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## U.S. DOE's ORNL: Tackling AI Data Center Energy and Cooling

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### RECENT DEVELOPMENT

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Oak Ridge National Laboratory (ORNL) recently launched the [Next Generation Data Centers Institute](#) (NGDCI), consolidating its capabilities across energy science, high-performance computing, cybersecurity, and grid research with a mandate to develop technologies that could make AI data centers more efficient, resilient, and grid-supportive. The launch supports the U.S. Department of Energy's Genesis Mission by coupling the upcoming computing resources with energy systems that can sustain them. NGDCI has identified six research priority areas: thermal management, power system architecture, grid integration, operations and load management, security, and integrated systems modeling.

### ANALYST COMMENT

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The Electric Power Research Institute projects that data centers could account for up to 17% of U.S. electricity consumption by 2030, up from roughly 4% today. Recent Hyperion Research studies consistently identify access to reliable, sustainable, and economic power as a limiting factor for future AI systems and use cases.

For the HPC/AI community, NGDCI's most significant potential contribution may lie in its ability to treat the national lab computing environment as a live research platform. ORNL operates Frontier and is preparing to deploy Discovery and Lux, HPC/AI systems that have and will push compute density and power draw into new territory. Research into power architecture, workload scheduling, and grid integration at that scale could yield findings with direct applicability to next-generation AI.

Specifically, the thermal management research priority area could carry meaningful implications for AI compute economics. Adoption of two-phase liquid cooling and advanced heat recovery has been uneven in commercial AI infrastructure, largely because upfront design costs are difficult to justify against short hardware refresh cycles. NGDCI's testbed infrastructure and partnerships with Chemours and Carrier, key US suppliers of cooling equipment, could help generate the performance and cost data needed to make that business case more compelling, particularly for GPU-dense clusters where rack power densities are climbing beyond what conventional cooling can efficiently handle. Whether this research translates into commercially replicable standards, rather than remaining lab-specific, may be among the more consequential questions surrounding the institute's long-term impact.

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