The Engine of Progress:

How Generative AI Will Transform the Future of Energy

Contents

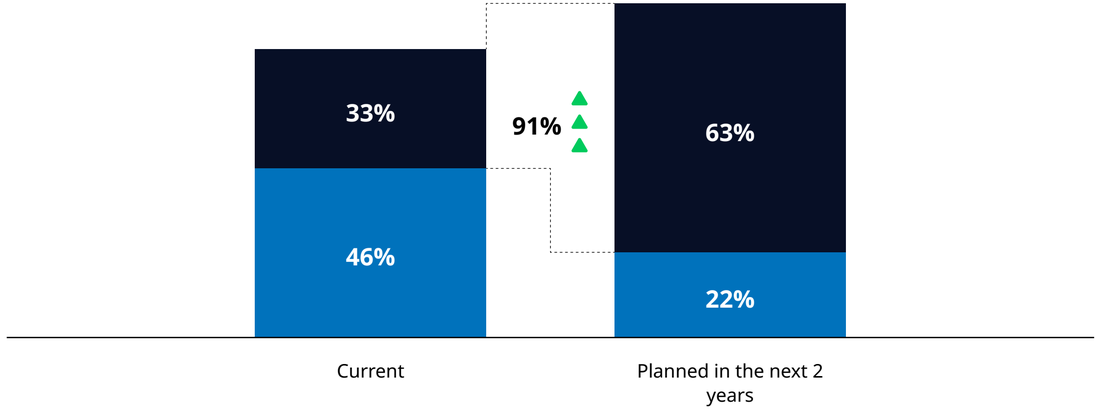
We are living in the era of Generative AI (GenAI), a compelling new technology that is drawing widespread global attention. What sets GenAI apart is its accessibility: even non-technical users can engage with it using natural language, without needing deep technical skills. This ease of use has rapidly expanded its reach, along with the expectations surrounding its business impact.

Testing a new technology is just the beginning—unlocking real business impact requires scaling it into core operations and driving measurable value. NTT DATA's Global GenAI Report reveals that nearly **90% of executives are struggling to move beyond experimentation**, facing fatigue from limited pilots and struggling to scale successful use cases.

Organizations seeking to deploy GenAI at scale are quickly realizing that this is not merely a technology initiative. Success depends on a comprehensive strategy that also addresses workforce adoption, data security, and seamless integration with the existing application ecosystem.

This is especially true for the Energy and Utilities sector, where the report points to a sharp rise in GenAI investment—63% of respondents plan to significantly increase their budgets in the next two years.

Energy and Utilities



This report is designed to provide energy sector executives with strategic insights to:

- Identify high-impact areas for GenAI adoption
- Define a strategic roadmap that enables end-to-end transformation required to unlock GenAI's full potential
- Explore current, real-world use cases based on NTT DATA's hands-on experience in the field
- Gain insight into how large enterprises are investing in energy-focused AI startups to accelerate innovation

Executive perspectives on the impact of GenAI

According to NTT DATA's Global GenAI Report, executives view GenAI as a game-changer, with 83% having already established dedicated expert teams to harness its potential.

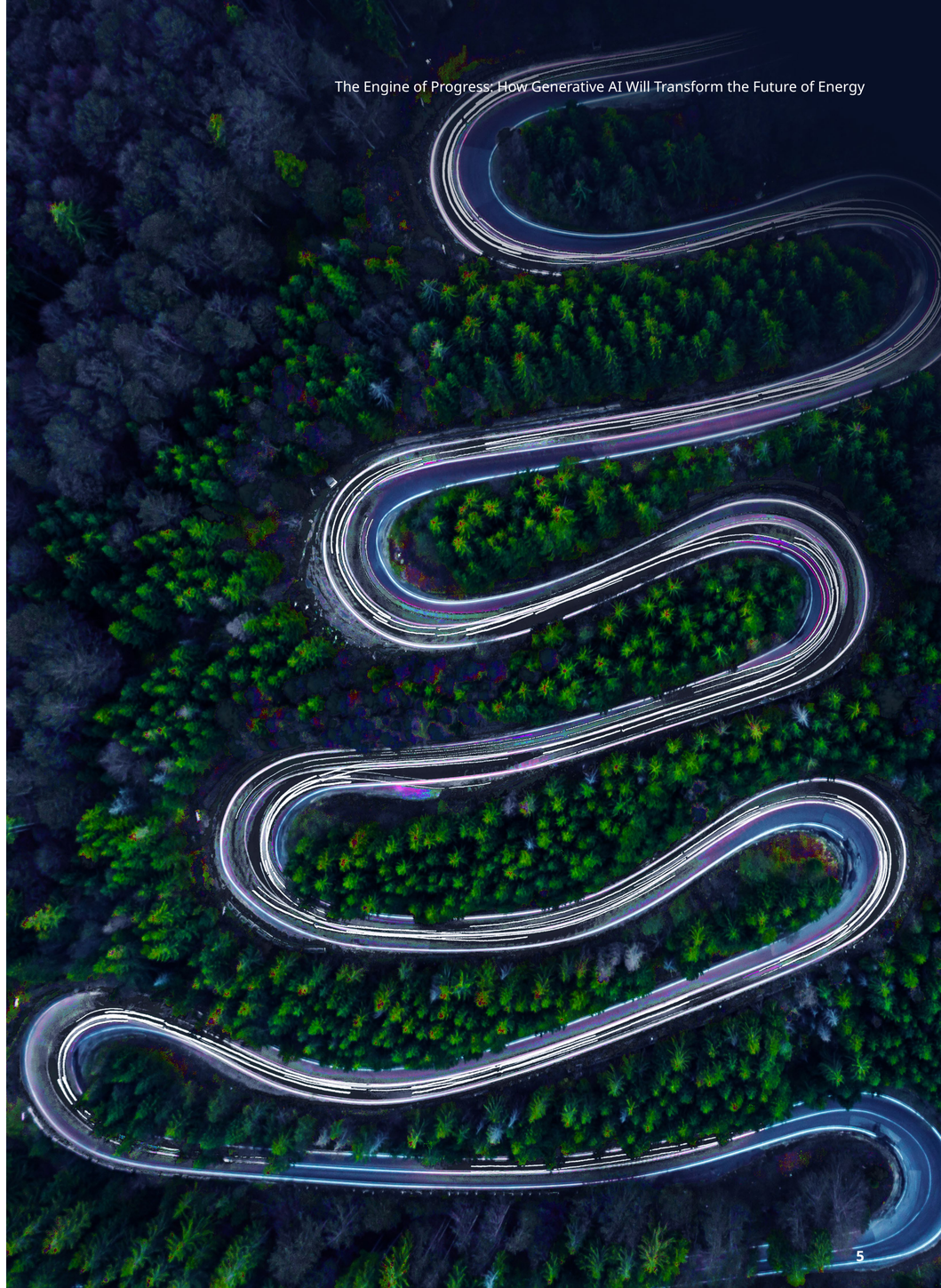
The report highlights four strategic areas where organizations should concentrate their efforts to ensure the successful deployment and integration of GenAI:

Strategy and transformation: making GenAI part of the business strategy

- 83% of respondents indicate they have a clearly defined strategy, yet 51% have not aligned it with their broader business objectives.
- Rather than focusing on short-term cost reduction, organizations are prioritizing GenAI's potential to drive long-term business growth. Cost reduction is not currently a leading motivator—falling outside the top five factors—as companies pursue GenAI through a strategic, value-driven lens.
- Thus far, companies have concentrated on foundational architecture and delivery models, such as cloud and Platform as a Service (PaaS), along with the complexities involved in building GenAI-ready environments. In the next two years, the focus is expected to shift toward integrating complementary technologies—such as IoT, 5G, edge computing, and GPUs—more effectively.

Technology and innovation: positioning cloud and emerging technologies at the core of GenAI enablement

- 90% of respondents point to legacy infrastructure as a significant obstacle, and only 45% strongly agree they possess the capabilities needed for integration.
- 96% agree that cloud-based solutions are the most practical and cost-effective approach to supporting GenAI workloads. However, only 44% are confident they have the optimal infrastructure in place to scale GenAI efficiently and sustainably in a cloud environment.



People and culture: navigating the technological and human shifts triggered by GenAI

- 66% of executives acknowledge that their workforce lacks the necessary skills to effectively operate GenAI tools. Roughly half are actively planning training and upskilling initiatives to facilitate adoption.
- 72% have yet to implement internal policies that govern GenAI usage—for example, to protect intellectual property.
- 95% believe GenAI will have a material impact on employee productivity, with 48% expressing strong agreement.

Ethics, security, and sustainability: establishing trust and resilience in the age of GenAI

- 89% of executives voice serious concerns about the security risks associated with GenAI deployment, although most agree the potential value and ROI outweigh these challenges.
- Three major trust-related obstacles remain among the key factors hindering widespread GenAI adoption:
    - Maintaining cybersecurity standards (e.g., threats, deepfakes, and misinformation)
    - Lack of transparency (including the difficulty in explaining the reasoning behind the models)
    - Reliance on third-party providers, leading to limited control and reduced ability to tailor solutions

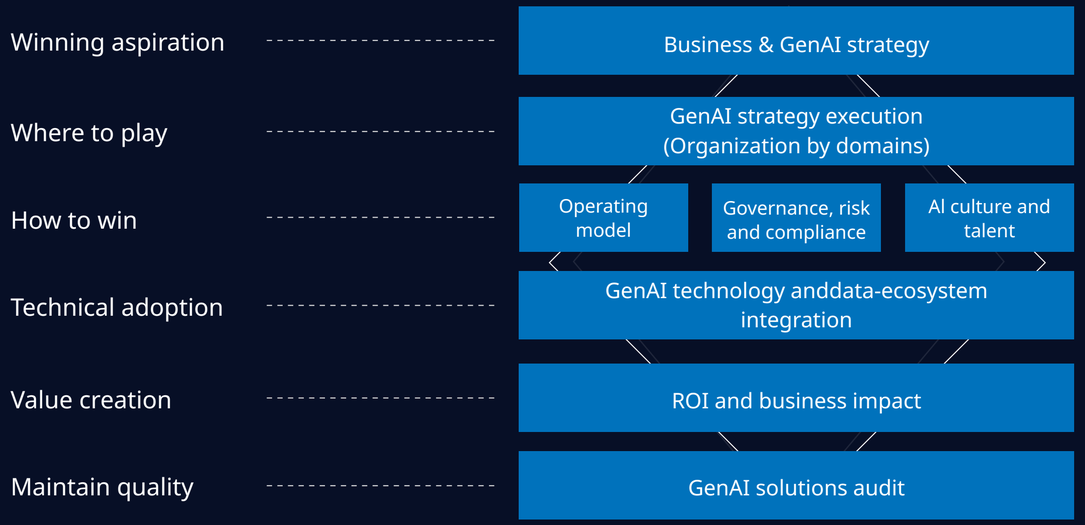
Based on the findings of the report, **the key lessons learned from GenAI implementations, as identified by NTT DATA**, are:

- High-quality, diverse, and clean data is essential for GenAI models to be effective.
- Starting with narrowly scoped projects and scaling based on validated results ensures more sustainable adoption.
- Internal testing must be rigorous and thorough before pursuing full-scale rollout.
- Partnering with a provider that offers end-to-end capabilities and industry-proven use cases is essential for success.

Enterprise GenAI Management

As AI redefines how organizations operate, compete, and innovate, NTT DATA has developed Enterprise GenAI Management (EGAIM) – a comprehensive framework designed to guide companies through a holistic transformation journey. The goal: to become a GenAI-driven company and fully capture the value of this transformative technology.

Enterprise GenAI Management (EGAIM)

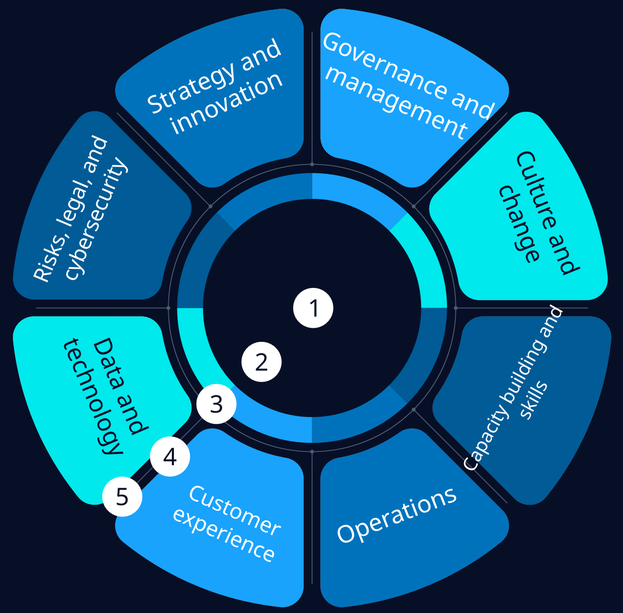


Enterprise GenAI Management (EGAIM)

The GenAI transformation journey calls for the articulation of multiple layers — from strategic aspiration and the definition of operational and technical frameworks to the monitoring of value realization, quality, and compliance. All of this must support the integration and scaling of GenAI across the business value chain.

The approach and speed required to become a “GenAI-driven company” will depend on the organization’s level of maturity—or starting point—across strategic, organizational, operational, and technological dimensions.

Framework - Organizational readiness



In addition to assessing the organization's starting point and defining priority areas, it is essential to equip teams with the capabilities required to address the challenges posed by GenAI. A key step in this process is clarifying how GenAI fits into the corporate strategy—ensuring that its contribution supports a defensive posture, offensive growth, new business development, or a combination thereof.

In this context, AI emerges as a strategic ally to:

- New business: Enhance the company's value proposition by unlocking new revenue streams.
- Offensive strategy: Access untapped or additional value that has yet to be realized.
- Defensive strategy: Accelerate time to market and improve value delivery.
- Defensive strategy: Safeguard the organization's current value offering.

When developing and scaling GenAI use cases, organizations can choose from several strategic approaches: Centralized, Distributed, or Domain-based. Each model offers distinct advantages and trade-offs that must be evaluated in light of the broader business objectives to ensure alignment.

The experience so far demonstrates that the domain-based model is the most effective execution strategy, enabling comprehensive transformation across strategic business areas in a coordinated and consolidated way.

A domain is understood as a process, value stream, user journey, business function, or area of focus within the organization.

Centralized

A core technology team develops all use cases, with prioritization set by a committee.

- Consistent standards and methodologies.
- Easier to manage resources and technologies.
- Centralized expertise and knowledge base.

- Potential bottlenecks in decision-making.
- Slower response to specific business unit needs.
- Risk of misalignment with individual business unit priorities.

Distributed

Each business unit independently manages and develops their use cases, hiring their own teams.

- Faster response to specific business unit needs.
- Greater flexibility and autonomy for each unit.
- Closer alignment with individual business goals.

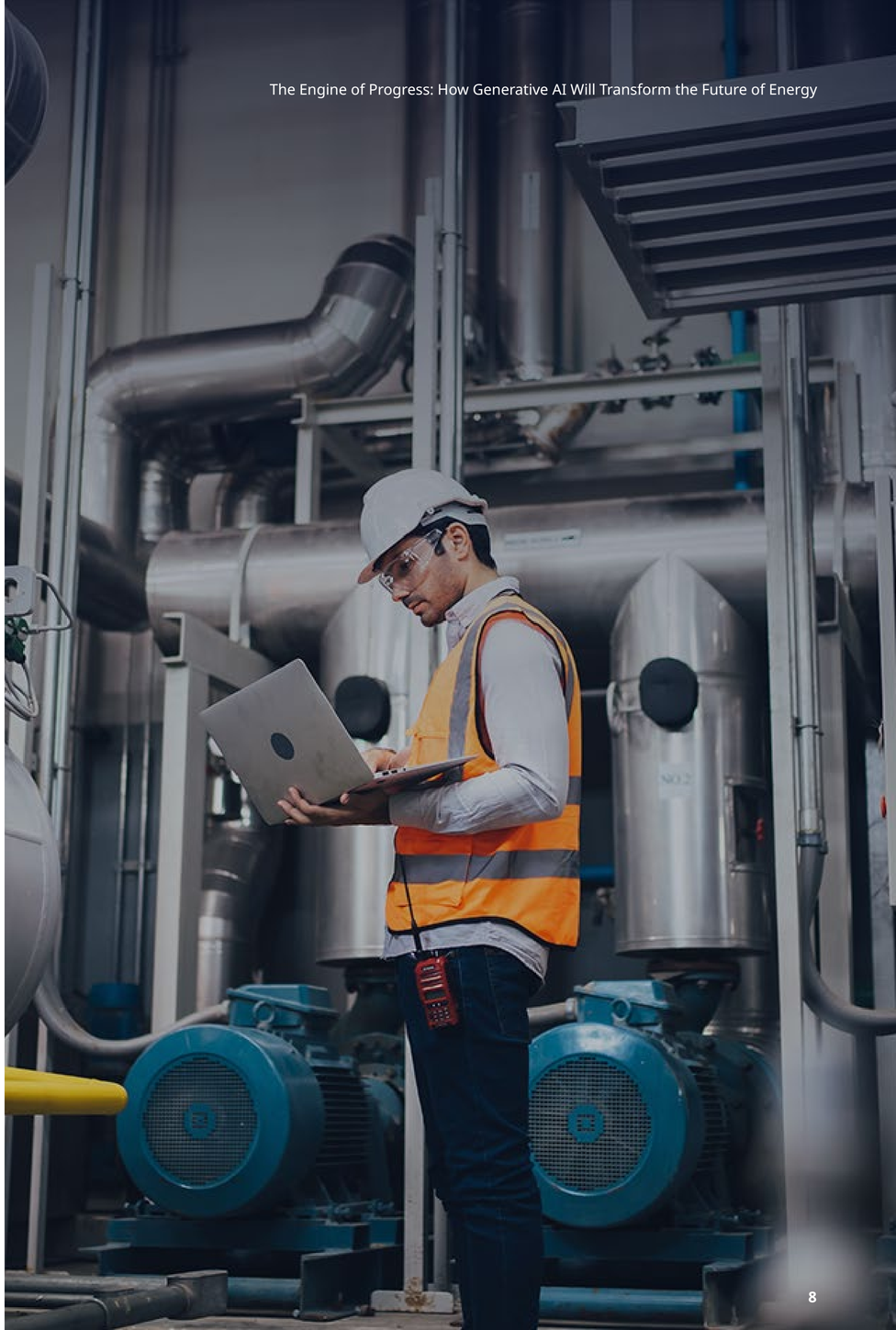
- Lack of central guidelines and standards.
- Potential for redundant efforts and resources.
- Inconsistent quality and integration challenges.

Domain-based

Centralized prioritization of efforts, with resources allocated to different business domains.

- Balanced control with tailored flexibility.
- Efficient resource allocationbased on strategic priorities.
- Consistent standards withlocalized implementation.

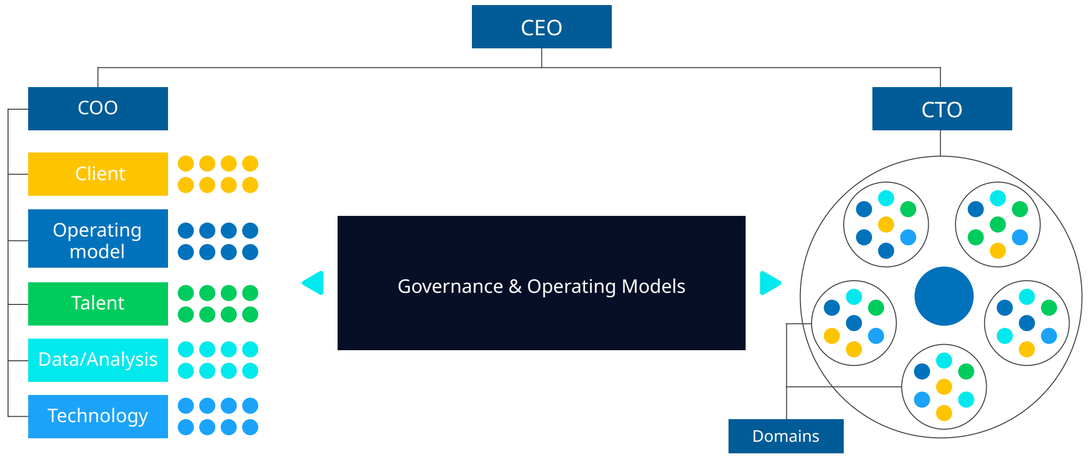
- Potential complexity in coordination.
- Possible conflicts between centralized and localized priorities.
- Need for robust communicationand management processes.



Why choose a domain-based strategy?

The domain-based approach enables organizations to:

- Federate strategy execution and transformation across the enterprise.
- Increase empowerment and accountability within domain-specific teams.
- Prepare the entire organization to adopt and extract value from any new technology entering the market.
- Maintain organizational stability, since domains are designed to continuously incorporate technology—and market innovation is an ongoing process.



BAU operations and business execution with functional approach

Decentralized: continuous innovation driven through domains

Since transforming the business through domain-based GenAI requires simultaneous innovation and ongoing operations management, it becomes necessary to structure a dynamic organization.

This organizational model will involve:

- Creating a governance model and an operating model that bridgeboth sides of the business: BAU (COO) and Transformation (CTO).
- The CTO’s role will focus on a core function around organization and processes within the dynamic organization.
- The dynamic structure and related roles must be continuously reviewed(Lean People Management).
- This new working model is embedded into the organization’s annual strategic planning cycle.

Alongside the implementation of agile governance to ensure compliance with ESG policies and standards, attention must also shift toward evolving talent management and organizational culture. This includes promoting a new cultural mindset around Artificial Intelligence and providing technical training to build new skills and capabilities across the workforce—clearly signaling the organization’s commitment to this emerging source of strategic value.

Create, modify, and implement...

When making decisions about how to implement these new technologies, it will be necessary to choose between different scenarios. These include:

- **Create** AI solutions from scratch, customizing them for specific needs.
- **Modify** existing AI technologies to adapt them to particular requirements.
- **Implement pre-built** AI tools to maximize efficiency and simplicity.

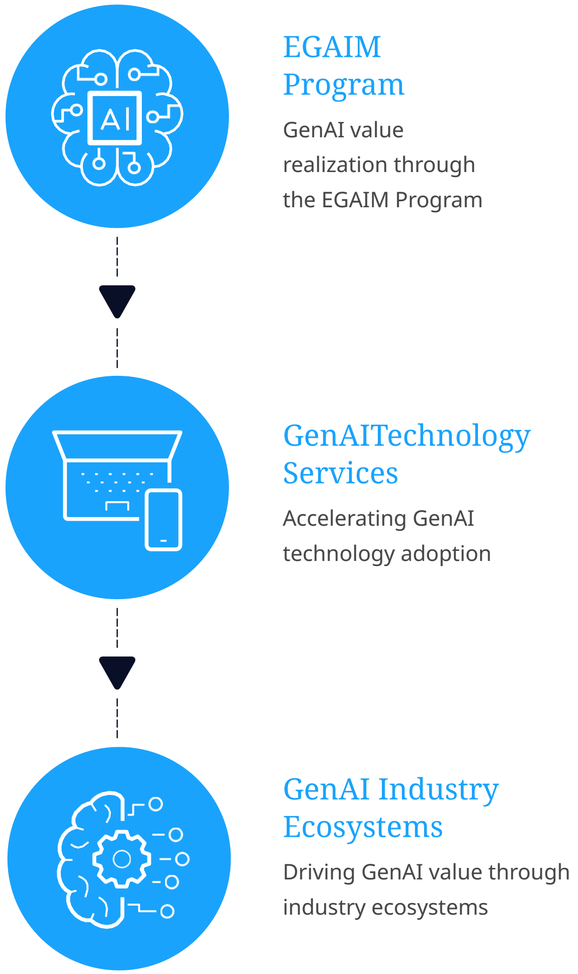
These decisions must be linked to approaches that can be classified as either **"Go Wide"** or **"Go Deep"**.

The first term refers to the use of "Copilot" features, which integrate capabilities into everyday tools and applications like Office 365 Copilot, Outlook/Teams Copilot, and more. GenAI should be available to all employees in the organization, enabling large-scale usage and exponential gains—when properly adopted.

On the other hand, "**Go Deep**" refers to implementing projects and solutions designed to address company-specific challenges. This approach requires deeper technical expertise, robust technology integration, and strong strategic partnerships.

In either case, regardless of the selected strategy, intelligent use-case selection will be critical—prioritizing return on investment and monitoring the actual value realization throughout the chain. This is essential to ensure that the value promised in the business case is captured and to optimize resource allocation.

Disciplines like **Lean Portfolio Management (LPM)** are often useful for applying lean principles that connect strategy with execution. Similarly, ensuring the delivery of value also involves securing the reliability, fairness, transparency, and compliance of GenAI models with risk and ethical standards. For this reason, they must conduct audits to ensure alignment across multiple domains (legal, ethical, technological, bias, usability, data protection, privacy, etc.).



EGAIM Program

GenAI value realization through the EGAIM Program

GenAITechnology Services

Accelerating GenAI technology adoption

GenAI Industry Ecosystems

Driving GenAI value through industry ecosystems

NTT DATA's value proposition in GenAI

At NTT DATA, we offer deep expertise and proven capabilities to support clients across every stage of the GenAI value chain. Our approach includes:

- **Value Realization:** We help clients drive enterprise-wide initiatives through our Enterprise GenAI Management program, crafting tailored strategies and guiding seamless implementation. We address all key value drivers—from strategy execution and governance to transformation and scalable technology enablement.
- **Technology Adoption:** We support clients in evaluating their current IT landscape, developing modernization roadmaps, implementing GenAI solutions, managing LLM lifecycles, and deploying environments across both public and private clouds. Our focus is on enabling responsible use, operational efficiency, and continuous support.
- **Ecosystem Value Capture:** We empower clients within specific sectors or industry domains by blending deep industry knowledge with advanced technical expertise. This approach helps unlock competitive advantages by transforming the value chain and delivering measurable outcomes.

Ultimately, EGAIM acts as a strategic and operational compass, enabling companies to embrace GenAI-driven transformation in a holistic and sustainable manner. At NTT DATA, we're committed to partnering with our clients on this journey—ensuring that every action contributes to long-term value creation and resilience.

By adopting this comprehensive approach, organizations not only strengthen their leadership in current markets but also position themselves to capture the transformative impact of emerging technologies.

The impact of GenAIin the Energy and Utilities industry

GenAI is here to stay—and it's reshaping the energy sector in ways few imagined just a few years ago. Companies that postpone adoption risk becoming obsolete in a sector that is rapidly evolving toward greater efficiency and agility.

At NTT DATA, we've implemented GenAI solutions across the entire energy value chain, helping address major challenges such as operational efficiency, safety, knowledge management, and service excellence.

In Oil & Gas, our upstream innovations include advanced GenAI applications for geological and geophysical exploration. These solutions integrate both public and proprietary datasets—enhancing subsurface analysis and enabling better decision-making in reservoir management. We've also implemented intelligent assistants in field operations to accelerate hands-on training, simulate real-world conditions, and support upskilling of technical personnel.

NTT DATA has developed tools to streamline the entire well lifecycle—from exploration and planning to operation and decommissioning. Our GenAI solutions automate reporting processes and facilitate essential business operations such as RFP generation, vendor selection, and contract analysis.

In the Gas & Power segment, we enable AI-powered customer service assistants and deploy solutions to automate sophisticated workflows. These include the analysis and interpretation of regulatory frameworks, technical data, and commercial terms. As a result, organizations benefit from improved efficiency, reduced operational costs, and faster, data-driven decision-making.

At NTT DATA, we are committed to accelerating digital transformation across the energy sector. Our GenAI capabilities are designed to help clients tackle evolving challenges while building sustainable, future-ready operations.

GenAI in the upstream value chain

Subsurface

Improves reservoir and geophysical modeling using synthetic seismic data and well logs—enhancing interpretation accuracy and speed (IPTC-23477-MS, SEG-2023-3911647) while reducing geological uncertainty.

Drilling and Completion

Real-time agents enhance operational safety, automate report generation, and optimize well design by leveraging historical and regulatory data (SPE-220798-MS, SPE-216267-MS), helping reduce errors and minimize non-productive time.

Production

Improves forecasting and anomaly detection using generative models (URTEC-4043583-MS), accelerates field decision-making, reduces downtime, and facilitates technical training through standardized knowledge access.

Surface Facilities

Accelerates facility design and extends asset lifespans through AI-driven predictive maintenance and layout generation (ISOPE-I-23-045, IPTC-23466-MS), reducing failures and enhancing project coordination.

Well Services

Supports interventions with virtual assistants that access procedures and integrity logs (SPE-216267-MS), improving safety, reducing operational errors, and preserving well productivity.

Logistics and Transportation

Optimizes inventory, transportation, and contract management with generative automation (SPE-216487-MS), reducing administrative errors and improving efficiency in logistics and field operations.

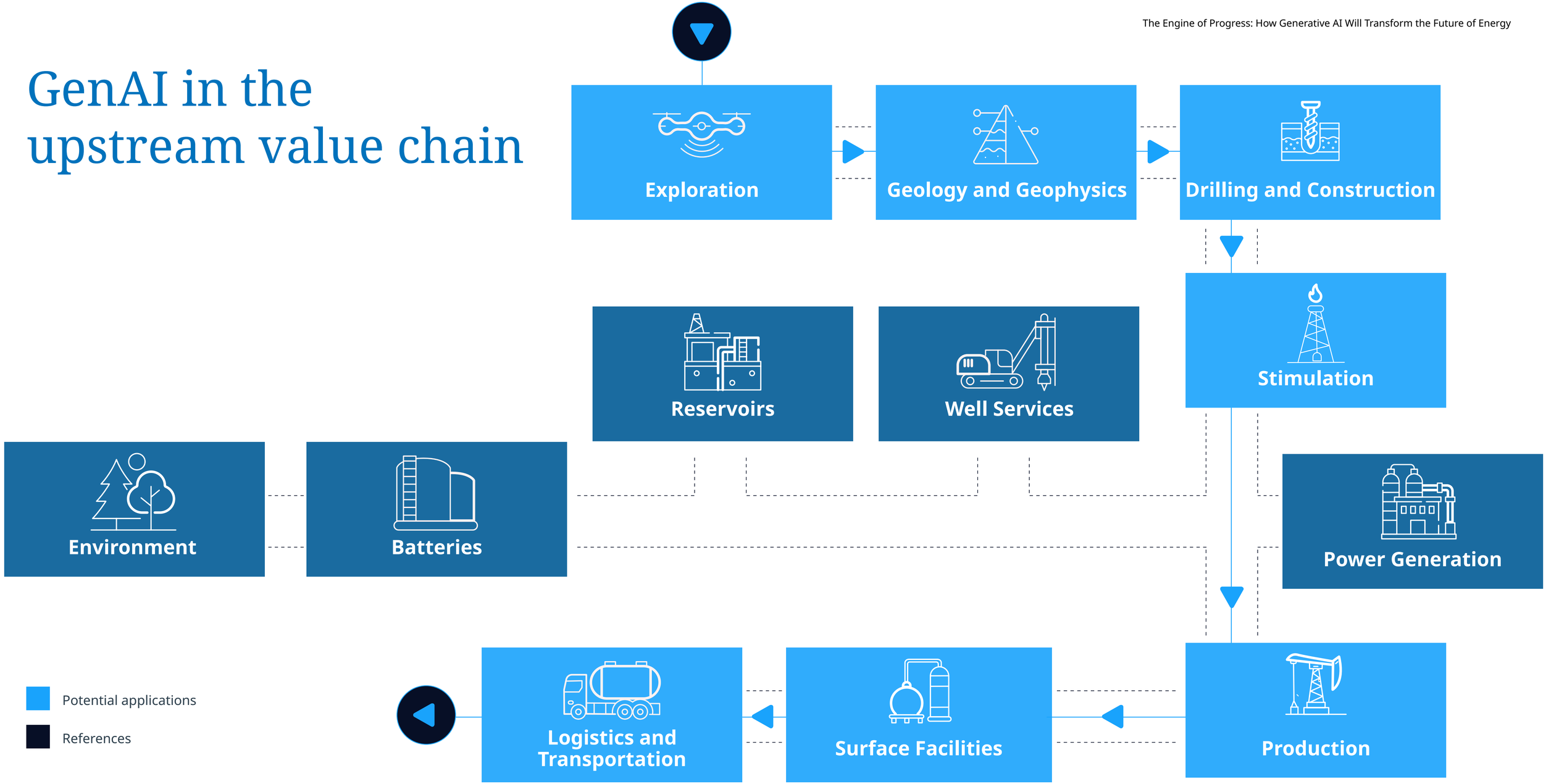
Onsite Power Generation

Improves efficiency and lifecycle of field power generation with predictive maintenance and intelligent distribution (IPTC-23466-MS), ensuring reliable supply in remote operations.

Safety and Environment

Predicts environmental risks, enhances regulatory compliance, and strengthens safety protocols through real-time monitoring and predictive modeling—reducing exposure and contributing to sustainability.

GenAI in the upstream value chain



GenAI in the Gas & Power value chain

Generation and renewables

- **Asset lifecycle management** using tools that analyze material, environmental, and degradation data to generate automated reports—enhancing maintenance planning and extending the service life of key components.
- **Intelligent assistant for field operators** enabling open queries on procedures and technical manuals to streamline operations.

Transportation and distribution

- **Support for regulatory asset classification**, optimizing reporting processes to regulators.
- **Engineering work validation,** checking project plans against regulatory requirements and internal system data.
- **Third-party claim management support,** accelerating claim classification and validation processes for customers.

Trading and supply

- **Automation of logistics management,** integrating actions from emails with transactional systems to speed up tasks like delivery notes, slot assignments, and returns.
- **Compliance automation in market transactions,** accelerating unstructured data validation processes.

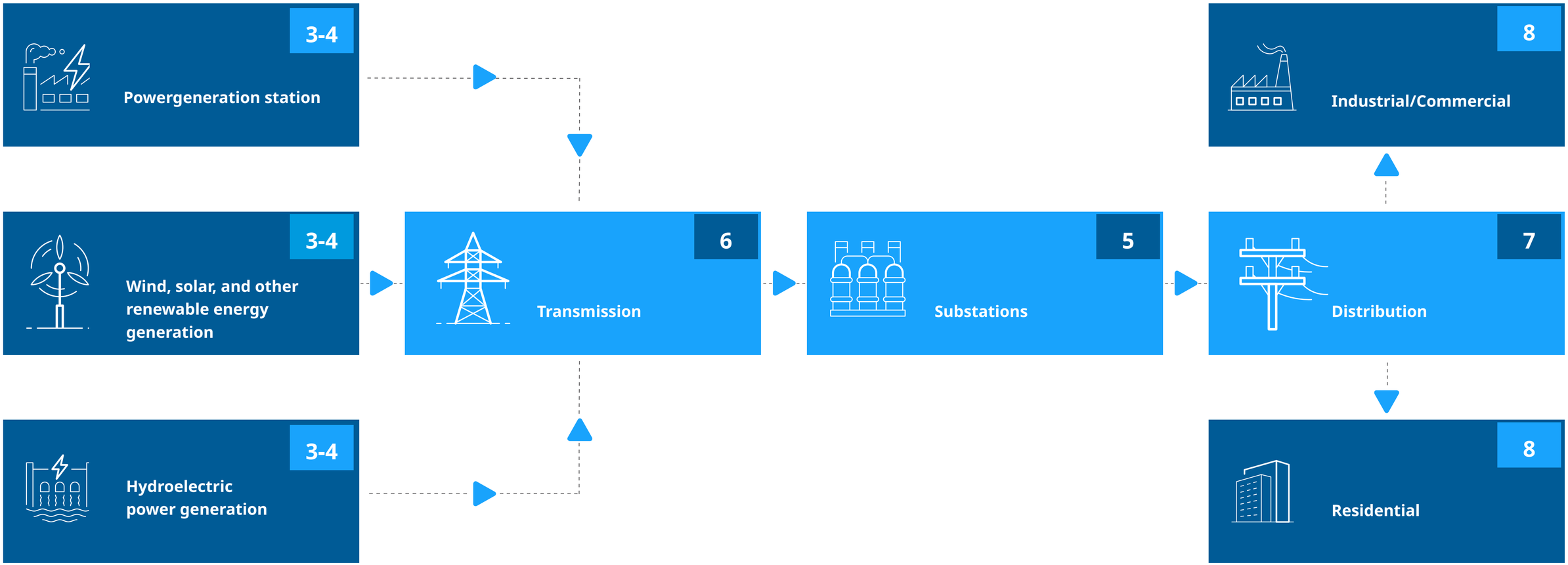
Commercialization

- **Conversational assistants for call center agents, reducing AHT,** improving FCR, and enhancing the customer service experience.
- **Automated classification and processing of claims,** reducing resolution time and costs.
- **Content generation for multi-channel campaigns,** creating materials based on core templates.
- **Customer communications generation, enhancing engagement.**

Support processes

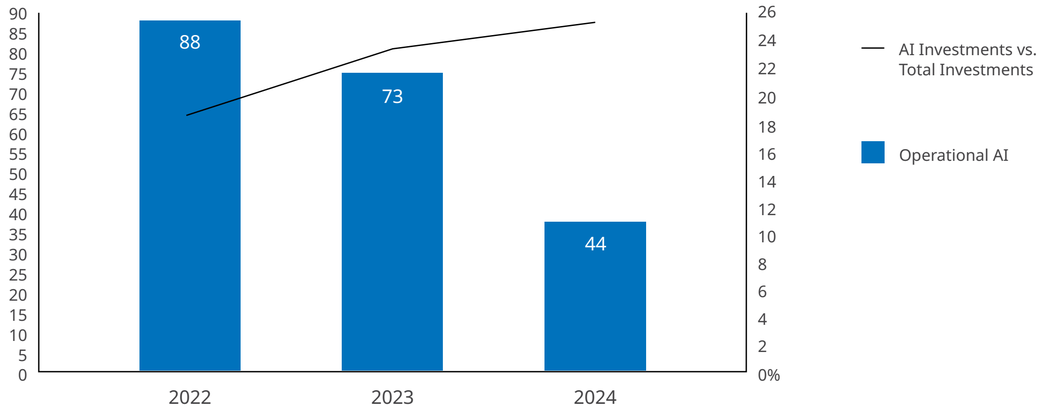
- **Regulatory and legal department assistants,** answering complex queries, comparing document versions, analyzing regulations, and generating automated drafts to improve operational efficiency and compliance.
- **Financial operations assistants,** automating tasks like bank reconciliations and guarantee management through data processing.

GenAI in the Gas & Power value chain



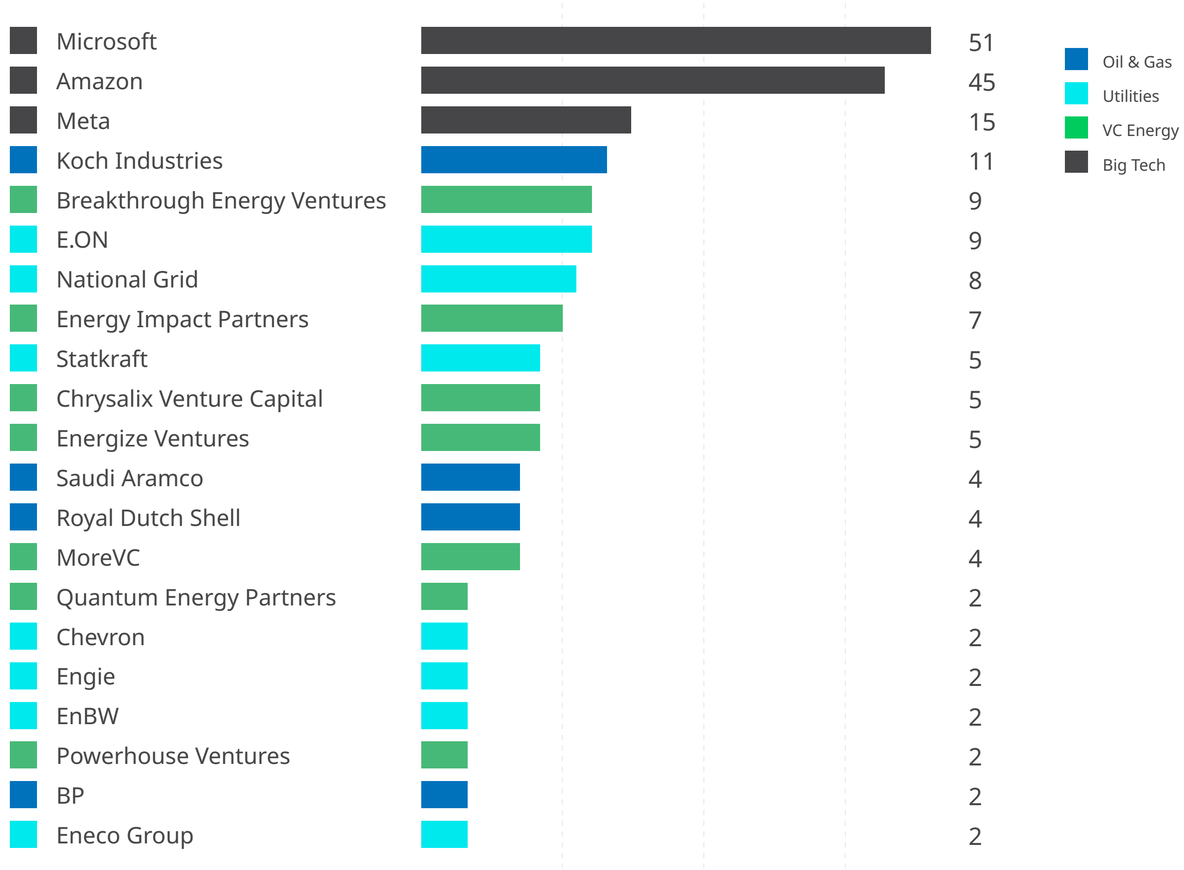
Investment trends across Artificial Intelligence

AI's Expanding Role in Corporate Investment



AI has become a key enabling technology, attracting a significant share of venture capital. The proportion of investments in AI-driven solutions has grown notably, rising from 18% of all deals in 2022 to 25% in 2024. While the absolute number of deals is decreasing, the share of AI-related startups within overall investment portfolios continues to rise.

This growth underscores AI's strategic importance as a transformative technology, sustaining investor interest despite broader market challenges. The focus on AI highlights its potential to deliver high-impact solutions, further consolidating its position as a critical area for innovation and corporate investment.



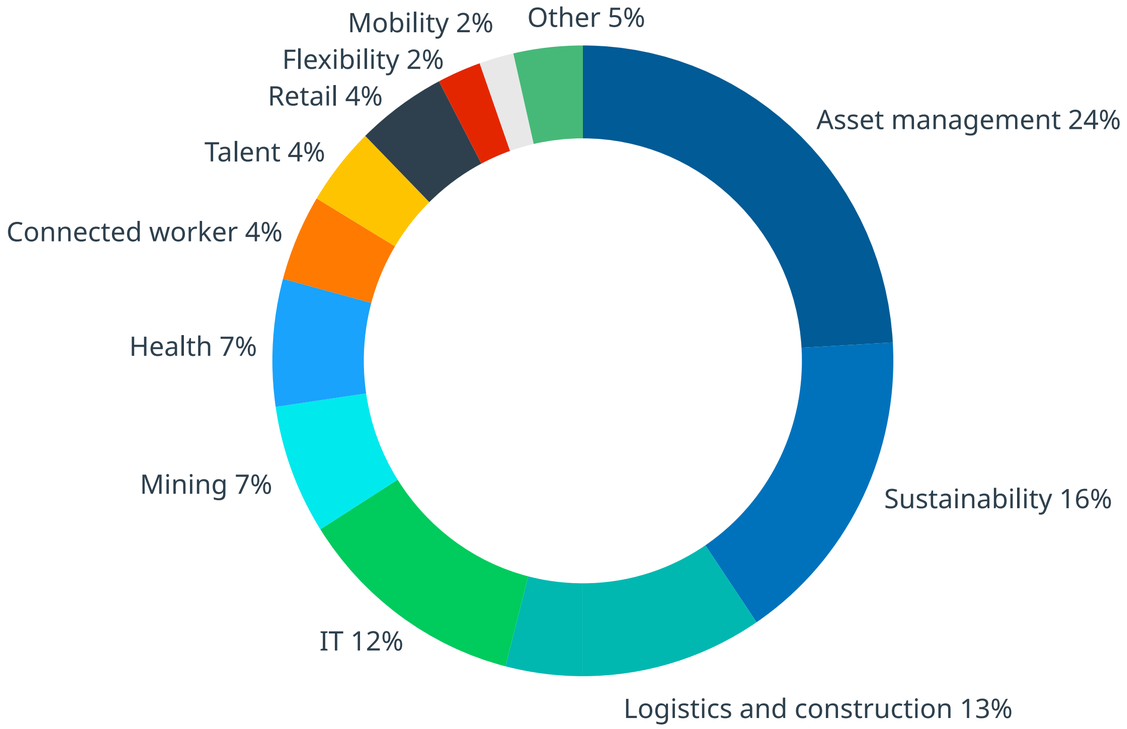
Among the four main investor segments analyzed, major technology corporations stand out as the most active in AI investment—allocating 35% of their total funding to startups leveraging artificial intelligence. The top three AI investors belong to this group, with Microsoft leading the charge. This dominance reflects the tech giants' commitment to advancing AI capabilities across a wide range of applications.

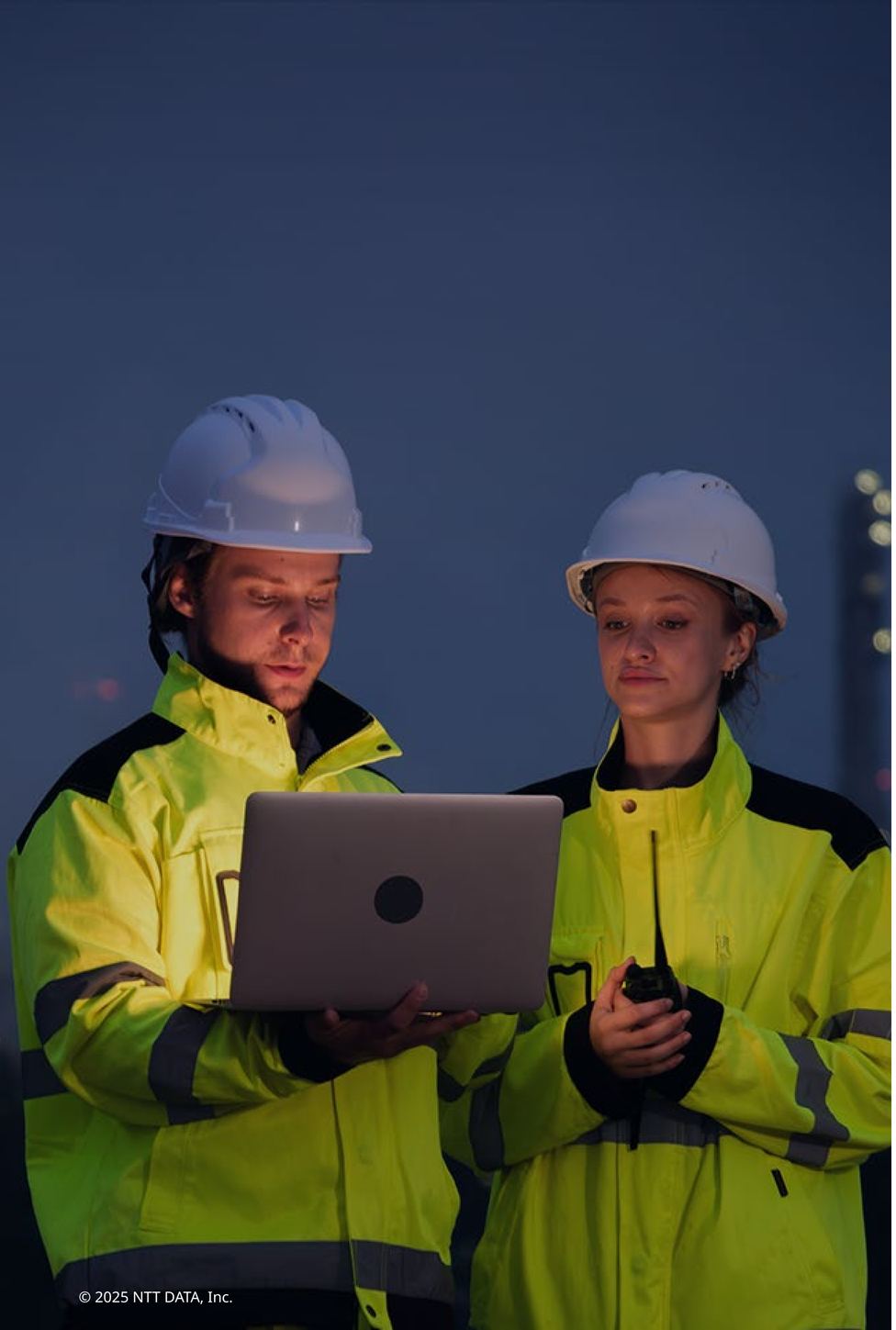
These companies have made significant investments in emerging players focused on developing large language models (LLMs) and GenAI applications tailored to coding and software engineering.

Energy Companies Drive AI Startup Investment to Manage Grid Complexity

In the energy sector, utility companies emerge as the most active AI investors, directing 23% of their total startup investments toward AI-driven solutions. This trend is fueled by the increasing complexity of managing power grids, prompting utilities to invest heavily in smart grid technologies and asset management capabilities. These investments reinforce the strategic value of AI in tackling operational challenges and enhancing grid performance.

Energy providers are expanding their use of AI across multiple areas of operation to drive efficiency, optimize production, and meet growing energy demands—many of which are themselves driven by the adoption of AI technologies.





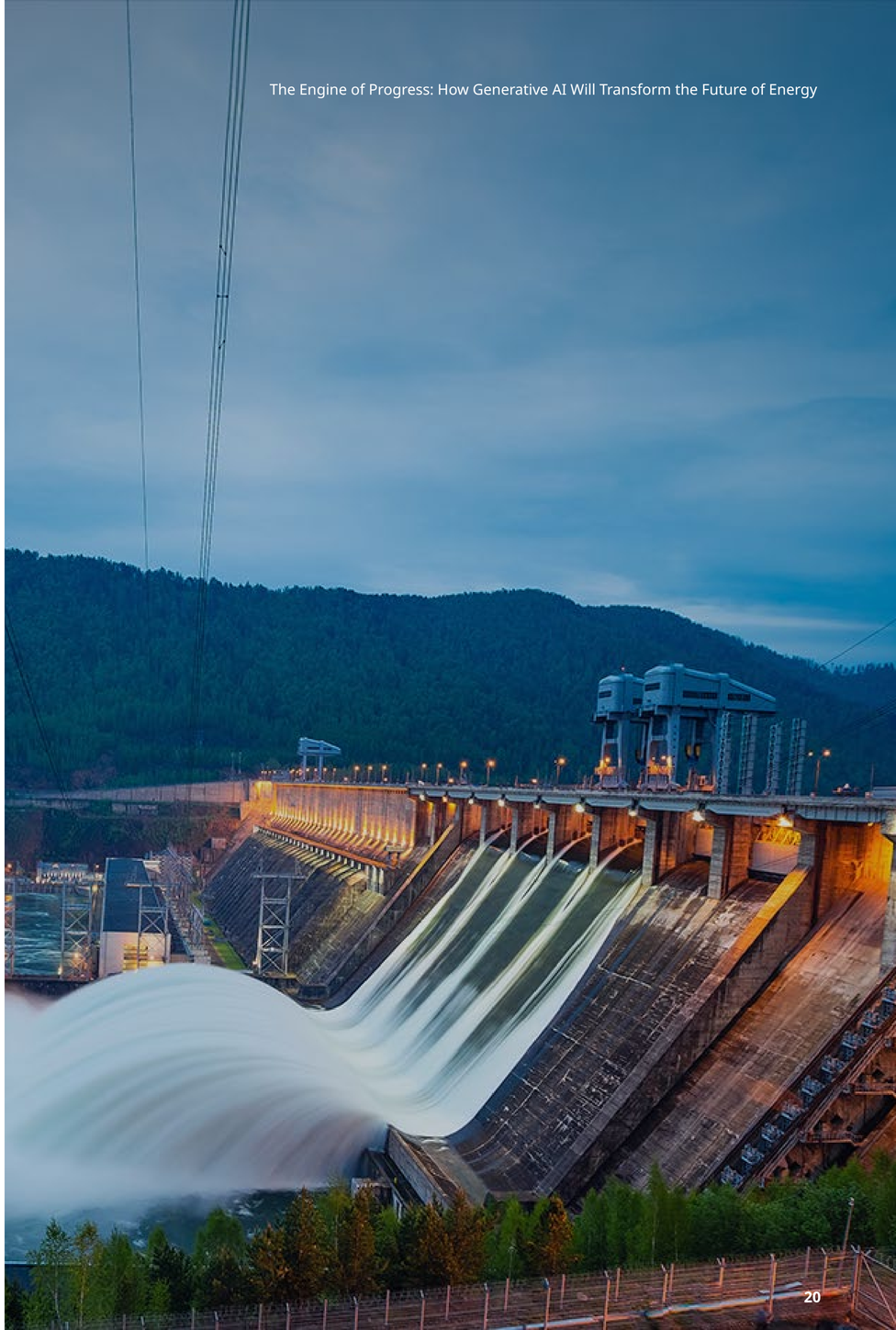
Focusing on the three areas with the highest investment activity, we identify the main AI use cases:

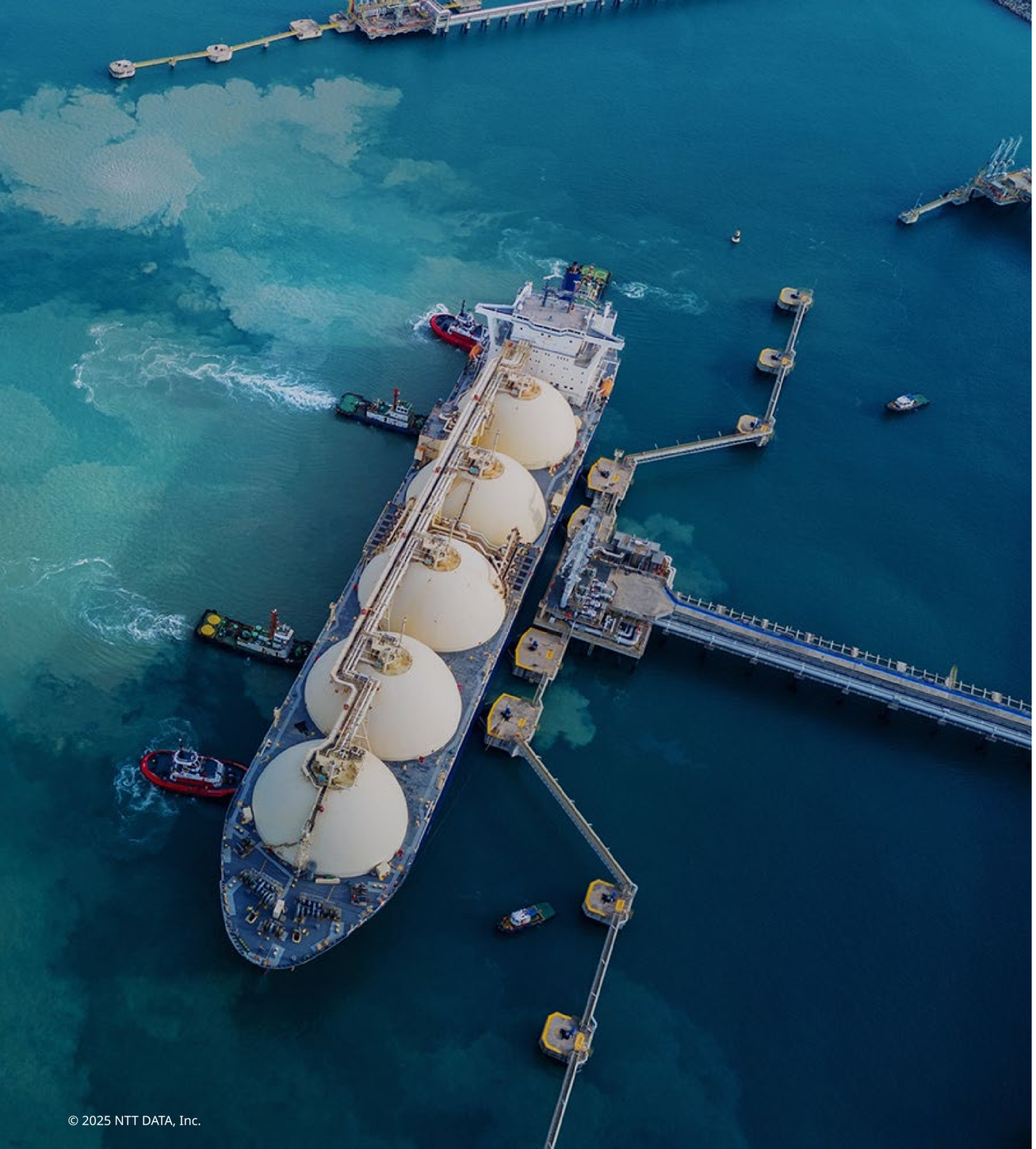
In asset management and maintenance, we see a wide range of startups using artificial intelligence (AI) to improve operational efficiency, automate complex tasks, and unlock new capabilities. AI is being strategically implemented by various innovative startups to enhance asset performance and operational efficiency across sectors.

- **TablePointer** uses AI to optimize energy consumption and asset performance in small and medium-sized commercial facilities, delivering predictive insights that drive immediate savings and return on investment.
- **Sitetracker** integrates AI into its SaaS platform to manage the entire lifecycle of critical infrastructure—from planning and deployment to maintenance—enabling greater visibility and operational control.
- **Jungle** applies AI in renewable energy operations by using predictive models and real-time data analytics to maximize uptime and improve the output of solar and wind assets.
- **Akselos** combines digital twin technology based on physics with AI to simulate and monitor structural integrity in real time, supporting critical operational decision-making.
- **Worlds** uses AI to automate physical operations through the analysis of video and sensor data, enabling real-time monitoring and anomaly detection in business environments.
- **Visionary.ai** enhances computer vision by processing image signals with AI to improve video quality in low-light and high dynamic range conditions—crucial for automated visual inspections.
- **Exodigo** leverages AI and physics-based simulations to create precise underground maps, helping utilities and infrastructure developers make safer, more informed decisions.

Sustainability: AI solutions are being deployed to automate, standardize, and streamline the collection, processing, analysis, and reporting of ESG data from diverse sources—improving precision and efficiency. Startups applying AI in this domain include:

- **QEA Tech** merges AI with drones and thermal imaging to detect energy inefficiencies in buildings, enabling targeted, low-cost improvements that reduce emissions and enhance performance.
- **CHOOOSE** embeds climate action into digital experiences via AI-powered APIs that support carbon offsetting at key customer touchpoints.
- **Greenly** offers an AI-driven carbon accounting platform to help companies track, manage, and reduce GHG emissions, implement sustainable purchasing, and decarbonize supply chains.
- **VerAI** applies AI and machine learning to mining exploration, identifying hidden deposits of critical minerals for the green energy transition, supporting more sustainable resource development.
- **Sinai Technologies** provides an AI-powered platform for corporate carbon management and ESG compliance, enabling data-driven decarbonization strategies and financial optimization.
- **Datamaran** uses AI to transform large ESG datasets into actionable insights, helping businesses prioritize material topics, monitor risks, and embed ESG into governance strategies.





Supply Chain Optimization: AI is transforming supply chain operations by delivering insights into demand forecasting, inventory control, and logistics planning—enhancing efficiency and driving cost reductions. Startups are applying AI in diverse and complementary ways to streamline logistics and boost end-to-end supply chain performance.

- **SourceMap** focuses on supply chain transparency and compliance, using AI to map and monitor upstream suppliers and verify traceability data from raw materials to finished products.
- **Detect Technologies** boosts industrial productivity through real-time monitoring, predictive maintenance, and safety compliance automation—minimizing equipment failures and extending asset lifecycles.
- **Wakeo** provides real-time visibility into multimodal transport, using AI to anticipate delays, reduce emissions, and improve stakeholder collaboration with actionable alerts.
- **Dynamon** applies advanced data analytics and simulation tools to help logistics companies optimize fleets, particularly for EV transitions, identifying ideal vehicle configurations and charging infrastructure.
- **Buildots** brings AI to construction logistics, converting on-site data into actionable insights to enable predictive process control and reduce costly delays and errors.

Energy companies have traditionally taken a cautious, value-oriented approach to emerging technologies—prioritizing investments in solutions with demonstrated business outcomes. Although interest in GenAI is rising, large-scale adoption hinges on identifying use cases tailored to the unique dynamics of the energy sector.

Today, energy leaders are prioritizing exploratory initiatives by aligning with strategic partners—such as Microsoft and Amazon—to collaboratively design and validate potential use cases. These partnerships allow energy companies and tech leaders to explore and validate GenAI applications together, fostering innovation while managing risk.

From a corporate venture capital perspective, GenAI's appeal stems less from the core technology itself and more from its ability to generate differentiated value through precise, industry-relevant applications. This trend mirrors developments in regulated sectors like legal and compliance, where startups such as Harvey train GenAI models on specialized datasets to address niche challenges. These startups are differentiating themselves by training their models on curated, domain-specific data—enabling them to offer high-impact AI solutions with strong relevance to energy-sector needs.

In conclusion, momentum around GenAI continues to build within the energy industry, with pilot programs already in motion. As adoption advances, more startups are expected to incorporate GenAI into vertical-specific use cases, sparking a new wave of strategic investment led by the corporate venture arms of leading energy companies.

About NTT DATA

NTT DATA is a $30+ billion business and technology services leader, serving 75% of the Fortune Global 100. We are committed to accelerating client success and positively impacting society through responsible innovation. We are one of the world's leading AI and digital infrastructure providers, with unmatched capabilities in enterprise-scale AI, cloud, security, connectivity, data centers and application services. Our consulting and industry solutions help organizations and society move confidently and sustainably into the digital future. As a Global Top Employer, we have experts in more than 70 countries. We also offer clients access to a robust ecosystem of innovation centers as well as established and start-up partners. NTT DATA is part of NTT Group, which invests over $3 billion each year in R&D. Visit us at nttdata.com.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