

How Much More Power Can the U.S. Grid Provide for AI?

Projections and Policy Implications for 2030

The anticipated growth in electricity demand from artificial intelligence (AI) is large, rapid, and geographically concentrated. Because of uncertainty about which planned generation projects will be completed, it is difficult to assess whether future U.S. grid capacity will keep pace with demand from AI data centers. An additional challenge lies in translating announced nameplate capacity into comparable estimates of reliable power that can meet large, inflexible loads to support data center power needs.¹ These factors complicate efforts to estimate how much additional power capacity the United States is likely to have by 2030.

Estimating Additional Power Capacity

A team of RAND researchers estimated how much additional power capacity the United States is likely to have by 2030 by translating planned electricity supply resources into a common measure of reliable capacity. For front-of-the-meter (FTM) resources,² the researchers analyzed planned generation and storage projects based on independent system operator (ISO) interconnection queues and federal generation data and applied historical completion rates by region and technology.³ This process adjusted for resource contributions to reliability

KEY FINDINGS

- There are plans to add a total of 151 gigawatts (GW) of front-of-the-meter (FTM) and 149 GW of behind-the-meter (BTM) nameplate capacity by 2030. After project completion rates, retirements, and resource reliability are accounted for, these additions translate into approximately 82 GW of additional net available capacity—about 33 GW from FTM resources and 49 GW from BTM resources that reduce peak grid demand.
- Most planned FTM additions are concentrated in the Electric Reliability Council of Texas (ERCOT), while BTM capacity is more evenly distributed across ERCOT, the Midcontinent Independent System Operator, and regions without centralized market operators.

and accounted for planned retirements to estimate net additions to grid capacity.

For behind-the-meter (BTM) resources,⁴ such as customer-sited solar and battery storage, the researchers relied on national deployment projections through 2030 and converted projected nameplate capacity into effective capacity using the same framework as in FTM.⁵ Using this approach, the researchers estimated how much BTM resources could reduce peak grid demand and free up capacity for large loads, such as AI data centers.

Estimates of Front-of-the-Meter and Behind-the-Meter Net Availability Capacity

The researchers found that the United States could add approximately 82 gigawatts (GW) of net available capacity by 2030,⁶ consisting of 33 GW from FTM resources and 49 GW from BTM resources; see Table 1.

TABLE 1
Front-of-the-Meter and Behind-the-Meter Available Capacity Additions by Region, 2025–2030 (GW)

Region	FTM	BTM	Combined
CAISO	(1.2)	3.6	1.9
ERCOT	59.0	10.0	69.0
NE-ISO	3.3	1.0	4.3
MISO	(12.0)	11.0	(0.8)
NY-ISO	0.4	3.3	3.6
PJM	(5.3)	4.7	(0.7)
SPP	(1.7)	3.5	1.8
All other regions	(9.4)	12.0	2.7
Total	33.0	49.0	82.0

NOTE: CAISO = California Independent System Operator; ERCOT = Electric Reliability Council of Texas; MISO = Midcontinent Independent System Operator; NE-ISO = New England Independent System Operator; NY-ISO = New York Independent System Operator; SPP = Southwest Power Pool. Negative FTM values (shown in parentheses) indicate that the expected additions to available capacity are less than the reductions in available capacity from expected retirements. Numbers might not add up to totals because of rounding.

Figure 1 illustrates how planned FTM generation and storage projects are translated from 1,086 GW of nameplate capacity into the estimated 33 GW of net available capacity after project attrition, retirements of existing plants, and differences in resource contributions to reliability are accounted for.

Net FTM capacity additions vary substantially by region, reflecting differences in generation mixes, the composition of interconnection queues, and retirement schedules. Growth in ERCOT interconnection requests drives a large share of forecasted additions (see Table 2), while queue requests are paused in CAISO and PJM.⁷ Figure 2 provides a consolidated view of how different resource types contribute to the gap between planned nameplate capacity additions and net available capacity.

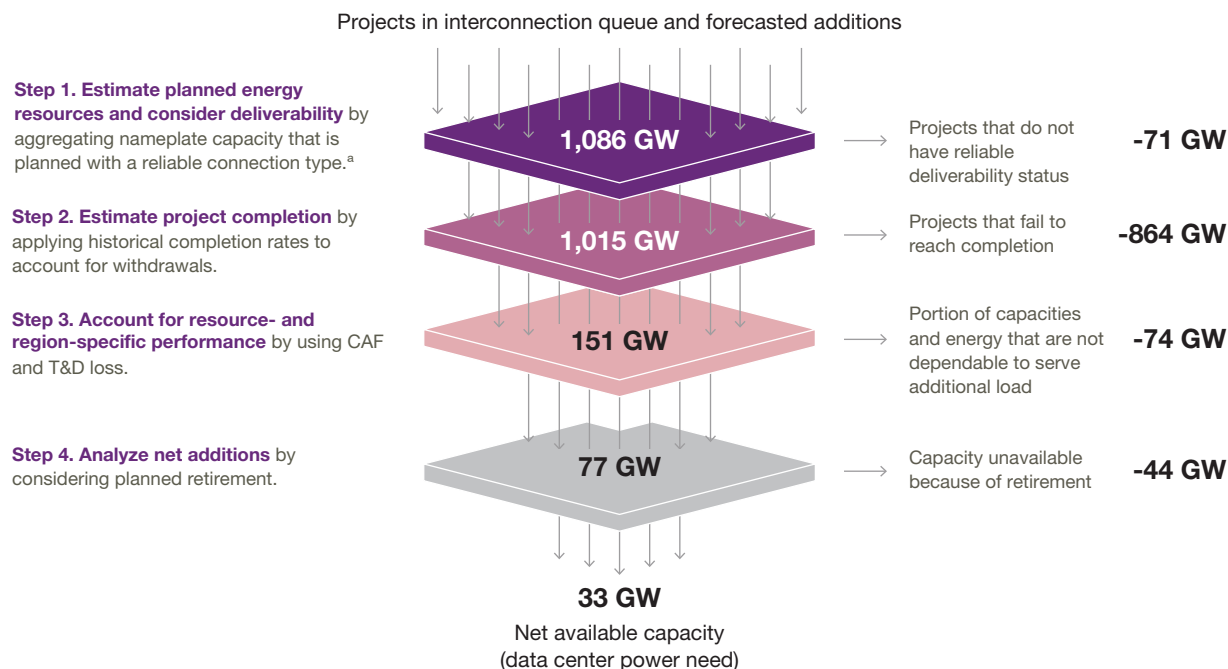
BTM resources play an important role in reducing peak grid demand and potentially freeing up FTM capacity. Projected BTM additions total 49 GW by 2030 (Table 3), though the contribution varies by region. In some regions, accounting for BTM resources materially changes the aggregate capacity outlook, while in others the effect is modest.

Abbreviations

AI	artificial intelligence
BTM	behind the meter
CAISO	California Independent System Operator
ERCOT	Electric Reliability Council of Texas
FTM	front of the meter
GW	gigawatt
ISO	independent system operator
MISO	Midcontinent Independent System Operator
NE-ISO	New England Independent System Operator
NY-ISO	New York Independent System Operator
SPP	Southwest Power Pool

FIGURE 1

Method to Translate Planned Front-of-the-Meter Projects to Data Center Power Need



NOTE: CAF = capacity accreditation factor; T&D = transmission and distribution. Values in gigawatts might not sum precisely because of rounding.

^a The analysis includes only projects with interconnection types that ensure a reliable power supply to data centers, overcoming transmission line constraints, available grid capacity, and potential congestion. Further details are available in the accompanying research report.

TABLE 2

Available Capacity by Region for Active Projects, Forecast Additions, Retirements, and the Net Final Estimate (2025–2030)

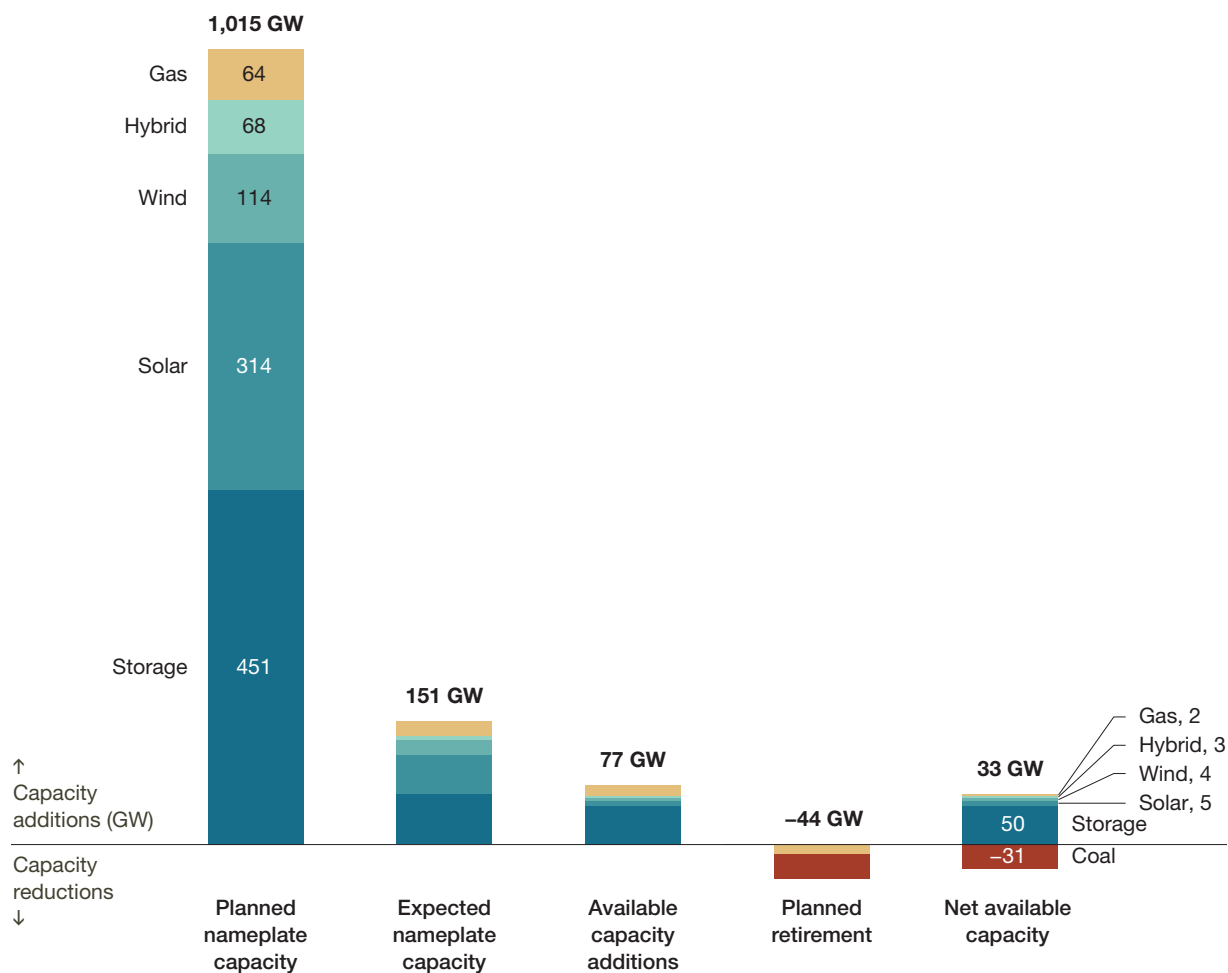
Available Capacity (GW)	CAISO	PJM	ERCOT	MISO	NY-ISO	NE-ISO	SPP	Non-ISO Regions	Total
Active projects	1.2	2.1	30.0	2.3	0.3	2.0	0.9	3.9	42.0
Forecast additions	—	—	32.0	0.2	0.1	1.3	0.9	—	35.0
Retirements	(2.9)	(7.4)	(2.3)	(14.0)	(0.0)	(0.1)	(3.5)	(13.0)	(44.0)
Net cumulative	-1.7	-5.3	59.0	-12	0.3	3.3	-1.7	-9.4	33.0

SOURCES: Initial inputs for active projects and forecast additions are interconnection requests as reported in October 2024 from the homepages of CAISO, ERCOT, NE-ISO, MISO, NY-ISO, and SPP. Available capacity for generators requesting interconnection in non-ISO regions and retirements estimated from resources with planned retirement dates in 2025–2030 are as reported in U.S. Energy Information Administration, "august_generator2024.xlsx," August 2024 data file, available at "Preliminary Monthly Electric Generator Inventory (Based on Form EIA-860M as a Supplement to Form EIA-860)," webpage, last updated May 22, 2025.

NOTE: Parentheses indicate negative values. Numbers might not add up to totals because of rounding.

FIGURE 2

Comparison of Planned and Expected Additions to U.S. Front-of-the-Meter Power Capacity by 2030



SOURCES: Planned nameplate capacity is estimated from October 2024 interconnection queues for CAISO, NY-ISO, ERCOT, NE-ISO, SPP, and MISO, and non-ISO planned capacity is as reported in U.S. Energy Information Administration, 2025. Expected nameplate capacity applies historical completion rates to planned capacity, as estimated from CAISO, NY-ISO, SPP, and MISO interconnection queues and self-reported by ERCOT. Non-ISO and NE-ISO completion rates are estimated as averages of completion rates across other regions. Available capacity, then, also takes transmission line losses and effective load-carrying capability (ELCC) estimates for CAISO, NY-ISO, ERCOT, NE-ISO, SPP, and MISO into account, using an average for non-ISO resources. Planned retirement resources are estimated by applying ELCC and transmission loss factors to nameplate capacity of resources scheduled for retirement in 2025–2030 that appear in U.S. Energy Information Administration, 2025. Net available capacity for 2025–2030 is equal to available capacity additions minus planned retirements.

TABLE 3

Overall Behind-the-Meter Effective Capacity Growth by Region Out to 2030 (GW)

	Actual			Forecast			
	2024	2025	2026	2027	2028	2029	2030
ISO regions							
CAISO	3.0	3.1	3.2	3.3	3.4	3.5	3.6
ERCOT	2.0	3.3	4.7	4.8	4.9	6.9	9.0
NE-ISO	0.2	0.2	0.2	0.4	0.6	0.8	1.0
MISO	2.2	2.5	2.9	3.9	5.0	8.1	11.2
NY-ISO	0.8	1.6	2.3	2.6	2.8	3.0	3.3
PJM	0.9	1.8	2.6	2.9	3.2	3.9	4.7
SPP	0.5	0.6	0.7	0.9	1.1	2.3	3.5
Non-ISO regions	2.3	3.5	4.6	6.0	7.3	9.7	12.0
Annual incremental	—	4.7	4.7	3.5	3.5	10.0	10.0
Total	12.0	17.0	21.0	25.0	29.0	39.0	49.0

NOTE: Numbers might not add up to totals because of rounding.

Key Limitations and Assumptions

The study had some important limitations and assumptions. The researchers assumed that data center load profiles are firm and inflexible. They also assumed static estimates of resource contributions to reliability. For BTM resources, the researchers based their estimates on aggregate projections rather than public project announcements. They also assumed that BTM resources will continue to be built out and that retirements will be limited.

Recommendations and Policy Implications

The study's findings suggest that planned power capacity expansions are unlikely to align evenly with

the geographic distribution and timing of rapidly growing electricity demand, particularly from large, inflexible loads, such as AI data centers. Policymakers and planners may therefore need to focus explicitly on locational adequacy, especially in regions where net additions of reliable capacity are limited. Incorporating realistic project completion rates, retirements, and resource reliability is critical for assessing future grid adequacy.

The analysis also highlights the importance of managing uncertainty through diversified resource portfolios. Although BTM resources can meaningfully reduce peak demand in some regions, they are unlikely to fully offset shortfalls in grid-connected supply where constraints are most severe.

Further research could refine these estimates by incorporating transmission expansion scenarios, more-granular locational data, and alternative demand growth trajectories from uncertain large-load growth.

Notes

¹ *Nameplate capacity* is the maximum theoretical output of a power-generation facility as specified by the manufacturer.

² *Front of the meter* refers to energy systems that are connected to the utility grid and supply electricity to a broad area, typically including large-scale generation and storage facilities.

³ ISOs operate and run the regional electric transmission grids, ensuring transmission access, planning, operation, and dispatch of energy.

⁴ *Behind the meter* refers to energy systems located on the customer's side of the utility meter. These systems generate, store, or manage electricity without passing through the meter that measures power consumption from the grid.

⁵ *Effective capacity* is a technology-agnostic reliable capacity. It is determined by capacity accreditation factors and used by energy planners for resource adequacy assessment.

⁶ *Available capacity* refers to the researchers' estimate of future, deliverable, and aggregated power. It is estimated from active and anticipated energy projects seeking interconnection to the grid and builds on effective capacity by adding completion rate, losses, and deliverability. More information can be found in the glossary of the accompanying research report, *Assessing the United States' Additional AI Power Capacity by 2030: Estimating Short-Term Increases in Electricity Generation and the Ability to Meet Growth in Power Demand*.

⁷ ERCOT, CAISO, and PJM are all ISOs.

This research brief was written by Ismael Arciniegas Rueda and Robin Wang and describes work done in RAND Global and Emerging Risks and documented in *Assessing the United States' Additional AI Power Capacity by 2030: Estimating Short-Term Increases in Electricity Generation and the Ability to Meet Growth in Power Demand*, by Ismael Arciniegas Rueda, Henri van Soest, Hye Min Park, Austin Smidt, David Gill, Robin Wang, Kelly Klima, and Aisha Najera, RR-A3845-1, 2025 (available at www.rand.org/t/RR-A3845-1). To view this research brief online, visit www.rand.org/t/RBA3845-1. RAND is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors. **RAND**® is a registered trademark.

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