Generative AI for the Energy Industry

IBM Industry Point-of-View

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AI's Impact on the Energy Industry

Energy, environment, and utilities companies are rapidly transforming in response to accelerated global focus on sustainability through clean electrification. Utilities are defining new opportunities as markets transform into energy ecosystems and technologies enable new services and solutions for customers.

Chemicals, petroleum, and industrial products companies are facing several key challenges resulting from commodity price volatility, fluctuating demand, aging infrastructure, and environmental concerns. Outside a plant's perimeter, customer expectations are increasing, and ecosystems are being disrupted and disintermediated. The need for improvements and enhancements across the entire value chain is ever-increasing.

AI and digital technologies will empower industry leaders around the world with speed, agility, efficiency, and dynamism – enabling turnkey decision making for safer, more reliable, more efficient, and sustainable energy delivery to businesses and consumers.

The entire energy sector is at a crossroads when it comes to the adoption of AI. Energy leaders have a choice to let AI happen to them or take the lead in its safe, secure, and responsible implementation to accelerate entire workflows and consumption models. While each organization is in a different step of their digital transformation journey, the choice is clear: fully embrace AI and the advantages it offers or stay on the sidelines and be surpassed in capability by those who adopt this technology quicker.

AI in the Energy Industry will allow companies to:

- modernize and digitalize energy infrastructure with an AI and real time data-driven approach to better operationalize assets to enhance effectiveness of entire slate of products and services.
- add resilience through predictive maintenance of assets (e.g., plant, grid, fleet vehicles, pumps, transformers, etc.).
- improve customer engagement through digital technologies, intelligence, and real-time modeling.
- transform customer engagement through virtual assistants that help consumers (B2B, B2C) navigate questions about orders – from complex products and services to accessing billing and account services.

AI technology is advancing quickly beyond Machine Learning to Generative AI, which focuses on creating new and original content from multiple variable datasets. Some of the most common generative AI tasks implemented today are: Retrieval-Augmented Generation, Summarization, Content Generation, Named Entity Recognition, Insight Extraction, and Classification.

Foundation Models and Generative AI at IBM

Generative AI is a step change in the evolution of AI. Powered by foundation models – large neural networks trained on extensive unlabeled data and fine-tuned for a variety of tasks – generative AI enables an array of use-cases like semantic search, code generation, email routing, customer service, and improved automation for businesses everywhere. This explains why over 80% of enterprises are working with or planning to adopt generative AI.[1]

Where can the Energy Industry implement AI now?

When considering the impact of transformational technologies, Energy Industry CEOs place Generative AI first in terms of expected value. This places Energy CEOs as a significant outlier in comparison to CEOs in other industries.

According to IBM's 2023 CEO Study, energy sector senior leadership expect more from Generative AI than all other industries. 63% of energy industry CEOs expect to realize value from Generative AI and Automation in the next three years. *(Learn more about energy industry CEO insights on generative AI here.)*

While IBM focuses on use-cases that are scalable and relevant to every industry (augmenting and automating talent acquisition, customer service, and app modernization), it's also developing industry specific capabilities and use-cases for Generative AI. This is where IBM differentiates itself from its competitors – the dedication to the Energy Industry, through which it constantly replenishes the library of use cases that address age-old as well as emerging challenges.

1 Scale Zeitgeist: AI Readiness Report, a survey of more than 1,600 executives and ML practitioners

Some Generative AI use-cases for the Energy Industry

Quick gains can be made by energy companies using data that is publicly available so as not to run into potential delays in security/privacy/auditability issues. For example, they could:

- Enhance customer care by leveraging existing foundational models and fine-tuning to enable customers to search company website and provide better insights into their accounts.
- Leverage public data for early proof of concept or MVP development to avoid concerns about data security and protection.
- Utilize LLMs to augment the regulatory filling process from creation through rulings.

Moving to more advanced examples, energy companies can leverage fine-tuned foundation models within established governance/policies for security and privacy of the underlying data sources.

- Leverage data sets to build better models to support equipment operators & field service engineers across oil, gas, and utility companies to carry out complex maintenance tasks by automating and augmenting knowledge with additional instructions and manuals to help prevent grid outages or plant outages – streamlining operational maintenance and resilience.
- Utilize image recognition for maintenance of assets (e.g., transformers, ESPs, etc.) and building models to monitor for cracks in facility walls and infrastructure could save a utility company or an oil refinery an outage, which will cost hundreds of thousands to millions of dollars per day depending on the size of the outage.

As energy companies further fine-tune their models, longer term examples could include the following.

- For power and utility companies: use of time series foundation models to enable better insights into long-term demand forecasting for the grid with new AI models that take into consideration expected contributions from renewables based on weather and climate forecasts combined with EV adoption rates, population growth, and patterns in regulatory changes.
- For oil companies: the use of AI to refine and further train predictive drilling analytics by creating large, cleansed, transformed datasets where none exist. In addition to more accurately predicting drilling failures, this enables quicker identification of the right drilling locations and eliminates weeks of analysis time by engineers and technicians.
- For all energy companies: the use of AI for the development of project and capital program management workflows for large EPC programs, as investing in “clean energy” infrastructure development increases across the entire sector and across all value chains. (This is the backbone of the Energy Transition.)

Why IBM?

IBM’s approach to AI is based on four core and differentiating beliefs:

- **Open** – IBM’s AI is based on the best open technologies available.
- **Trusted** – IBM’s AI is responsible and governed.
- **Targeted** – IBM’s AI is designed for the enterprise and targeted for business domains.
- **Empowering** – IBM’s AI is for value creators, not just users.

Access to IBM’s AI

You can access IBM’s AI through three modes:

- Through watsonx, our cloud-native AI and data platform, offering maximum control and portability.
- Through AI products, such as Watson Orchestrate, Watson Code Assistant, and Watson Assistant, all built on watsonx.
- Through open-source platforms such as Red Hat OpenShift, AI, and seamless integration with our partners’ products (SAP, etc.)

Enter watsonx

To help businesses capitalize on the opportunities of generative AI and foundation models, IBM has launched watsonx – our enterprise-ready AI and data platform. It consists of watsonx.ai, watsonx.data, and watsonx.governance.

- **Watsonx.ai** is a next generation enterprise studio for AI builders to train, validate, tune, and deploy both traditional machine learning and new generative AI capabilities powered by foundation models through an open and intuitive user interface.
- **Watsonx.data** is our data repository, based on a lakehouse architecture and open data formats designed to manage enterprise data for foundation models with trust and confidence.
- **Watsonx.governance** is a powerful set of tools to specify and manage enterprise-wide governance processes and control risk.

watsonx is open

Our approach is open. You benefit from IBM models, the best open-source models, and even the models you co-create with us, to create flexible and fit-for-purpose enterprise solutions rather than relying on a single model. We leverage cutting-edge innovations from IBM Research and the open research community to ensure performance, customization, speed, and efficiency.

watsonx is trusted

Enterprises need to protect their proprietary data and IP, deploy in multiple environments, and be supported with tools to mitigate risks. At IBM, we prioritize AI you can trust. Watsonx.governance tracks data, curating methods, and models, enabling AI that can be updated to meet evolving business and regulatory requirements. IBM's Center of Excellence for Generative AI helps clients operationalize the full AI lifecycle and develop ethically responsible generative AI solutions.

watsonx is targeted

Consumer AI is not the same as enterprise AI. Watsonx is designed to solve real business problems. At IBM, we focus on those domains that drive quick gains in productivity and time to value for enterprises – augmenting and automating HR, customer service, and code generation.

We focus on use cases that are scalable and relevant to every industry, such as:

- Talent: 40% improvement in HR productivity
- Customer care: 70% call center calls contained by conversational AI
- Application modernization and operations: 30% productivity gain in application Modernization

watsonx is empowering

Watsonx empowers you to be an AI value creator, not just a user. With watsonx, you are not limited to just prompting someone else's AI model with no control over the model or the data. Watsonx allows you to train, fine-tune and deploy, and govern the data and AI models you bring to the platform and own completely the value they create. This is important as more than 75% of enterprises seek to fine-tune open-source models or build their own for specific needs.

Empower your business in the age of AI

IBM is committed to unleashing the transformative potential of foundation models and generative AI. We provide open, trusted, and targeted value creating AI solutions for businesses. Watsonx, our integrated AI and data platform, embodies these principles, offering a seamless, efficient, and responsible approach to AI deployment across a variety of environments.

With IBM, you're not just an AI user—you're an AI value creator. Whether it's fine-tuning open-sourced models, creating your own, deploying AI on-premises or in the cloud, or gaining transparency into AI decisions, IBM stands ready to empower every business in the age of AI.

Let's embrace the age of AI value creation together.

Additional Resources

More detail on time series foundation models can be found in a blog on "The Battle of Time-series Transformers" by Vijay Ekambaram, Senior Research Engineer and IBM Master Inventor.

This blog, building on joint work outlined by IBM and NASA, explores how energy companies could more effectively detect natural hazards and track changes to vegetation and wildlife habitat for natural resource management.

Learn more about the annual IBM CEO study, "CEO decision-making in the age of AI, Act with intention."

If you would like to learn more about watsonx and IBM AI solutions for energy industry companies, please contact your IBM representative today.

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