S&P Global
Market Intelligence

451 Research
Business Impact Brief

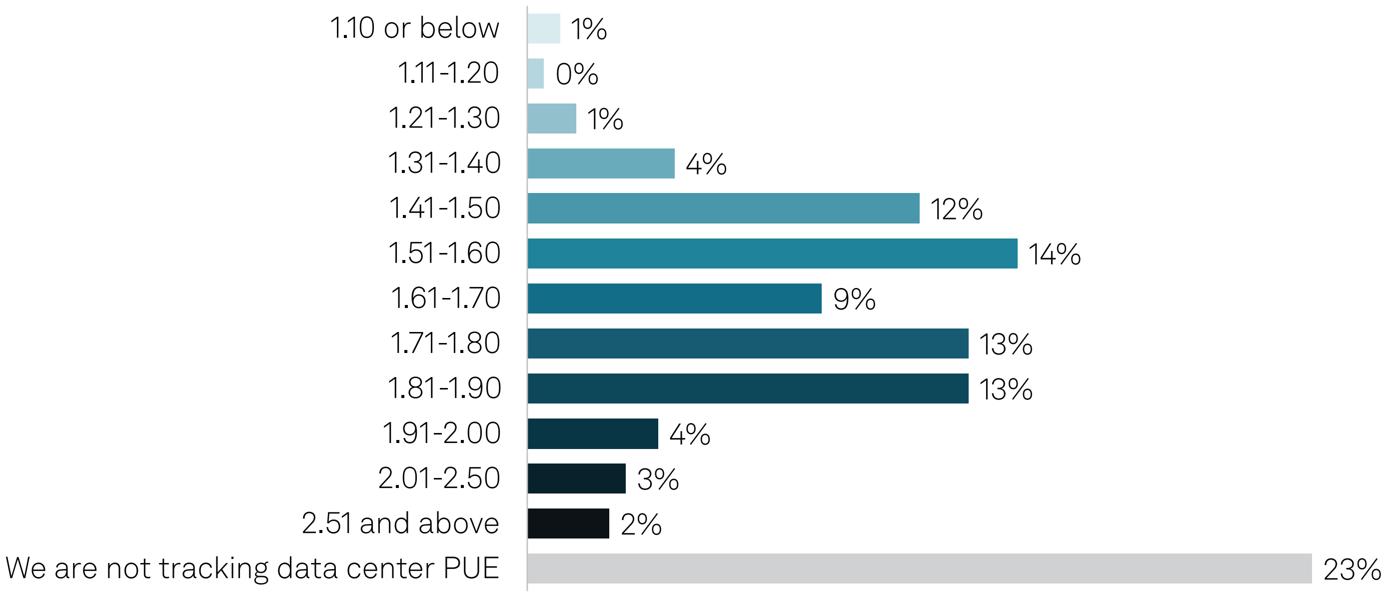
The AI era exposes a gap: One in four data center operators are behind on tracking power usage data

The Take

Hundreds of billions of dollars are flowing into data center infrastructure, driven by the rapid expansion of AI. This wave of investment marks a structural shift as traditional data center operating practices fall short of AI workload demands. The ability to capture and use accurate, real-time operational data, such as power consumption and quality metrics, has become a defining capability for next-generation facilities. The principle is simple: What cannot be measured cannot be improved.

As AI pushes electrical and thermal systems to their limits with highly variable, unpredictable demand, tracking operational signals becomes essential. Predictive maintenance, capacity planning and revenue optimization all depend on timely, actionable insights. Analytics have become a strategic requirement, especially for power systems. Power has become the decisive constraint in building, scaling and monetizing AI-ready infrastructure. Yet according to 451 Research's Voice of the Enterprise: Datacenters, Datacenter Infrastructure 2025 study, nearly one in four operators still does not track power usage effectiveness (PUE).

Nearly 25% of data center operators are not tracking PUE



Q. What is the actual PUE of your organization's primary data center today (i.e., data center environment that holds strategic importance to its business and operations)?
Base: Respondents involved with or knowledgeable about data center infrastructure decision-making (n=208).
Source: 451 Research's Voice of the Enterprise: Datacenters, Datacenter Infrastructure 2025.

Historically, PUE has been regarded as a measure of efficiency rather than a performance metric. However, in the AI era, where power dictates throughput and revenue potential, the absence of power-usage visibility signals a more significant issue. If operators are not measuring PUE, they are behind on the more complex task of monitoring power quality across increasingly volatile electrical systems.

While traditional workloads exhibited relatively minor variations in power usage — typically 10% to 15% over several hours — AI workloads operate in rapid cycles that drive power fluctuations of 40% to 70% within milliseconds, placing unprecedented stress on electrical networks. For facilities built around graphics processing unit clusters, tensor processing units and other dense accelerators, this instability elevates power quality from a secondary consideration to a primary operational risk. AI operations require a higher level of instrumentation and data fidelity to maintain system health, safeguard capital investments and ensure long-term returns. Power data has become a baseline for competitiveness in the AI-driven landscape.

Business impact

The business case for AI workloads is clear. Use cases such as predictive maintenance, capacity planning and revenue optimization deliver immediate benefits. Such functions require trusted information that moves as fast as operations, to support systems that adapt, protect investments and create value. This is how data center operators can turn today's facilities into tomorrow's engines of opportunity.

The path forward includes challenges. The energy consumed and heat generated by AI hardware often make traditional data center designs inadequate. AI workloads demand higher power densities, typically 40 kW to 120 kW per rack, compared to the 5 kW to 10 kW common in traditional data centers. This intense power draw can overwhelm existing infrastructure and often requires advanced solutions, such as liquid cooling systems, that introduce new variables affecting long-term reliability.

Power needs are also becoming less predictable. Traditional workloads run sequentially, completing one task at a time and consuming power steadily. AI workloads run many processes simultaneously through parallel computing. This approach is faster but significantly more power-intensive. As a result, power usage is not only higher but also harder to anticipate and control.

The fluctuating nature of AI workloads, marked by rapid surges and pauses, intensifies pressure on electrical systems. Without the right monitoring and insights, these fluctuations can cause harmonic distortion, transient spikes and load imbalances, resulting in hardware degradation, overheating and damage to sensitive equipment.

To protect their investments, data center operators need real-time visibility into their power usage and utility health. In a world where milliseconds matter, actionable data can provide a foundation for profitable AI operations.

Looking ahead

AI-driven infrastructure is entering a phase of accelerated escalation, where rack power densities will continue to rise as operators push for greater performance. As AI models grow in scale and complexity, demand for increasingly powerful compute will rise in parallel. This trajectory reinforces a central theme for next-generation facilities: Operators will need reliable, high-quality data to manage environments that are increasingly volatile, power-dense and operationally sensitive. AI systems consume enormous and highly variable energy loads. Sudden power surges can throttle processor performance or shorten hardware lifespan. With billions of dollars being invested in AI-ready data centers, ensuring efficient use of power and safe operation of equipment will be essential to safeguarding returns.

Success will depend on intentional planning for comprehensive power data collection across the full electrical chain. Continuous measurement enables early diagnosis and proactive mitigation, ensuring operators stay ahead of emerging risks. Visibility from the main utility entry through switchgear, power distribution units, remote power panels, and down to individual racks and servers provides the detailed visibility needed for informed, timely decisions.

A flexible monitoring approach will be critical as AI requirements evolve. Facilities capable of adapting quickly can scale faster, reduce project delays and deliver the tailored data needed by engineering, operations and financial stakeholders alike. In a market defined by rapid change and tight power constraints, flexibility and data-driven insight will differentiate operators that merely keep up from those that lead.