



Unlock Value Using Generative AI in the Utilities Industry

Introduction

Shifting load growth in utilities across the world, along with the headwinds of soaring energy prices, rising inflation and unpredictable weather conditions, mean grid reliability and resiliency is becoming an ever-present concern.

In the meantime, most utilities have bold aspirations to reduce their carbon footprint to net zero in coming decades—and, in doing so, face capital, labor and materials challenges. Moreover, the grid is only getting more complex

to operate as distributed energy resources introduce new information and variables into the system.

The emergence of generative AI is set against this turbulent backdrop. Here we'll explore some of the possibilities gen AI presents to the sector. We'll look at ways energy suppliers can leverage the technology's benefits to improve operations, and we'll explore the transformational potential of gen AI to help create a highly interconnected energy system and improve customer experience (CX).

What Is Generative AI?

Generative AI represents the forefront of artificial intelligence, focusing on creating contextually appropriate content. In general, the term refers to a type of neural network that can create new content based on human instructions. The large language models that underpin gen AI have been trained on vast amounts (typically more than a billion parameters) of text data, enabling them to comprehend and generate human-like responses in natural language.

Fundamentally, gen AI tools perform four key things well:

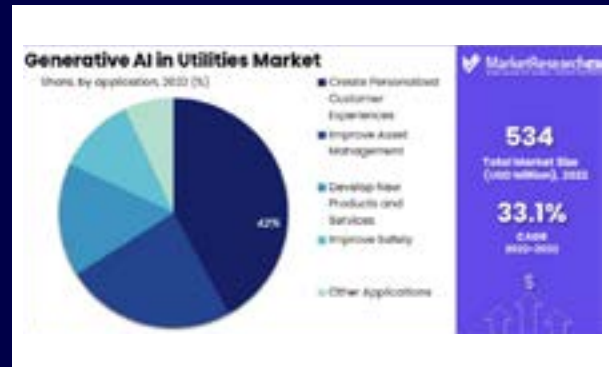
1. Generating new content with little or no guidance.
2. Summarizing existing content in a manner that can be understood by the target audience.
3. Holding intelligent conversations with an almost human-like understanding of various domains.
4. Performing Chain of Thought activities.

Market Opportunity

The tsunami of data generated in utilities from myriad sources (sensors, smart meters, grid infrastructure, customer interactions and more) mean gen AI has enormous potential in the sector. This is reflected in the following figures.

The gen AI market in utilities is expected to hit \$8,676 million in less than a decade.

Operating segments due to see immediate investment include transmission and distribution; renewable energy integration; and energy efficiency. Focused applications like personalized CX, improved asset management, new energy business, and safety are gaining the most rapid traction.



Impending Use Cases for Utilities

There are several business functions in Energy & Utilities that can improve or acquire differentiable capabilities. Our approach is based on SIG: Search + Interactive + Generate. Some of these differentiable capabilities are listed below:

Idea Evaluation and Refinement

Gen AI tools can aggregate the raw data (from process gaps, logs, defects, historical data, procedures, specifications, and regulatory documentation) and combine or merge large numbers of ideas to produce a best idea for a specific problem. For example, gen AI can consume large ideas fed into training model and produce a best sequence for a specific business process, optimizing both cost and time.

Customer Engagement

Gen AI can generate a load profile for service technicians and provide relevant information to customers based on historical data, energy usage, weather patterns and family size. Facilitating open dialogue between customers and the data which supports their utility needs will build a stronger relationship between company and consumer.

Employee Engagement and Asset Optimization

Gen AI can provide live asset information and engineering knowledge to help technicians better understand asset history, engineering manuals, and manufacturing specifications. This can act as a chatbot for technicians to access and understand T&D assets more effectively.

Intelligent chatbots for customer service language models can power intelligent chatbots that offer round-the-clock support to customers addressing their queries, scheduling appointments, and providing relevant information on account-specific, outage info, usage predictions, EV rates, and solar panel installations. These chatbots enhance customer service while interacting with the customers to generate responses from in-house data. AI-driven chatbots are well-versed in human speech and provide more holistic and empathetic responses than a traditional chatbot.



Maintenance Operations

Utilities can leverage gen AI to optimize maintenance processes. These models can generate and follow rules and inputs, including work order statuses, crew schedules, weather patterns, asset inspection histories, circuit diagnostics, public safety needs, and manufacturer recalls. Maintenance operators can use this information to create an inspection schedule for efficient routines and emergency maintenance.

Drone Data Processing

Along with the growing interest in gen AI, utilities are also increasingly using drones to streamline field processes and improve data capture. Blending these two new technologies can give utilities a better way to manage assets in the field, remotely perform inspections, collect data for restoration, and mitigate weather risks. Specifically, gen AI can be used in conjunction with a post-processing engine to delineate the information drones are capturing in the field. Summarizing the results of the data a drone (or many drones) is capturing, then creating a plan of action for support, is a prime use case for generative AI.

Improving Failure Mode Analysis

Gen AI will help utilities mine unstructured information captured from field visits, pictures and historical data to identify critical conditions that signal potential field-equipment failure (such as damaged conductors or dampers, loose cotter pins, vegetation encroachment, etc.), reducing maintenance costs while maintaining reliability.

Additionally, gen AI-powered chatbots will act as intelligent personal assistants that help field engineers get things done, answer questions, provide advice, send messages, place calls, and check location information.

Automated Energy Usage Advisor

Gen AI excels at analyzing claims or prior authorizations, swiftly extracting crucial information, and identifying areas in which humans need to focus more. By reducing the decision-making load on electricity users around electricity use and providing information on batteries, EV usage and solar household consumption, gen AI can generate high-quality recommendations to assist consumers in reducing electricity consumption—and relieving them of sticker shock.

The models can help consumers understand home energy consumption, providing answers to such questions as:

- How do I consume?
- How should I consume?
- When should I consume?
- What is my consumption lifecycle?

In this way, gen AI will benefit consumers, promote green energy use, and generally reduce the world’s carbon footprint.

Risk-Based Replacement Decisions

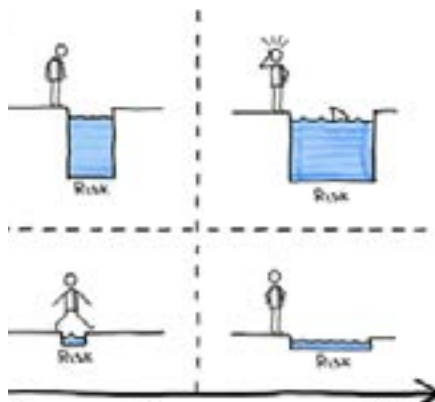
Gen AI models can serve as intelligent companions, providing operators with

comprehensive information to ease decision-making chores as utilities consider the prioritization of network replacement projects based on customer risk, environment, health, safety impacts, and more.

Through integration with field information, electrical equipment status and spatial data overlay, gen AI can offer real-time insights boosting the accuracy of:

- Location-based network risk visualization.
- The risk estimate methodology of multiple massive datasets.

Utility team leaders, network designers, capital works program leaders, and others will enjoy reduced stress and better decision-making.



Smart Back-Office Intelligence

Gen AI can automatically extract key concepts, relationships, and insights from textual data such as internal policy documents, procurement contracts, HR policies, financial documents, training content, electricity literature, salaries, benefits, and pensions.

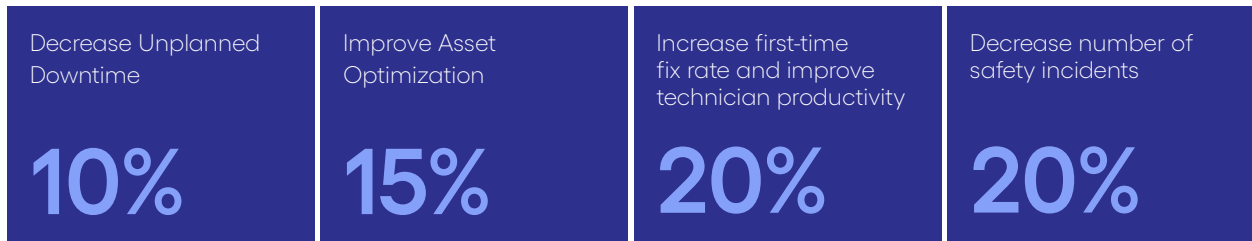
When a user enters a search query, the software processes the query and maps it to relevant documents based on semantic similarity, context, and topic modeling. This will help in reducing back-office mistakes and will produce a faster procurement process and a better employee experience in the following ways:

- Experience usage through automation for back-office issue resolution like held tickets, stuck invoices, regulatory filing, etc.
- Elimination of technical debt created through massive applications and multiple process documentation with removal of human labor.
- Provision of a smart interface to assist in document flow, approvals, and error correction.

Procurement leads, the finance operations team, regulatory and corporate lawyers, HR leaders, and training managers will all benefit significantly.



Immediate tangible business benefits



Developing a strategy

While more utilities are starting to explore the industrialization of gen AI, the rate of adoption must keep pace with innovation. There exists enormous opportunity in several areas, as shown in this vertically integrated value chain for electric and gas utilities.

Stages	Generation	Transmission and Distribution	Retail	Trading
Categories	Asset management	Asset management	Customer relationship management	Contract management
	Work management	Work management	Customer information system (CIS)/billing	Pricing
	GIS	Outage management	Customer self service	Trade operations
	Fuel management	Field force management	Customer communication	Balancing and settlements
	EHS and regulatory compliance	GIS	BPO/call centre management	Risk management
	Workforce management	Regulatory reporting	Energy efficiency/DSM programs management	
	Supply chain and procurement	PHEV Management	Outage/complaint management	
	Plant operations	Advanced metering infrastructure		

■ High applicability
 ■ Medium applicability
 ■ Low applicability

Gen AI needs orchestration to balance risk and rewards

Look for ways to foster awareness programs:
It is crucial to educate employees about gen AI to dispel fears of job replacement and promote understanding of its capabilities. This can be achieved through awareness campaigns, workshops, and educational programs.

Work with regulators and government agencies:
Considering the importance of data quality in building robust gen AI models, there is a major need for electricity, gas, and water regulatory frameworks to govern data-sharing policies in both regulated and deregulated markets. This can help protect privacy, ensure ethical practices, and maintain transparency in AI development.

Emphasize safety in workplace procedures: As gen AI continues to advance, prioritizing safety controls is a must. As critical infrastructure, utilities tend to be high-risk environments that are incident-prone. There ought to be active collaboration with governments, forestry agencies, defense establishments, and customer privacy and transportation authorities to establish safeguards that prevent malicious use or unintended consequences.

Adoption and acceleration

Develop a strategy for gen AI that integrates it with existing AI: Providing access to curated enterprise data is crucial in enabling AI governance. Utilities must incorporate process transformation to leverage a cognitive approach. Due to the rapid growth and adoption of gen AI, whether a utility is modernizing existing models or building them from scratch, it is important to use third-party partners.

Use high-quality training data: High-quality input data is crucial; garbage in, garbage out. Gen AI must be trained on a varied and representational dataset that covers a wide range of systems and applications. Using sufficient, unbiased data is key to training an accurate, resilient model.

Incorporate human feedback: The training process must incorporate feedback from humans. This will ensure that an understanding of the world that only a human can have is incorporated into the gen AI.

Implement continuous quality control: Combining countermeasures like probing “hallucinations” will help monitor and control the types of inputs allowed in a gen AI model. These countermeasures include using varied examples, asking irrelevant questions, and checking privacy data; all will improve gen AI’s ability to respond appropriately. It’s vital to audit all generated outputs in continuous cycles.

In Conclusion - Cognizant’s Point of View

As gen AI keeps changing our way of life, its rapid development is likely to multiply the impact of AI overall, generating trillions of dollars of additional value each year and transforming the nature of work. Stakeholders must act quickly to adopt gen AI, and must prepare to address both the opportunities and the risks.

At Cognizant, we are looking to gen AI to bring value to our clients’ business. We are mobilizing speed to scale our own capabilities; focusing on value; and helping our utility clients define their strategy. We are helping utilities develop the full solution architecture and comprehensive transformation approach encompassing people, an operating model, technology and tooling, data, adoption and change management, and associated risk management.



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