Capturing Value at the AI Inflection Point

A Guide for Utility Executives

By Guidehouse's
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With almost half of the world's data center capacity currently centered on the United States – and a potential tripling of associated electricity consumption by 2035, according to the International Energy Agency (IEA) – the nation's power sector finds itself at a crossroads.

Not only does the AI data center boom present utilities with a potentially large revenue opportunity from these new loads, but AI deployment within the industry also offers a burgeoning array of opportunities to improve operational efficiency and resilience, maintain competitiveness, and preserve capital.

That said, AI adoption is at a clear inflection point and the resultant data center infrastructure expansion presently underway brings a unique set of challenges to an industry prone to measured (read slow) innovation.

While AI is not a silver bullet for the many challenges utilities currently face, it is quickly proving to be a critical tool in the toolbox as they work to adapt to a rapidly changing operating environment.

According to Guidehouse's annual Pulse Survey of utility executives conducted in partnership with Public Utilities Fortnightly and published in the June 2 PUF Special Issue, nearly two-thirds of industry executives indicate that their organizations are prepared for substantial load growth from the AI economy and data center infrastructure but cautioned that maintaining system reliability remains a mitigating factor.

Ultimately, utilities that can leverage AI technology to be more proactive around grid transformation, improve resilience and sustainability, and deliver greater value to their stakeholders (both customers and investors alike) have the potential to drive meaningful returns for their organizations. Preparation and strategic planning for significant shifts in enterprise processes and data management associated with AI readiness should be top priorities for utility C-suite executives today.

In this article, we explore AI's challenges and benefits, the pathways utilities are pursuing, where early gains are being realized, and how to position the utility organization for future success in the AI environment.

The Elephant in the Room: Hyperscalers and Grid Resilience

Utilities today can't ignore the elephant in the room when evaluating the evolving AI landscape. Compute-hungry hyperscalers are investing trillions into data infrastructure in anticipation of massive growth in the use of AI for consumer, enterprise, industrial, and government use cases. They are demanding access to ever-larger energy capacities on an accelerated timeline, and they prefer that energy comes from clean, uninterruptible sources.

AI is one cause for unanticipated stress but can also be part of the solution. AI can help optimize existing generation, as well as streamline new supply integration. It can reduce operating costs.

As such, after decades of predictable, relatively flat demand, utilities and balancing authorities today are racing to find solutions for unprecedented load growth and grid constraints, which may emerge sooner than previously expected.

AI is surely one cause for unanticipated stress, but it can also be part of the solution. AI can help optimize existing generation, as well as streamline new supply integration. It can reduce operating costs across not only generation and T&D, but also back office and customer engagement functions.

It can more accurately predict and manage the variability of renewable energy, optimize energy storage and dispatch, reduce curtailment and maximize the utilization of clean energy resources, improve grid stability and reliability, and lower the operational costs of renewable energy projects, thus enhancing financial viability.

But utility implementation of these new AI systems can be a long process, as can regulatory signoff. Meanwhile, the hyperscalers are already searching for ways to bypass the grid interconnection bottleneck. In May, Google announced it will

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– Michelle Fay

partner with Elementl Power on three advanced nuclear energy projects slated to produce six hundred megawatts of power each; both Amazon and Microsoft have also proposed partnership projects to build new or restart existing nuclear facilities.

Some of these deals involve utility partners, but some could ultimately bypass them altogether. In their push to build out AI data centers, developers are increasingly searching for ways to develop their own behind the meter energy supply.

In order to maximize the AI and data center opportunity to meet hyperscaler buildout schedules, utilities will be best served by beginning to plan and implement their own AI strategies today. Guidehouse recommends an incremental strategy, with initial focus on use cases offering the greatest promise for immediate returns.

Focus on Operations: But Take It One Step at a Time

For more than a century, utilities have been governed by a regulated rate of return model focused on heavy capital investments and building custom internal solutions. But with technology and critical software increasingly housed in the cloud, the industry is being pushed to invest more in systems and solutions that fall under the OPEX umbrella, such as SaaS and PaaS.

Guidehouse Research has forecast North American utility investment in more traditional analytics solutions to increase by nearly fifty percent over the next five years, from almost six hundred million dollars to around nine hundred million dollars by 2030 – but generative AI is a whole new ball game, and strategies need to be retooled accordingly.

It's a paradigm shift that traditional regulators and organization managers have sometimes been slow to embrace. But to progress at the pace customers have come to expect and drive operational efficiency leveraging sophisticated AI-based tech, utilities will need to be bolder.

While utility managers should expedite AI integration into all facets of a utility's operation, an iterative, layered approach is going to yield better results than overarching all-in moves.

Utilities are complex enterprises with work spread across multiple, siloed departments.

Those organizations that embrace a top-down approach to AI adoption and implementation will be best positioned for long-term success in deploying company-wide applications. At the same time, initiatives will still need to be managed across different departments with sometimes diverging objectives.

Utility executives should avoid tying up resources on big AI initiatives targeting complex tasks, which AI may not measurably improve in the near term. Con Edison, for example, has worked with C3 AI to implement AI-based tools for a range of use cases across its customer service and grid operations units, including its virtual assistant for customer inquiries, predictive grid maintenance, revenue protection, and optimizing workflows.

Two-Speed Adoption: Balancing Quick Wins with Long-Term Vision

Taking a two-speed approach to AI adoption offers utilities an opportunity to take a top-down approach to tackling table stakes bets within individual departments. Early efforts should be focused on operational efficiency and helping employees get things done or improve customer service.

This offers the organization an opportunity to build momentum around AI adoption and capture near-term productivity, which can then be leveraged towards other priorities – with the added benefit of providing proof of concept to potential naysayers. On the customer experience front, there are clear gains already being made through the use of AI-based solutions in areas like customer correspondence, personalized energy insights, chatbots and virtual agents, call deflection, and proactive outage communication.

Beyond the opportunities to improve workforce efficiency in critical customer-facing applications, significant potential for value creation can be found across the entire power utility value chain, especially in areas like generation optimization, transmission management, asset maintenance, vegetation management, and post-storm damage assessments.

AI models, for example, can forecast demand and generation from specific assets with increasingly higher precision especially as data quality improves, enabling more dynamic dispatch and resource optimization in line with specific goals, such as reducing costs and emissions.

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Here, the "get" is substantial, and it's critical the can is not kicked down the road in the face of inherent complexity or because resources are tied up chasing only the easiest wins.

Broad-based AI integration into enterprise systems can also transform utility operations from more reactive interventions to a more proactive focus on infrastructure and operational performance. AI copilots for field technicians and control room operators can dramatically improve employee efficiency, as can intelligent scheduling and dispatch.

Furthermore, particularly in light of heightened concerns around infrastructure risk in the face of more destructive weather-related events, AI-based solutions can be deployed alongside existing IT/OT applications to improve, for example, vegetation management for wildfire risk mitigation or predictive maintenance and asset management for storm resiliency.

These "sidecar" use cases can be deployed on relatively short timelines and address one of utility executives' top priorities today: improving grid resilience. In Guidehouse's latest Pulse Survey of utility executives, more than eighty-six percent selected T&D upgrades and improved system resilience as a top priority in 2025.

Importantly, however, these AI initiatives should be layered on top of existing OT and IT systems. Company leaders should not think of the AI opportunity as an all or nothing investment – rip and replace is not the answer. Rather, AI-based capabilities should be thought of as a supplement to existing OT/IT systems.

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in a detailed power system model used for diagnosing potential grid issues. Correctly diagnosing and remediating such issues is time-intensive, often requiring seasoned experts spending days to months to resolve.

In this case, an LLM successfully pinpointed the specific asset causing the issue within a system of hundreds of assets. With expert guidance, the LLM recommended updates to the model. After several adjustments, the oscillation was resolved within a day.

This example highlights the potential of AI in power system management. Moving forward, integrating LLMs and other forms of AI tools could improve how the sector diagnoses and resolves not only power oscillations, but other potential anomalies, leading to more efficient and reliable energy grids.

Under the consortium, only public data will be included in open-source versions of models, with no proprietary or nonpublic data. We anticipate releasing several free, open-source models, which will be updated periodically as new foundation models and data become available.

The consortium is just getting started and we welcome a wide range of organizations. Members can choose how best to contribute according to their organizational needs and available resources, ensuring that the consortium remains flexible and dynamic while driving impactful results. Member engagement can include active participation in meetings and sharing data and insights.

As AI rapidly evolves, the Open Power AI Consortium offers a unique opportunity to participate in this collaborative effort to shape AI's application in the power sector.

Visit www.epri.com/opai or contact opai@epri.com to learn how you can join the consortium. PUF

AI Inflection Point

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A Utility Blueprint for Capturing AI Value

The utilities that succeed in harnessing AI will be those that treat AI technology not as a standalone tool, but as a strategic enabler of intelligent, adaptive, and customer-centric operations.

In effect, generative AI can be considered as a new company hire, a resource that can be trained and become expert in a given area just like its human counterparts. Indeed, with an aging workforce and increasing competition for tech-savvy employees, smart deployment of AI solutions can help alleviate utility brain drain and ensure generational knowledge continues to be passed on over time.

As noted above, support from the C-suite is a key element of a successful long-term AI implementation plan. There should be a top-down approach to prioritizing AI projects – but hands-on departmental oversight will ensure that the most effective and immediately beneficial projects are tackled first within each operational area.

Specifically, Guidehouse recommends the following five overarching steps for utility leaders to establish their AI integration strategy and plans:

Establish a clear AI vision and roadmap that aligns with your organization's broader goals. This includes identifying high impact use cases across the value chain and priorities based on ROI, feasibility, and alignment with regulatory mandates.

Architect an enterprise-wide strategy with executive sponsorship and cross-functional collaboration. This should be backed by a centralized AI governance framework.

Invest in data infrastructure and interoperability. This includes modernizing utility data platforms and establishing sound data management, integrating OT/IT systems, and adopting cloud-native architectures.

Look for quick wins to build organizational confidence (such as sidecar AI) and consider partnering with AI vendors, startups, and research institutions to accelerate innovation and reduce deployment times.

Incorporate a robust change management and communication strategy to foster organizational adoption and build trust. This includes transparency around the benefits of the enterprise strategy around AI, potential benefits, and organizational goals that address workforce security concerns.

The Time is Now

AI at scale is no longer experimental – it's a strategic imperative for utility leaders facing a rapidly changing set of pressures and problems. Utilities are being squeezed to do more with less and seeing their operating model shift away from CAPEX plus return on investment to an OPEX-driven model.

Behind the meter competition, regulatory pressures, and the need to improve grid resilience – while weathering measurable workforce attrition and recruitment difficulties – are all critical challenges utilities will need to manage in coming years. Strategic and well-planned deployment of AI-based solutions can help the industry meet these challenges by acting as a force multiplier for grid modernization and customer-centricity.

The risk of inaction is arguably a bigger threat to long-term utility success than the risks associated with taking up the AI mantle. Ultimately, the winners will be those who align their AI strategies with core utility missions by starting with high impact use cases, building momentum, and then scaling with purpose. PUF