GridCARE

AI Data Centers as Engines of Affordability and Capital Investment

A quantitative framework for how utilities can turn the AI energy boom into affordability, investment, and national competitiveness

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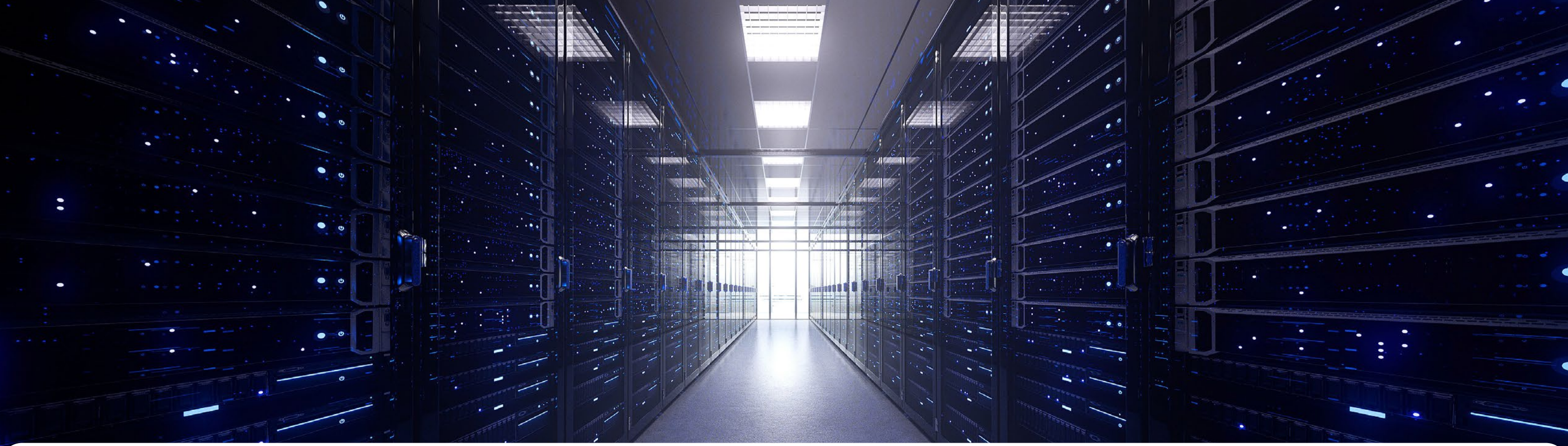


AI data centers represent the most significant opportunity for grid economics in a generation.

The key insight

Today's electric grid operates at less than 40% utilization for much of the year.[1] When AI data centers are interconnected strategically to leverage existing capacity, they don't strain the system—they optimize it. **By spreading fixed grid costs across substantially more kilowatt-hours, these AI facilities become catalysts for lower rates and accelerated infrastructure investment.**

Summary

The energy conversation surrounding AI has focused heavily on challenges: unprecedented demand, strained infrastructure, and concerns about rising costs.[2] Utilities nationwide face a trillion-dollar infrastructure modernization imperative while customers struggle with affordability.

However, a deeper look at utility economics reveals a different story—one of transformational potential for affordability and growth. Strategic data center interconnection offers a pathway to address both simultaneously—an outcome traditional utility planning treats as impossible. This is beneficial load growth at scale.

Our analysis of a 1 GW of data center deployment in a representative mid-sized electric utility with one million customers shows:

1. **Customer rates can decrease by nearly 5%**—providing tangible relief to millions of Americans.
2. **Over $1.35 billion in new capital investment becomes justifiable**—without any rate increases.
3. **Critical grid modernization accelerates**—funded by new revenue streams rather than ratepayer burden.

The question facing the industry is one of execution: **can utilities interconnect this new load fast enough, and intelligently enough, to capture the value?**

The Challenge

When Speed Meets Constraint

The New Reality Facing Utilities

Across North America, utilities are receiving interconnection requests unlike anything in their history: hyperscale AI data centers seeking gigawatts of capacity on timelines measured in months, not years. According to the latest numbers from Wood Mackenzie, US utilities have committed to serve a staggering **160 GW of new demand**, largely driven by data centers, equivalent to almost a quarter of today's demand.[3]

The collision between this demand and today's grid reality creates predictable—and painful—outcomes:

For Utilities	For Communities	For The Nation
• Interconnection queues stretching 3-7 years • Pressure to build multi-hundred-million-dollar substations and trans-mission upgrades • Regulatory scrutiny over cost recovery and rate impacts • Risk of stranded assets if load forecasts prove incorrect	• Rate increases to fund massive infrastructure buildouts • Lost economic devel-opment as data centers choose faster markets • Growing affordability crisis as fixed costs spread across fewer kilowatt-hours	• AI leadership migrating to regions with available power • Manufacturing and digital economy constrained by energy access • Billions in economic value unrealized

Designing for a New Paradigm

AI data centers operate on a fundamentally accelerated timeline. They need power immediately, not in ten years. They represent concentrated loads that dwarf traditional industrial customers. And they're mobile—willing to locate wherever they can get fast, reliable interconnection.

Utilities need a new approach. One that can find and deliver capacity now, validate that safety and reliability standards are met, and unlock economic value immediately.

The Opportunity

AI Data Centers as Engines of Economic Growth and Affordability

AI data centers do not need to overwhelm a utility's already constrained grid. In fact, today's grid operates at less than 40% utilization throughout much of the year. This means that if AI data centers can incorporate just modest amounts of flexibility into their operations, **the grid can absorb a tremendous amount of new load—up to 100 GW**, according to research from Tyler Norris.[4]

This is **beneficial load growth**: with the new load increasing the utilization of the grid, everyone's electricity costs go down.

This is fundamental utility economics. Electricity rates are, in large part, driven by the fixed costs of the grid divided by the amount of electricity consumed. If AI data centers are able to leverage the existing grid such that their consumption increases more than the fixed costs, then everyone's electricity rates will decrease.

Recent analyses have shown how this plays out in practice: a report from Lawrence Berkeley National Lab and The Brattle Group showed how states with higher load growth see lower electricity rates in part because of lower fixed system costs.[5]

Utility leaders are starting to recognize and build towards this type of beneficial load growth. In Portland General Electric's Q3 earnings call, CEO Maria Pope acknowledged how AI data center growth is "helping us spread fixed costs of our system across a larger base, supporting affordability for all customers."[6] Pacific Gas and Electric has published how a 1 GW increase in data centers in its service territory could decrease rates 1–2%.[7]

If AI data centers can leverage the existing grid, they can lower rates.

Current grid utilization: <40%

The Value Framework

From Contraint to Catalyst

We can create value through two transformational mechanisms that work together:

MECHANISM 1

Higher Asset Utilization = Lower Rates

When new load interconnects using existing infrastructure, something powerful happens: fixed costs get spread across more kilowatt-hours.

This is beneficial load growth in its purest form. The utility's transmission, distribution, and generation costs don't increase—but the energy delivered does. The result: **lower average costs for all ratepayers.**

Think of it like a highway: the cost of building and maintaining the road is fixed. Adding more vehicles during off-peak hours doesn't increase those costs—it just makes the infrastructure more economically efficient. We can do the same for the electric grid.

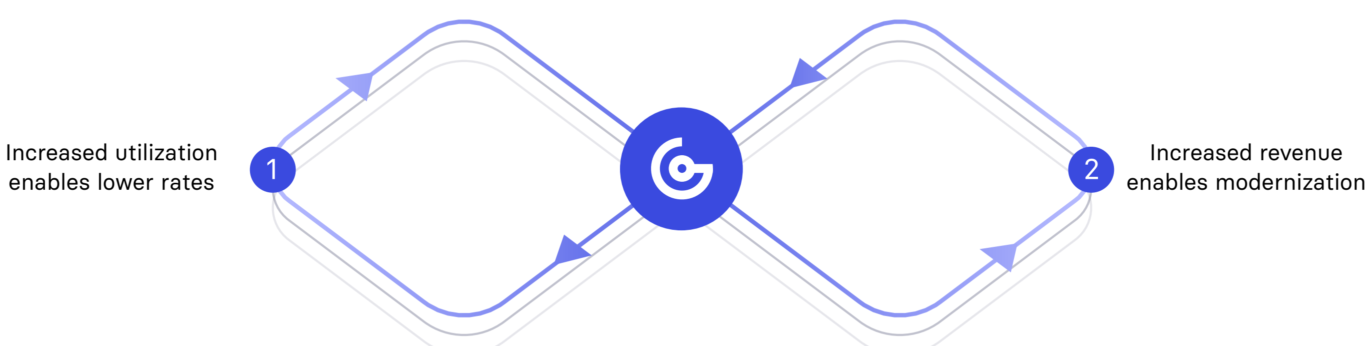
MECHANISM 2

New Revenue Enables Faster Infrastructure Modernization

The second mechanism is equally transformative: accelerated revenue allows accelerated investment—without raising rates.

Utilities face a trillion-dollar infrastructure modernization challenge: aging assets, climate resilience, renewable integration, and electrification. But with rising electricity costs hurting ratepayers across the country, justifying new capital expenditures are facing increased scrutiny.[8]

By unlocking new load and revenue now, utilities can justify and finance infrastructure improvements that would otherwise require rate increases or take years to approve.



The Result

A utility can simultaneously modernize faster and keep rates lower —outcomes that traditional planning treats as mutually exclusive.

Quantifying the Impact

A 1 GW Case Study

INTRODUCTION | LOWER RATES | ACCELERATED INVESTMENT | BALANCING BENEFITS

To make these benefits concrete, we modeled a representative case: **1 GW of AI data center load**[9] in a typical investor-owned utility service territory. We then examined how the utility's incremental earnings from this new load could be applied under three different scenarios. In the following sections, we walk through our analysis and the supporting calculations.

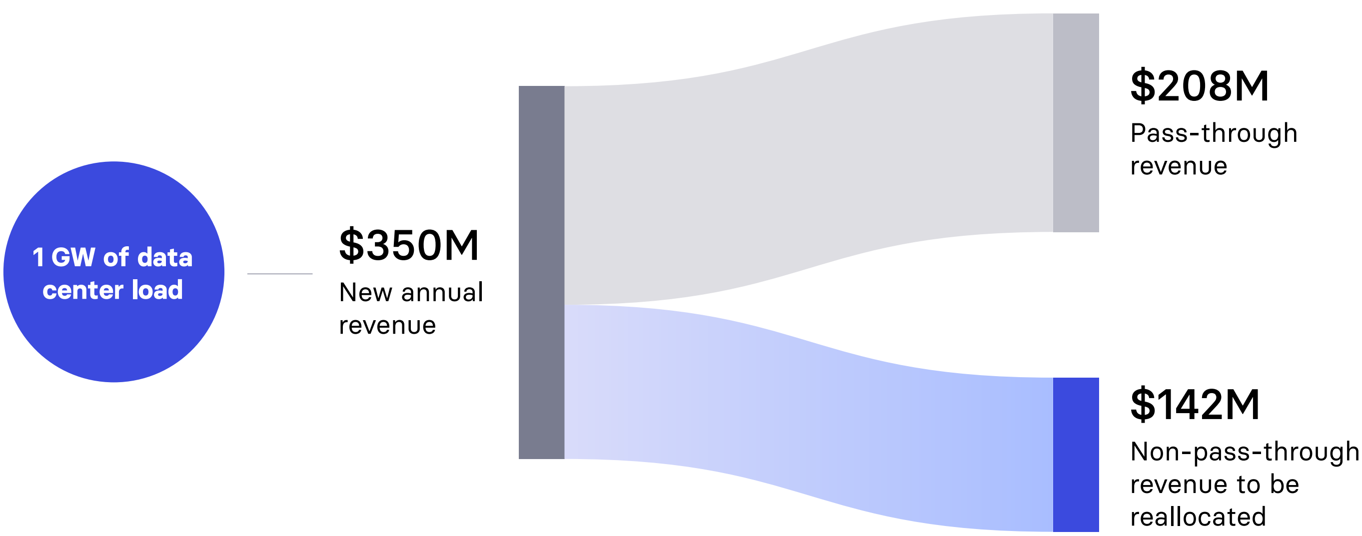
The Revenue Opportunity

First, we consider how much revenue this 1 GW of data center development would bring to the utility.

1 GW of new data center load operating at a 50% capacity factor consumes roughly **4.4 million MWh annually**.[10] Considering a typical large-load tariff of $0.08 per kWh, the additional data center development would generate approximately **$350 million in new annual revenue**.

Approximately 40% of that total—**$142 million**—comes from non-pass-through charges that flow directly to the utility as incremental earnings.

The result: $142 million in new recurring annual revenue without incremental system costs.



Quantifying the Impact

A 1 GW Case Study

Lowering Customer Rates

In this scenario, the utility prioritizes rate relief by allocating the full $142 million to reduce its revenue requirement.

Impact: System-wide rates decrease by approximately **5%** across all customer classes. For an average American residential customer using 1,000 kWh per month at $0.176/kWh, this represents **annual savings of $103**.[11]

This is a tangible example of **beneficial load growth:** new load that pays for itself while making energy more affordable for everyone else.

Non-pass-through revenue

$$\frac{\text{Utility system costs}}{\text{Utility system load} + \text{1GW}} = \text{5\% rate reduction}$$

Quantifying the Impact

A 1 GW Case Study

Accelerating New Capital Investment

Alternatively, the utility could use this revenue stream to justify and finance critical capital projects—without raising rates. In this scenario, the utility invests the $142 million annual revenue in grid upgrades.

Impact: The utility can justify $1.35 billion in new capital investments without raising rates. Using a Capital Charge Rate (CCR) of approximately 10.5% (typical for investor-owned utilities), the $142 million annual revenue can fully support $1.35 billion in new capital investments with no additional capital needed from increased rates.

Non-pass-through revenue

$$\frac{\text{\$142M new annual revenue}}{\text{\textasciitilde 10.5\% CCR}} = \text{\$1.35B capex}$$

This could fund:

- Substation modernization and capacity upgrades
- Distribution automation and smart grid technology
- Renewable interconnections and energy storage
- Climate resilience and undergrounding programs
- Reliability improvements in underserved areas

In this scenario, shareholders also benefit: the added CapEx investments into the rate base and associated earnings increase net income for the utility. For our representative utility with a standard 50/50 debt/equity split and average cost of capital assumptions, this increased net income can boost **earnings per share by almost 8%**, while customers see improved service reliability with no increase in rates.

Quantifying the Impact

A 1 GW Case Study

Balancing Rate Reduction and Investment

In reality, utilities and regulators often seek a balance between lowering rates and increasing investment. In this scenario, we consider a balanced approach, where the utility allocates some capital towards lowering rates and some towards grid improvements.

For instance, if the data centers required just $400 million in new interconnection-related CapEx (about 30% of the total justifiable investment in Scenario 2), the utility would be able to service that investment from a portion of the additional revenue earned ($42 million at 10.5% CCR). This would leave **$100 million** available for rate reduction.

The result would be:

- **3.4% reduction in system-wide rates**
- **$400 million in new infrastructure investment** without rate impact
- **Improved reliability and resilience** for all customers
- **Shareholder value creation** through prudent rate base growth

This blended approach highlights the value that AI data centers can unlock when leveraging the existing grid, allowing utilities to simultaneously **enhance shareholder value, deliver rate relief, and support system growth**.

Non-pass-through revenue

$$\frac{\text{Utility system costs}}{\text{Utility system load} + \text{1GW}} = \text{3.4\% rate reduction}$$

$$\frac{\text{\$42M annual revenue}}{\text{\textasciitilde 10.5\% CCR}} = \text{\$400M capex}$$

The National Competitiveness Imperative

The United States is in a global race for AI and advanced manufacturing leadership. These industries are fundamentally energy-intensive. The nations that can deliver reliable, affordable, rapidly-accessible power will win this competition.

While the financial benefits are significant, AI data center development extends beyond the balance sheet to:

- **Leadership in transformational technology:** Expanding U.S. AI infrastructure ensures that advanced computing capacity remains domestic, supporting innovation, economic leadership, and energy independence.
- **Economic development:** Large-scale data center projects create thousands of local construction and long-term operational jobs, inject millions in tax revenues, and attract supporting industries that strengthen regional economies.
- **Infrastructure acceleration:** New load growth enables utilities to modernize and harden the grid faster—improving reliability and resilience for all customers.
- **Community benefits:** Strategic siting and faster interconnection of data centers can revitalize local economies, fund public services, and sustain long-term regional prosperity. These community benefits create positive feedback loops that reinforce the utility's social license to operate.

GridCARE's Solution

Finding Power Where Others Can't

GridCARE uncovers hidden capacity and flexibility on the existing grid. By analyzing operational data, dynamic loading patterns, and flexibility options, GridCARE identifies underutilized system capacity that can safely accommodate additional load. This allows utilities to interconnect large new loads in **months rather than years**, without the need for immediate capital projects.

The electric grid is the foundation of economic competitiveness—powering industries, enabling innovation, and shaping where growth happens.

Yet as the pace of electrification accelerates, utilities face a choice: treat new demand as a constraint, or as an opportunity to modernize faster, more affordably, and for everyone's benefit.

In short, GridCARE turns today's grid constraints into a catalyst for shared prosperity—fueling the next wave of American growth and keeping energy both affordable and abundant.

If this is of interest, we want to hear from you. Please reach out to us at info@gridcare.ai.

Endnotes

1 World Economic Forum, For a clean energy future, our relationship to the grid must change. Here's how, July 15, 2022.

2 For example: Bloomberg, AI Data Centers are Sending Power Bills Soaring, September 27, 2025. The New York Times, Big Tech's A.I. Data Centers Are Driving Up Electricity Bills for Everyone, August 14, 2025. The Washington Post, As data centers for AI strain the power grid bills rise for everyday customers, November 1, 2024.

3 Wood Mackenzie, US utility large load commitments reach 160 GW amid unprecedented PJM demand surge, October 27, 2025.

4 Tyler H. Norris, Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems, Nicholas Institute for Energy, Environment & Sustainability, February 11, 2025.

5 LBNL, Factors Influencing Recent Trends in Retail Electricity Prices in the United States, October 2025.

6 Portland General Electric, Company Third Quarter 2025 Conference Call, October 31, 2025.

7 Pacific Gas & Electric, Surging Data Center Growth to Help Lower Energy Costs for PG&E Customers, May 27, 2025.

8 The New York Times, Big Tech's A.I. Data Centers Are Driving Up Electricity Bills for Everyone, August 14, 2025.

9 Assumed to be enabled by GridCARE's approach of connecting new loads on existing infrastructure

10 Our representative utility has system wide sales of ~20,000,000 MWh, so our 1 GW data center represents a ~20% increase in electricity sales.

11 US EIA, Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector.

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