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STATE OF THE GRID

QUARTER 4, 2025

Connecting the dots for a smarter energy future.
Expert consulting services tailored to utilities and their vendors, focusing on Smart Grid and System Operations.

IN THIS ISSUE

Welcome to our newsletter!

The final months of 2025 underscored a clear message: the grid is entering a new era of scale, complexity, and opportunity. There's no shortage of change across the energy sector, and this quarter was no exception. We've curated the developments, conversations, and emerging ideas that will shape utility planning and grid modernization in 2026 and beyond. Happy reading!

INDUSTRY EVENTS AND INFORMATION

DistribuTECH (DTECH) 2026

February 2-5 in San Diego, CA

DistribuTECH (DTECH) International is a premier transmission and distribution event that brings together utilities, technology providers, and policymakers to explore grid modernization, automation, DER integration, cybersecurity, and sustainability. With 800+ exhibitors and a robust conference program, DTECH fosters collaboration and innovation to advance reliable, resilient, and future-ready energy systems worldwide. Dr. Vadari and JD Hammerly will represent MGS at the event. More info here.

POWERGEN 2026

January 20-22 in San Antonia, TX

POWERGEN International unites power producers, utilities, and innovators to explore renewables, distributed generation, and grid modernization. This premier networking hub showcases cutting-edge solutions driving the transition toward cleaner, more resilient energy systems. More info here.

Top *L-R: KVIIT Principal Shri R. N. Sendhil Kumar; Prof. S. Aniruddhan, EE Dept, IIT Madras; Dr. Vadari (more photos on pg 7)*
Bottom *L-R: Dr. Vadari, Lee Krevat*

CERAWeek 2026

March 23-27 in Houston, TX

CERAWeek 2026 convenes global leaders to explore clean energy innovation, smart grids, electrification, and climate solutions. Through executive sessions and the Innovation Agora, the event fosters collaboration and strategies to advance resilient, sustainable, and future-ready electricity systems worldwide.
More info here.

IEEE PES Energy & Policy Forum

March 23-26 in Washington, DC

The IEEE PES Energy & Policy Forum brings together policymakers, utilities, and researchers to address grid reliability, affordability, and innovation. This forum bridges technical expertise and regulatory strategy to shape a secure, resilient, and abundant energy future.
More info here.

FROM IIT TO THE ENERGY TRANSITION: CONVERSATIONS WITH DR. VADARI

Dr. Mani Vadari, President of Modern Grid Solutions, recently returned to Chennai to celebrate the 40th anniversary of his alma mater, KVIIT (Kendriya Vidyalaya, IIT Madras) alumni association. During the visit, he reconnected with fellow alumnus and UW graduate Prof. Aniruddhan Sankaran, toured the Electrical Engineering department's modernized machines lab, and met with current KVIIT principal Shri R. N. Sendhil Kumar to reflect on the school's legacy under the leadership of Smt. Visharada Hoon and now. He also joined an alumni podcast highlighting the institution's impact across generations. Watch the episode: https://youtu.be/_--vMBF5660?si=OvcuKjlAIJ7HHNnR

Next, Dr. Vadari joined The Climate Champions for a dynamic conversation with host Lee Krevat on what it really takes to build the modern grid. Mani breaks down the industry's biggest challenges and opportunities—from accelerating the clean-energy transition to strengthening resilience and reliability—while offering a clear-eyed view of where utilities must go next. It's an insightful, forward-looking discussion from the President of Modern Grid Solutions. And as a bonus, stay to the end for Lee's unexpected custom rap inspired by Mani's work. Watch the episode: https://climatechampions.podbean.com/e/dr-mani-vadari-president-modern-grid-solutions-episode-164/

M&A

Constellation receives FERC approval for Calpine acquisition

Constellation Energy has secured regulatory clearance from the US Federal Energy Regulatory Commission (FERC) for its planned $16.4bn acquisition of Calpine. This marks the latest regulatory endorsement following approvals by the New York State Public Service Commission and the Public Utility Commission of Texas. The transaction, initially announced in January 2025, is anticipated to conclude in Q4 2025, pending approval from the Department of Justice and other standard closing conditions. Read more.

MacLean Power Systems and Power Grid Components joining forces

MacLean Power Systems (MPS) and Power Grid Components (PGC), two leading manufacturers of engineered components and solutions for electrical transmission, distribution, substation and communication infrastructure, announced the signing of definitive agreements to merge and recapitalize MPS. This, through Blackstone investment, brings together two complementary suppliers of critical equipment for the U.S. power grid. Read more.

Blackstone to acquire TXNM Energy

Blackstone Infrastructure reached a unanimous settlement with stakeholders to acquire TXNM Energy, the parent of Texas-New Mexico Power Company (TNMP), in an $11.5 billion deal. This marks one of the largest recent private equity moves into regulated U.S. utilities. Read more.

Eaton buys Resilient Power Systems

Eaton has completed its acquisition of Resilient Power Systems Inc., a Texas-based developer of solid-state transformer (SST) technology with applications in grid modernization, electric vehicle charging, and data centers. Resilient's technology delivers higher power density in a smaller footprint than conventional solutions, helping utilities and developers reduce costs, increase efficiency, and improve power reliability. Read more.

Blockfusion to be acquired by Blue Acquisition

Blockfusion, an operator of renewable-energy data centers designed to transform Bitcoin production,

reached a definitive agreement to be acquired by Blue Acquisition for an undisclosed amount. Blockfusion delivers clean, reliable and production-ready power and infrastructure with 46MWs currently energized and operating. The Company is transitioning to become a next-generation HPC/AI data center in accordance with detailed development plans already prepared over a 20-month period alongside industry-leading architectural, design and engineering partners. Read more.

GE Vernova to fully acquire Prolec GE joint venture

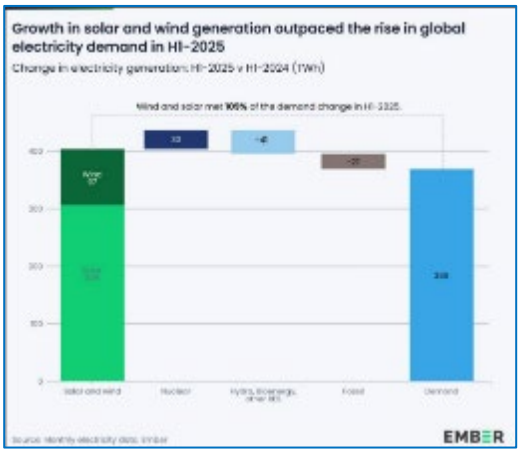
GE Vernova Inc. announced it will acquire the remaining 50% stake in Prolec GE, its unconsolidated joint venture with Xignux. GE Vernova said it would pay $5.28 billion to acquire the 50% stake it does not already own in transformer-maker Prolec GE, as the artificial intelligence boom fuels demand for grid equipment. The purchase from joint venture partner Xignux would be funded equally between cash and debt and is expected to close by mid-2026, subject to regulatory approvals. Read more.

Electron to acquire Rythmos.io to boost grid capacity

Electron has announced plans to acquire Rhythmos.io, a developer of distributed energy resource (DER) detection and grid analytics technology. The deal combines Rhythmos' grid-visibility tools with Electron's flexibility marketplace platform, enabling utilities to better identify, measure, and manage DERs such as EVs, batteries, and rooftop solar. The acquisition aims to help utilities expand grid capacity affordably while deferring costly infrastructure upgrades. Read more.

KEY HIGHLIGHTS

Global solar and wind surpass coal



For the first time, solar and wind power outpaced coal in global electricity generation during the first half of 2025, according to Ember. The shift marks a turning point where clean energy is growing fast enough to meet rising demand, driving declines in coal and gas output. The IEA projects renewable capacity will double in the next five years, with solar accounting for 80% of that growth, though U.S. expansion is expected to slow due to policy and local restrictions. Read more.

U.S. oil output hits record high

The EIA's December Short-Term Energy Outlook projects U.S. crude oil production at 13.61 million barrels per day, the highest on record. This surge underscores America's role in global supply, even as concerns mount over a potential glut. Analysts note that while record output strengthens U.S. energy security, it also raises questions about balancing fossil fuel growth with climate commitments. Read more.

Five mega-trends reshape energy, per Wood Mackenzie

Wood Mackenzie identifies five defining forces: U.S. LNG dominance, rare earth geopolitics, European petrochemical decline, AI-driven power demand, and uncertainty in the UK North Sea sector. Together, these trends illustrate the interconnected nature of energy markets. They also highlight how technology, geopolitics, and climate policy are converging to reshape investment strategies worldwide. Read more.

Utilities expand virtual power plants and demand response

The NC Clean Energy Technology Center's *50 States of Grid Modernization Q3 2025* report found that 45 states plus D.C. and Puerto Rico took grid modernization actions in the last quarter. The most notable trend: utilities are scaling virtual power plants (VPPs) and demand response programs to improve flexibility and resilience. By aggregating rooftop solar, batteries, and smart devices, VPPs provide dispatchable capacity that reduces reliance on peaker plants. This distributed intelligence is becoming a cornerstone of utility planning as electrification accelerates. Read more.

States embrace advanced transmission technologies

Electricity demand in the U.S. is projected to rise 25% by 2030, putting immense strain on existing infrastructure. To ease congestion without waiting a decade for new transmission lines, states are turning to advanced transmission technologies (ATTs) such as dynamic line ratings, topology optimization, and advanced conductors. These tools allow utilities to unlock hidden capacity in existing lines, boosting efficiency and reliability while deferring costly new builds. The shift from pilot projects to policy adoption signals a new era of pragmatic modernization. Read more.

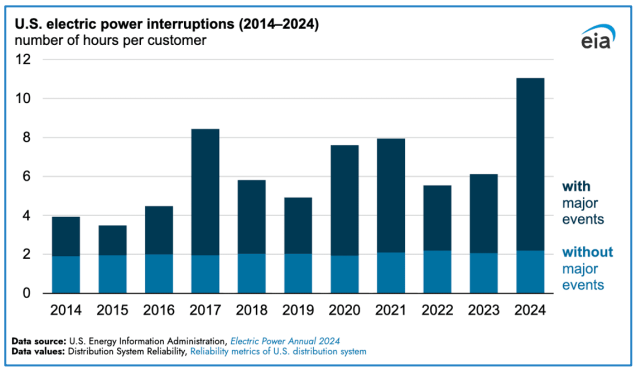
DOE invests $1 billion in critical minerals

The Department of Energy announced over $1 billion in funding to boost U.S. research and processing of rare earths and critical minerals, aiming to reduce reliance on imports and strengthen domestic supply chains. These materials are essential for batteries, wind turbines, and other clean energy technologies. The initiative is seen as a strategic move to counter China's dominance in global mineral supply. Read more.

MIT study on grid expansion trade-offs

A December MIT study examined U.S. grid expansion strategies, weighing reliability, cost, and emissions impacts of different approaches. Researchers compared regional renewable-focused expansion with nationwide interconnections, finding trade-offs between affordability and resilience. For example, inter-regional transmission could unlock vast wind resources in the Midwest, but requires complex coordination and higher upfront costs. The study underscores that utilities must plan for both near-term upgrades and long-term resilience, balancing competing priorities in a rapidly evolving energy landscape. Read more.

Hurricanes drive worst U.S. outage hours in a decade



The EIA reports that U.S. electricity customers experienced an average of 11 hours without power in 2024—the highest in ten years. Hurricanes Beryl, Helene, and Milton accounted for nearly 80% of total outage hours, with South Carolina residents facing the longest interruptions at 53 hours. While some states averaged less than two hours of downtime, the data underscores how extreme weather is now the dominant driver of reliability metrics, pushing utilities to accelerate resilience investments. Read more.

Global grid investment tops $470 billion

BloombergNEF reported in December that global grid investment surged 16% in 2025, reaching over $470 billion for the first time. Rising equipment costs and inflation contributed, but the bulk of spending reflects urgent efforts to connect renewables, electrify transport, and power data centers. For utilities, this signals intensifying competition for capital and supply chain resources, as grid infrastructure becomes the bottleneck of the energy transition. The report highlights that even record spending may not fully eliminate delays in connecting new generation. Read more.

IRENA and industry leaders unveil grid modernization blueprint

In September, a coalition of power sector companies released a global blueprint for grid infrastructure upgrades, coordinated with IRENA. The plan emphasizes integrating 11.2 terawatts of renewable capacity by 2030, tackling bottlenecks in transmission expansion, and aligning investment with decarbonization targets. Networks today are not expanding fast enough to meet demand, and the blueprint calls for streamlined permitting, coordinated financing, and smarter grid technologies. Utilities worldwide are expected to play a central role in executing this roadmap. Read more.

Data centers drive grid bottlenecks

A December analysis highlighted how data centers' rising power demand is straining grids, alongside tariff disputes and infrastructure delays. AI and cloud services are driving unprecedented load growth, forcing utilities to accelerate modernization while balancing affordability and reliability. Senators have already pressed tech giants to explain how they will prevent data center projects from raising household bills. This trend is reshaping utility planning priorities, as one new facility can consume as much power as a mid-sized city. Read more.

DOE directs FERC to standardize large load interconnections

In October, the U.S. Department of Energy invoked Section 403 of the Federal Power Act to direct FERC to create standardized procedures for connecting large electricity loads (20 MW+) such as AI data centers and industrial facilities. The framework will mirror generator interconnection rules, requiring readiness deposits, cost responsibility for upgrades, and expedited studies for flexible loads, with a final rule expected by April 30, 2026. Read more.

FERC approves PJM plan to streamline DR connections

Also in October, FERC approved PJM's proposal to simplify how distribution-level resources under 5 MW—including rooftop solar, batteries, and small DERs—connect to the transmission system. The reform reduces administrative hurdles, shortens wait times, and lowers costs, enabling faster deployment of distributed resources while maintaining reliability and expanding customer participation in wholesale markets. Read more.

Michigan regulates data center energy demands

In November 2025, the Michigan Public Service Commission approved new tariff rules for Consumers Energy to manage the surge in large data center loads. The order requires long-term contracts of 15+ years, upfront fees, and environmental standards, ensuring that data centers fully cover the costs of grid upgrades while preventing other ratepayers from subsidizing these massive energy users. This landmark decision adds financial and operational safeguards as Michigan positions itself to host a growing wave of energy-intensive facilities. Read more.

FEATURED ARTICLE

PLANNING FOR POWER IN THE AGE OF AI:

WHY UTILITIES AND DATA CENTER DEVELOPERS NEED EACH OTHER

By Dr. Mani Vadari, President, Modern Grid Solutions

Global data center demand is surging, driven largely by generative AI. Boston Consulting Group projects a 16% annual growth rate through 2028, reaching roughly 130 GW[1]. This growth is reshaping the relationship between utilities and data center developers—two groups often portrayed as misaligned, but in reality, navigating the same challenge from different angles.

Utilities: Reliability Requires Deliberate Planning

Utilities aren't slow—they're deliberate. The grid is a long-lead, highly regulated system designed to serve entire communities, not just the fastest-growing customers. When a utility commits to a multi-hundred-megawatt or multi-gigawatt load, it must ensure reliability for every school, hospital, and household already connected.

That requires multi-year transmission and distribution upgrades, regulatory approvals, and coordination across regional and federal entities. Planning horizons for major infrastructure now extend 10 to 20 years[2]. These timelines aren't arbitrary—they're designed to prevent cascading risks and avoid stranded assets that ultimately fall to ratepayers.

Speculative or duplicative interconnection requests—what utilities call Phantom Data Centers—further complicate planning. When developers submit multiple applications across regions to hedge risk, utilities struggle to distinguish real demand from noise. Overbuilding for phantom load is costly; underbuilding threatens reliability. Utilities need clarity, not volume.

Developers: Speed is the Competitive Advantage

For developers, the urgency is real. Data centers are now the backbone of cloud computing, AI training, and global

digital competitiveness. While U.S. utilities work through multi-year planning cycles, other countries offer faster timelines, aggressive incentives, and turnkey infrastructure. A 36-month energization delay in the U.S. versus 18 months abroad can shift market share and slow innovation.

Before construction even begins, developers must navigate land siting, zoning, water sourcing for cooling, fiber access, environmental permitting, and long equipment lead times—transformers and switchgear can take 18 to 20 months to procure. Electricity is just one piece, but it is often the bottleneck.

AI Data Centers are Different

AI training loads are massive and variable. During training, GPUs can consume hundreds to thousands of megawatt hours; during inference, consumption drops significantly. These swings challenge traditional utility planning and can create grid-level instability if unmanaged.

Recent research warns that power fluctuations at the rack, facility, and grid levels can risk instability and mechanical failure[3]. Developers are exploring solutions such as staggered scheduling, asynchronous training,

[1] Boston Consulting Group (BCG), global data center power demand forecast, 2023–2028.

[2] FERC transmission planning guidelines and long-term planning horizons (10–20 years).

[3] Power Stabilization for AI Training Datacenters, arXiv:2508.14318v2 (Aug 2025).

and overlapping compute and communication, but they need utilities at the table to ensure grid compatibility.

Where the Perspectives Meet

Despite the tension, both sides want the same thing: reliable, scalable, cost-effective power.

Developers don't need gigawatts on day one. Many are willing to start smaller and ramp over time, giving utilities room to plan. Utilities, for their part, are modernizing planning processes and accelerating study cycles.

The opportunity lies in alignment, not acceleration alone.

A Shared Path Forward

1. **Co-design scalable solutions** that match realistic buildout timelines.
2. **Share forecasts and grid specifications** openly to reduce uncertainty.
3. **Develop power-aware AI training methods** to reduce grid stress.
4. **Engage regulators jointly** to streamline permitting in preferred development zones.
5. **Support industry forums** to standardize telemetry, load signaling, and grid-stability practices.

Conclusion

The AI era is arriving fast. GPU power consumption is doubling in short cycles—recent generations have jumped from 250W to 700W to 1,200W, with the next expected to reach 2,700W[4]. The demand curve is steep, and the stakes are high.

Utilities must protect reliability. Developers must move at market speed. Both perspectives are valid—and both are essential.

The future of digital infrastructure won't be powered by pressure. It will be powered by partnership.

This condensed piece draws from two full articles published in Dr. Vadari's blog, Watts on Mani's Mind, which you can find on the Modern Grid Solutions website.

[4] Beth Kindig, "AI Power Consumption: Rapidly Becoming Mission Critical." Forbes, June 20, 2024; see also Scott Guthrie,

FEATURED ARTICLE

TO IRP OR NOT TO IRP:

RETHINKING THE QUESTION FOR A MODERN GRID

By Dr. Mani Vadari, President, Modern Grid Solutions and
Catherine Koch, Principal, Reimagine Energy Consulting PLLC

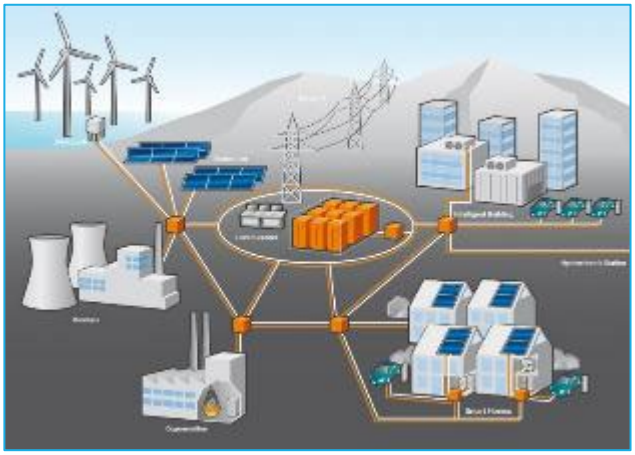
The grid is changing faster than ever before. Demand is surging from data centers, electric vehicles, and building electrification. Technologies are evolving at breakneck speed, like solar + storage, hydrogen, small modular reactors, and vehicle-to-grid, which are reshaping the landscape. Policy mandates are tightening, equity concerns are rising, and the stakes have never been higher. All of this is forcing the utility industry to reevaluate the Integrated Resource Plan (IRP) analysis process.

The traditional IRP, with its 20-year horizon and multi-year update cycle, was built for a slower era. It answered questions about coal and nuclear plants that took decades to build. But today, the IRP risks becoming a relic—too static, too siloed, too slow.

The question is no longer whether to IRP. The question is how to transform it into an integrated, agile, inclusive process that considers deliverability. Into a tool that enables action rather than delays it. Into a framework that reflects stakeholder priorities and equity realities. Into an ISP: an Integrated System Plan.

Setting the Context: What Was the IRP Intended to Do?

Originally, the IRP was designed to guide long-term utility investments by forecasting load growth, evaluating resource options, and ensuring cost-effective, reliable service. It offered a directional roadmap—often over 20 years and updated every 2 years—highlighting marginal needs that could be met through market purchases or new generation. The 20-year horizon was important because building a new coal or nuclear power plant took a long time from the time of conception to coming online and generating power. A 20-year plan helped answer questions about the asset's cost-effectiveness over its life. As coal began its decline in the late 2000s, IRPs gained new significance in shaping the future energy mix, especially as renewables emerged as viable and cost-effective alternatives.



"Smart Grid" by Milos Krivan, at Wikimedia Commons, under CC0 1.0

Where IRPs Fall Short

An additional issue is that most IRPs are performed from the perspective of the individual utility, with links to other utilities via power market purchases and sales. All resources and transmission lines are analyzed for the utility performing the IRP. With grid electrification and a high reliance on renewables, many utilities will need to bring wind and solar from remote locations via HV transmission lines. There are scale economies in regional planning for such resources and HV transmission lines; if utilities coordinate planning, the results could be lower-cost resources and HV transmission.

Another issue to consider is the structure of the "IRP Advisory Committees". The utility IRP process requires robust public involvement and must include a group of individuals with expertise in the field, but with no conflict of interest in the outcome of the proceeding.[1] Too often, advisory committees devolve into lobbying forums. What's needed instead is a panel of independent experts

[1] https://www.bakerinstitute.org/research/texas-crez-lines-how-stakeholders-shape-major-energy-infrastructure-projects

who can advance integration rather than protect incumbency. Key questions come from this:

- Are the engagement models of the current IRP wasting stakeholders' time by developing plans that are likely not what will be implemented (based on RFPs)?
- Are they helping to inform the advancement of technologies, integration, or positional platforms?

These shortcomings set the stage for why the IRP must evolve.

What Has Changed?

Against this backdrop, the energy landscape itself has transformed. Today's energy environment is defined by volatility and innovation. Load growth is no longer steady; it's changing in fits and surges as new needs emerge due to data centers[1], transportation, and building electrification. Resource costs are fluctuating rapidly. Technologies like solar + storage, vehicle-to-grid (V2X), hydrogen, and small modular reactors (SMRs) are reshaping the grid, forcing utilities to rethink their generation mix. Meanwhile, equity and locational impacts demand more granular analysis than traditional IRPs can offer.

The market itself has become a double-edged sword: while it enables flexibility, it also introduces risk. Utilities must act swiftly to secure resources, or competitors[2] will outpace them. The IRP's multi-year analysis cycle often lags behind real-time opportunities, leading to delayed decisions and rework.

Lastly, a new dimension has emerged – deliverability. Very often, these new sources, renewable or otherwise, are either outside the utility's core jurisdiction or require new/updated transmission and/or distribution delivery mechanisms to bring the energy from the source to the delivery point.

What Does the Future Portend?

The future demands a planning paradigm that is integrated, agile, and inclusive. Enter the Integrated System Plan—known variously as the Integrated Grid Plan or similar frameworks—which considers distributed energy resources (DERs), transmission and distribution (T&D) planning, and locational equity in tandem. It's not just about forecasting, it's about enabling.

Utilities must also grapple with cross-sector challenges. Electrification of natural gas systems, for instance, requires coordination between gas and electric IRPs. Without integrated modeling, trade-offs and synergies are overlooked, and the resulting plans fail to achieve holistic energy solutions.

What Do We Need?

We need a planning process that:

- Delivers locationally specific resource mixes and builds on prior analyses rather than starting from scratch
- Engages stakeholders meaningfully—with both diverse voices and technical expertise
- Integrates gas and electric planning across shared horizons to capture trade-offs and synergies
- Enables real-time modeling and iterative refinement to keep pace with market shifts
- Completes within a year, ensuring decisions are timely and actionable
- Ensures reliability and integrity of both resources and the system
- Includes full transmission and distribution costs alongside system reliability metrics
- Aligns regulatory outcomes with stakeholder intent—not just procedural compliance
- Measures equity benefits and burdens based on geography and resource type
- Provides transparency in assumptions, criteria, and enablement costs
- Provides opportunities to share data across utility boundaries and considers cross-utility acquisitions for scaling benefits and decreasing costs.

Where Do We Go From Here?

To keep pace with change, utilities must rethink the IRP not as a static document but as a dynamic process. Advisory committees must evolve beyond self-interest

[1] Learn more about data centers in the September and October Watt's on Mani's Mind articles.

[2] The competitor in this case could either be another utility or a data center developer.

to become forums of expertise and collaboration. Regional coordination, such as Texas's CREZ initiative and reforms like FERC Order 2023[1], can unlock scale economies and accelerate the integration of renewable energy.

Ultimately, the IRP must transform from a compliance exercise into a strategic enabler for utilities, regions, and regulators. It must inform, not impede action. It must reflect, not obscure, stakeholder priorities. And it must empower, not delay, the transition to a modern, equitable, and resilient grid.

In short, the IRP must become the ISP.

[1] https://www.ferc.gov/explainer-interconnection-final-rule

WATT'S on MANI'S MIND?

GRID ACCESS FOR LARGE LOADS:

FERC'S ANOPR IS A NECESSARY STEP, BUT THERE ARE CAVEATS

By Dr. Mani Vadari, President, Modern Grid Solutions

The Urgency of Grid Evolution

The Federal Energy Regulatory Commission's (FERC) Advance Notice of Proposed Rulemaking (ANOPR) to standardize interconnection procedures for large electrical loads—particularly data centers and advanced manufacturing—is a long-overdue response to the seismic shift in energy demand. With AI, cloud computing, and industrial electrification surging, the grid must evolve to accommodate these loads swiftly, reliably, and fairly.

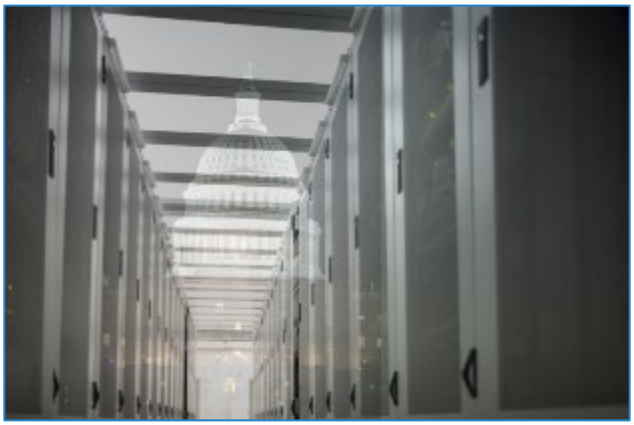
What's in the FERC ANOPR

FERC issued this ANOPR following a Department of Energy directive to ensure that large-load projects, such as data centers, can connect in a timely, orderly, and nondiscriminatory manner. The rule is meant to address rising demand and fill a regulatory gap, since FERC has historically not overseen load interconnection.[1]

The Rise of AI Data Centers

Data centers house the computing power behind everything from processing to storage. Increasingly, they have become the epicenter of artificial intelligence and machine learning. These AI Factories are purpose-built for machine learning and inference workloads. The recent surge in electricity demand is driven by these AI data centers, which are distinct in their energy profile[2]: during training (learning mode), they consume immense computing power, requiring hundreds to thousands of megawatt-hours. Once models are deployed (operating mode), consumption drops significantly. Yes, we're only at the dawn of the AI revolution, still only scratching the surface of the 'art of the possible[3]. The exponential growth of AI data centers is just beginning, with demand poised to accelerate far beyond today's scale.

Power and Transmission Challenges



Meeting this demand requires a significant amount of power and transmission capacity to deliver it from its source to its destination. FERC is working with utilities and uses the gavel of federal legislation to improve the situation – and this ANOPR is one of the arrows in its arsenal.

Why Standardization Matters

The current patchwork of regional interconnection rules creates uncertainty, delays, and inefficiencies. Developers face vastly different timelines and cost structures depending on their geographical location. While many of these companies have a global footprint and accept that regulations vary from country to country, they would benefit from a unified national approach within the U.S. A standardized framework could streamline processes, reduce bottlenecks, and unlock investment in critical infrastructure. It would also support a coherent national strategy to maintain U.S. leadership in this rapidly expanding sector.

Reliability and Equity Cannot Be Sacrificed

Reliability must be paramount, especially given the variability in power consumption within a single data center (see figure below). This need for speed must not come at

[1] McGuireWoods LLP. "FERC Establishes Proceeding to Consider DOE Directive on Large Load Transmission Interconnection Rulemaking." McGuireWoods Alerts, October 2025.

[2] Numerous authors. "Power Stabilization for AI Training Datacenters." arXiv preprint, August 2025. arXiv:2508.14318v2.

[3] Beth Kindig. "AI Power Consumption: Rapidly Becoming Mission Critical." Forbes, June 20, 2024.

the expense of equity or reliability. State regulators and consumer advocates rightly warn that fast-tracking, high-variability, large loads could saddle existing ratepayers with upgrade costs or compromise grid stability. The ANOPR must include safeguards to ensure that cost allocation is transparent and equitable and that reliability studies are rigorous rather than rubber-stamped.

Rethinking Large Loads as Grid Partners

Large loads should not be treated as passive consumers. Many data centers are co-located with generation or storage assets. FERC should adopt hybrid interconnection models that enable these facilities to contribute flexibility and resilience to the grid, rather than just drawing from it.

Defining Priorities for the Future

Ultimately, this rulemaking presents an opportunity to reassess what constitutes a "priority." Here are a couple of key questions we should be asking:

- Should AI data centers receive expedited access over community solar or electrified transit hubs?
- Should speculative crypto operations be treated the same as mission-critical public infrastructure?

FERC must define criteria that reflect societal and commercial value, not just load size.[1] [2]

The Path Forward

The ANOPR is a vital step toward modernizing interconnection policy. But it must be guided by principles of fairness, transparency, and strategic foresight. We need a grid that's not only larger but also smarter, cleaner, affordable, and more inclusive.

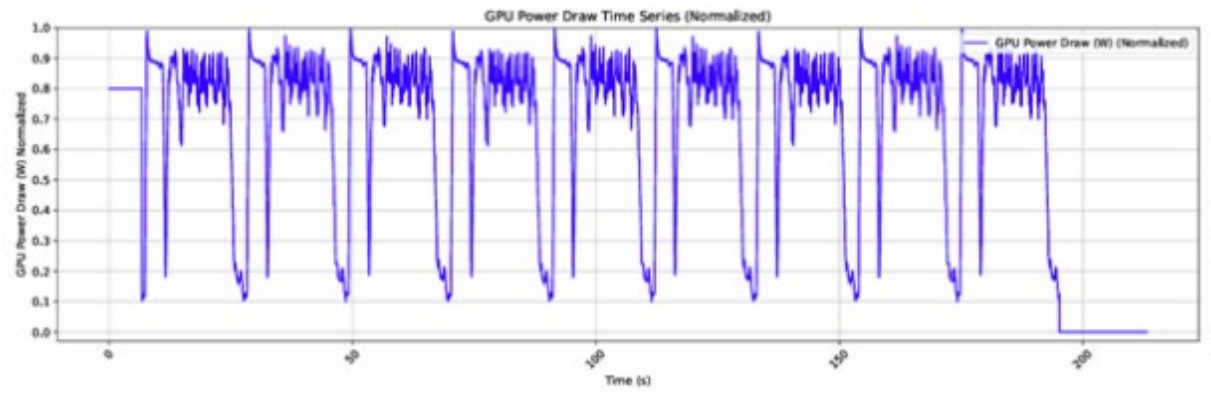


Figure 1: Power consumption profile from an at-scale AI training job on DGX-H100 racks, illustrating the extreme variability in load during machine learning training. This variability underscores the importance of rigorous reliability studies in FERC's interconnection framework.

Keep an eye out for "The Great Electricity Squeeze: How Utilities Can Navigate Large-Load Interconnection Trade-Offs," in the next installment of *Watt's on Mani's Mind*. *In this post,* Mani Vadari is joined by JD Hammerly to offer a sharp, actionable playbook for utilities under pressure. Large-load interconnections are arriving faster than traditional planning cycles can handle, and this piece lays out how utilities can turn that squeeze into a strategic advantage.

[1] Modern Grid Solutions. "Planning for Power: What Data Center Developers Need to Know." Watt's On Mani's Mind.

[2] Modern Grid Solutions. "From Vision to Voltage: What Data Center Developers Need Utilities to Understand." Watt's On Mani's Mind.

DID YOU KNOW...

AI Data Centers Can Double Local Peak Demand?

As artificial intelligence accelerates across industries, hyperscale data centers are becoming one of the most energy-intensive parts of the grid.[1,2] These facilities don't just resemble traditional IT hubs—they consume power at the scale of small cities. A single large data center can use as much electricity as 50,000 homes, and clusters of AI-driven facilities may double local peak demand in some regions.

Fun Fact: *Data centers consumed an estimated 415 TWh of electricity in 2024—about 1.5% of global use, and demand has grown 12% annually over the past five years.*[3]

This rapid growth creates unique challenges for utilities. Data centers require continuous, high-quality power with virtually no tolerance for interruptions. AI facilities are especially complex: during training, they draw hundreds to thousands of megawatt hours, while consumption drops sharply once models move into deployment. These swings reshape local load curves and force utilities to plan transmission lines, substations, and new generation far earlier and much faster than traditional IRP cycles anticipate.

When well designed, however, the infrastructure built for data centers can also help utilities smooth load variations across daily, weekly, and seasonal patterns.

Regulators are beginning to respond. In November 2025, the Michigan Public Service Commission approved new tariff rules for Consumers Energy to manage the state's data center boom. The order requires 15-year contracts, upfront payments for grid upgrades, and compliance with environmental standards.[4] These measures ensure data centers cover their share of infrastructure costs rather than shifting them to other customers.

The financial stakes are high: grid upgrades for a single hyperscale facility can reach hundreds of millions of dollars. By requiring upfront payments and binding contracts, Michigan is setting a precedent for how utilities nationwide may handle the next wave of AI-driven demand.

Operationally, the rules also encourage data centers to align with broader sustainability goals, align growth with state decarbonization goals, and create opportunities for utility developer collaboration.

Looking ahead, AI-driven demand is expected to grow even faster. McKinsey estimates that U.S. data center energy use could nearly triple by 2030, reaching up to 11.7% of all electricity consumption.[5]

In short: AI data centers aren't just another load—they're reshaping the structure of electricity demand. With thoughtful financial, planning, and operational design and safeguards, states like Michigan are ensuring that digital innovation doesn't come at the expense of grid reliability or customer affordability.

[1] https://moderngridsolutions.com/watt_s_on_mani_s_min/from-vision-to-voltage-what-data-center-developers-need-utilities-to-understand/
[2] https://moderngridsolutions.com/watt_s_on_mani_s_min/planning-for-power-what-data-center-developers-need-to-know/
[3] https://www.iea.org/reports/energy-and-ai/energy-demand-from-ai
[4] https://www.michigan.gov/mpsc/commission/news-releases/2025/11/06/mpsc-approves-terms-of-service-between-consumers-energy-and-data-centers
[5] https://www.mckinsey.com/industries/private-capital/our-insights/how-data-centers-and-the-energy-sector-can-sate-ais-hunger-for-power/

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The guy (literally) wrote the books!

Dr. Vadari's books serve as widely-used textbooks in universities across the U.S. and beyond. Major utilities also favor them.

- ***Smart Grid Redefined: Transformation of the Electric Utility***
- ***Electric System Operations – Evolving to the Modern Grid. 2nd edition***
- ***Resiliency of Power Distribution Systems*** - Chapter 14, *Technology and Policy Requirements to Deliver Resiliency to Power System Networks,* by Dr. Mani Vadari, Gerry Stokes, and John (JD) Hammerly.
- ***Enhancing OMS Implementation Success Rates*** Our online book and e-book are coming soon. Stay tuned for more news on their release.

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