The AI Race is a Race for Power

Bloomenergy

The race for power

Power is the ultimate competitive edge

As AI shatters technology records, another race is unfolding – quieter, but just as urgent.

A race for power.

AI needs massive amounts of power, and we're running out of places to get it, permit it and build it. New data centers require power at a scale from hundreds of megawatts to over a gigawatt – enough to power up to a million American homes. But the grid can't keep up. That's why companies are turning to onsite power for speed, scale and certainty.

Historically, onsite power required trade-offs, but in today's AI-driven world, no one can afford to choose. Reliability isn't optional; it's mission critical. Delays aren't just costly – they can cost companies the race.

Resilience, reliability, sustainability, speed and cost all matter. This is the new foundation of AI success: Power without tradeoffs.

What if power came without compromises?

Reintroducing: fuel cells

Uniquely powerful performance for the AI age

While fuel cells have been around for decades, they've never been more relevant. With data growing faster than the available power supply, fuel cells have become a mainstream solution, offering efficient, reliable, and scalable onsite power ideal for AI data center needs.

Once considered niche, today they are a go-to solution for powering data centers. Years of development have made fuel cells purpose-built for this moment: engineered for AI compute's relentless power demands.

Fuel Cell Facts

1. Onsite power generation (primary power)
2. Run on natural gas
3. Deployable in as little as 90 days
4. Ultra-reliable: up to 5-9s availability
5. Near-zero air pollution
6. Scalable to 100's of megawatts
7. Cost-efficient

Fuel cell economics: What's changed?

Cost-competitive power solution

Gas turbines and engines—the industry's staid mechanical horses—burn fuel and use mechanical motion to generate electricity. These machines were developed at a time when horsepower was the benchmark of industrial progress. But today, the power industry doesn't need a faster horse — it needs a supersonic jet.

Fuel cells make that leap. They don't just improve the old model; they unlock a fundamentally better one.

Why?

Fuel cells directly convert natural gas into electricity with no combustion and no moving parts. In real-world conditions – including hot and cold days and part load operation – this Process achieves efficiency of 54%, rivaling the most advanced natural gas conversion technologies. To compare, many open-cycle gas turbines and gas engines operate at 35% to 40% fuel efficiency.

Lower fuel costs

Fuel costs are by far the biggest operating expense for onsite power production. Fuel cells offer a cost advantage due to their higher efficiency. For a 100 MW data center this can translate into a savings of $40-$60 million in over five years (at $5/MMBtu gas).

Less overbuild needed

Onsite power capacity must be overbuilt to achieve grid-level availability, or 99.9% uptime. The extent of this overbuild depends on the power generation technology used, maintenance requirements and time to repair.

Fuel cells generally need less overbuild to achieve grid-level reliability, resulting in less equipment and lower upfront capital.

Typically, to ensure 100 MW being delivered to a data center at 3-nines availability:

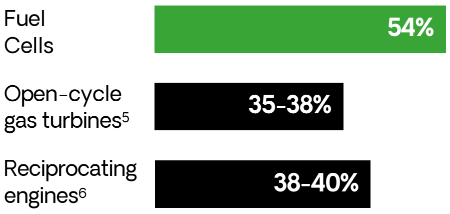
- Gas turbines are overbuilt to 130-150 MW.[1]
- Reciprocating engines are overbuilt to 120-130 MW.[2]
- Bloom's fuel cells are overbuilt to only 109 MW.[3]

For customers requiring 4- or 5-nines uptime, the advantage of needing less overbuild with fuel cells grows even stronger.

The result: An ROI-effective solution with higher efficiency, lower fuel costs, no moving parts to wear out, and strong performance even at partial loads.

Fuel cells are ~15-20% more efficient than open-cycle gas turbines and reciprocating engines

Net efficiency[4] across technologies, %



Innovation drives down cost

Fuel cells were once dismissed as too expensive for widespread use. But decades of relentless innovation by Bloom has driven double-digit annual cost reductions, making fuel cell technology cost-competitive with other onsite power solutions.

1. Assumes a ~50MW power block with 95% availability; achieving 99.9% availability for a 100 MW data center requires ~50% overbuild | 2. Assumes a ~3.3MW power block with 93% availability; achieving 99.9% availability for a 100 MW data center requires ~33% overbuild.
3. Assumes a ~850kW power block with 99.7% availability; achieving 99.9% availability for a 100 MW data center requires ~9% overbuild | 4. Net efficiency accounts for auxiliary power consumption including degradation and cooling. | 5. Assumes a heat rate ranging from 8,500-8,800 Btu/kW-hr
6. Assumes a heat rate ranging from 7,600-8,400 Btu/kW-hr

Faster power

When it's needed, where it's needed

Time to power, the speed at which a data center can become operational and reliably handle compute demands, has become the top requirement for data centers.

Because the capital cost of data center assets is so much higher than the cost of power infrastructure, accelerating operations by one to two years saves on depreciation and substantially increases ROI.

Accelerated Permitting

Fuel cells usually benefit from faster, simpler permitting. Their ultra-low emissions profile minimizes environmental reviews and community opposition faced by other technologies, further accelerating approvals and shortening time to power.

Bloom can deliver 50 MW of onsite power in as little as 90 days, and 100 MW in 120 days.

Easy installation and scalability

Fuel cell systems arrive skid-mounted; a "copy-and-paste" modular architecture allows for quick deployment at any scale—from 100s of kW to 100s of MW— without scaling risk.

This modularity allows power to be ramped with compute growth, reducing risk of idle assets.

Fuel cells offer high power density options, they are deployable as single-level ground mounts or stacked towers up to four levels.

"Customers expect to run their AI workloads and new AI applications at peak performance. Bloom's fuel cell technology will join OCI's extensive energy portfolio, further supporting our cutting-edge AI infrastructure with reliable, clean power that can be quickly deployed and easily scaled."

–EVP, Oracle Cloud Infrastructure

Ultra-reliable and resilient

Built to stay on and endure demanding conditions

Think of fuel cells as multiple, independent 65 kW power modules, much like Lego® blocks, that fit together to create a robust and reliable system.

170+

microgrid sites deployed by Bloom since 2011

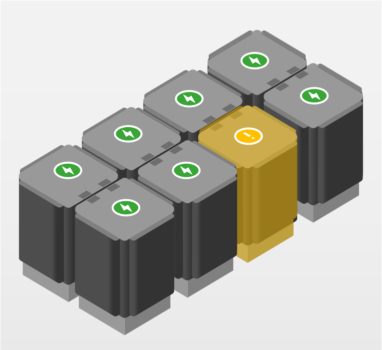
This modular design ensures uninterrupted power, even during natural disasters and outages. If one module falters, the others keep running, eliminating single points of failure.

Fuel cell systems can deliver **up to 99.999% uptime**, matching the availability of top-tier facilities with grid and backup power.

Maintenance is simple: modules can be hot-swapped, 65 kW at a time, without shutting down the entire system. Together, these features make fuel cells a highly resilient power solution for critical infrastructure.

The result: Fuel cells offer always-on power, reducing operational, and financial risk of downtime.

Reliable



Bloom Energy modules can be repaired or easily hot-swapped, 65 kW at a time, without shutting down the entire system.

Resilient

With 17 years in operation and over 22,000 power modules deployed, Bloom's fuel cell technology has a proven a reliability record in rugged environments, providing resilience when it matters most.

> "Bloom's fuel cells allow us to generate cleaner and reliable electricity onsite at our data centers in a cost-effective way. We're proud to have continued to expand our relationship with Bloom over the last decade and helped lead the industry forward."
>
> **–VP of Energy Operations, Equinix**

Solving AI load volatility

Real-time load response unlocks the performance potential of AI compute

Traditional data centers support thousands of simultaneous users engaging in various activities, from researching vacations to analyzing financial data and streaming media. This creates a consistent, flat load on power supply that is reliably served by the grid and traditional power generation.

The rise of AI has driven massive gains in compute performance. And while data center architectures have evolved to meet this demand, power infrastructure has not.

Battery burnout

AI training centers run singular, compute-intensive tasks across thousands of densely-packed, high-powered silicon chips. This creates extremely volatile power loads that can swing from 20% to over 150% of provisioned power in milliseconds, often tens of times per minute.

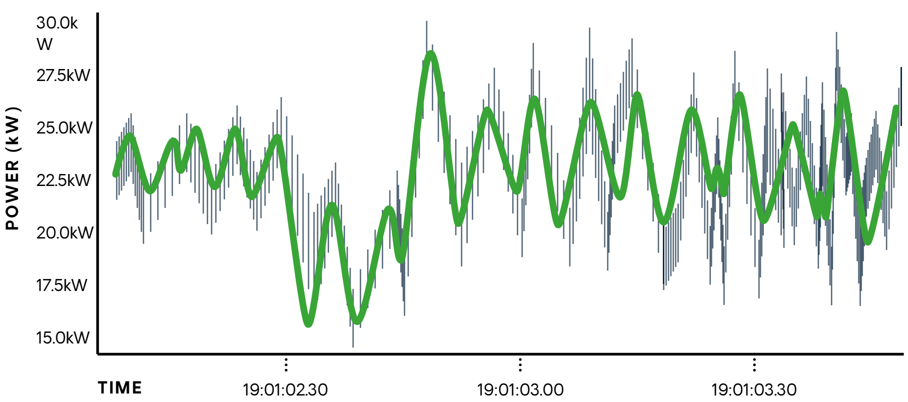
Most AI data centers depend on large arrays of battery storage to manage variable loads. Yet in AI environments, load following force batteries to cycle at high frequency and intensity, far beyond their typical backup role. This causes faster battery cell degradation, increases replacement costs and raises system-level risk.

Following the load

Fuel cells are inherently better suited to handle AI workloads. As noted, they generate electricity without combustion, which means precise, real-time control of output by adjusting fuel flow. With no spinning components or mechanical lag, they respond at least twice as fast as rotating generators when stepping up, and instantly when stepping down. When combined with supercapacitors, they reach 100% in milliseconds. Fuel cells also maintain high efficiency at partial load, making them ideally suited to handle the volatility and density of modern compute.

Direct GPU Testing

Llama 2 70B, Stable Diffusion v2, HPCG



The result: Responsiveness of fuel cells reduces the need for large battery systems and unlocks the computerized performance benefits of tightly packed, high density server clusters.

Fuel cells are at least twice as fast in following load variations than turbines and engines.

Community-Aligned

Power built to be a good neighbor

Community resistance is becoming a major barrier to data center growth. Concerns about air pollution, noise and aesthetics loom large, but many communities are also worried about the impact on their own rates and power reliability. When data center operators use utility power, the needed grid upgrade costs can be passed on to all ratepayers.

With islanded fuel cells, the data center is separate from the local power grid and assumes the cost of its own power, protecting local customers from higher utility bills. Where grid connections exist, fuel cells can enhance stability through services like frequency regulation and demand response, turning data centers into grid assets rather than a drain on local power resources.

Non-attainment zone friendly

With its superior emissions profile, Bloom is ideal for regions with strict air rules, currently communities where 48.5% of U.S. data center capacity is located.

Looks and environmental impact matter too. Fuel cells don't need transmission lines or substations, which helps keep space open. They are compact and quiet (about 65 dBA), making them easy to fit in. With no combustion and near-zero emissions of NOx and SOx, fuel cells are far more likely to win community support.

The result: Cleaner, lower impact power that communities can support.

The Only Power Move

AI is reshaping the global economy, along with the power solutions that come with it.

For decades, gas turbines and engines served as the workhorses of industrial growth. But the future won't be won on legacy infrastructure any more than a Formula 1® race can be won by a Clydesdale.

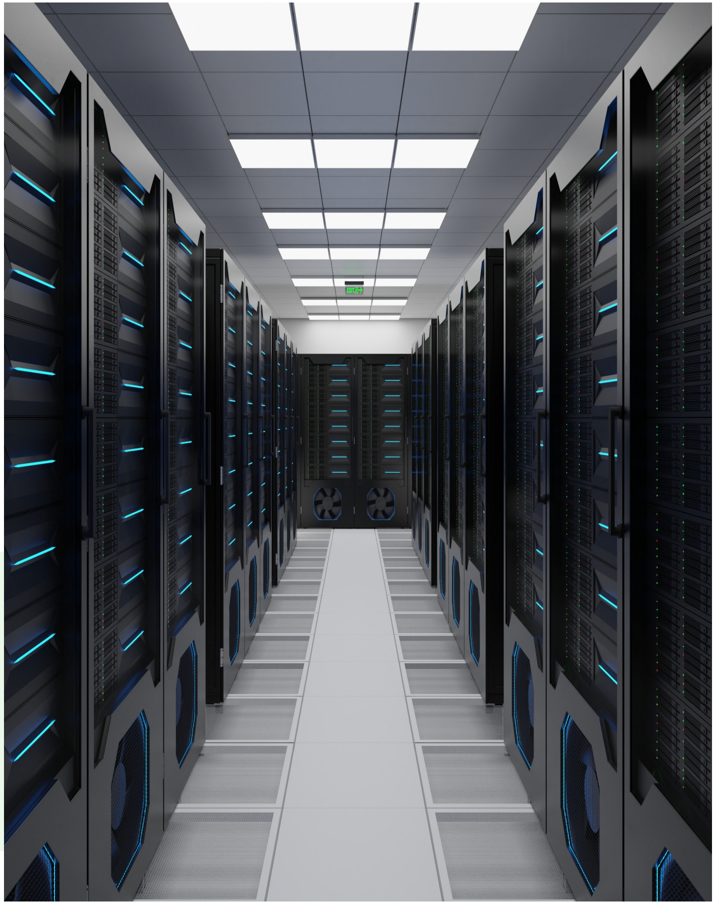
Today's race requires something different: reliable, clean, and cost-effective onsite power that can be deployed quickly and keep pace with AI's demands.

Fuel cells have reached maturity at exactly the right moment. With proven performance, rapid deployment, cost efficiency, and reliability, they remove the trade-offs that once defined onsite power generation.

As AI reshapes the global economy and entire industries, power will be the deciding factor. The advantage will go to those who rethink the model and shape the future on their own terms.

Get the full briefing on how Bloom Energy's fuel cell technology can help your business stay ahead.

Bloomenergy.com/fuel-cell-whitepaper



Questions to ask your team

Cost

Are we still using yesterday's cost model?

Are we basing our decisions on legacy power pricing assumptions?

Do our current models reflect current realities: supply chain risk, infrastructure delays, fuel prices, requirements for overbuild?

Time to Power

Can we afford to wait for grid power?

When will we need power at key sites? Which solutions have been explored to shorten power delivery timelines?

How confident are we that our energy supply agreements will not be delayed? What is our backup plan?

What is our business case for accelerating time to power? How much is a 6- month acceleration worth to our business? 12 months?

Reliability

Where is power reliability a business-critical risk?

Which sites or operations would materially suffer from outages or power instability?

Under what conditions would our current systems fail to maintain full operational performance?

Which solutions have we evaluated as a hedge for these vulnerabilities?

Sustainability and Community Impact

Does our power strategy advance our sustainability goals or stall them?

How does our current plan align with our sustainability and community commitments?

How are we accounting for emissions, air quality, noise, and community impact?

What are our risk-mitigation plans? What solutions would make us a 'good' neighbor?

AI Readiness

Are we building a power platform that can keep pace with AI demands?

How does our infrastructure perform when faced with sustained, spiky, high-density loads?

Are we making long-term bets on energy storage systems (like batteries) that weren't designed for continuous or load-following performance?

Can our platform evolve as technologies and regulations change —e.g., integrating carbon capture, switching to DC power.

About Bloom Energy

Bloom Energy is the world leader in fuel cell power generation by market share. With nearly 1.5 GW of systems deployed in 1,200+ locations and 9 countries globally, the company's fuel cells provide ultra-resilient, highly scalable onsite electricity generation for Fortune 500 companies around the world, including data centers, AI infrastructure, large utilities, and other commercial and industrial sectors.

Data Center Customers Include:

aws, intel, ORACLE, PayPal, ebay, CoreWeave, EQUINIX, AT&T, NOKIA, verizon, CORESITE An American Tower Company

Commercial & Industrial Customers Include:

Walmart, The Home Depot, CONAGRA BRANDS, Quanta Computer, FedEx, Ferrari, Owens Corning, Kellanova, Taylor Farms, COHERENT, Medtronic

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