursue early use cases

The opportunity presented by generative AI is attractive, and the technology is moving fast, so ENRC companies will not want to wait for an exhaustive, enterprise-wide solution to their data shortcomings to be completed before they begin experimenting with generative AI. Even as efforts to create a sound data foundation get underway, we encourage companies to identify discrete use cases for generative AI and then experiment with the technology. The goal should be tangible, quick wins that will naturally build momentum. A good way to target the highest-value use cases will be to look for those that will have a direct impact on revenue, costs, risk, or other important outcomes, and that are reliant on high volumes of data, insight, and reasoning.



3 Create a strategy for deployment

As with any sector, we encourage ENRC companies to use their existing investments in AI as a foundation to explore generative AI, and to create a broad generative AI strategy that weighs costs against revenue opportunities, considers the impact on people and operations, and, perhaps most importantly, creates a framework for the responsible use of this powerful new technology. Safeguard the integrity and protection of your data and your algorithms, and establish effective governance across solution development, deployment, training, and improvements. Pay special attention to identifying and mitigating the risks associated with generative AI models, including the tendency of current iterations to sometimes hallucinate—to generate outcomes that seem authoritative but are not accurate or factual.

4 Ready the workforce

Build a team with the necessary skills and expertise to take advantage of generative AI. Companies will help their efforts by becoming more open to hiring data scientists, machine learning engineers, and other generative AI experts from outside their own industry. Investments to train existing employees to stay current with developments in the AI field also will be important. Most companies in this sector will want to designate a single person to coordinate generative AI activities across the enterprise, but it also could be helpful to develop generative AI literacy across the workforce. Because generative AI is not just an IT or human resources issue, it also could be useful to form a cross-functional team to serve as a liaison between management and employees. This team can help accelerate the integration of the innovative AI technology while bringing cultural sensibility to the undertaking.

5 Look for the right partners

As companies start to develop their generative AI literacy and capabilities, many will want to find external partners to help them begin forming and executing on their generative AI strategy now. Look for partners with extensive AI experience and expertise, strong “compute power,” and technical engineering chops who are prepared to leverage this newest version of the technology.

How KPMG can help

An early and enthusiastic advocate for the power of AI, KPMG is a leading firm that is well positioned to help your organization leverage generative AI. We can guide your organization through strategy, use case development, vendor selection, and pilot implementations—and then provide ongoing support to help you scale and optimize your investment in this transformative technology. We understand both the promise of generative AI and the process and cultural changes that will be required to realize its full potential, and our proprietary methodologies, frameworks and tools can help with assessing and managing the impact it will have on your workforce.

KPMG also recognizes that all users of generative AI have a responsibility to learn about the technology's risks and how to control those risks to prevent harm to customers, businesses, and society. Those risks will grow and evolve as AI technology advances and becomes more pervasive, and as public pressure from regulators increases.

The KPMG responsible AI offering is a set of frameworks, controls, processes, and tools that can help ensure AI systems are being designed and deployed in a trustworthy and ethical manner so that companies can accelerate time to value from using those systems. We understand that responsible AI is a complex business, regulatory, and technical challenge, and we are committed to helping clients in the ENRC sector overcome those challenges as they incorporate this exciting new technology into their operations.

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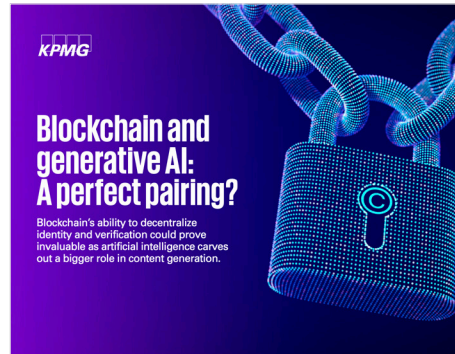
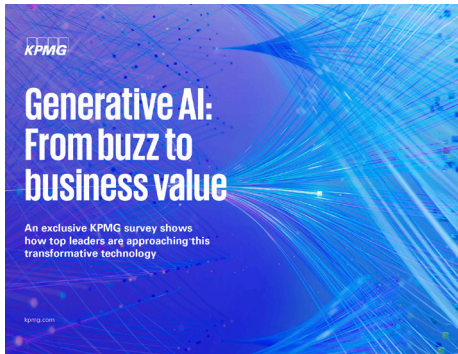


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