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Powering AI

The outlook in energy and utilities



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Introduction

Characterised by highly complex processes such as power generation and transmission, the energy industry has long been a pioneer in technology, from using seismic data in early oil and gas exploration to adopting machine learning (ML) in demand management for electricity grids. Factor in spending that accounts for a third of total global capital expenditure,¹ and the sector is able to experiment with technology at a scale unmatched by others, making it a primary candidate to lead the adoption of generative AI (GenAI).

An Economist Impact survey, commissioned by Databricks, polled 715 technical executives and 385 data and AI technologists with titles such as data scientists, data engineers and enterprise architects. The survey included 125 respondents representing the energy and utilities industry.

We found:

- **Despite the sector's potential and resources, it is not embracing AI and GenAI as extensively as most other industries. Instead, energy companies are taking a cautious approach to scaling AI solutions, according to our survey.**
- **Positively, over half of respondents believe AI will help them comply with energy efficiency regulations, integrate renewables and optimise within energy markets.**
- **Enhanced customer experience is a leading current use case, which is welcome for an industry that has faced criticism in the past in this domain.**

We'd like to thank the following executives for participating in interviews and sharing insights:

- **Juan Jose Casado**, chief digital officer, **Repsol**
- **Mohit Kapoor**, group chief technology officer, **Mahindra Group**
- **Robbert Van Rutten**, chief information officer, **Shell**



¹ <https://www.bcg.com/press/20november2023-18-trillion-capital-gap-threatening-the-green-energy-transition>

From AI to GenAI

‘Traditional’ AI applications have been embedded in the energy industry for more than two decades. AI platforms like Kraken, developed by Octopus Energy, are used to co-ordinate distributed power-generating assets, dialling them up and down to meet dynamic demand.² The global smart grid market is expected to reach US\$123bn by 2027,³ while the US Department of Energy is banking on AI to significantly enhance the efficiency and reliability of the country’s overburdened power grid, which costs American businesses US\$150bn annually.⁴

Respondents to our survey are widely optimistic about AI’s role in the renewable transition (see figure 1). Mahindra Group, for example, uses AI to optimise solar panel cleaning routes, while Enel Green Power uses ML to develop a predictive maintenance model for its hydroelectric power plants, allowing it to repair or replace parts in advance and avoid costly outages.

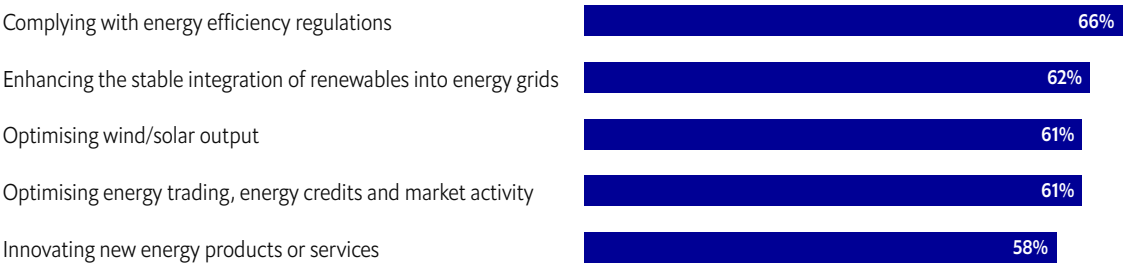
By contrast, GenAI uptake is still an emerging phenomenon.

“As a company we’ve been dealing with AI for more than 25 years so we know the process and we have the skills. But GenAI is a new technology, just over a year in the market, so we still need to learn how to launch and put into production these initiatives in an agile way.”

Juan Jose Casado, chief digital officer, Repsol

Figure 1: AI’s top applications in the renewable energy transition

Percentage saying AI will have a high impact on their organisation’s efforts to do the following over the next 3-5 years



Source: Economist Impact

² <https://kraken.tech/>
³ <https://www.emergenresearch.com/industry-report/smart-grid-market>
⁴ https://www.energy.gov/sites/default/files/2024-04/AI%20EO%20Report%20Section%205.2g%28i%29_043024.pdf

Sixty-nine percent of executives say long-term strategic impact is very important to building successful business cases for AI investment.

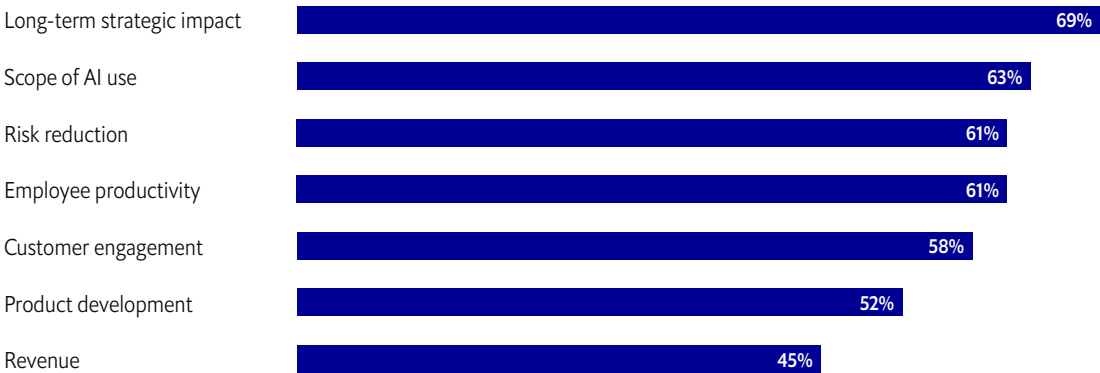
Along with other sectors, however, energy companies are actively seeking use cases for the new technology. Repsol, for example, convened different brainstorming sessions involving all business units to identify potential applications across the company, which it then narrowed down to 50 GenAI trial use cases. It is already using GenAI, for example, to generate informative material on safety recommendations to strengthen the security culture and help its

legal department process documents and simplify workflows. Meanwhile, an experiment with 200 of its software engineers found that automating tasks with GitHub Copilot improved productivity by up to 30%, depending on the coding language.

As these examples suggest, energy executives appear less focused on revenue alone as the justification for AI investment than leaders in many other industries, with only 45% citing it as particularly helpful in building a case for AI investment. Instead, our survey identified other key metrics that have been more important for energy companies, including long-term strategic impact (69%), scope of AI use (63%), risk reduction (61%), employee productivity (61%), customer engagement (58%) and product development (52%).

Figure 2: Energy executives are less focused on revenue alone as the justification for AI investment

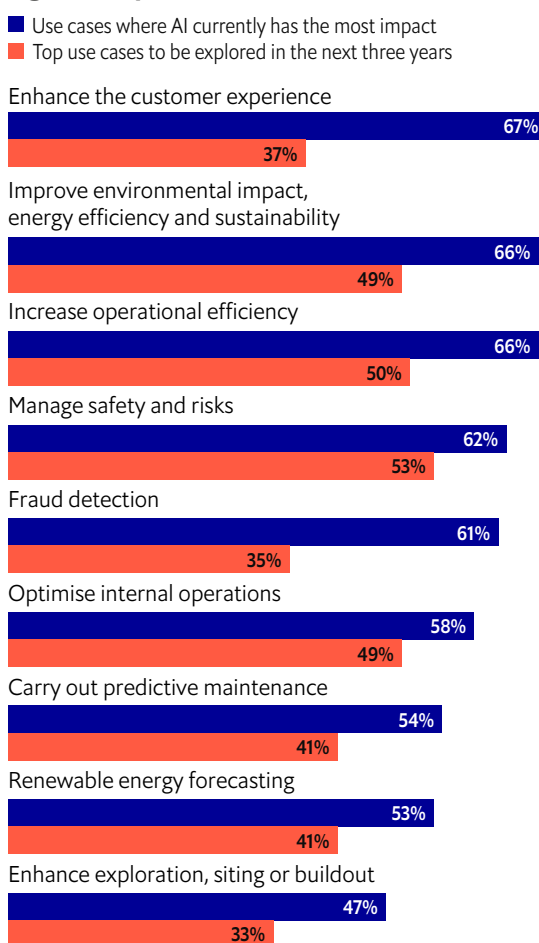
Percentage of executives who say the following metrics have been most important in building a successful business case for AI investment.



Source: Economist Impact

The most impactful use case for AI identified by industry respondents today is enhancing customer experience. Over the next three years, managing safety and risks will emerge as a key area of focus.

Figure 3: Top use cases now and in the future



Source: Economist Impact

GenAI at scale

As likely future 'power users' of GenAI, energy companies are seeking to integrate the technology into their own platforms. To launch its 50 trial use cases, for example, Repsol extracted data and fed it into existing commercial large language models (LLMs). However, in future the company expects to see a shift towards the use of small, private LLMs, possibly in combination with open-source models, as it develops the capacity to build models internally.

Shell has integrated GenAI into its Shell-e platform, allowing its employees to put the technology to work on its internal data trove. Use cases include allowing procurement teams to validate contracts against a set of historical standards, as well as automating coding for software engineers.

"Many companies have seen big investments in some of the bigger platforms but are struggling to demonstrate their full benefits," says Robbert Van Rutten, chief information officer at Shell.

"In a world of GenAI, the ability to build on top of these platforms and go beyond their initial scope is very important."

Robbert Van Rutten, chief information officer, Shell

Secure and legal

Energy companies handle sensitive and highly varied information, ranging from their customers to infrastructure. Technology failures can therefore have major consequences, such as power outages for industrial customers or entire cities.

Given the critical nature of the industry, data governance is crucial to ensure high accuracy and reliability. For instance, there is a reluctance at energy companies to upload data to the cloud without a clear business use case. For any data moved into cloud storage, says Mr Casado at Repsol, “you need to create data dictionaries. You need to create a data catalogue and define the rules about who can access it.”

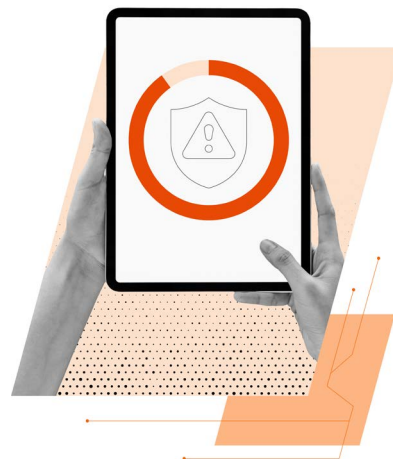
Mohit Kapoor, group chief technology officer at Indian conglomerate Mahindra Group, which is a renewable energy leader, concurs:

“We have to maintain data sanctity and data separation, ensuring data is always identifiable but that it can also be anonymised to drive insights from across our companies.”

Mohit Kapoor, group chief technology officer, Mahindra Group

Data security is also a key consideration for the industry. Given the sector's importance, it is unsurprisingly a major target for cyber-attacks:

Among the world's top energy firms, 90% experienced data breaches in 2023,⁵ while utility companies were the target of 1,100 cyberattacks per week on average in 2022.⁶



Companies that provide consultancy or industrial energy supply services directly to clients pay particular attention to cybersecurity. “For a lot of these companies, we’re essential infrastructure, entrusted with a large set of consumer data,” says Shell’s Mr Van Rutten. “You need to anchor that risk evaluation directly into your governance.”

Shell's approach to AI implementation is therefore guided by three key questions: What would create value? Are we capable of doing it? And then, most crucially, is it both safe and legal to do so?

⁵ <https://securityscorecard.com/research/third-party-data-breaches-in-the-energy-sector/>

⁶ <https://www.iea.org/commentaries/cybersecurity-is-the-power-system-lagging-behind>

Data for all

Energy sector leadership in technology has traditionally come through vast spending on narrow disciplines with very specific use cases, such as seismic data in oil and gas exploration. GenAI, however, with its natural language component, offers the potential for every energy sector worker to actively engage with technology by typing simple prompts or using basic workflows.

Energy companies appear determined to make this a reality. Repsol, for example, has created data skills courses for all employees to help them self-serve and use insights, while Shell places a similar emphasis on data democratisation, which Mr Van Rutten believes has become a broader phenomenon across the industry.

“There's an increasing amount of data available, and we're able to provide tools to everyone in an organisation, not just IT professionals. At Shell we call this initiative DIY. This ensures everyone can effectively work with data to become more efficient and effective.”

Robbert Van Rutten, chief information officer, Shell

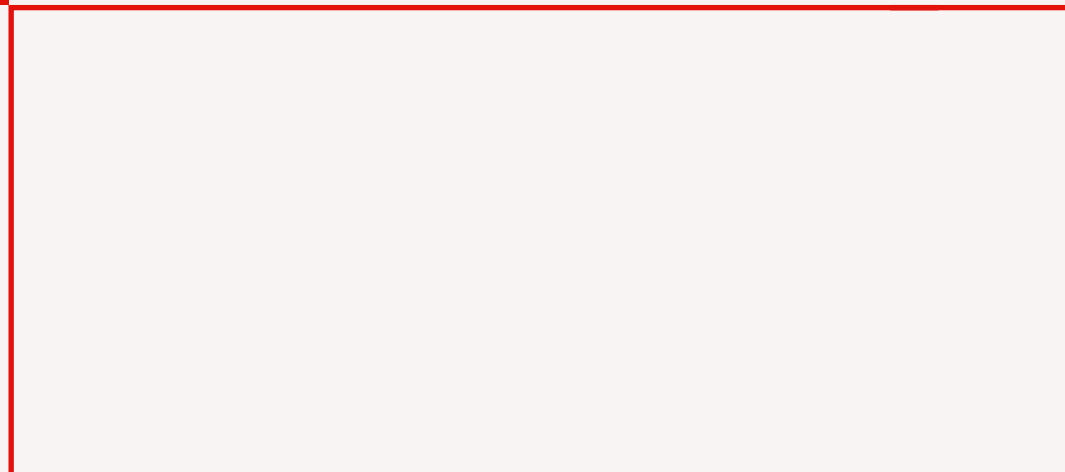
Yet, energy sector respondents to our survey were the least likely to say that their organisation is investing sufficiently in AI across both technology and non-technology business functions (only half agreed).

This possibly reflects high expectations in a sector where traditional AI has already been used for decades, and suggests substantial work is still to be done to unlock GenAI's full potential.

Few industries in our survey will shape the future of humanity more than energy and utilities, faced with enabling a rapid transition to a more sustainable power system. From identifying the best locations to capture nature's energy and optimising maintenance to improving transparency and customer convenience, every step in the energy delivery chain can be optimised with AI.



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