

WHITEPAPER

ENERGY & UTILITIES INDUSTRY

Agentic AI in Power Distribution

From Automation to Autonomous Execution

Table of Contents

Executive Summary	3
The Distribution Inflection Point: Why Business as Usual Is No Longer an Option.....	4
The AI Framework: Why the Distinction Between Traditional AI, GenAI and Agentic AI Matters.....	5
Intelligence Across the Value Chain: Where AI Changes the Game.....	5
Power Distribution System Planning: Getting Ahead of the Grid.....	6
Commercial Strategic Planning: From Reactive Procurement to Intelligent Market Participation	6
Grid Operations and Maintenance: From Reactive Response to Predictive Control	7
Customer Management: Building Trust Through Transparency and Precision	8
The LTM Agentic AI Framework: From Pilot to Enterprise Scale	8
The Implementation Roadmap: Discovery, Pilot, Scale.....	10
The Next Frontier: Autonomous, Governed, and Grid-Ready	11
The Utilities That Move Now Will Define the Next Decade	11
References.....	13
About the Authors.....	14

Executive Summary

Power utilities aiming for leadership in the next decade must prioritize resilience and a people-centric approach. Leveraging intelligence across the value chain, from infrastructure planning to fault response and customer engagement, is essential. At LTM, we call this Outcreating the Grid. Our global experience highlights the urgency to act now.

Power distribution is transforming as the energy mix evolves. Rapid electrification, expanding data centers, more EVs, distributed generators, and digital grids have increased operational complexity. This leads to underutilized assets, reliance on intuition, heightened risks, and a widening gap between utility promises and delivery.

AI will lead advanced technology from pilots to enterprise-wide transformation. We consult on and deploy sustainable solutions across the utility value chain to drive real business results and accelerate utility digital transformation.

Agentic AI for utilities is the next leap forward. Its real value is linking intelligent tools directly to the workflows and decisions that drive utility performance.

A sustained competitive advantage will be secured by Chief Digital Officers and Chief AI Officers who act quickly, develop with discipline, and collaborate with the appropriate international actors. As the grid grows more complex, those who wait for the perfect moment will be left behind.

LTM Perspective: Utilities shouldn't build tech from scratch. The real win is applying proven frameworks with deep industry expertise to transform the entire business, not just small experiments.



The Distribution Inflection Point

Why Business as Usual Is No Longer an Option

The electricity distribution industry is at a turning point not seen in the previous fifty years. Utilities were stable, regulated organizations with predictable load patterns and controllable complexity for many years. The business model is now under next-gen stress from six converging forces:



Electrification at Pace

Lifestyle pattern changing that drives new demand growth that outpaces traditional planning cycles.



Data Center Proliferation

AI infrastructure is getting larger, and sudden load additions that strain distribution networks designed for gradual growth.



Prosumer Complexity

Rooftop solar and distributed battery storage capabilities are pushing toward today's bidirectional participants, requiring complex management.



Climate Risk

Extreme weather events test the resilience of assets built to different standards.



Diversification of Hydrocarbons

With uncertainty over natural gas and trade routes, millions of households are adopting greener alternatives, such as EVs, induction ovens, and electric appliances.



What We See in the Field

In engagements with Tier-1 distribution utilities, it is observed that the biggest barriers to performance are not technological gaps. They are decision latency, data fragmentation, human adaptation, and the inability to translate operational data into actionable intelligence at the speed the grid now demands.

The AI Framework

Why the Distinction Between Traditional AI, GenAI and Agentic AI Matters

Developing an AI strategy for digital transformation is sometimes misunderstood because of the recent hoopla around AI. The strategy you choose is crucial because it will influence whether you acquire really autonomous operational capabilities or merely make incremental advances. We foresee the need to operate with a three-layer framework:

AI Layer	What It Does	Where It Applies in Utilities
Traditional AI/ ML/OR	Deterministic optimization, forecasting, anomaly detection, heuristic-based rules. Proven, auditable, and regulatory-friendly.	Load forecasting, asset health scoring, fault detection, demand-side management, and procurement optimization.
Generative AI (GenAI)	Contextual content generation from natural language: reports, contract drafts, regulatory summaries, customer communications.	Tender, Policy document, Technical Design document, Regulatory compliance, Customer feedback, Invoice, Legal document, Vendor Profiling, and more...
Agentic AI	Agentic AI's human-centric framework orchestrates a network of deterministic and probabilistic AI agents that reason, plan, and act across complex, multi-step workflows with human oversight in Industry 5.0.	End-to-end outage management, autonomous grid balancing with human-approval gates, and multi-domain demand forecasting with market execution.

Our key insight is that Agentic AI creates value not by replacing individual solutions or removing human oversight, but by establishing an orchestrated intelligence layer that connects these solutions.

Intelligence Across the Value Chain

Where AI Changes the Game

We have identified Agentic AI for utilities opportunities across four main segments of the power distribution value chain, supporting Outcreate the grid through a utility digital transformation. For each segment, we outline the core challenge, the AI-driven intervention, and the expected business outcome based on our delivery and advisory experience.

Power Distribution System Planning: Getting Ahead of the Grid

Infrastructure planning has usually been slow, expensive, and focused on experts. Decisions made now will affect the grid for decades, but most planning still depends on old data and engineer know-how. As power sources spread out and networks become two-way, old methods are now much riskier.



Load Growth Forecasting: Beyond Simple Extrapolation

The challenge now is to forecast demand with sufficient detail down to the sub-station level. AI forecasting models incorporated features such as macro- and microeconomic data, and climate data, to deliver explainable demand forecasts using CPUs, GPUs, or quantum computing. In select geographies, this approach reduced MAPE by up to 10 percent, and in some cases 5 percent, compared to traditional methods, directly improving capital investment decisions.



Infrastructure Planning and Grid Modernization

Network optimization to design and sequence grid upgrades, maximizing capacity while minimizing losses and capital costs. BlueVerse CoE has developed Agentic AI-based optimization agents that reduce development time from six months to one month using requirements documents. With domain expertise in GIS, SCADA, CIM, and BIM, delivery success is ensured, and deployment risk is minimized.



Design Document Review and Regulatory Compliance

By automating engineering design reviews using client standards and compliance frameworks, AI and DS Engineering CoE has developed Vision Language Model capabilities, cutting costs and time while lowering error rates that frequently result in project overruns. With AI augmentation, utilities have cut design review cycles by up to 60%, relieving analysts of manual mapping tasks. (A Generative AI-Driven Industrial Design Framework for Human-AI Co-Creation, 2026)

Commercial Strategic Planning: From Reactive Procurement to Intelligent Market Participation

Dynamic geopolitics creates volatility in power distribution and commercial operations, affecting power purchase, procurement, pricing, and contract management.



Power Purchase Strategy and Market Optimization

Agentic AI-based optimization agents that use operations research to optimize power procurement by working with senior leadership at a national grid. These agents create a single decision engine by combining market prices, contract terms, demand projections, weather, and legal restrictions. Demand for this accelerator is anticipated to increase, giving early adopters a distinct advantage.



Material Requirements, Fraud Detection, and Invoice Integrity

Material misuse and invoice irregularities are persistent sources of financial loss in utility operations. Previously, these issues were only partially addressed with isolated ML or computer vision solutions. The BlueVerse Agentic AI framework enables the creation and orchestration of multiple agents to address compliance challenges centrally.



Dynamic Pricing and Contract Automation

One high-value commercial use of AI led Engineering. Contract drafting time, errors, and turnaround cycles can be greatly decreased by integrating the MCP server tools, document data stores and Agentic AI framework. LTM has established itself as a top service integrator for customers by collaborating with leading hyperscalers namely Azure, AWS, Google, Oracle, and Databricks, and has emerged as a leader among Service Integrator partners. (LTM Partners, n.d.)

Grid Operations and Maintenance: From Reactive Response to Predictive Control

This is where the stakes are highest. Power distribution is no longer unipolar business within a specific demographic, such as Mumbai, India's financial capital. Performance leading to customer satisfaction is crucial to success, as in other industries. Failures in grid operations can lead to outages, safety incidents, regulatory fines, downgrading CSI and investor confidence. Here also Agentic AI can bring significant impact by providing situational awareness and decision support to act promptly and confidently.



Fault Detection and Outage Response

By merging IoT data, aerial imaging, GIS, and agentic orchestration, the average fault-to-restoration time a Tier-1 distribution utility can lower from more than 4 hours to less than 45 minutes. Without the need for a single field technician, the system located faults on its own, recommended crew dispatch, and escalated unclear situations to a human controller. This is the Outcreate model, which uses intelligence to enhance human expertise rather than replace it.



Asset Health Monitoring and Predictive Maintenance

Reactive maintenance is expensive, and overprotective maintenance lengthens system outages. Predictive Maintenance 4.0 uses continuous asset monitoring, AI-driven failure analysis, and sophisticated signal processing to deliver timely interventions. With human-centered, explainable, and responsible AI, Agentic AI along with advances PdM 4.0 within the digital transformation roadmap and supports Industry 5.0.



Energy Storage and Distributed Energy Resource Management

Distribution losses attributable to electricity theft represent 2 to 4 percent of revenue at many emerging-market utilities, totaling hundreds of millions of dollars annually at scale. (Plummer, 2025) Agentic AI-powered optimization layer can manage battery dispatch cycles, balance generation and load, and coordinate DER participation in grid stability services autonomously, within set governance parameters, with human oversight maintained at the portfolio level.



Cybersecurity

In today's power distribution, cybersecurity is a battlefield encompassing all connected sensors, substations, and smart meters rather than a perimeter issue. IT service integrator shouldn't compromise on the client's security when delivering the solution, providing the utmost value to the partner ecosystem and delivering excellence. Dedicated Cyber Defense practice with SMEs has provide consultation and delivering value.

Customer Management: Building Trust Through Transparency and Precision

Utilities are shifting customer service from a necessary cost to a competitive edge as regulatory and consumer demands rise.



Electricity Theft Detection and Billing Accuracy

Distribution losses attributable to electricity theft represent 2 to 4 percent of revenue at many emerging-market utilities, totaling hundreds of millions of dollars annually at scale. (Plummer, 2025) AI theft-detection framework analyzes power factor, active and reactive power correlations, smart-meter anomalies, and spatial consumption patterns to identify suspicious accounts with high precision and low false-positive rates. In certain demographics, the framework can recover between 1.5 and 3 percent and can reach a break-even point of investment in 2 years. (Agentic AI Return on Investment, n.d.)



Outage Management and Customer Communication

The most common cause of customer dissatisfaction in utilities isn't the outage itself; it's the lack of timely, accurate information during an outage (Dean et al., 2021). Enterprise AI platform in production operations along with an AI-assisted management system, integrates IoT data, GIS, workforce availability, and customer feedback to speed up detection, localization, and restoration, while AI-powered communication tools keep customers informed in real time, reducing ticket volume, improving mean-time-to-repair (MTTR), and maintaining critical services at scale.



Smart Meter Intelligence and Service Quality

Smart meters are critical instruments that should not be used only for meter reading. Meter tampering and malfunction can lead to severe loss. We as Business AI Consultant proposes an Agentic AI-based solution that leverages multiple agents to analyze images of meter installations and inspections, meter reading data, appliance profiles, location-based consumption baselines, and historical patterns to validate billing accuracy and identify anomalies.

The LTM Agentic AI Framework: From Pilot to Enterprise Scale

The most frequent cause of AI program failure is not technical; rather, it is related to Solution Architecture and Approach. Businesses target point solutions that address specific issues but don't provide enterprise-level benefits. Instead of a basis for change, the outcome is a portfolio of costly experiments.

Modules	Personas	Persona and Agentic AI Modules Matrix										
		Power System Planner	Sustainability Officer	Energy Economist	Procurement Manager	Compliance Officer	Load Dispatch Officer	Asset Management	Network Modernization	OT Security Specialist	Metering & Billing	Network OT Officer
Assessing Load Growth		✓			✓							
Infrastructure Planning		✓										
Design Document Review		✓				✓						
Smart Grid Integration		✓	✓	✓		✓						
Infrastructure Planning			✓	✓								
Sustainability Initiatives			✓									
Power Demand & Supply Forecasting				✓								
Power Purchase Strategy				✓								
Dynamic Pricing				✓								
Material Requirement Planning					✓							
Material Misuse Detection					✓							
Procurement Planning					✓							
Material Price Forecasting					✓							
Design-based Material Audit					✓							
Vendor Selection					✓							
Invoice Fraud Detection					✓							
Contract Document Preparation					✓							
Regulatory Compliance						✓						
Material Misuse Detection						✓						
Design-based Material Audit						✓						
Invoice Fraud Detection						✓						
Contract Document Preparation						✓						
Power Load Balancing							✓		✓			
Peak Load Forecasting							✓					
Asset Health Monitoring								✓				
Fault Detection and Management								✓				
Predictive Maintenance								✓		✓		
Network Modernization									✓			
Routine Inspections								✓				
Energy Storage Management									✓			
Cybersecurity										✓		
Smart Meter Inspection											✓	
Billing Accuracy											✓	
Electricity Theft											✓	
Outage Management												✓
Service Quality Monitoring												✓

Table 1-Persona and Agentic AI Matrix for Power Distribution Business

Only pitching will not work but need to be backed by action, innovation, and investment. As part of AI Native CoEs, with a diverse team of experts, we envisioned that Agentic AI frameworks on Azure, AWS, Google, Databricks, and Claude to lead the journey of AI led Transformation. Delivered AI solutions at scale requires a modular, governed approach that connects individual capabilities into an orchestrated intelligence layer. Table 1 presents the entire persona-centric Agentic AI modules, represented as Agent and Tools to turn mapped personas ready with Agentic AI armor to compete in the next generation AI business.

Framework Principle	What This Means in Practice
Persona-centric Design	AI capabilities are mapped for tech empowerment for every role from operators to customer service with specific, relevant insights instead of one-size-fits-all data.
Human-centric Governance	Automation stays within strict limits under human control. Clear reporting ensures operators understand and trust every recommendation, with the final say always resting with the person in charge.
Enterprise Scalability	As a thought leaders, we view the customer’s business through a platform-agnostic technology lens. Provides a 4D AI-led Digital Transformation roadmap: Discovery-Development-Deployment-Dollar Saving.
Modular Composition	We value the need for sustainability. From a digital transformation perspective, we achieved sustainability by reusing modules, frameworks, and agents. These tools from forecasting to MLOps, work independently or together, scaling alongside the organization’s needs.
Continuous Learning	The resilient framework is built for continuous improvement using established MLOps, LLMOps, and AIOps. Models are retrained with new data, agent behaviors are refined based on operational feedback, and governance rules are updated as regulations change.

The Implementation Roadmap: Discovery, Pilot, Scale

A big-bang AI transformation without evaluating business and data readiness is not possible. We recommend a structured, three-phase approach that manages risk while building toward enterprise impact:

- **Discovery (Week 8):** Rapid value chain assessment, data readiness audit, use case prioritization against business impact and technical feasibility, and governance framework design. Output: a funded, board-ready AI roadmap.
- **MVP or Pilot (Months 2-6):** Deployment of two to three high-priority use cases in a production environment with real data, real users, and real governance. Output: validated business cases, operational playbooks, and organizational change insights.
- **Scaled Innovation (Months 6-12):** Enterprise rollout of the full Agentic AI framework, connecting validated use cases into an orchestrated intelligence layer. Output: measurable, sustained business impact across the value chain.

LTM's Advantage: Our practice and platform have evolved through real-world utility in AI Advisory, Delivery, and Deployments—not just in a lab. The result is an enterprise-grade architecture that addresses the integration, governance, and scalability challenges that most AI programs encounter only after significant investment.

The Next Frontier

Autonomous, Governed, and Grid-Ready

The trajectory of Agentic AI in power utilities points toward a future that is more autonomous, more interconnected, and more data-driven than anything the industry has previously encountered. Our view of the near-term horizon is grounded in what we are already building and testing with leading utilities today.

Multi-agent orchestration at grid scale: Frameworks such as Databricks Mosaic AI, Google Agent Development Kit, Microsoft Azure AI Foundry, and AWS Bedrock are evolving to handle complex, multi-domain workflows with robust data lake connectivity.

Causal AI for regulatory confidence: Explainable and causal AI models that can demonstrate the reasoning behind decisions to regulators and auditors will become a prerequisite for autonomous grid operations in regulated markets.

Power trading through exchanges: AI-powered distributed resource management will enable utilities to participate in intraday energy markets, demand response programs, and ancillary services with a level of speed and precision that manual processes cannot match.

AI governance: Industries that establish AI governance frameworks early, covering auditability, explainability, bias management, and human oversight, will discover that governance is not a barrier but a facilitator.

The Utilities That Move Now Will Define the Next Decade

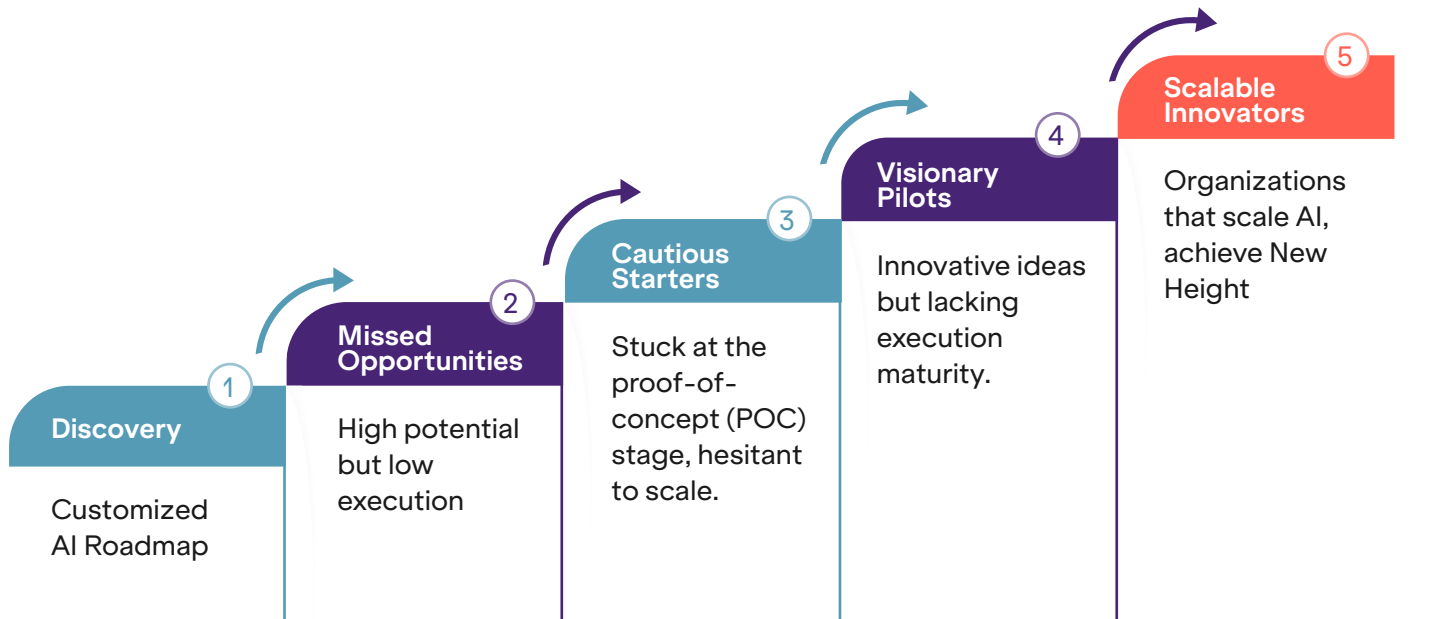


Figure 1- Chief Digital Officers to follow the steps to stay ahead of other in AI Adaption

The fundamental challenge facing power distribution utilities today is not a technological one; it is a leadership one. The Chief Digital Officer or Chief AI Officer at a utility company needs to be proactive and collaborative, not conservative. The Global experience that a Business AI Service Integrator can provide is hard to match through in-house. Building in-house development capability is time-consuming and investment intensive. CxO should focus on change management and increase AI adaptability to accelerate ROI. The business cases are compelling and well-documented.

The ability to act with the urgency required by the grid and the discipline to construct for enterprise scale shall be the focus else risk of lagging behind.

Step-by-step roadmap with key ROI metrics KPIs

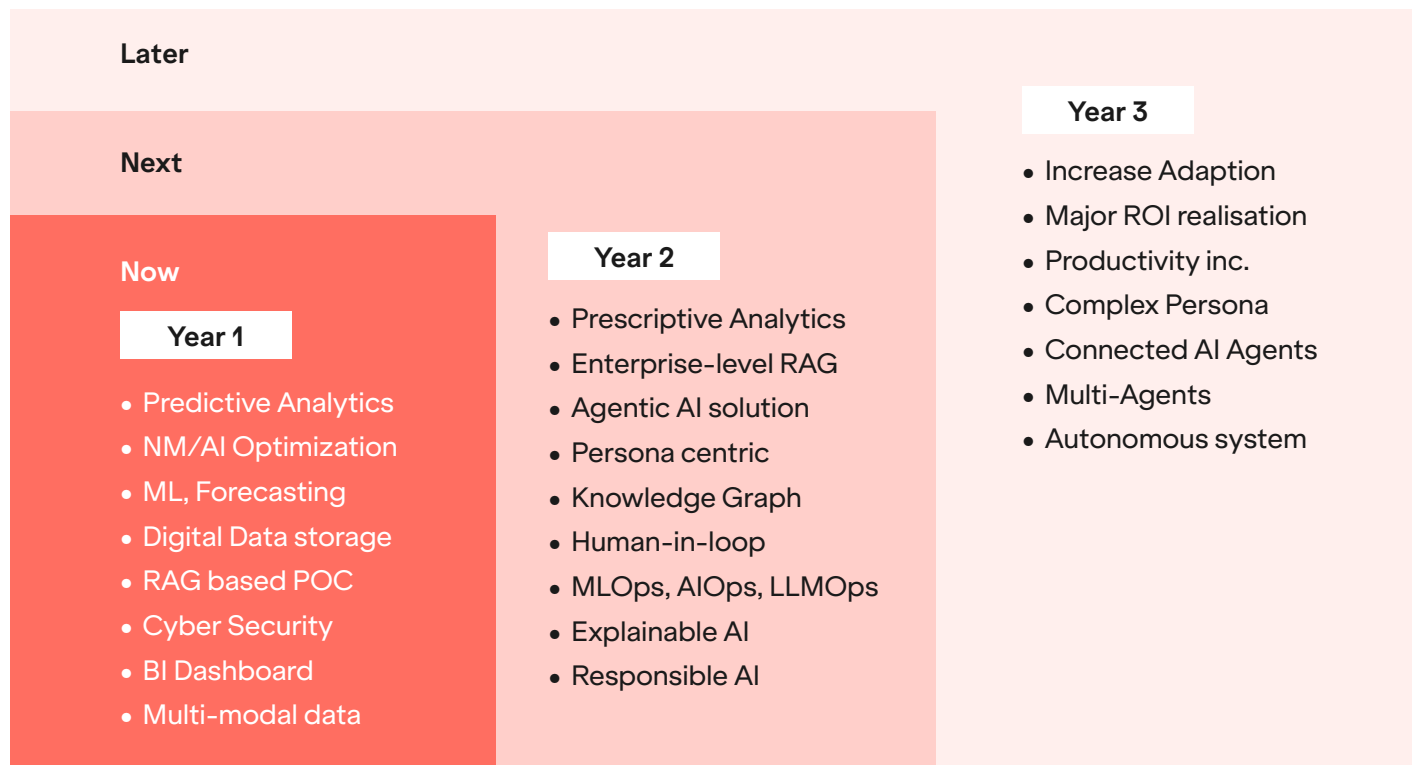


Figure 2: Step-by-step roadmap with key ROI metrics KPIs for CDO/CAO

LTM offers what tech vendors can't: deep industry expertise, a proven platform, and a track record of scaling digital solutions from simple concepts to lasting business results.

Our Commitment: LTM is invested in the long-term success of the utilities we work with. We do not win by selling technology. We win by delivering measurable, sustained business impact -- and by earning the right to be a strategic partner in the transformation ahead.

The grid will not wait. Neither should you.

It is time to Outcreate with agentic AI for utilities and redefine the future of utility digital transformation.

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LTM — a Larsen & Toubro Group Company — is an AI-centric global technology services company and the Business Creativity partner to the world's largest enterprises.

We bring human insights and intelligent systems together to help clients create greater value at the intersection of technology and domain expertise. Our capabilities span integrated operations, transformation, and business AI — enabling new ways of working, new productivity paradigms, and new roads to value. Together with over 87,000 employees across 40 countries and our global network of partners, LTM owns outcomes for our clients, helping them not just outperform the market, but Outcreate it.