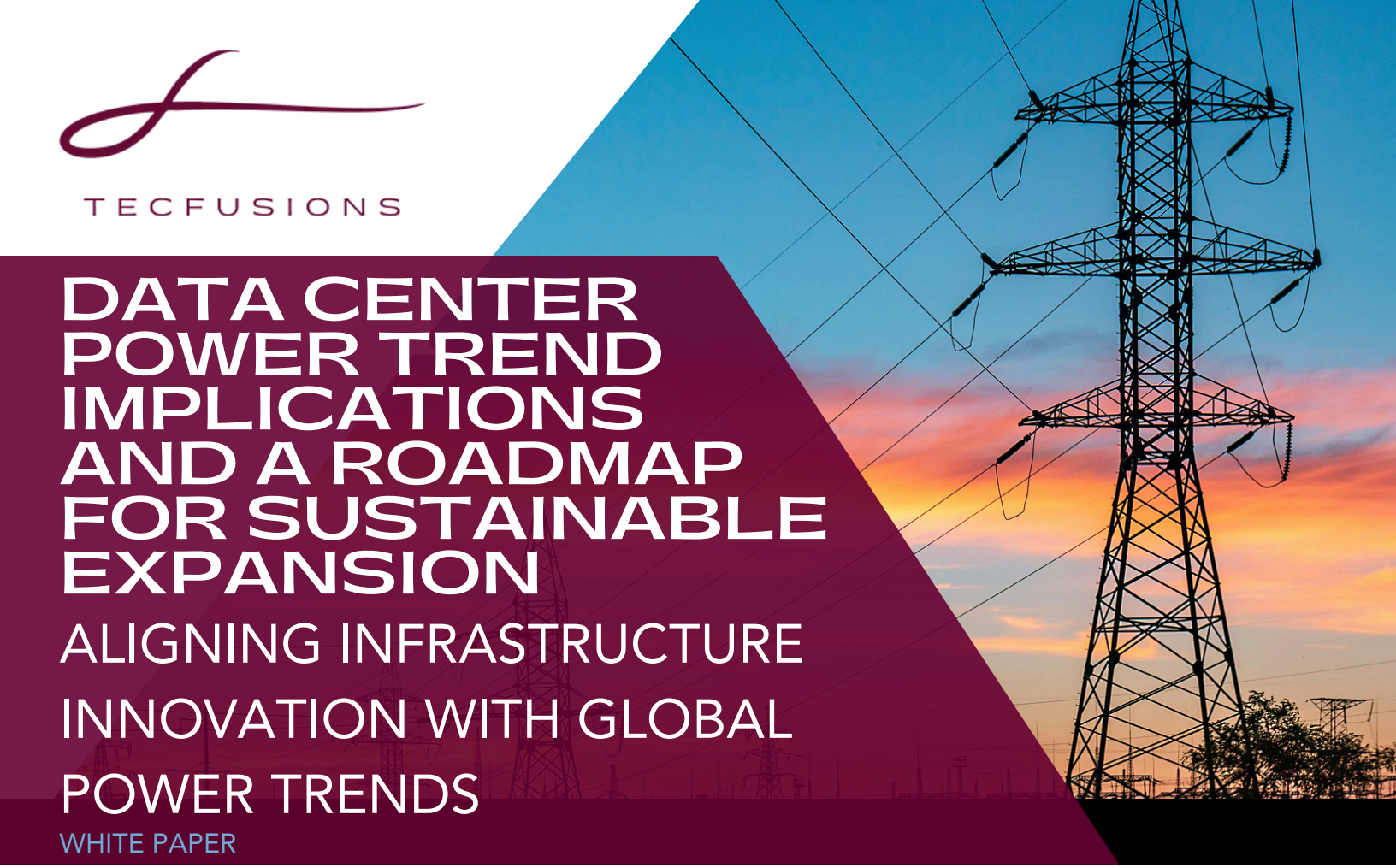
TECFUSIONS



DATA CENTER POWER TREND IMPLICATIONS AND A ROADMAP FOR SUSTAINABLE EXPANSION

ALIGNING INFRASTRUCTURE INNOVATION WITH GLOBAL POWER TRENDS

WHITE PAPER

INTRODUCTION

The global data center industry faces unprecedented power challenges, with demand projected to reach 71GW by 2027[1], equivalent to powering 53 million homes. This surge is primarily driven by AI workloads, which are growing at a 47.9% compound annual growth rate (CAGR)[1]. As traditional infrastructure struggles with interconnection delays exceeding 5 years and thermal limitations capping rack densities, TECfusions has pioneered a dual-path solution that redefines sustainable scalability.

An Adaptive Reuse strategy can convert dormant industrial sites into high-capacity computing hubs, delivering 83% faster deployment[1] than greenfield construction. Simultaneously, Grid-Independent Power Solutions integrate behind-the-meter microgrids combining nuclear, renewable, and natural gas resources, enabling clients to bypass grid constraints while locking in 15-year fixed energy rates.[1]

These approaches directly address some of the industry's most critical bottlenecks:

·Transmission limitations

·Baseload generation gaps

·Thermal barriers to AI deployments

"AI is rewriting the rules for data center power, and the only way forward is to innovate faster than the constraints. By combining adaptive reuse with on-site generation, we're showing the industry that speed, scale, and sustainability don't have to be at odds."

Mark Hamilton
Chief Operating Officer

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INTRODUCTION CONT'D

With 220MW operational in Virginia and several GW in development across the country, TECfusions demonstrates how industrial repurposing creates a sustainable competitive advantage—turning legacy infrastructure into the largest AI deployments in under 9 months while reducing embodied carbon by 80%.

MARKET FORCES RESHAPING DATA CENTER ECONOMICS

The AI Acceleration Imperative

AI workloads have fundamentally altered power requirements, with modern facilities now demanding 50-100MW per campus – a 233% increase over traditional 30MW installations. This surge stems from GPU-intensive computations, where rack densities now routinely reach 40-120kW to support platforms like NVIDIA's GB200[2]. TECfusions addresses this through:

- GPU-Optimized Infrastructure: Purpose-built facilities supporting 120kW/rack densities sometimes through direct liquid cooling, enabling 92% thermal efficiency for sustained AI workloads.
- Phased Deployment Timelines: Phased deployment model allowing 48-hour rack commissioning and incremental 10MW capacity expansions to match compute demand curves.

Grid Capacity Crisis

Data center construction projects now exceed five years in major markets due to transmission constraints and generation shortfalls[3]. This delays critical deployments and increases project risk, therefore, traditional reliance on grid power is no longer sufficient for hyperscale and AI-driven projects. Industry-wide, operators are exploring alternatives to ensure timely, reliable power to their data centers, such as hybrid microgrids, especially in reuse sites where power has already been allocated.

The rise of AI is driving unprecedented demand for data center capacity, with global electricity consumption from data centers expected to double by 2030. Operators are increasingly adopting onsite and hybrid power solutions to overcome grid limitations and deliver scalable, reliable infrastructure for next-generation workloads. TECfusions' adaptive reuse model exemplifies this shift, converting legacy industrial sites into high-capacity data centers with dramatically reduced deployment timelines.

Approach	Power Source(s)	Deployment Timeline	Infrastructure Leverage	Example Use Case
Traditional Grid	Utility Grid	4-5+ years	New substations, lines	Standard colocation data
Emerging Microgrids	Gas, Fuel Cells, BESS	1-2 years	On-site generation	Hyperscale, AI campus
Adaptive Reuse	Existing plant/grid mix	6-12 months	Legacy transmission,	Retired coal/gas plant reuse

Fig. 1 Industry Power & Infrastructure Approaches

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CRITICAL INFRASTRUCTURE CHALLENGES

The convergence of infrastructure challenges means that data center operators must navigate a complex landscape of regulatory, technical, and market barriers to secure the power needed for current and future workloads. The need for 24/7 reliability and redundancy further complicates these efforts, making infrastructure planning and investment more critical than ever.

Transmission & Distribution Limitations

Data center operators are increasingly encountering bottlenecks in transmission and distribution infrastructure. As demand for high-capacity, AI-ready facilities surges, regions with concentrated data center development, such as Northern Virginia, Silicon Valley, and Dublin, are experiencing significant grid congestion and interconnection delays. These bottlenecks are compounded by aging infrastructure and the time required to upgrade substations and transmission lines. The result is multi-year wait times for new data center projects to secure the power they require, threatening the pace of digital transformation and AI innovation.

Generation Resource Shortfalls

Alongside transmission challenges, many markets face shortfalls in generation capacity. While the transition to renewable energy sources is underway, the rapid growth in data center electricity demand—driven by AI and high-performance computing—is outpacing the ability of utilities to bring new generation online. This is particularly true in regions where legacy coal and gas plants are being retired faster than new resources can be commissioned. As a result, data center operators are exploring a range of solutions, including onsite generation, advanced power purchase agreements, and partnerships with utilities to ensure reliable, scalable power.

OPERATIONAL STRATEGIES FOR POWER-CONSCIOUS OPERATORS

The adoption of energy-efficient equipment, regular maintenance, and smart energy management systems is helping operators optimize power usage and reduce waste. Microgrids, battery storage, and backup generators are increasingly common, providing resilience against grid outages and supporting uninterrupted operations.

Sustainability is also a growing priority, with operators exploring renewable energy sources, sustainable backup fuels, and equipment upgrades to minimize environmental impact and align with net-zero goals.

Adaptive Site Selection

As power and grid constraints intensify in primary markets, data center operators are increasingly looking to secondary and tertiary markets where power availability is greater and interconnection queues are shorter. This shift is enabling more agile deployment strategies, with a focus on sites that already have robust transmission infrastructure or are less likely to encounter regulatory bottlenecks.

Operators are also leveraging modular and prefabricated power systems to accelerate build-outs and improve flexibility. These plug-and-play solutions allow data centers to scale capacity quickly, reduce downtime during expansion, and adapt to changing workload demands.

Traditional Deployment Need	**TECfusions' Model**
Proximity to fiber hubs	Existing transmission infrastructure
Low energy costs	15-year fixed-rate contracts
Tax incentives	Brownfield redevelopment credits

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OPERATIONAL STRATEGIES FOR POWER-CONSCIOUS OPERATORS CONT'D

Advanced Power & Thermal Management

To address rising rack densities and dynamic workloads, especially from AI and high-performance computing, operators are investing in advanced power management technologies. This includes high-amp power distribution units (PDUs) capable of safely delivering more power to racks, as well as intelligent monitoring systems that provide real-time visibility into power usage and efficiency.

Thermal management is another critical area, with liquid cooling and advanced air containment systems becoming standard for supporting high-density deployments. Efficient cooling not only ensures equipment reliability but also enables operators to maximize the use of available power without overloading their thermal capacity.

FUTURE-PROOFING THROUGH ENERGY INNOVATION

The data center sector is at an inflection point, with the need for rapid innovation and strategic investment to meet the demands of a hyperconnected, data-driven world. Operators who embrace flexibility, efficiency, and sustainability will be best positioned to thrive in the years ahead.

Immediate-Term Solutions (through 2026)

In the near term, data center operators are prioritizing strategies to overcome current power and infrastructure bottlenecks. This includes rapid deployment of modular data centers, investment in utility partnerships to secure long-term power supply, and expansion into markets with underutilized infrastructure. Operators are also leveraging advanced cooling technologies and hybrid power solutions, such as onsite generators and battery storage, to maintain uptime and support high-density workloads. Regulatory engagement is key, as operators advocate for streamlined permitting and interconnection processes to accelerate project timelines.

Mid-Term Roadmap (2027-2030)

Looking ahead, the industry is expected to embrace more radical innovations to meet surging demand. This includes the integration of artificial intelligence into energy management systems, enabling predictive analytics for power usage and cooling efficiency. The adoption of liquid cooling will become more widespread, with the next launch of GPUs seeing rack densities beyond 160kW and upwards of 200-400kW a cabinet by 2027.

Operators like TECfusions will continue to diversify their energy portfolios, incorporating a mix of traditional and emerging power sources, and exploring new models for energy procurement and storage. The push for sustainability will intensify, with an emphasis on reducing carbon footprints through renewable energy procurement, waste heat recovery, and advanced grid integration.

Long-Term Vision (2030+)

Over the next decade, the data center industry will face both new opportunities and challenges. The proliferation of AI, IoT, and edge computing will drive demand for distributed, resilient infrastructure. Operators will need to invest in next-generation power technologies, such as advanced microgrids and smart grid integration, to ensure reliability and scalability.

Collaboration with utilities, governments, and technology providers will be essential to address systemic challenges and unlock new sources of clean, reliable power. Ultimately, the industry's ability to adapt to evolving energy landscapes and regulatory environments will determine its capacity to support the digital economy of the future.

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POWERING THE NEXT ERA OF DATA CENTER INNOVATION

The data center industry stands at a pivotal moment, facing unprecedented demand for power and infrastructure resilience. To ensure continued growth and support the digital economy, stakeholders must act decisively.

Operators and Industry Leaders

- Invest in Adaptive Infrastructure: Prioritize flexible deployment models, modular power systems, and advanced cooling technologies to overcome grid constraints and meet rising workloads.
- Forge Strategic Partnerships: Collaborate with utilities, technology providers, and local governments to streamline permitting, accelerate interconnection, and secure reliable, scalable power.
- Embrace Sustainability: Commit to energy-efficient operations, explore renewable energy procurement, and implement waste heat recovery initiatives to reduce environmental impact.

Policymakers and Regulators

- Simplify Interconnection Processes: Reduce bureaucratic hurdles and create incentives for infrastructure upgrades to support rapid data center deployment.
- Encourage Innovation: Support research and development in advanced cooling, microgrids, and smart energy management systems.

Together, we can build a resilient, sustainable, and scalable foundation for the next generation of data centers, ensuring that the digital economy continues to thrive in a world of evolving power challenges.

CONCLUSION

The convergence of surging AI workloads, grid constraints, and sustainability imperatives is reshaping the data center industry at a pace never seen before. Success will depend on a willingness to rethink deployment strategies, embrace adaptive reuse, and leverage grid-independent energy solutions that accelerate timelines while reducing environmental impact. TECfusions' model proves that scaling responsibly and rapidly is possible, providing a roadmap for the industry to meet future demand without compromising resilience or sustainability.

AUTHOR

MARK HAMILTON
CHIEF OPERATING OFFICER

About

TECfusions is a global data center operator dedicated to innovative, sustainable technology and energy-efficient solutions. With over thirty sites operational or in due diligence worldwide, we specialize in designing, building, and managing next-generation data centers for AI and HPC. The strategic approach for adaptive reuse of industrial facilities enables rapid deployment and market readiness, delivering capacity in record time. Additionally, we are committed to dedicated microgrid integration for on-site energy infrastructure. Our environmentally enhanced configuration technology is in high demand by global tenants for lower cost data center operations for new build and existing aging infrastructure.

Contact Us

sales@tecfusions.com www.tecfusions.net