

Integrated Executive Report AI Foresight Radar

ENERGY & UTILITIES – 2026





Table of Contents

Foreword	03
AI Foresight Radar for Oil & Gas	04
AI Foresight Radar for Utilities	05
Rating Scale	06
Key Trends	
• Predictive Maintenance	07
• Real-Time Drilling Surveillance	08
• Digital Twins for Pipelines & Terminals	09
• Refinery Planning and Scheduling	10
• Intelligent VPP Orchestration	11
• Grid Capacity Optimization	12
• Energy Storage & Dispatch Optimization	13
• Fault Detection & Automated Restoration	14
Key Contributors	15

Foreword

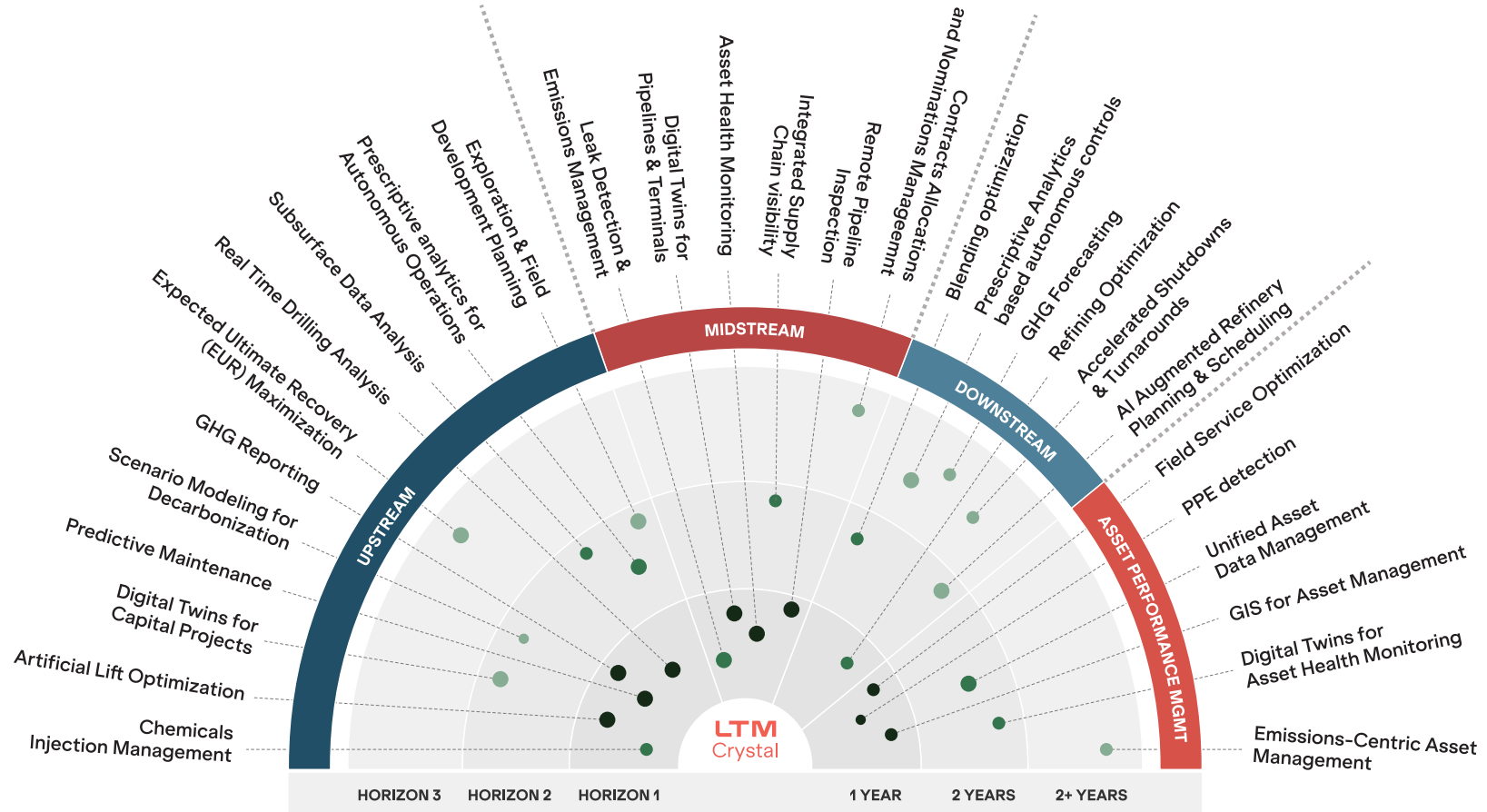


The energy and utilities sector is entering a defining decade. Accelerating electrification, large scale renewable integration, electric mobility, AI intensive data centers, hydrogen ecosystems, and economy wide decarbonization are fundamentally reshaping how energy is produced, transported, and consumed. Electricity demand is rising beyond historical planning assumptions, exposing the limitations of legacy grid design, forecasting and operations. At the same time, oil and gas operators face mounting pressure to deliver high efficiency, safety, sustainability, and capital discipline across complex, asset intensive value chains. In this environment, digitalization alone is no longer sufficient. The next phase of transformation is defined by intelligence and the ability of energy systems to sense, predict, decide, and act in real-time. AI is rapidly emerging as the decision fabric, converting connectivity into cognition, enabling resilient, adaptive, and sustainable operations at scale.

The future of energy and utilities will not be shaped by assets, megawatts, or molecules alone, but by intelligence. Organizations that treat AI as the intelligence fabric of the enterprise will be best positioned to convert volatility into resilience, complexity into opportunity, and transition pressures into long term competitive advantage.

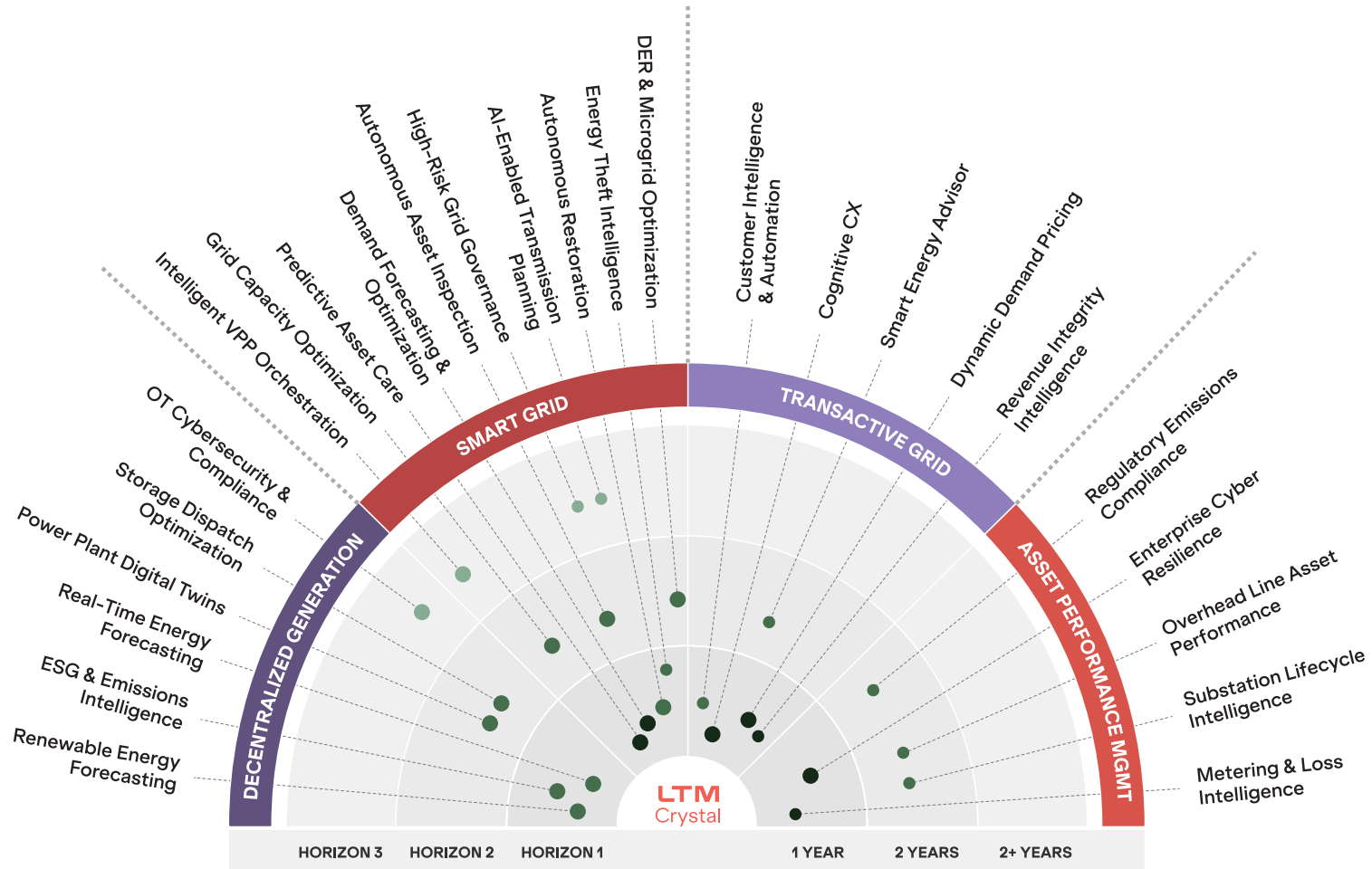
At LTM, we are ready to help energy organizations Outcreate this future by bringing true **'domain meets digital' transformation through AI**. Across upstream and generation, midstream and transmission, and downstream and distribution, we help organizations move beyond isolated AI pilots to enterprise grade intelligence, embedding AI into core workflows such as predictive maintenance, production optimization, asset integrity management, and grid intelligence. By aligning domain knowledge with modern data foundations, scalable AI platforms, and governed operating models, LTM enables measurable gains in reliability, efficiency, safety, and sustainability while preparing clients for the next evolution of energy systems.

AI Foresight Radar for Oil and Gas



RATING	ADOPTION PHASE			MARKET POTENTIAL		
	● EMERGING	● IMPROVING	● MATURE	● LOW	● MEDIUM	● HIGH
	HORIZON 1			HORIZON 2		HORIZON 3

AI Foresight Radar for Utilities



RATING	ADOPTION PHASE			MARKET POTENTIAL		
	EMERGING	IMPROVING	MATURE	LOW	MEDIUM	HIGH
	HORIZON 1		HORIZON 2		HORIZON 3	

Energy & Utilities AI Trends Radar - Rating Scale

HORIZON

HORIZON 1 (0 - 1 YEAR)

Relevant industry players are scaling the trend

HORIZON 2 (1 - 2 YEARS)

Relevant industry players have started incubating the trend to assess the potential, risk implications, and benefits

HORIZON 3 (2 - 2+ YEARS)

Emerging trends in research with potential for transformational change

MARKET POTENTIAL

LOW ●

Market potential indicates the expected revenue opportunity from the technology trend

MEDIUM ●

Market potential indicates the expected revenue opportunity from the technology trend

HIGH ●

Market potential indicates the expected revenue opportunity from the technology trend

ADOPTION PHASE

EMERGING ●

Trend is at its initial stages of adoption, with innovators and early adopters exploring its potential

IMPROVING ●

Adoption is increasing, and it has proven to have the potential to improve efficiency and effectiveness

MATURE ●

The trend has achieved widespread acceptance and usage among the general population or targeted audience



KEY TRENDS

Predictive Maintenance

Key Opportunities

Predictive maintenance is helping shift asset management from reactive intervention to continuous, intelligence led prevention. By combining Internet of Things (IoT) sensor data with Machine Learning (ML) models, operators can detect early signs of degradation in pumps, compressors, turbines, pipelines, and drilling equipment, well before failures disrupt production. As models mature and integrate with edge and real time systems, predictive maintenance is evolving into a prescriptive, closed loop capability that improves reliability and resilience across upstream, midstream, and downstream operations.

Why is it Pivotal

Predictive maintenance transforms downtime from an unpredictable risk into a controlled, data driven outcome. Beyond improving uptime, it enables smarter maintenance scheduling, longer asset life, safer operations, and optimized spare parts planning. By combining IoT data, AI, and advanced analytics, failures are detected early, preventing unplanned shutdowns across remote and high risk assets. Predictive maintenance allows operators to run assets closer to true performance limits, protecting margins while meeting rising costs, safety, and reliability expectations.

LTM Capability

LTM and AsInt formed a strategic partnership to deliver AI powered asset performance management and reliability solutions. By combining AsInt's deep expertise with LTM's strengths in SAP, Industrial Internet of Things (IIoT), analytics, and Industrial AI, the partnership accelerates predictive maintenance, improves reliability, and drives operational excellence across oil and gas, and utilities.



KEY TRENDS

Real-Time Drilling Surveillance

Key Opportunities

Real time drilling surveillance, powered by ML, shifts operations from reactive monitoring to predictive and prescriptive decision making. By continuously analyzing high frequency surface and downhole data, ML models detect early signs of drilling dysfunctions such as stuck pipes, torque drag issues, and wellbore instability before they escalate into Non productive Time (NPT). Advanced models enable real time lithology and pore pressure insights, dynamically optimizing drilling parameters. Combined with physics based models, ML delivers explainable, context aware alerts that reduce NPT, enhance safety, and accelerate decision cycles for cost efficient well delivery.

Why is it Pivotal

By continuously ingesting high frequency surface and downhole data, ML models detect subtle deviations in Rate of Penetration, torque, pressure, and vibration that traditional rule based systems miss. This enables early identification of hazards such as kicks, stuck pipes, bit wear, wellbore instability, and safety risks. Integrated with real time data platforms, ML-driven insights support faster, collaborative decision making and automated parameter optimization, delivering consistent drilling performance, lower costs, and higher operational integrity across increasingly complex wells.

LTM Capability

LTM helped a global oilfield services provider operating in around 70 countries modernize drilling operations by deploying an edge based, real time analytics solution at their rig sites. The platform enabled continuous monitoring of critical drilling parameters, early detection of operational risks, and faster, data driven decisions despite connectivity constraints, reducing manual monitoring, improving safety, and enhancing drilling efficiency through real time insights.



KEY TRENDS

Digital Twins for Pipelines & Terminals

Key Opportunities

Digital twins enable continuous monitoring of pipelines and terminals by combining sensor data, asset models, and operational systems. This enables early leak detection, pressure and corrosion monitoring, and remote surveillance of critical assets. By providing a single source of truth for asset condition, inspections, and incidents, digital twins simplify regulatory reporting, improve auditability, and increase transparency with regulators. This also helps reduce manual inspections, enhance safety and compliance, and improve asset availability across large, distributed energy infrastructure.

Why is it Pivotal

Digital twins transform surveillance from occasional inspections into continuous, predictive monitoring. They allow operators to create a live digital view of pipelines and terminals, simulate potential failures, and test response actions before issues occur. This enables early intervention, lowers safety and environmental risks, reduces unplanned downtime, and builds greater confidence in managing large, complex, and high-risk energy infrastructure.

LTM Capability

LTM's digital twin solution combines IoT, cloud, simulation, and visualization technologies. It delivers product, asset, and process twins that enable real time visibility, collaboration, and data driven decisions. Built through a Minimum Viable Product based approach, it maximizes existing IT investments and improves operational performance, agility, and business outcomes.



KEY TRENDS

Refinery Planning and Scheduling

Key Opportunities

Agentic AI opens new possibilities in refinery planning by automating decision making across production, scheduling, and constraint management. It supports dynamic re-planning during disruptions, optimizes feedstock and product mix, and reacts quickly to demand or equipment changes. This reduces dependency on manual planning cycles and improves speed, consistency, and operational resilience. AI agents enable the rapid evaluation of complex what-if scenarios and deliver optimal recommendations under uncertainty, improving decision confidence and responsiveness during high-pressure operational situations.

Why is it Pivotal

Agentic AI moves refineries from rule based planning to intelligent, self adjusting decision making. Instead of planners constantly reacting to changes, AI agents evaluate options, recommend actions, and support continuous optimization. This shortens planning cycles, improves throughput and margins, increases operational resilience, and creates a consistent, repeatable planning process that reduces dependency on individual expertise in complex refinery environments.



KEY TRENDS

Intelligent VPP Orchestration

Key Opportunities

Virtual Power Plants (VPP) aggregate Distributed Energy Resources (DERs) to deliver flexible capacity, reduce grid congestion, and participate profitably in wholesale, demand response, and ancillary service markets. Their ability to simplify customer enrollment, enhance asset monetization, and enable dynamic multi asset orchestration drives greater grid resilience and lowers system costs. As VPPs gain regulatory support and access to national markets, new revenue streams emerge, from real time flexibility trading to scalable participation across the expanding DER ecosystem.

Why is it Pivotal

VPP orchestration and market participation are important because they transform millions of scattered DERs into fast, flexible, dispatchable capacities that rival traditional power plants at a fraction of the cost. VPPs deliver grid balancing, peak shaving, and renewable integration with unprecedented agility, stabilizing demand spikes and avoiding expensive infrastructure investments. As software, automation, and market access mature, VPPs unlock new revenue streams, enhance resilience, and reshape utility strategy, shifting power from centralized assets to intelligent, customer powered networks.

LTM Capability

LTM partnered with a global utility to deploy a scalable VPP platform that aggregates DERs to improve grid efficiency and sustainability. Leveraging Snowflake for automated data validation and AWS Step Functions for orchestration, the solution delivered real time operational insights, streamlined renewable integration, and enabled grid forming VPP capabilities, driving USD 3.2million in annual savings while supporting future energy demand growth.



KEY TRENDS

Grid Capacity Optimization

Key Opportunities

Dynamic Line Rating (DLR) and real-time grid optimization unlock major opportunities by safely boosting transmission capacity using real time weather, wind, and line condition data, reducing congestion and deferring costly new infrastructure. They accelerate renewable integration by matching dynamic capacity to variable generation, enhance grid reliability through continuous monitoring and predictive insights, and improve operational flexibility for system operators. These capabilities strengthen resilience, lower costs, and maximize existing asset value, delivering faster, smarter, more sustainable grid performance.

Why is it Pivotal

DLR is critical because it shifts grid operations from a reactive, infrastructure heavy model to an intelligence driven, predictive system. Instead of relying on static assumptions, operators gain real time visibility into weather driven capacity, enabling safer and faster decisions with greater precision. By combining AI, sensor less forecasting, and physics based modeling, DLR transforms the grid into a living, data rich network, unlocking superior visibility, forecasting accuracy, operational agility, resilience, and value beyond what traditional static ratings can deliver.

LTM Capability

LTM helps utilities optimize grid capacity by combining AI driven forecasting, advanced analytics, and deep IT/OT integration across generation, transmission, and distribution. By unifying Supervisory Control and Data Acquisition (SCADA), Advanced Metering Infrastructure (AMI), Geographic Information System (GIS), Distributed Energy Resource (DER), and operational data, utilities gain real time visibility into grid constraints and available capacity. This enables better load forecasting, congestion management, peak optimization, and deferred infrastructure investments through smarter utilization of existing assets.



KEY TRENDS

Energy Storage & Dispatch Optimization

Key Opportunities

Energy storage and dispatch optimization create meaningful value when storage is treated as a system level flexibility enabler rather than a standalone asset. Key opportunities lie in deploying grid scale and distributed storage to manage renewable variability, relieve congestion, and improve reliability. Value is amplified through real time, data driven optimization that enables participation in energy, capacity, and ancillary service markets. When coordinated with distributed generation and aggregators, optimized storage enhances resilience, maximizes asset utilization, and supports the transition to decentralized, low carbon power systems.

Why is it Pivotal

Energy storage and dispatch optimization is transformative because it unlocks far greater use of renewable energy by absorbing oversupply, cutting curtailment by over half, and replacing fossil fuel reserves with fast responding, flexible storage. Advanced battery analytics enhance performance, extend asset life, and enable multi use revenue stacking with millisecond level precision. Optimized storage strengthens grid reliability, mitigates renewable variability, and supports full decarbonization pathways, while AI elevates forecasting and grid stability, making clean energy consistently dependable at scale.

LTM Capability

LTM offers AI-driven forecasting and automated power scheduling to optimize battery storage and grid dispatch. The solution offers Asset Performance Management (APM) for real-time battery health monitoring and Energy Trading and Risk Management (ETRM) solutions for market arbitrage. These capabilities ensure grid stability and maximize ROI by integrating IT/OT data for precise energy management.



KEY TRENDS

Fault Detection & Automated Restoration

Key Opportunities

The primary opportunity lies in significantly improving System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) metrics, meeting strict regulatory requirements. AI enhanced analytics derived from smart meter data enable rapid anomaly detection, precise fault pinpointing, and predictive insights that help avert failures before they occur. Meanwhile, self healing grid technologies strengthen overall resilience by autonomously rerouting power, minimizing downtime, and delivering real time visibility to maintain stability and enhance customer reliability.

Why is it Pivotal

Fault detection and automated restoration transforms network management from reactive to proactive, leveraging powerful AI algorithms and ML models to predict, prevent, and mitigate potential disruptions before they occur, ensuring optimal grid stability and reliability. It makes the network inherently more resilient to natural and cyber threats by autonomously adapting to changing grid conditions, demand patterns and emerging threats, significantly reducing outage times, operational costs, and manual interventions, while fundamentally revolutionizing utility operations with predictive intelligence and real-time optimization capabilities.

LTM Capability

LTM enables utilities to modernize distribution operations by unifying IT/OT data, AI analytics, and real time monitoring to improve grid reliability and responsiveness. Powered by the BlueVerse™ AI ecosystem, LTM delivers scalable, agent based automation and orchestration that enable closed loop decisioning, autonomous fault detection, predictive outage management, and real time optimization, supporting faster, more resilient Fault Location, Isolation, and Service Restoration (FLISR)-enabled grid operations.

Key Contributors

Research Leaders

Indranil Mitra

Vice President

Sachin Jain

Principal Director

Bharat Trivedi

Senior Principal

Energy and Utilities Leaders

Ramesh Kannan

Chief Business Officer

Parsh Ramanathan

Vice President

Tushar Trivedi

Vice President

Venkat Sarma

Global Delivery Head

C. Ravi

Head of Technology & Innovation



It's time to
Outcretate