

The “New Load” and the “New Supply” – Ongoing Challenges in Integrating Data Center/Crypto Demand and Intermittent Generation Supply

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THE CHALLENGE: DEMAND RAPIDLY OUTPACING GENERATION SUPPLY AND TRANSMISSION SYSTEM CAPACITY

Segments for Increased Demand

■ Data Center Load Profiles

- 1) Traditional Storage/ Cloud Computing – steady, 24/7 loads
- 2) Cryptocurrency Mining – fluctuating load, potentially fleeting load
- 3) Artificial Intelligence – late 2022 breakthroughs in Generative AI
 - Roughly ten times the electricity required from a Google Search; load steps up, then down, then repeats
 - Creating original music, photos, and videos based upon user prompts will use even more electricity
 - Source: [Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption \(epri.com\)](https://www.epri.com/Portals/0/PDF-files/Powering%20Intelligence%20Analyzing%20Artificial%20Intelligence%20and%20Data%20Center%20Energy%20Consumption.pdf)
 - Over time, efficiency improvements for processors and computing power will occur
 - Densification: more capacity and increased computing within the same footprint

■ Onshoring of Industrial Manufacturing

- Lithium mining, lithium battery production, steel, semi-conductors, ethenyl/oil refineries, hydrogen hubs

■ Electric Vehicles and electrification of buildings and energy systems



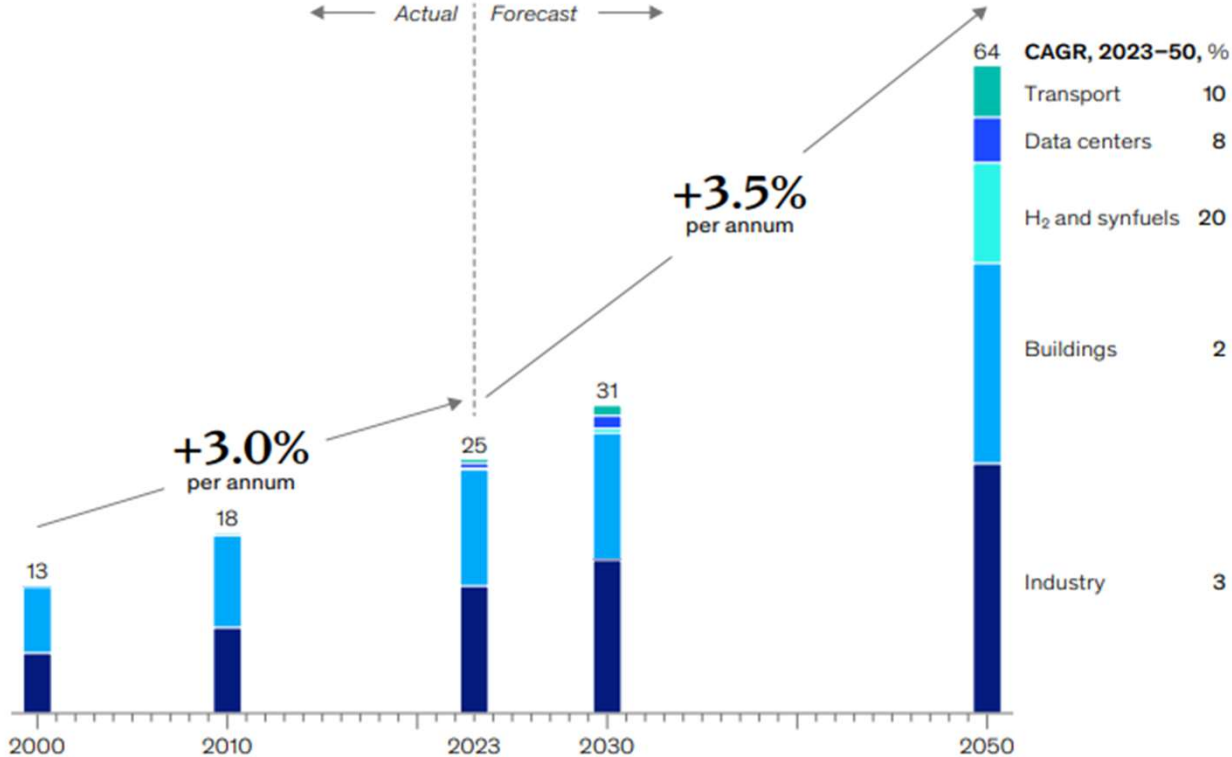
THE CHALLENGE: NEAR-TERM DEMAND RAPIDLY OUTPACING GENERATION SUPPLY AND TRANSMISSION SYSTEM CAPACITY

- McKinsey's recent [Global Energy Outlook](#), shows 3.5% annual volumetric load growth to 2050 globally.
 - By 2030, 150 GW capacity of graphic processing units for data centers globally; up to 45,000 TWh of electricity consumption by 2050 (5-9% of total electricity consumption)
- GridStrategies December 2023 Report: "[The Era of Flat Power Demand is Over](#)" anticipates about a 130% growth rate for data center peak load over 5 years.
- [MISO's members](#) show anticipation of about 2% volumetric load growth to 2029
 - Source: Organization of MISO States/OMS 2024 Survey.
- Utilities need to adjust their business model to balance growth, affordability, and sustainability
 - Source: [Utilities Must Reinvent Themselves to Harness the AI-Driven Data Center Boom | Bain & Company](#)
 - "Surging data center power consumption could require more than \$2 trillion in new energy generation resources worldwide"
 - U.S. utilities need to increase their generation between 7 and 26% above 2023 levels to meet total projected demands in 2028
 - 44% of load growth in 2028 will come from data centers (17% from manufacturing)
- Ongoing permitting and supply chain issues challenge utilities in serving new large loads



MCKINSEY REPORT – GLOBAL USAGE

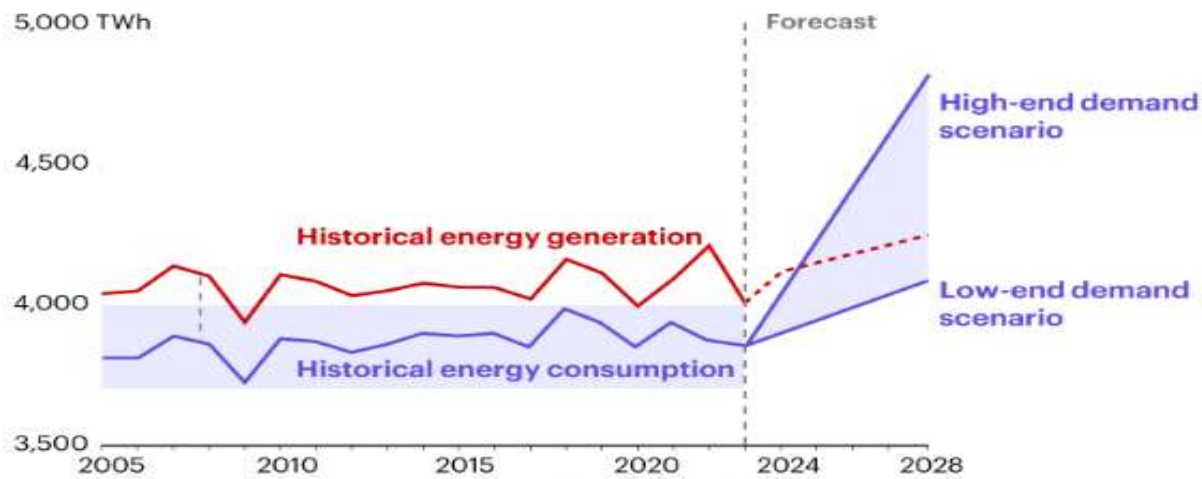
Global power consumption by sector, Continued Momentum, thousand TWh



BAIN ANALYSIS – SHORT TERM U.S. OUTLOOK

US electricity demand could exceed supply within the next few years

US electricity demand vs. generation (terawatt hours)



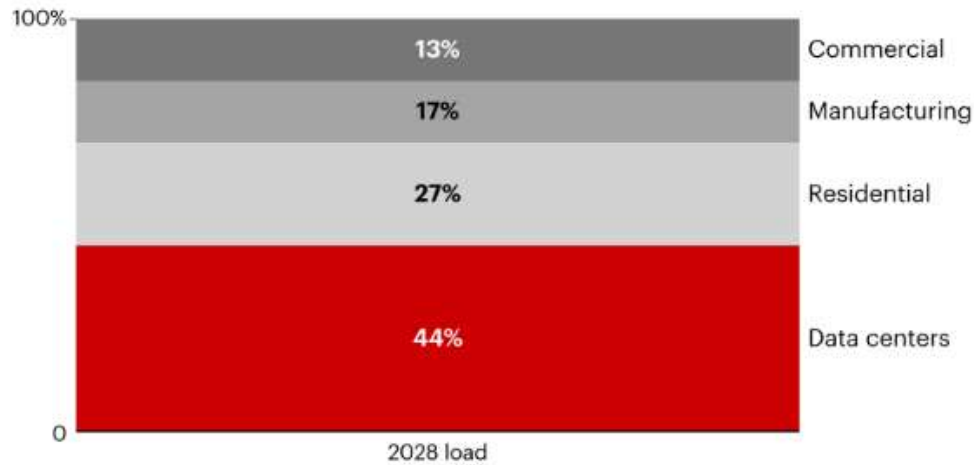
Notes: Demand forecast is an aggregate of multiple industry forecasts; historical numbers and generation forecast based on EIA data; historical gap between energy generation and consumption necessary to ensure sufficient load that accounts for some energy loss in transmission.

Sources: EIA 2023-2025 Short-Term Energy Outlook (May 2024); EIA 2025-2028 Energy Outlook (March 2023); ISO reports (H2 2023 - H1 2024); FERC; Grid Strategies; Goldman Sachs and Bank of America analyst forecasts (April 2024); Bain analysis.

BAIN ANALYSIS

Data centers will account for the largest share of new electricity demand growth in the US over the next few years

US electricity load growth by customer segment, 2023–2028
(high case)



Notes: Values are rounded; commercial excludes data centers; residential includes electric vehicles

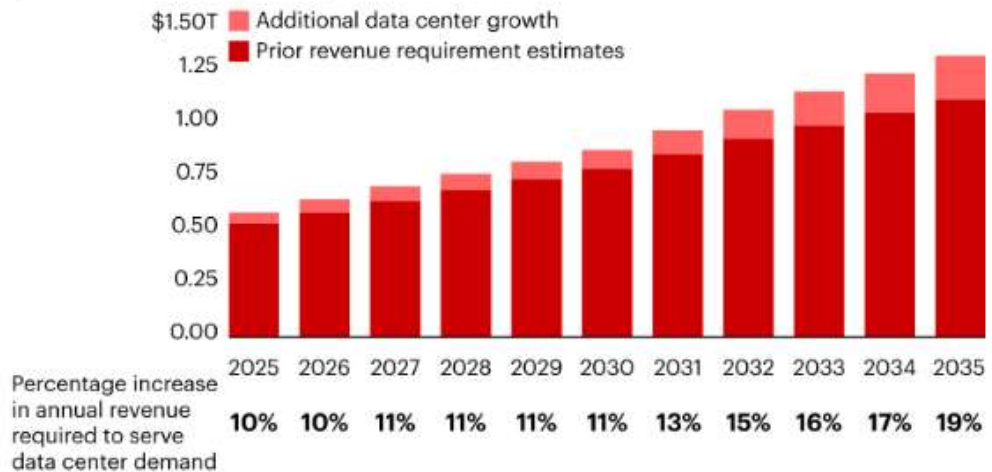
Sources: Bank of America and Goldman Sachs analyst forecasts (April 2024); EIA Short-Term Energy Outlook (May 2024); EIA 2023 Outlook; IDC Datacenter Deployment and Spend Forecast (H2 2023); Bain analysis



BAIN ANALYSIS

Funding the capital investments to serve data center demand will require US utilities to generate at least 10% more annual revenue over the next decade

US utilities' estimated total revenue requirement (in trillions of US dollars)



Notes: Only includes fuel expense at regulated utilities, not at independent power producers; assumes inflation of about 3% and a 20-year depreciation schedule

Sources: Princeton University Net-Zero America study; S&P SNL Energy; S&P Capital IQ; US Bureau of Labor Statistics Consumer Price Index; EIA; Bain analysis



Long-Term Reliability Assessment 2023

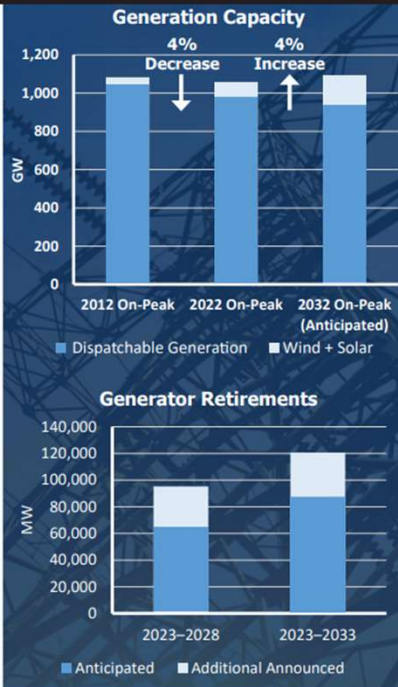
The LTRA identifies reliability trends, emerging issues, and potential risks to the bulk power system (BPS) over a 10-year assessment period. Industry faces mounting pressure to keep pace with accelerating electricity demand, energy needs, and transmission system adequacy as the resource mix transitions.

[LTRA | Video](#)



Demand Growth

The BPS is currently forecast to have its highest demand and energy growth rates since 2014, mainly driven by electrification and projections for growth in electric vehicles over this assessment period.



Generation Trends

As fossil generation is retired, resource growth is becoming more challenging. More than 83 GW of generator retirements are planned through 2033, and more are expected. Generation plans need to consider growing energy needs and grid stability.

High Risk Areas

MISO
2028: Capacity shortfall; winter generator and fuel risk

SERC-Central
2025-2027: Capacity shortfall

Elevated Risk Areas

Maritimes
2026: Low capacity reserves

New England
2024: Winter fuel supply risk

New York
2025: Low capacity reserves

Ontario
2028: Low capacity reserves

SPP
2024: Winter generator and fuel risk; insufficient dispatchable resources

ERCOT
2024: Winter generator and fuel risk; insufficient dispatchable resources

WECC-BC
2026-2027: Low capacity reserves

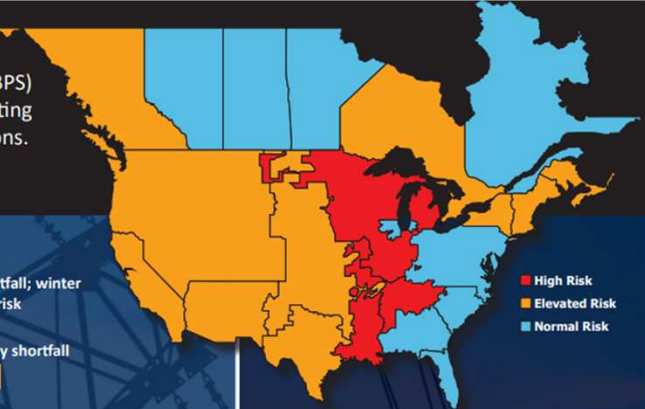
WECC-CA/MX
2026: Insufficient dispatchable resources

WECC-NW
2026: Insufficient dispatchable resources

WECC-SW
2026: Insufficient dispatchable resources

Resource Adequacy Risk

Capacity shortfalls are projected in areas where future generator retirements are expected before replacement resources can be put in service to meet rising electricity demand.



- Add new resources with reliability attributes, manage retirements, and make existing resources more dependable
- Expand the transmission network to provide more transfer capability and deliver supplies from new resources and locations to serve changing loads
- Adapt BPS planning, operations, resource procurement markets, and processes to a more complex power system
- Strengthen relationships among reliability stakeholders and policy makers

Priority Actions

Natural gas supply infrastructure and the BPS form an interconnected energy system. NERC endorses actions to establish reliability rules for the natural gas infrastructure that is necessary for an interconnected energy system.

PENDING AND RECENT REGULATORY PROCEEDINGS INVOLVING DATA CENTER LOAD

- FERC Docket No. ER24-1640-000: Filing by Basin Electric Cooperative to establish different rates for cryptocurrency loads and 75+ MW “large loads”; FERC rejected the filing without prejudice because Basin had not justified differential treatment
- FERC Docket No. ER24-2172-000: Filing by PJM Interconnection, LLC and Talen Energy to amend the interconnection agreement for Talen’s Susquehanna Nuclear Plant to accommodate “co-located” Amazon data center; highly contentious proceeding; still pending at FERC
- FERC Docket Nos. ER24-2888-000, et al: Filing by all Exelon operating companies to charge all load that is synchronized with the grid for transmission service on a “gross” basis; Exelon subsequently clarified its intent to focus only on “co-located” load, but did not offer any evidence to support the distinction between gross billing for co-located load and net billing for retail and non-retail behind the meter generation



PENDING AND RECENT REGULATORY PROCEEDINGS INVOLVING DATA CENTER LOAD

- FERC Docket No. AD24-11-000: FERC Commissioner-led Technical Conference Regarding Large Loads Co-Located at Generating Facilities; to be held November 1; outgrowth of Docket No. ER24-2172-000, but with national scope
- Virginia State Corporation Commission Docket No. PUR-2024-00144: SCC Commissioner-led Technical Conference on the policy issues around data center and other large load interconnections; to be held December 16
- Public Utilities Commission of Ohio: PUCO Case No. 24-508-EL-ATA, In the Matter of the Application of Ohio Power Company For New Tariffs Related To Data Centers And Mobile Data Centers; AEP-Ohio seeking to require long-term contracts for new large load interconnections; unilateral settlement recently filed by all parties except AEP-Ohio and PUCO Staff; proceeding pending
- Oregon Public Utility Commission: Docket No. UE 433, Pacific Power rate case involving proposal to add a Capacity Reservation Charge and Excess Demand Charge that would be applicable to large customers who reserve more power than they require or use more than the level for which they contracted





QUESTIONS?



 McNees