Leveraging AI/GenAI in Energy Sector to Enhance Operations, Maintenance, and Sustainability

Rakesh Patni
Associate Research Director,
IDC Asia/Pacific

Swapnil Shende
Associate Research Manager,
IDC Asia/Pacific

AI and Generative AI (GenAI) technologies are rapidly transforming the energy sector, streamlining operations, and improving maintenance, security, and sustainability. Energy companies in the Asia/Pacific region state that 83% are using AI, while 73% are utilizing GenAI technology.

GenAI is revolutionizing the energy sector by optimizing operations and driving innovation. Key applications include predictive maintenance, renewable energy forecasting, smart grid management, and autonomous energy systems. GenAI also enables dynamic pricing models, improves energy storage, and supports sustainability tracking and emissions monitoring. By enhancing cybersecurity and facilitating energy decentralization, GenAI is shaping a more efficient, resilient, and sustainable energy future.

GenAI-powered Digital Twins are revolutionizing energy operations in Asia/Pacific. By creating virtual replicas of physical assets, Digital Twins enable predictive maintenance, optimize asset performance, and simulate various scenarios to assess risks and optimize operations. Additionally, GenAI-driven Augmented Threat Intelligence is crucial in combating cyber threats, proactively identifying vulnerabilities, and responding to attacks in real-time. These innovations are not only improving efficiency and reliability but also accelerating the transition to a sustainable energy future.

Top 5 Industry AI/GenAI Use Cases in Energy

- Augmented Threat Intelligence and Prevention
- Digital Twins / Augmented Connected Maintenance
- AI-enabled Connected and Enhanced Facilities Management
- Augmented Planning and Logistics
- Augmented Compliance and Risk

Extent to which Asia/Pacific energy companies believe GenAI will disrupt their competitive position or business operating model in the next 18 months

Source: IDC's Worldwide AI and Generative AI Spending Guide 2024 | August (Version 2, 2024) Forecast

Source: IDC FERS 2024, Wave 1 Asia/Pacific n = 300, Asia/Pacific Energy n = 30

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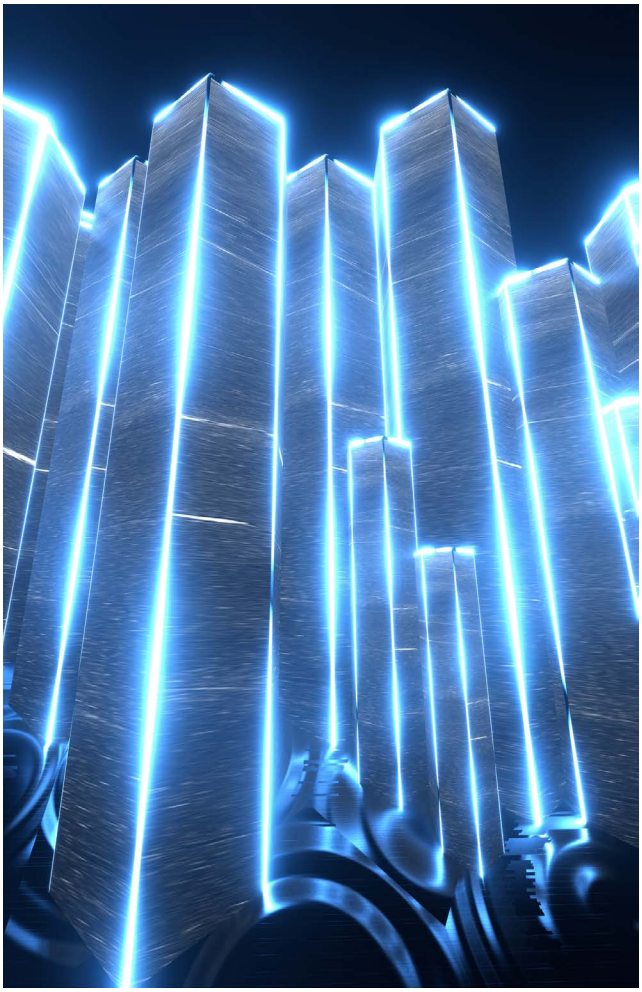
GenAI in Energy

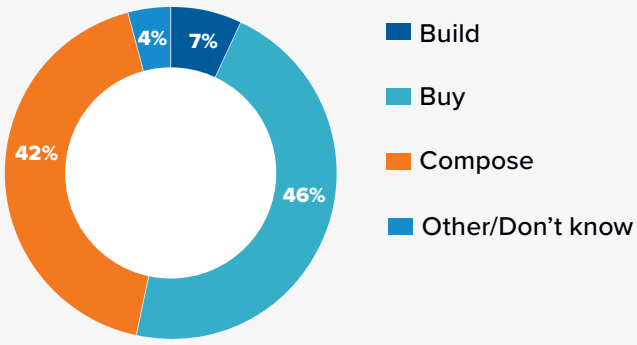
GenAI offers energy companies in Asia/Pacific an opportunity to drive operational improvements across the value chain. GenAI can be used to enhance predictive maintenance, grid optimization, renewable energy integration, simulations, scenario analysis and customer experience. For example, GenAI enhances energy operations by enabling precise demand forecasting and real-time energy monitoring by processing data from smart meters and sensors. It then applies ML algorithms to generate predictive models and simulations that dynamically adjust energy distribution. This streamlines operations, lowers costs, and improves service reliability for consumers by continuously adapting energy production to meet real-time demand and operational conditions. This GenAI-led transformation is reshaping the energy sector by emphasizing the critical role of data-driven decision-making, which is vital for maintaining competitiveness and sustainability in a rapidly changing market.

Energy companies prefer 'composing' their own GenAI solutions (42%) and will customize tools for their specific needs to enhance data security and achieve long-term cost efficiency. Customizing GenAI systems facilitates the integration of components from multiple vendors, allowing for tailored solutions that specifically address complex energy needs, such as grid management and renewable energy integration.

This strategy typically requires investment in GenAI infrastructure and platforms, along with specialized professional services support for managing energy data, monitoring assets, and addressing skills gaps. To successfully integrate GenAI, secure operations, and deploy solutions effectively, energy companies must develop scalable infrastructure and acquire domain-specific expertise across their networks and systems.



GenAI Adoption Approach in Energy



Compose: fine-tuning an existing GenAI model (usually open source) on top of an enterprise AI platform.

Build: developing a foundational model using institutional data.

Buy: leveraging enterprise applications with GenAI capabilities or native GenAI applications.

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Top GenAI Use Case Areas by Function in Energy

01 **Sales: Sales Enablement —** Text prompt interface and personalized training

02 **Procurement: Contract Management —** Contract drafting

03 **Cybersecurity: Information Security —** Auto-updates rules and policies

04 **Supply Chain: Planning —** Dynamic demand forecasting, enhanced risk management, and identification

05 **Facilities: Connected Maintenance —** Digital twin models for external impact predictions

Conclusion

The rapid adoption of AI and GenAI in the Asia/Pacific energy sector is set to drive significant improvements in operational efficiency and energy optimization. Custom-built AI solutions address areas such as predictive maintenance, energy grid optimization, and the integration of renewable energy. By analyzing large datasets in real-time, these AI tools enhance grid management, predict equipment failures, optimize energy storage, and reduce emissions, all while improving resource allocation. A focus on AI-ready infrastructure would equip energy companies with the scalable, high-performance computing power required to harness advanced technologies. These innovations drive more sustainable energy practices, helping the sector meet its ESG goals while optimizing efficiency and resource management.

Source: IDC WW AI Use Case Survey, July 2024 (Asia/Pacific n = 919, Asia/Pacific, Energy. n = 71.)

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