REGULATORY ASSISTANCE PROJECT

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Building Resilient Foundations for Large Loads

Part of the series *Data Centers and the Next Era of Energy Regulation*

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Contents

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Executive Summary

The data center boom is stressing the electric system with load growth that is far faster, larger and more unpredictable than U.S. regulatory practices were designed to handle. Amid this change, regulators and policymakers are racing to secure safeguards that minimize harm without strangling development. RAP offers practical, adaptable strategies to help turn this wave of data center growth into a catalyst for an affordable, reliable and clean grid that benefits all customers.

Although there are many aspects to this challenge, the foundations for informed and effective decision-making are transparency and planning. We identify four primary steps in optimizing transparency and planning, with strategies for implementing each step.

Get Collaborative

Effective collaboration on many levels is essential. Decision-makers can start by ensuring that any incentives (e.g., tax breaks or special rates) align with state-specific energy policy and reflect the status and capacity of the electric system.

Coordination among state agencies and levels of government is essential as data centers affect local economies along with electric rates and reliability, air quality, water use and noise pollution. Because impacts do not stop at service territory or other boundaries, decision-makers also need to ensure coordination among utilities and utility types (investor-owned, cooperative and municipal) as well as at the regional level.

Strategies to share information among agencies, utilities, data centers and stakeholders include:

- Creating a working group or collaborative.
- Infusing policy goals with regulatory expertise.
- Engaging in regional or national coordination forums.

Gather Information About What Is Coming

Coordination without information will provide limited results, especially given data centers' huge scale and high uncertainty. Collecting sufficient data about potential impacts to inform decisions is complicated by the necessary balancing of competitive interests in confidentiality versus the need for public disclosure and engagement. The goal is to get as full a picture as possible and ensure the basic structures are in place for robust utility planning. Decision-makers pursuing information can utilize and expand existing tools:

- Data requests can provide needed information but may require legislative action to compel information from data center companies.
- Investigations and studies can be tailored to meet needs.
- Reporting can provide ongoing necessary information.

Scrutinize Data Center Demand in Planning

Data center load growth is stress-testing demand forecasting practices. Although large-load forecasting best practices are still evolving, decision-makers should at least ensure clear explanations of forecasting practices. While large-load flexibility is getting a lot of deserved attention, many of its benefits won't materialize if flexibility isn't captured in forecasts and planning. We offer these observations to guide scrutiny of data center demand:

- Contingencies, scenarios and sensitivities are key for navigating uncertainty.
- Modeling data center load flexibility opens up options to balance quick connections with reliability and affordability.

Evaluate Existing System and Resource Options

It is critical to assess the existing system's resources, the ability to scale those resources, and how to optimize them — especially given the increasing delays and costs for new dispatchable options like gas turbines. Decision-makers can utilize and expand well-established planning tools to gain insight into needs in this era of rapid load growth. Robust planning will consider a range of resources that can be deployed quickly and effectively:

- Systemwide flexibility and opportunities for targeted flexibility to support reliability.
- Systemwide energy efficiency and whether targeted energy efficiency can scale up quickly.
- Transmission innovations to make the most of existing investments.
- Utility-scale renewable energy and battery storage.

Context influences what tools and options are available to decision-makers. Regulators may be reviewing a single application or multiple simultaneous applications, responding to the need for systemic change, or assessing impacts related to unregulated development. RAP's recommendations take into account these differences in context and represent a starting point, with ideas and examples to inspire action.

See the full paper for specific policy and regulatory options, as well as examples from states leading the way.

Introduction

Rapid data center growth is transforming electricity demand across the country, challenging policymakers and regulators to capture economic benefits while protecting affordability, reliability and sustainability. Decades of regulatory best practice for managing demand now need to be adapted to a new era of fast, concentrated load growth. The size of the load growth challenge, and many unique characteristics of hyperscalers themselves, mean that this challenge is not simply the province of utility regulators. The size of this challenge will require the combined attention and focus of policymakers at all levels, from the federal government and agencies such as the Federal Energy Regulatory Commission (FERC) and the Department of Energy to state governors' offices, legislatures, economic development offices, air and environmental agencies, and public utility commissions.

Resources offering policy solutions to address data center demand are being published at pace; piecing together recommendations can be overwhelming, especially for decision-makers facing time pressures with limited resources. The purpose of this series is to synthesize these resources and identify actions for regulators and policymakers that can secure essential protections and safeguards to minimize harm without placing a stranglehold on development.

The broad impact to the electric system from data centers not only calls for regulators to implement minimum safeguards, but also to pursue systematic change to modernize the energy system. Doing so will require creativity: refining proven tools, piloting new approaches, and building modern frameworks that can keep pace with evolving energy needs. Many of the technologies best suited to meet the pace of load growth are also the most cost-effective and sustainable: energy efficiency, solar plus storage, distributed energy resources/virtual power plants and transmission optimization. This series will offer practical, adaptable strategies to help policymakers and regulators turn this wave of data center growth into a catalyst for an affordable, reliable and clean grid that benefits all customers.

About This Series

Throughout 2026, RAP is releasing a series of papers assessing the load growth boom and identifying actions for regulators and policymakers to secure essential safeguards for the public without strangling beneficial development. This series offers practical, adaptable strategies to help turn the wave of data center growth into a catalyst for an affordable, reliable and clean grid that benefits all customers.

What Makes Data Center Load Different?

While load growth isn't new, data centers have certain characteristics that differentiate them from traditional large loads.

Understanding these characteristics is a key first step to contextualizing the challenges these loads present and opportunities they may offer.[1]

> "Time-to-power" means how long it takes to connect a data center to a power source, including construction of facilities or interconnection. Data centers' need for speed is driven by an economic imperative for companies to build large and sophisticated models quickly to make it difficult for future competitors to catch up. Consequently, many companies are trying to find the quickest path to generation.

- **Urgency to interconnect:** Time-to-power is crucially important to data center developers, particularly given the artificial intelligence (AI) race at global and industry scales, and it increasingly outranks price in driving site selection.[2] The traditional electric utility business model, meanwhile, prioritizes deliberate analysis and prudent actions to secure least-cost and least-risk power. This spread — on both price tolerance and speed — is key to understanding the AI load challenge.[3]

- **Demand scale and uncertainty:** Forecasts for total requested data center demand by 2030 range from roughly 200 terawatt-hours (TWh) to 400 terawatt-hours,[4] which means the estimates vary by roughly the size of California's 2023 in-state generation.[5] That is both a huge amount of potential power as well as staggering uncertainty. Dialing in more accurate forecasts, particularly where demand will be highest, will be difficult but is critical to anticipate and address grid impacts.

- **High power density:** New data center proposals are often an order of magnitude larger than the prior norm for large-load facilities. Many proposals are seeking hundreds of megawatts (MW) at a single facility, and headline-grabbing gigawatt-scale proposals are becoming more common. The increasing size increases energy density — the amount of power being drawn at a single point of interconnection — and in many cases requires construction of new transmission service before the facility can begin full operation. This impact is compounded

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1 Eberle, L., Kadoch, C., & Linvill, C. (2025). *We're opening the AI "bottle." So, what should regulators wish for?* Regulatory Assistance Project. https://www.raponline.org/blog/were-opening-the-ai-bottle-so-what-should-regulators-wish-for/

2 Amazon's chief executive told investors at the end of July 2025 that "the single biggest constraint" holding back construction of data centers "is power." Weise, K. (2025, July 31). Amazon reports strong retail demand, but says future is less clear. *The New York Times*. https://www.nytimes.com/2025/07/31/business/amazon-earnings-second-quarter.html

3 Former Microsoft Vice President of Energy Brian Janous termed this differential the "Watt-Bit Spread." Janous, B. (2024, October 14). *The watt-bit spread*. LinkedIn. https://www.linkedin.com/pulse/watt-bit-spread-brian-janous-xg7cc/

4 Shehabi, A., Newkirk, A., Smith, S. J., Hubbard, A., Lei, N., Siddik, Md. A. B., Holecek, B., Koomey, J., Masanet, E., & Sartor, D. (2024, December). *2024 United States data center energy usage report*, Fig. 1.1. Lawrence Berkeley National Laboratory. https://escholarship.org/uc/item/32d6m0d1

5 Total in-state generation for California in 2023 was reported to be roughly 216 TWh. California Energy Commission. (n.d.). *California electrical energy generation*. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-electrical-energy-generation

when data centers group in particular geographic locations, driven by major fiber optic infrastructure, welcoming utilities and the presence of other large-scale data centers.

- **Outsized risks to affordability and reliability:** Expanding the grid quickly, particularly based on load growth that may not materialize in a particular location, risks raising costs. Bloomberg News analyzed wholesale electricity prices and found that locations near significant data center development have seen monthly costs increase as much as 267% in five years.[6] High electric rates not only jeopardize affordability for residential customers but can cause economic ripple effects such as hampering expanded manufacturing or beneficial electrification. On the other hand, failing to expand quickly enough threatens resource adequacy, operating reliability and resilience for all users — or dampens the growth of artificial intelligence that may provide substantial benefits to society and decarbonization efforts.[7]

- **Environmental implications:** Beyond the estimated 30% increase in power sector emissions from data center energy usage by 2030,[8] data centers create water, air and noise pollution that affects surrounding communities. While many data center developers have made commitments to reduce their climate impacts, others have not. Although some mitigation strategies can reduce multiple impacts simultaneously (e.g., expanding clean generation or replacing diesel generators with battery storage), others may require trade-offs (e.g., energy versus water efficiency of cooling systems). Regulators and policymakers must therefore carefully consider whether and how data center developers can bring resources and innovation to the energy system in a manner that ultimately benefits all ratepayers. Although regulators and policymakers could adapt several of the strategies we discuss to advance broader environmental policy goals (such as water use), this series primarily focuses on measures to address data centers' energy and climate impacts.

Data center loads are not the only large loads impacting the energy industry, but the confluence of these characteristics means that data centers present special challenges and opportunities that regulators and policymakers need to be aware of. Therefore, we focus this series on data centers, recognizing the broader context of large loads and load growth from electrification.

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[6] Saul, J., Nicoletti, L., Pogkas, D., Bass, D., & Malik, N. (2025, September 29). AI data centers are sending power bills soaring. *Bloomberg News.* https://www.bloomberg.com/graphics/2025-ai-data-centers-electricity-prices. See also Blackhurst, M., Wade, C., DeCarolis, J., de Queiroz, A., Johnson, J., & Jaramillo, P. (2025, July 26). *Data center growth could increase electricity bills 8% nationally and as much as 25% in some regional markets.* Carnegie Mellon University. https://www.cmu.edu/work-that-matters/energy-innovation/data-center-growth-could-increase-electricity-bills

[7] The International Energy Agency, for example, describes the potential contributions of AI to optimization and innovation in the energy sector. International Energy Agency. (n.d.). *Energy and AI*. https://iea.blob.core.windows.net/assets/b3a8b37f-32d1-4873-9eca-31cec5895264/EnergyandAI.pdf

[8] Wade, C., Blackhurst, M., DeCarolis, J., de Queiroz, A., Johnson, J., & Jaramillo, P. (2025, June). *Electricity grid impacts of rising demand from data centers and cryptocurrency mining operations*. Carnegie Mellon University. https://energy.cmu.edu/_files/documents/electricity-grid-impacts-of-rising-demand-from-data-centers-and-cryptocurrency-mining-operations.pdf

Data Center Series Part 1: Transparency and Planning

This paper begins RAP's series with strategies to understand the landscape in this era of load growth and characterize the problem that policymakers face. Much of the data necessary to build a clear picture is either unavailable or protected by nondisclosure agreements, limiting the ability of policymakers and regulators to understand what's happening. This paper describes the most important data, how to collect it and strategies for collaboration and data sharing.

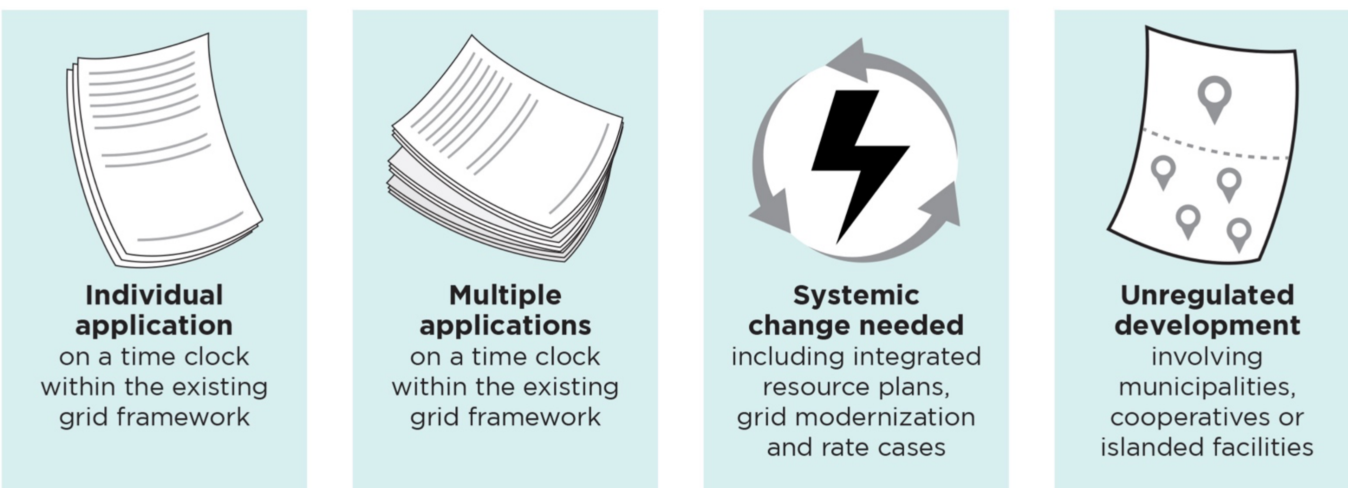
We recognize that data center issues are unlikely to present in a clean, linear way. Many states may be facing multiple proceedings or applications simultaneously or may need to make decisions on tariffs or interconnection before any evaluation of risks and benefits is complete. We start here with transparency and planning, which are foundational, whether states act on them first or later (see Figure 1 for a breakdown of steps). Given the nature of development and confidentiality protections, however, regulators and the public are likely to have less information than developers do regarding the potential system impacts of proposed data centers. It will be essential to enact safeguards through tariffs or special contracts to protect existing customers. Safeguards that allocate risk and cost will put the onus on large-load customers to put skin in the game, thereby discouraging speculation and providing assurances that existing customers won't pay the price if projects don't materialize. We will address safeguards later in this series.

Figure 1. Steps in transparency and planning

Tailored Recommendations for Four Common Scenarios

States experience data center impacts across a spectrum. Some places, like Virginia, have been at the forefront of data center growth for years. Others may have received only a few, or no, large data center interconnection requests to date but anticipate substantial future load. This context may influence considerations guiding policy outcomes. We have represented this spectrum through four common scenarios, evaluating considerations when a decision-maker is: (1) reviewing a single application in isolation; (2) evaluating multiple (simultaneous) applications within the existing grid (e.g., because urgency or a mandatory time clock prevents systemic analysis); (3) responding to the necessity to pursue and promote systemic change (e.g., integrated resource plans — IRPs — or rate cases that look beyond an individual application); or (4) assessing impacts on municipal utilities or another unregulated service provider, and impacts on the jurisdictional system of data centers locating in unregulated service areas. These common situations are summarized in Figure 2.

Figure 2. Four common scenarios facing commissions



A region may encounter several or all of these scenarios in coming years. We provide a starting point by tailoring the recommendations in this paper to the most common situations in which data center issues may arise. In many states, all four scenarios may already be occurring in some form, and there may be interdependence among them on a given project.

Get Collaborative

As a result of their massive energy needs, data centers are stretching the limits of processes designed to accommodate much smaller loads. Our existing regulatory system considers generation, transmission and distribution separately. Additionally, different agencies evaluate energy, water, air and zoning considerations. This system works reasonably well with normal loads but is strained by high-impact loads. Given this dynamic, it is imperative that all areas of state government (governors' offices, legislators, agencies and regulators), data center industry representatives, utilities and other stakeholders engage in regular communication and collaboration to fully address the risks and opportunities that data centers can provide. We urge decision-makers to "get in the loop" with processes that may already be in place in a state, or to start a collaborative engagement if one is lacking. We have identified at least three areas of collaboration:

1. Collaboration between energy regulators and policymakers on aligning any incentives offered to data centers with the public interest.
2. Collaboration among utility system entities and state agencies, because data center impacts cut across policy domains.
3. Collaboration among states on understanding regional implications of data center demand and developing a coordinated response across state boundaries.

In support of these collaborative efforts, we suggest that states set up information-sharing methods to holistically address data center load concerns and opportunities. We examine the various methods that states have set up to do so and emphasize that stakeholders are a valuable part of these convenings.

Collaboration in the four common scenarios

Individual application. Opportunities for collaboration regarding individual applications may be more limited, particularly by ex parte restrictions, but regulators may request input from other agencies as submissions to the proceeding.

Multiple applications. See "Individual application," above.

Systemic change needed. Opportunities for system change (e.g., IRPs) may naturally attract more attention from other state agencies; utility regulators may also request input. These opportunities may also prompt discussion at a multistate or regional level.

Unregulated development. We strongly encourage municipal utilities and cooperatives to collaborate with other utilities, utility regulators and other state-level decision-makers.

Collaborate on Incentives in the Public Interest

Utility regulators have a "public interest" obligation specific to their role overseeing electricity rates; other state decision-makers (policymakers and other agencies) have their own "public interest" obligations, which partially overlap. For instance, state policymakers, including governors' offices and legislators, must determine whether offering financial incentives to data centers, such as tax breaks or discounted electric rates, will broadly promote the public interest. While data centers may provide aspects of economic development, they can also substantially impact local communities through strain on local energy infrastructure and cost and by creating water, air and noise pollution. To help weigh these trade-offs when assessing whether data center incentives would serve the public interest, policymakers should consider evidence-based analyses of potential economic and community benefits and risks. Conducting a fact-based analysis will be easier if the necessary data is readily available (see the "Gather Information" section below). For example, policymakers should consider a full economic analysis that investigates data center impacts on local economies. This includes not only how many long-term jobs a new data center will provide, but also economic impacts stemming from increased costs that might be incurred locally (such as energy prices) when determining how much to offer as a tax credit. Policymakers may also consider whether to prioritize or increase incentives for facilities that reduce impacts on the energy system and/or the environment, such as those that bring clean power, energy efficiency or workforce development — or even condition such incentives on achieving designated mitigation criteria.[9]

Policymakers should also utilize perspective and expertise from utility and environmental regulators when weighing data center incentives. For instance, regulators can provide insight regarding the implications of data center demand on the electric grid and best practices to mitigate those impacts. Regulators are also concerned about whether and which data centers will connect for the long run, to limit the possibility of stranded resources and effort. Alternatively, regulators may identify limitations in their authority that prevent effective management of data center risks; pairing financial incentives with other policymaking action to address these limitations may more effectively align outcomes with policy goals than incentives alone. Together, policymakers and regulators can optimize incentives and requirements to maximize benefit to the state.

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[9] For additional examples of state tax incentives, see Mims Frick, N. (2025, June 10). *Large loads: evolving practices and opportunities* [Presentation]. National Association of State Utility Consumer Advocates Mid-Year Meeting. https://www.nasuca.org/wp-content/uploads/2025/02/Large-Load-Rate-Designs_NASUCA_nmf4.pdf

Implementation strategies:

Regulatory options

- Collaborate with state agencies across economic development, environment, workforce and utility commission.
- In concert with other agencies, develop data-gathering tools necessary to inform evaluation of incentives in the public interest.
- Provide information and analysis to support policymakers and recommend changes to regulatory authority, if appropriate.

Policymaking options

- Evaluate any incentives to ensure they are commensurate with state public interest received, including jobs, state policy goals and consumer protections.
- Encourage coordination of state agency analysis and response.

Examples of information sharing:

- A Virginia legislative report evaluated jobs and economic benefits, ultimately concluding that the "data center [tax] exemption has moderate economic benefits and moderate return in revenue to the state compared with Virginia's other economic development incentives."[10]

- Oregon's POWER Act requires the utility commission to report to the Legislature on large load trends every two years. The report may include recommendations on legislation.[11]

Examples of incentives promoting policy goals:

- Minnesota (H.F. 16) charges large data centers annual fees (from $2 million to $5 million) based on their peak demand and allocates those funds to low-income weatherization and energy efficiency programs.[12]

- New Mexico limits economic development rates to when a utility or cooperative has "excess capacity." A utility is also allowed to recover in rates the cost of infrastructure deployed in pursuit of economic development customers, even if those customers never materialize, emphasizing the risk that pursuing uncertain data centers may expose existing customers to substantial costs for stranded assets without a separate source of state funds.[13]

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[10] Joint Legislative Audit and Review Commission. (2024). *Data centers in Virginia* (Report 598). https://jlarc.virginia.gov/landing-2024-data-centers-in-virginia.asp

[11] H.B. 3546 § 7. 83rd Legislative Assembly. 2025 Reg. Sess. (Or. 2025). https://olis.oregonlegislature.gov/liz/2025R1/Downloads/MeasureDocument/HB3546/Enrolled

[12] H.F. 16. 94th Legislature. 1st Special Session. (Minn. 2025). https://www.revisor.mn.gov/bills/text.php?number=HF16&version=0&session=ls94&session_year=2025&session_number=1

[13] N.M. Stat § 62-6-26 (2025).

- Iowa will now allow data center tax exemptions to expire 10 or 15 years after site preparation begins (depending on the facility location).[14] Taxes raised following expiration will go into an energy infrastructure fund. Eligibility for the tax exemptions also depends on meeting minimum investment requirements in the state.
- Kansas (S.B. 98) limits tax exemptions to data centers that commit to invest at least $250 million, maintain at least 20 new Kansas jobs, purchase power from local utilities for at least 10 years and implement water conservation efforts. Eligibility is also subject to a cybersecurity review. The law also excludes data centers from eligibility for discounted economic development rates.[15]
- California S.B. 58 (introduced in the 2025 session) would have limited eligibility for a partial tax exemption on data center equipment to facilities that, among other things: create at least 20 qualifying jobs and invest at least $200 million; utilize carbon-free energy (starting at 70% carbon-free in the first year of operation); obtain at least 50% of energy from behind-the-meter sources; and deploy on-site energy storage in place of diesel backup generators.[16]
- Texas H.B. 4908 (introduced in the 2025 session) would have taxed energy consumption for cryptocurrency mining as well as revenue from artificial intelligence infrastructure, data centers and semiconductor manufacturing, deposited the funds into the Texas Prosperity Payout Fund and distributed them to Texas residents.[17]

Collaborate Among State Agencies

Given their size, data center impacts will likely be evaluated by many different state agencies, including utility commissions, environment and water agencies, economic development offices and workforce agencies, as well as the state and local zoning offices. State policymakers should therefore coordinate state agencies charged with responding to disparate aspects of data center development, either through legislation, collaboratives, working groups or other methods. Collaboration among these state agencies can lead to coherent interaction with data centers and developers, as well as yield high-quality information that can help states determine the most beneficial path forward.

Collaboration efforts should also include electric cooperatives, public power entities and a range of stakeholders. Although many data centers are working with investor-owned utilities (IOUs), some are seeking partnerships with electric cooperatives, public utility districts or other public power entities.[18] Ensuring these entities are part of the conversation will further a holistic

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[14] H.F. 976. 91st Gen. Assem. Reg. Sess. (Iowa 2025). https://www.legis.iowa.gov/docs/publications/LGE/91/Attachments/HF976_GovLetter.pdf

[15] S.B. 98. 2025-2026 Reg. Sess. (Kan. 2025). https://kslegislature.gov/li/b2025_26/measures/documents/sb98_enrolled.pdf

[16] S.B. 58. 2025-2026 Reg. Sess. (Cal. 2025). https://leginfo.legislature.ca.gov/faces/billStatusClient.xhtml?bill_id=202520260SB58

[17] H.B. 4908. 89th Legislature. Reg. Sess. (Tex. 2025). https://capitol.texas.gov/BillLookup/History.aspx?LegSess=89R&Bill=HB4908

[18] Martucci, B. (2025a, April 24). *Smaller, public utilities see growth potential in data centers, but there are risks: APPA*. Utility Dive. https://www.utilitydive.com/news/public-power-utilities-data-centers-appa/746254/

understanding of the landscape and may promote solutions for state residents that a public utility commission (PUC) could not achieve alone. Similarly, other external stakeholders, particularly those from overburdened or underrepresented communities, bring perspective that is key to understanding and protecting the public interest.[19] To maximize the benefit of their engagement, stakeholders need access to transparent data as well as the opportunity to influence decision-making. Strategies to ensure transparency and gather public information are discussed later in this paper. Strategies to share information among agencies, utilities, data centers and stakeholders include:

- Creating a working group or collaborative.
- Opening an informational docket or other noncontested docket at the public utility commission.
- Utilizing an economic development office forum to engage agencies, the utility commission, utilities, stakeholders and data center representatives.

Policymakers may consider pursuing one or more of these strategies. The goal should be to enable a coordinated, efficient and informed response to data center projects in the state that benefits all involved.

Implementation strategies:

Regulatory options

- Consider which partners are most essential to gathering information relevant to scope.
- Develop data center transparency requirements that are consistent and apply across government and regional transmission organizations (RTOs).
- Share information and options among relevant agencies to create best outcomes for consumers.
- Ask policymakers for updated collaboration pathways, if needed.
- Request participation by public power during investigations or other regulatory proceedings.

Policymaking options

- Determine whether collaborative structure(s) are sufficient or if legislative intervention is needed.
- Consider designating a lead agency to facilitate information sharing.

[19] Farley, C., & Farnsworth, D. (2023, April 10). *Opening the door: How officials can improve access to energy decision-making*. Regulatory Assistance Project. https://www.raponline.org/blog/opening-the-door-how-officials-can-improve-access-to-energy-decision-making/

Examples of collaboration among state agencies:

- In Washington, E.O. 25-05 requires the Washington Department of Revenue to establish a data center workgroup aimed at evaluating the impacts of data centers on Washington's tax revenue, economy, environment and energy use. The workgroup was tasked with balancing "industry growth, tax revenue needs, energy constraints, and sustainability."[20] The group's preliminary report, filed December 1, 2025, laid out nine recommendations, including the development of a new rate class, standardization of load-forecasting methodology, and incentives for load flexibility and energy efficiency.[21]

- Georgia's Developments of Regional Impact process facilitates collaboration among impacted state agencies and stakeholders regarding certain large infrastructure projects.[22]

- Maryland H.B. 0270 / S.B. 116 requires the Department of Legislative Services to coordinate preparation of a report by the Department of the Environment, the Energy Administration, and the University of Maryland School of Business analyzing likely environmental, energy and economic impacts of data centers.[23]

Collaborate at the Regional Level

Given the interconnected nature of the electric grid, regional coordination has always been important. With respect to data centers, however, the scale of impacts and the likelihood that developers are submitting duplicative requests in multiple states increases the need for regional and cross-state collaboration. Regional indications of duplication can clarify whether and how to press utilities for more information on forecasts for large loads in an individual state. Understanding the pressures other states are experiencing can also indicate how attractive a particular state is and how likely proposals are to reach completion.

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[20] E.O. 25-05. Data Center Workgroup. (Wash. 2025). https://governor.wa.gov/sites/default/files/exe_order/25-05 - Data Center Workgroup.pdf

[21] Department of Revenue, Washington State. (2025, Dec. 1). *Data center workgroup: Preliminary report*. https://dor.wa.gov/sites/default/files/2025-12/2025DataCntrWrkgrpPrelimReport.pdf

[22] Georgia Department of Community Affairs. (n.d.). *Developments of regional impact*. https://dca.georgia.gov/community-assistance/coordinated-planning/regional-planning/developments-regional-impact. The Department of Community Affairs recently paused its review of data center applications under this program while it evaluates land use and environmental impacts. Hansen, Z. (2025, July 17). *Georgia agency pauses reviews of data center proposals*. GovTech. https://www.govtech.com/policy/georgia-agency-pauses-reviews-of-data-center-proposals. Because the department did not prevent local reviews from continuing in the meantime, however, critics asserted the pause will only make local reviews less informed and transparent. Williams, D. (2025, July 18). *State pauses review of data center plans*. The Current. https://thecurrentga.org/2025/07/18/state-pauses-review-of-data-center-plans/

[23] H.B. 270. Reg. Sess. (Md. 2025). [Veto Overridden]. https://mgaleg.maryland.gov/mgawebsite/Legislation/Details/HB0270?ys=2025RS

This collaboration could include holding informal conversations or taking advantage of regional or national groups to facilitate dialogue between states (e.g., the National Association of Regulatory Utility Commissioners or its regional gatherings). For states in RTO or independent system operator (ISO) territories, it may also require robust engagement in regional state coordination bodies. Notably, RTOs and ISOs cannot resolve these issues without state involvement. For example, PJM's senior vice president recently asked participating states to enact stricter financial requirements and entry commitments for data centers to reduce speculative requests, which will in turn increase the accuracy of PJM's load forecasts.[24] States can and should engage with each other — and with regional bodies — to share information and best practices at a minimum.

While such collaboration is helpful, it is not sufficient to weed out all duplicative requests. Actions at the federal, ISO/RTO and state level are evolving and will likely be necessary to institute a system that creates clarity.

Implementation strategies:

Regulatory options

- Collaborate with other states to develop best practices and a coordinated response.
- Ask policymakers for updated cross-state collaboration pathways, if needed.

Policymaking options

- Consider enabling frameworks for multistate collaboration, including providing funding for state personnel to engage in such collaborations.
- Identify measures to reduce the number of speculative and duplicative data center applications within and among regions. These can include coordination options articulated here along with safeguards in application processes or tariffs such as stiff application fees, financial collateral and contributions in aid of construction.

[24] Haque, A. (2025, October 2). *State frameworks are critical to addressing PJM affordability*. Utility Dive. https://www.utilitydive.com/news/state-frameworks-critical-to-addressing-consumer-affordability/801784/

Gather Information About What Is Coming

When facing new challenges, gathering information is a standard starting place because strategic decision-making depends upon making informed choices. Policymakers and regulators should take steps to gather the information needed to understand data centers' potential impacts. Many states have already done so.

Transparency about potential data center impacts will provide visibility and facilitate informed decision-making. Proponents of full transparency assert that public access will enable scrutiny and proactive review. Regulators and policymakers need information about expected load growth to enable development of load forecasts, before unchecked load forecasts trigger an energy emergency.[25] It also empowers decision-makers to understand what's possible.

Many high-impact load customers are concerned that providing this information, however, could endanger a competitive advantage and deter innovation.[26] Nondisclosure agreements have become commonplace between high-impact load customers or developers and utilities, curtailing the amount of information available. Policymakers must try to strike a balance to ensure regulators, state agencies, stakeholders and other decision-makers have the information they need to make informed decisions, without unduly compromising economic concerns of high-impact load customers. While state requirements for handling confidential materials vary, regulators and policymakers should ensure they have access to the data necessary for informed oversight and scrutiny. A variety of tools can enhance transparency while protecting truly confidential material, and states may select which strategies are appropriate for them. These include obtaining information through discovery requests in contested cases, investigations or studies (legislative or administrative), mandatory reporting requirements, or other information-sharing requirements. We provide additional information and examples of some of these tools below.

[25] Sierra Club. (2025, June 6). Comments in Pennsylvania Public Utility Commission Docket No. M-2025-3054271, En banc hearing concerning interconnection and tariffs for large-load customers. https://www.puc.pa.gov/pcdocs/1882223.pdf

[26] Velvet Tech Services. (2025, June 3). Motion for protective order in Missouri Public Service Commission File No. EO-2025-0154. https://efis.psc.mo.gov/Document/Display/834612

Striking the right balance: Protecting confidentiality yet enabling informed decision-making

Even if legitimate confidentiality concerns preclude full public disclosure, they need not prevent *all* access;[27] the level of disclosure may be tailored to the context. Most states have statutory guidance on the types of information that can be claimed as confidential, such as trade secrets. Regulators will need to carefully consider the level of confidentiality necessary to protect economic interests versus the need for transparency. For instance, detailed facility specifications (e.g., for energy efficiency measures) or granular load forecasting may justify more protection than aggregated usage data. A 2023 Texas law requires cryptocurrency data centers to register with the PUC and provide information, including usage and demand response. (Texas recently passed more general legislation, S.B. 6, that would require disclosure of specified information to the grid operator and PUC, not the public at large.) That information is meant to be public but is currently pending litigation wherein the PUC is seeking to prevent disclosure, claiming that the information raises security risks. The Texas Attorney General's Office has largely concluded that information should be released publicly and that security arguments lack evidence.[28]

At a minimum, key information such as duplicative requests should be disclosed to the regulator, under confidentiality protection if necessary. As a last resort, if information cannot be shared directly with regulators, reliance on a trusted third party's review of the data may provide some assurance; the Electric Reliability Council of Texas (ERCOT), for example, has considered new large load additions verified by a "credible" third-party forecast.[29] Third-party forecasts carry their own limitations, however, and absent oversight or direction from regulators, third parties may not provide the type, objectivity or level of review necessary. These limitations could be mitigated through collaboration between an RTO and its regional state committee in a manner similar to the joint annual resource adequacy study conducted by the Midcontinent Independent System Operator (MISO) and its regional state committee, the Organization of MISO States, Inc.[30]
By pooling publicly available load forecasts shared by utilities with each entity (or its individual members in the case of a regional state committee), potentially duplicative reporting could be identified.

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27 Kunicoff, Y., & Washington, J. (2025, August 4). Public officials reconsider NDA process amid Project Blue outrage. *Arizona Luminaria*. https://azluminaria.org/2025/08/04/project-blue-nda-policy-secrecy/

28 Brisbin, S. (2025, August 13). Public Utility Commission sues Paxton's office over release of crypto miners' power usage. *Texas Standard*. https://www.texasstandard.org/stories/texas-public-utility-commission-sues-attorney-general-ken-paxton-office-crypto-mining-power-data/

29 Electric Reliability Council of Texas. (2025, July 1). *Update on ERCOT's adjusted load forecast and request for good cause exception for 2025 regional transmission plan*, p. 8. Filing in Public Utility Commission of Texas Project No. 55999. https://interchange.puc.texas.gov/Documents/55999_121_1495046.PDF

30 Organization of MISO States & Midcontinent Independent System Operator. (2025, June 6). *2025 OMS-MISO survey results* [Presentation slides]. https://cdn.misoenergy.org/20250606%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation702311.pdf

Using these tools, regulators and policymakers should seek to obtain information that falls broadly into three categories: energy impacts, rate impacts and environmental impacts.[31]

- **Energy impacts:** Regulators, policymakers and service providers need information from customers and utilities about the type, location and energy characteristics of proposed data centers. In addition to helping weed out speculative requests, detailed information about data centers' energy use is necessary to run models that evaluate system and reliability impacts of a new interconnection request.[32] Access to information about the interconnection process, available headroom in the grid, size of any interconnection queue and anticipated time to power may also benefit prospective customers by empowering them to submit fewer applications each with greater chance of success and streamlining interconnection review and negotiations.[33]

- **Rate impacts:** Industrial rates have existed for decades, and special rates for economic development are not new. The scale of costs associated with serving data centers, and the increased risk of stranded assets, merit review of these rate structures. Financial transparency is necessary to protect existing customers from bearing costs to serve new large loads. This includes information regarding a utility's financial exposure to data center deals, the structure of those deals and how the utility proposes to allocate costs to serve new large customers. Establishing general policy through tariffs rather than one-off service agreements can increase transparency and improve oversight. Clarity about anticipated job benefits (over the short and long term) will also assist policymakers in determining the extent of public incentives (e.g., special rates) to offer. Frontline community advocates, for example, have emphasized the need for transparency and accountability around corporate subsidies.[34]

- **Environmental impacts:** Decision-makers need information about potential environmental impacts — including water usage, noise pollution and direct air pollution — to get a full picture of how large-load development will impact the public interest and well-being. This is especially important in industries that are geographically clustered — like data centers in northern Virginia — where cumulative impacts can cause significant harm to neighboring communities. Gathering this information may require collaboration among state agencies.

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[31] Mims Frick, 2025.

[32] Such data could include load profiles and forecasts, data center operational equipment specifications, and behind-the-meter generation specifications. Quint, R., Zhao, J., & Thomas, K. (2025a, February). *An assessment of large load interconnection risks in the Western Interconnection*. Elevate Energy Consulting for Western Electricity Coordinating Council. https://www.wecc.org/sites/default/files/documents/products/2025/Report_WECC%20Large%20Loads%20Risk%20Assessment%204.pdf. A later report provides additional detail regarding the specific data needed to inform interconnection modeling. Quint, R., Thomas, K., Zhao, J., Isaacs, A., & Baker, C. (2025b, May). *Practical guidance and considerations for large load interconnections*. Elevate Energy Consulting, GridLab. https://www.elevate.energy/_files/ugd/cf361d_a604b2edbdf34a2b94a1ebc3cd4be3bd.pdf

[33] The Data Center Coalition, for example, has explained, "A disconnect between near-term customer demand signals (such as from data centers) and the long-term forecasts that guide infrastructure planning can lead to misaligned investments. That gap must be closed through greater transparency, better data sharing, and consistent stakeholder engagement." See, for example, Public Utilities Commission of Ohio, Docket No. 24-508-EL-ATA, Opinion and Order on July 9, 2025, pp. 44-45. https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A25G09B43531I00509

[34] NAACP. (2025). *Frontline framework community guiding principles*. https://naacp.org/resources/frontline-framework-community-guiding-principles

Information gathering in the four common scenarios

Individual application. Information gathering is possible and appropriate even for the review of a single application. Regulators can implement a baseline set of information required for every data center-related application. Absent that, regulators can utilize data requests or other discovery tools to obtain information necessary to place an application in context. Decisions on individual applications may also provide an opportunity to require ongoing reporting or signal an intent to open broad investigations.

Multiple applications. As with a single application, regulators may utilize investigatory tools within each individual application to gather relevant information. Having multiple applications pending simultaneously should also facilitate broader inquiries or enable similar data requests to collect consistent types of information across applications or utilities. Rather than wasting time evaluating a series of applications individually, regulators may choose to pursue broader review, such as a regionwide assessment of needs and capabilities that integrates demand with supply-side resource and transmission planning.

Systemic change needed. The necessity for system change provides a natural opening to request broader information and analysis. If multiple utilities are on simultaneous tracks for planning (e.g., IRPs), it may also naturally tee up statewide review. Ongoing information requirements may also enable more robust decisions in the future.

Unregulated development. While not necessarily common among municipal utilities and co-ops to routinely request information, it is well within the purview of an oversight board or council and is arguably a necessary tool to utilize for any planned large-load additions. Even basic inventories similar to information requests for IOUs or ballpark estimates could help place large-load requests in context — for example, identifying requests that could double or triple the existing system's current capacity. Furthermore, municipality and co-op decisions to connect large loads can impact the bulk power system and neighboring (regulated) utilities. Impacts from these large loads need to be studied on the same basis as others seeking interconnection in the same region. Mutual transparency among municipal utilities, co-ops and IOUs can support planning efforts and help regulators and policymakers decide how to address costs being passed through to regulated customers.

Implementation strategies:

Regulatory options

- Conduct investigations regarding system, reliability, rate and environmental impacts.
- Utilize existing processes (e.g., IRPs, rate proceedings, certificates of public convenience and necessity) to collect information from utilities and developers.
- Require utilities to disclose key information about grid status and the interconnection queue.
- Ensure utility tariffs or interconnection rules mandate the disclosure of necessary data from project developers.

Policymaking options

- Require facilities, IOUs, municipal utilities and co-ops to provide information directly to state agencies on the scope and scale of data center impacts.
- Empower state agencies, including public utility regulators, to request such information from data center developers and utilities.
- Empower utility commissions to evaluate cost shifts in existing rate structures and to create new rate structures as needed.

Data Requests Can Compel Utility Disclosure

Regulators, in their quasi-judicial function, can require utilities to answer data requests. The opportunity for parties to conduct discovery is one of the hallmarks of a contested case proceeding. Data requests are a predominant tool for conducting discovery, but some states may allow other forms of discovery as well (e.g., depositions). In addition to data requests submitted by commission staff, commissioners themselves may pose direct questions through a contested case docket to regulated entities or request information from intervenors. Information needed includes at least the following:

- Energy, cost and environmental impacts of data centers.
- Existing system flexibility.
- Existing system grid status and interconnection queue.
- Least-cost, fastest deployment options.
- Options to stagger interconnection (ramp periods).
- Energy efficiency and demand response of the data center.

Utilizing discovery tools through existing regulatory pathways — such as within rate cases, certificate of public need proceedings or resource planning — is a straightforward option to access data with relatively little effort. For example, RMI has developed a set of specific questions regulators can ask regarding load forecasting.[35] However, given the unique

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[35] Sward, J., Shwisberg, L., Stephan, K., & Becker, J. (2025, February). *Get a load of this*, appendix. RMI. https://rmi.org/wp-content/uploads/dlm_uploads/2025/03/Get_a_load_of_this_Load_Forecasting.pdf

characteristics of data centers, specific investigations or informational proceedings may be warranted. In any approach, utility commissions have broad purview, by virtue of their enabling statutes, to ask the questions necessary to ensure robust oversight of the utilities they regulate.

Examples of data requests:

- Virginia's State Corporation Commission requested Dominion Energy to run additional scenarios for its IRP, including two runs that exclude new data center demand.[36]
- In response to press releases from NorthWestern Energy about its intent to serve new large customers, the Montana Public Service Commission requested documentation of any agreements with the reported large customers; a detailed explanation of the evaluation of whether providing electricity supply service to these entities would adversely impact other customers; the utility's projected seasonal retail resource adequacy positions inclusive of expected loads; and an explanation of how the utility will ensure compliance with state statute.[37] The utility subsequently indicated its intent to develop and seek approval for a large-load tariff before providing service to any customer over 5 MW.[38]

Investigations and Studies Are Flexible Tools

Many states have opened formal investigations or mandated studies that examine the impacts of data centers and other large loads. In addition to utility commissions formally opening investigatory dockets, studies can also be conducted by other state entities or mandated by statute. Creation of state and multistate staff-level working groups will enable commissions and other state agencies to not only understand ways to address current load growth challenges, but to also fully understand the opportunities large loads could present. Such ongoing working groups could be empowered to:

- Make recommendations on near-in-time approaches to data centers with information available now.
- Identify informational needs and areas of investigation or study.
- Identify new regulatory tools, or adaptations to existing tools, necessary to address data center loads.
- Engage with stakeholders and industry thought leaders to identify creative opportunities in regulation or policy.

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[36] Virginia State Corporation Commission, Docket No. PUR-2024-00184, Final Order on July 15, 2025. https://www.scc.virginia.gov/docketsearch/DOCS/86qq01!.PDF

[37] Montana Public Service Commission. (2025, September 3). Request for information regarding data center loads. Filing in Montana PSC Docket No. 2022.09.087. https://s3.documentcloud.org/documents/26192252/letter-new-large-loads-doc-67601.pdf

[38] NorthWestern Public Service. (2025, September 17). Response to request for information regarding data center loads. Filing in Montana PSC Docket No. 2022.09.087. https://s3.documentcloud.org/documents/26192253/e-filedresponseforinformationregardingdatacenter.pdf

Examples of investigations:

- The New Mexico PUC opened an investigation to evaluate grid readiness and economic development, which included an assessment of large-load interconnection requests.[39]
- Pennsylvania's PUC opened an en banc investigation into data center impacts on the state's grid and ratepayers.[40] In early November 2025, the commission issued for public comment a tentative order with recommendations for a transparent public interconnection queue and a model tariff informed by responses to its investigation.[41]
- The Arizona Corporation Commission opened an investigation into "existing rate classifications and the possible creation of more transparent rates for data center customers and the public."[42]
- In response to increasing large-load requests, the North Carolina Utilities Commission opened a generic proceeding in June 2025 "for the purpose of receiving information and recommendations as how to fairly and efficiently integrate large electric load additions."[43]

Examples of studies:

- Washington Governor Bob Ferguson's E.O. 25-05 requires the Department of Revenue to lead a working group, including utilities, to study and "recommend policies and actions for addressing [data center] energy use and impacts on the economy and job market."[44]
- North Dakota legislation (H.B. 1579) requires the state's legislative support body to study the impact of large energy consumers on the electricity grid.[45] The study must evaluate grid reliability and infrastructure requirements, including costs of upgrades and effects of congestion; "best practices for integrating high-demand users while maintaining reliability for all ratepayers"; economic impacts affecting the energy industry; and market dynamics in the local energy industry, including possibilities for demand-side management and load flexibility. The study team must include representatives from the data center industry, IOUs, co-ops, municipal utilities, independent power producers and RTOs, along with the Public Service Commission and other state agencies.

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[39] New Mexico Public Regulation Commission. (2025, March 7). Docket 24-00257-UT. Second bench request.

[40] Pennsylvania Public Utility Commission. (2025, March 27). *PUC launches review of grid impacts from data center growth* [Press release]. https://www.puc.pa.gov/press-release/2025/puc-launches-review-of-grid-impacts-from-data-center-growth-03272025

[41] Pennsylvania Public Utility Commission, Docket M-2025-3054271, Tentative Order on November 6, 2025. https://www.puc.pa.gov/pcdocs/1901687.pdf

[42] Arizona Corporation Commission. *Docket details*. Docket No. E-00000A-25-0069. https://edocket.azcc.gov/search/docket-search/item-detail/29509

[43] North Carolina Utilities Commission, Docket No. E-100 Sub 208, Order on June 6, 2025, initiating proceeding and requesting comments. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=e11bad51-1ebd-4237-acf7-358c292be069.https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=e11bad51-1ebd-4237-acf7-358c292be069

[44] Office of the Governor of Washington State. (2025, February 4). *Governor Bob Ferguson signs executive order establishing a data center workgroup* [Press release]. https://governor.wa.gov/news/2025/governor-bob-ferguson-signs-executive-order-establishing-data-center-workgroup

[45] H.B. 1579. 69th Legislative Assembly. 2025 Reg. Sess. (N.D. 2025). Enrolled. https://www.sos.nd.gov/sites/www/files/documents/services/leg-bills/2025-69/house-bills/1579.pdf

- California A.B. 222[46] (introduced in the 2025 session) would require the Public Utilities Commission to include "an assessment of electrical load trends from data centers" as part of its 2027 edition of the integrated energy policy report. This report would include recommendations for mitigating impacts, including potential energy efficiency and demand response measures; the bill would also require data center developers to submit the power usage effectiveness ratio[47] in a process to be developed by the commission.

Reporting Can Provide the Long View

While some utilities argue that public reporting is overly burdensome,[48] ongoing reporting can complement discrete information gathering by ensuring the continual flow of updated information over time and consistent data points across utilities. In addition to state agencies that require reporting from regulated entities (e.g., a PUC requiring reporting by a regulated utility), policymakers may require a state agency such as the PUC to provide updates to the legislature or mandate that regulated utilities or prospective large customers provide information directly to the PUC.

Examples of reporting requirements:

- Oregon's POWER Act (H.B. 3546) requires the PUC to report every two years on large data center trends to the Legislative Assembly, with the option to recommend legislation.[49]
- Iowa H.F. 976 requires data centers to register and provide annual reports with information on backup fuel and electricity purchased in the prior year.[50]
- Texas S.B. 6 requires new large loads to disclose to the service provider the details of on-site generation as well as any duplicative applications submitted to another Texas utility or municipality.[51] This law does not require public disclosure or disclosure to policymakers or regulators, nor does it require disclosure of requests outside of ERCOT's footprint.

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[46] A.B. 222. 2025-2026 Reg. Sess. (Cal. 2025). Introduced. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202520260AB222

[47] Although power usage effectiveness is an important metric, it only reflects the relative efficiency of the supporting infrastructure (e.g., cooling), not the overall efficiency of a data center. See: Van Geet, O., & Sickinger, D. (rev. 2024, July). *Best practices guide for energy-efficient data center design,* p. 29. Federal Energy Management Program. https://www.energy.gov/sites/default/files/2024-07/best-practice-guide-data-center-design_0.pdf. Importantly, the ratio excludes potential efficiencies related to the load from the computing equipment (e.g., semiconductor chips), which represents the majority of most data centers' energy consumption. International Energy Agency, n.d., p. 5. In the absence of another metric that measures overall facility efficiency, however, power usage effectiveness is a reasonable starting point. Nor is power usage effectiveness information confidential; Google already publicly posts its ratios: Google. (n.d.). *Growing the internet while reducing energy consumption*. https://datacenters.google/efficiency/

[48] See, for example: Public Utilities Commission of Ohio, Docket No. 24-508-EL-ATA, Opinion and Order on July 9, 2025, p. 46. https://dis.puc.state.oh.us/DocumentRecord.aspx?DocID=badab793-e041-4173-9b6d-436e51f80e5c

[49] H.B. 3546 § 7. 83rd Legislative Assembly. 2025 Reg. Sess. (Or. 2025). https://olis.oregonlegislature.gov/liz/2025R1/Downloads/MeasureDocument/HB3546/Enrolled

[50] H.F. 976. 91st Gen. Assem. Reg. Sess. (Iowa 2025). Enrolled. https://www.legis.iowa.gov/docs/publications/LGE/91/Attachments/HF976_GovLetter.pdf

[51] S.B. 6. 89th Legislature. Reg. Sess. (Tex. 2025). Enrolled. https://capitol.texas.gov/BillLookup/History.aspx?LegSess=89R&Bill=SB6

- An approved Indiana Michigan Power settlement requires the utility to provide semiannual reports to the commission on the number and scale of existing and prospective large-load customers.[52]

- Georgia Power submits quarterly "large load economic development reports" to the commission. As part of the approved settlement in its 2025 IRP, these reports will additionally include "the date that any new project enters the large load pipeline, the announced load of any new project entering the large load pipeline, and new large load projects that have entered into a Contract for Electric Service."[53]

Scrutinize Data Center Demand in Planning

Load forecasting and resource planning provide the foundation for power system investment decisions. Any forward-looking analysis will have inherent uncertainty; load forecasting and resource planning best practices are intended to make predictions as accurate as possible while grounding decision-making in a range of potential outcomes. Because doing so is especially challenging with respect to anticipating potential data center growth — which now dominates load-growth forecasts[54] — forecasting and planning around data center demand deserves careful scrutiny.

There is huge uncertainty as to the size and timing of data center load growth.[55] According to one already outdated Lawrence Berkeley National Laboratory (LBNL) figure summarizing various reports, the range between high and low estimates for 2030 U.S. data center energy demand is roughly 200 TWh,[56] nearly equivalent to California's entire in-state generation in 2023.[57] This uncertainty is compounded at the utility level, with aggregations of utility reports collectively outpacing even the highest national or regional estimates. Grid Strategies estimates that FERC-submitted load forecasts collectively overstate data center-driven demand by roughly 40% compared with data center industry estimates.[58] An analysis by the Sierra Club found that just 23 utilities collectively reported 700 gigawatts (GW) in new data center demand by 2030[59] —

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52 Indiana Utility Regulatory Commission, Cause No. 46097, Order on February 19, 2025. https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/2b48cf93-d9ee-ef11-be20-001dd80b8c52/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_46097_021925.pdf

53 Georgia Public Service Commission, Dockets No. 56002 and 56003, Order on July 15, 2025, adopting stipulation. https://psc.ga.gov/search/facts-document/?documentId=223496

54 Wilson, J., Meyer, S., Zimmerman, Z., & Gramlich, R. (2025, November). *Power demand forecasts revised up for third year running, led by data centers*. GridStrategies. https://gridstrategiesllc.com/wp-content/uploads/Grid-Strategies-National-Load-Growth-Report-2025.pdf

55 Martucci, B. (2025b, May 15). *A fraction of proposed data centers will get built. Utilities are wising up*. Utility Dive. https://www.utilitydive.com/news/a-fraction-of-proposed-data-centers-will-get-built-utilities-are-wising-up/748214/

56 Shehabi et al., 2024, Fig. 1.1.

57 Total in-state generation for California in 2023 was reported to be roughly 216 TWh. California Energy Commission, n.d.

58 Wilson et al., 2025.

59 Fisher, J. (2025, August 8). *Fools gold: When 700 gigawatts of data centers come knocking*. Sierra Club. https://www.sierraclub.org/articles/2025/08/fools-gold-when-700-gigawatts-data-centers-come-knocking

more than five times LBNL's high-end estimate of 132 GW by 2028.[60] In California, the Energy Commission anticipates 3.5 GW of data center load by 2040, but utilities are reporting over 16 GW of data center requests in their interconnection processes.[61]

These high utility estimates are unlikely to fully materialize. According to London Economics International, "uncertainties inherent in outlooks for data center electricity demand reflect a bias to overstating future demand."[62] Forecasts may reflect duplicative requests — perhaps submitted to multiple utilities in multiple states — for a small number of projects to maximize the chance of securing fast connections for the desired amount of data center capacity.[63] Speculative developers are also submitting requests that bet on future data center demand. Dominion Energy disclosed to North Carolina regulators that it has 54 data center customers, seven of which comprise 73% of its data center load. The utility has an additional 50 prospective customers that it characterizes as real estate developers hoping to get in on the game — and an equal size of demand. As more developers enter the market, particularly those with no prior data center experience, utilities may find it difficult to weed out those proposals unlikely to come online. Confidentiality further hampers efforts to accurately predict which load will materialize. These challenges raise the stakes for load forecasting and utility planning.

Real-world experience confirms that developers are submitting speculative connection requests. AEP Ohio reported that after its data center tariff was approved, requests in the queue dropped from 30 GW to 13 GW. The tariff requires new data center customers to pay for a minimum of 85% of the energy they say they need each month, even if they use less, to cover the cost of the infrastructure required to bring electricity to those facilities. This example reiterates the importance of including safeguards in utility tariffs and queue-management practices that deter this type of prospecting.

To combat these challenges, regulators should ensure they are able to robustly scrutinize utility load forecasting and provide guidance on proposed utility transmission and generation investments — and policymakers should ensure regulators have the authority to do so. Tried-and-true strategies such as integrated resource planning, grid modernization plans and performance-based regulation can provide transparency around expectations and place data center demand in a broader system context, if the planners have adequate data and insights as

60 Shehabi et al., 2024.

61 Millar, N. (2025, October 2). *Managing the challenges of large load integration* [Presentation]. Fall 2025 Joint CREPC-WIRAB Meeting. https://www.westernenergyboard.org/wp-content/uploads/06_Millar_CREPC-2025-10-02-NMILLAR-final.pdf

62 London Economics International LLC. (2025, July 7). *Uncertainty and upward bias are inherent in data center electricity demand projections*. Prepared for Southern Environmental Law Center. https://www.selc.org/wp-content/uploads/2025/07/LEI-Data-Center-Final-Report-07072025-2.pdf

63 An energy market development lead for Google noted that during the planning stage, "the same entity might make multiple requests for the same unit of supply, but only a portion of planned data [would] ultimately get built." Sawyer, A. (2025, May 20). *Uncertainty in data center load forecasts creates planning difficulties*. NewsData. https://www.newsdata.com/clearing_up/supply_and_demand/uncertainty-in-data-center-load-forecasts-creates-planning-difficulties/article_66bb1c5a-0a1e-453d-a2b4-985f2ee0f651.html

to how to weight the likelihood of the data center project requests materializing. Even certificates of public convenience and necessity, which may have a narrower scope, typically require some analysis of a proposed project's alternatives and context. In addition to understanding potential resources available to meet demand, these planning tools enable regulators and utilities to understand how other sources of potential load growth — such as demand from electrification of buildings, industry and vehicles — could add further demand pressure on top of data center growth forecasts over a longer time span, possibly identifying grid upgrades that could remain durable even if data center demand grows less than expected.[64]

Some states may need to put these planning policies into place for the first time. Even in states where planning tools exist, they may need updating to respond appropriately to current needs. For instance, IRP forecasting strategies put into place 15 to 20 years ago may need modernizing to keep up with current data-processing capabilities and demands. As RMI explains, best practices include employing scenario-based or stochastic forecasting models, integrating end-use forecasting with econometric forecasting, and ensuring consistent treatment of load forecasts throughout planning processes.[65] Even recently implemented regulatory tools might benefit from updates, including exploring the use of shorter IRP cycles to accommodate the rapidly changing environment.[66]

Although it may take time to update statutes or regulations, effective modern planning tools and methods are essential and merit ongoing upkeep. Regulators and policymakers should evaluate what holes might exist in their state's planning processes and enact updates. For example, regulators could consider whether to:

- Establish clear expectations for forecast methodologies, elements and metrics (e.g., how to manage data center speculative applications, stages of data center and other loads progress and timing from application to energization).
- Enhance load forecasting review with robust third-party or stakeholder input.
- Improve forecasting tools and requirements.
- Compare individual utility forecasts and RTO-level estimates to identify and understand the reasons for over- or undercounting.

In the meantime, to the extent possible, regulators should scrutinize data center load growth by utilizing existing planning tools. We lay out specific recommendations to do so below.

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64 Wilson et al., 2025.

65 Sward et al., 2025.

66 Innovations throughout grid planning and integration practices can motivate progress toward a less congested, more utilized grid. Pató, Z. (2024, May 13). *RIP first come, first served*. Regulatory Assistance Project. https://www.raponline.org/toolkit/rip-first-come-first-served/. See also: Charles River Associates. (2025, September 16). *Utility planning best practices: Data center load considerations*. Attached as Appendix A to Ameren Missouri. (2025). *Integrated resource plan update 2025*. https://efis.psc.mo.gov/Document/Display/851694

Scrutinizing demand in the four common scenarios

Individual application. Many times, given the speed of data center load growth needs, regulators may first face the issue in a rate case or a proceeding for a certificate of public need. Planning forecasts, if any, may be outdated or inadequate to provide a full profile of the new load and how it can fit in the existing system. Regulators may want to consider the extent to which they can pause proceedings to obtain a full analysis or incorporate some planning tools, such as forecasts and modeling, within the pending case. New data center requests can be evaluated in the context of recent planning processes. However, it is more difficult to view a new data center proposal in context with older planning documents. Even within proceedings on individual applications, regulators can utilize discovery tools (data requests or commissioner letters) to request analysis of specific contingencies, sensitivities or the implications of load flexibility. Decisions on individual applications can also signal regulators' intent to require or scrutinize this type of analysis in upcoming proceedings, though we encourage regulators to start modifying methods and collecting wide-scale information as soon as possible, rather than handling it ad hoc in one-off proceedings.

Multiple applications. Multiple overlapping applications may justify pausing a proceeding to obtain a full analysis. And as with individual applications, regulators may utilize discovery tools to request information. Gathering consistent information on multiple applications will offer a better landscape view.

Systemic change needed. Opportunities to evaluate system change can and should include modeling of data center contingencies and sensitivities as well as robust analysis of load flexibility implications. However, planning processes may be lengthy or operate on a defined schedule. Requiring updated IRP filings for significant changes from previously filed planning documents might be advantageous.

Unregulated development. We strongly encourage municipalities and co-ops to do this type of analysis. Even basic contingencies (e.g., 0%, 50% and 100% of data center load materializing) can contextualize large-load requests and identify low- or no-regrets pathways.

Implementation strategies:

Regulatory options

- Utilize existing regulatory structures, including IRPs, grid modernization, certificates of public convenience and necessity, and performance-based regulation metrics.
- Evaluate and implement updates to structures as needed.
- Establish clear expectations for forecast methodologies, elements and metrics.

Policymaking options

- Adopt integrated resource planning or other planning authorization to enable regulators to assess large-load implications.
- As needed, update statutes to provide authorization for enhanced forecasting tools or third-party or stakeholder review of load forecasts.

Examples of scrutinizing data center demand:

- Missouri (S.B. 4)[67] recently updated and strengthened integrated resource planning. Other states, such as Iowa[68] and Wisconsin,[69] are considering legislative action on integrated resource planning.
- ERCOT's review of its load forecasting process resulted in a request to refine estimates of large-load and data center demand consistent with historic data.[70]
- The Minnesota PUC refused to exempt Amazon from a certificate of need for 250 backup generators.[71] Amazon has not submitted a subsequent application for a certificate, which would require the company to justify the need for the generators compared with other alternatives.

Contingencies, Scenarios and Sensitivities Are Key

Given the uncertainty inherent in data center load forecasting, it is generally unwise to plan based on a single potential outcome. Utilities therefore typically evaluate a range of contingencies, scenarios and sensitivities. These are used to probe how outcomes could change depending on a range of factors, such as economic outlooks, population growth patterns or

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67 S.B. 4. (Mo. 2025). https://www.senate.mo.gov/25info/bts_web/Bill.aspx?SessionType=R&BillID=66

68 S.F. 2244. Reg. Sess. 2024. (Iowa 2024). Introduced. https://www.legis.iowa.gov/legislation/BillBook?ga=90&ba=sf2244

69 2025-2027 Budget. 2025-2026 Legislature. (Wis. 2025). Introduced. https://docs.legis.wisconsin.gov/2025/related/budget/drafts/25_1020_p1.pdf

70 Electric Reliability Council of Texas. (2025, July 1). *Update on ERCOT's adjusted load forecast and request for good cause exception for 2025 regional transmission plan*. Filing in Public Utility Commission of Texas Project No. 55999. https://interchange.puc.texas.gov/Documents/55999_121_1495046.PDF

71 Minnesota Public Utilities Commission, Docket No. PT-7151/CN-24-435, Order on April 1, 2025, requiring certificate of need and granting exemption from certain application data requirements. https://www.edockets.state.mn.us/documents/%7B6062F295-0000-CF1C-96AE-61D59FA827E4%7D/download?contentSequence=0&rowIndex=4

technology development. Typically, scenarios are based on two sets of possible futures: a baseline or reference case and a set of alternative scenarios exploring a range of outcomes.[72] Given data center loads' uncertainty and influence on utility planning, these alternative scenarios should include potential data center outcomes.[73] There are few established practices for load forecasting, particularly for large-load forecasting, and there is little historical data or experience available to offer insight into future large-load demands, timing and behavior. That makes it essential to clearly explain forecasting methodology and assess a reasonable range of future outcomes.[74]

The baseline case should exclude forecast (new) data center demand. Preventing data center growth from being baked into utility analysis will make it easier to identify the impacts and risks that stem from serving new data center load. PacifiCorp's 2025 IRP, for example, excluded new data centers from its base forecast but developed a "high data center scenario" for comparison.[76]

Regulators should ensure that utilities compare the baseline to reasonable data center scenarios. For example, assuming 100% of data center requests will come online is unlikely to be realistic or insightful. At a minimum, states may require large loads to meet threshold criteria before they are included in any forecast. For example, the Texas PUC has proposed detailed eligibility thresholds that comply with the state's new large-load law, S.B. 6.[77]

Utilities are inconsistent in how they handle data centers in load forecasting. According to a 2024 survey, a quarter (6 out of 24) of the surveyed utilities reported that they do not presently include data center requests in their load forecasts. Just under half (10 of 24) include the full capacity specified by the data center customer, with most of those (8 of the 10) ramping that capacity over time. A third of respondents (8 of 24) reported derating the requested capacity value by some amount, but no one provided exact calculations for doing so.[75]

Even large loads that meet designated milestones are not guaranteed to come online; some forecasting is required to inform more realistic scenario selection. Evaluating how much data center demand may materialize is challenging, especially given the limited availability of historic

[72] Zhou, E., Gadzanku, S., Hodge, C., & Campton, M. (2023, April). *Best practices in electricity load modeling and forecasting for long-term power system planning*. National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory. https://docs.nrel.gov/docs/fy23osti/81897.pdf. See also: Biewald, B., Glick, D., Kwok, S., Takahashi, K., Carvallo, J. P., & Schwartz, L. C. (2024, November). *Best practices in integrated resource planning: A guide for planners developing the electricity resource mix of the future*. Lawrence Berkeley National Laboratory. https://emp.lbl.gov/publications/best-practices-integrated-resource

[73] Quint et al., 2025a.

[74] Mims Frick, 2025.

[75] Larson, D. (2024, September). *Utility experiences and trends regarding data centers: 2024 survey*. Electric Power Research Institute. https://www.epri.com/research/products/000000003002030643

[76] PacifiCorp. (2025, March 31). *2025 integrated resource plan. Volume II*. https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2025-irp/2025_IRP_Vol_2.pdf

[77] Public Utility Commission of Texas, Project No. 58480, Proposal on September 18, 2025, for publication of new 16 TAC 25.370. https://interchange.puc.texas.gov/Documents/58480_8_1540588.PDF

data and rapidly changing landscape. As Charles River Associates lays out, there are four primary forecasting approaches for data center load:[78]

- **Top-down adjustment** wherein utilities "apply macro-level adjustments to reflect anticipated growth."[79] That is, some utilities have simply reduced their forecast data center load by a specified percentage, a practice called "derating." Based on historic data, for example, ERCOT has proposed assuming that roughly 25% to 50% of requested data center capacity will come online.[80] The Texas PUC has proposed to allow ERCOT to make such adjustments "based on actual historical realization rates or other objective, credible, independent information."[81] While this approach is simpler, determining the level of adjustment is challenging given the lack of historical data in many states and the rapid pace of change in the data center industry. In recognition of this challenge, states may consider bookend outcomes (e.g., 10% and 50% of the load materializing) that provide insight into a range of potential outcomes.

- **Bottom-up deterministic forecasting** that "relies on detailed, site-specific information — such as interconnection requests, public filings, permitting activity, and direct engagement with developers — to forecast expected load from known data center projects."[82]

- **Stakeholder-informed forecasting** that "builds on the bottom-up approach by incorporating project-specific intelligence while extending beyond publicly disclosed developments."[83] Salt River Project, for example, incorporates private intelligence along with publicly available information on the achievement of identified milestones into its assessment of likelihood that individual projects will come online.[84]

- **Probabilistic modeling** that "simulate[s] a distribution of potential data center build-out scenarios over time" through Monte Carlo simulations.[85]

Ultimately, the selected data center scenarios or sensitivities should be designed to provide insight given the circumstances in the utility's territory, which requires transparency and clarity from utilities. Utilities could adjust data center load projections based on developer

78 Charles River Associates, 2025.

79 Charles River Associates, 2025.

80 Electric Reliability Council of Texas, 2025.

81 Public Utility Commission of Texas, Project No. 58480, Proposal on September 18, 2025 for publication of new 16 TAC 25.370. https://interchange.puc.texas.gov/Documents/58480_8_1540588.PDF

82 Charles River Associates, 2025.

83 Charles River Associates, 2025.

84 Energy Systems Integration Group, Large Loads Task Force. (2025). *Forecasting for large loads: Current practices and recommendations.* https://www.esig.energy/large-loads- task-force/forecasting/

85 Charles River Associates, 2025.

experience: Developers with little or no data center experience may be treated as more speculative than those with a track record of successfully completing projects.[86]

Regardless of which scenarios are selected, it is important to view data center scenario(s) as a comparison tool, not a blank check. A straight discounting approach, for example, may create a false sense of certainty that the discounted demand will materialize. Instead of giving a green light to utilities to build out to a specified level of demand, derating should be treated as a tool and used to evaluate how the utility would respond to data center demand, if it materializes.

Implementation strategies:

Regulatory options

- Utilize staff data requests and/or the oversight role to require utilities to detail how they integrate high-impact load requests into load forecasts, including whether and how they discount any requests.
- Require utilities to include a range of sensitivities exploring a spectrum of high-impact load scenarios.
- Adopt and implement other recommendations from RMI's load forecasting report.[87]
- Increase the frequency of IRPs and IRP updates.

Policymaking options

- Require utilities to include high-impact load sensitivities and respond to regulator requests.
- Require data centers to disclose relevant operational information to state regulators.
- Establish a process to study historical data to determine the likelihood that high-impact load will materialize.

Examples of planning based on contingencies, scenarios and sensitivities:

- To comply with S.B. 6, the Texas PUC has proposed to include a large load in forecasts only if it has an executed interconnection agreement or meets defined milestones such as demonstrating site control and providing financial commitments. Load forecasts must exclude requests whose eligibility cannot be validated.[88] ERCOT has also proposed to automatically reduce data center requests to 49.8% of the MW submitted by the transmission and distribution provider. For data center loads supported by an attestation letter from the transmission and distribution provider (e.g., without a service contract), ERCOT will discount even more, to only 27.6% of the submitted MW.

[86] Georgia Power Company. (2025, January 1). *2025 integrated resource plan PD*. Filing in Georgia Public Service Commission Docket 56002. https://psc.ga.gov/search/facts-document/?documentId=221233

[87] Sward et al., 2025.

[88] Public Utility Commission of Texas, Project No. 58480, Proposal on September 18, 2025, for publication of new 16 TAC 25.370. https://interchange.puc.texas.gov/Documents/58480_8_1540588.PDF

- The Virginia State Corporation Commission ordered Dominion Energy to provide sensitivities for comparison that both include and remove projected data center demand.[89]

- PacifiCorp's 2025 IRP excluded new data centers from its base forecast and developed a "high data center scenario" that assumed 100% of requested data center demand would materialize.[90] In addition to this all-or-nothing approach, a middle-ground scenario would have provided additional, perhaps more useful, insight.

- NV Energy discounted data center loads that have not signed a service agreement by 85% in its recent IRP.[91] While this mitigates risks somewhat, it may still expose ratepayers to increased costs to serve 15% of prospective data center load even if none materializes.

- Salt River Project changed its load forecasting methodology to discount customer load requests based on assigned probability values for specified factors (e.g., client construction, development permits, land acquisition).[92]

- Georgia Power developed a "load realization model" that utilizes a Monte Carlo simulation. Among other things, the model provides different likelihoods based on characteristics of the developer: hyperscaler, co-locator with or without tenants, developer with data center experience, and developer without prior data center experience.[93]

Modeling Data Center Load Flexibility Opens Up Options

Most new grid resources are only built to serve peak loads, so in addition to knowing maximum capacity needs, utilities need to understand how new data center demand will be allocated both over multiple years and over time based on operational load shapes. Initially, data centers were treated as having constant demand throughout all 8,760 hours of the year. Yet information from data centers indicates that assuming unvarying, 24/7 load is both inaccurate and leaves potential solutions on the table. Regulators should therefore require utilities to explore flexible demand solutions with data centers that can respond to system needs.

Flexible options, such as participation in grid event-focused demand response and curtailment programs, peak shaving and other flexibility options can greatly decrease overall grid costs. Unless policies are in place that change the throughput incentive or require analysis of nonwire alternatives, most modeled options may not include flexibility options. Consequently, the

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[89] Virginia State Corporation Commission, Docket No. PUR-2024-00184, Final Order on July 15, 2025. https://www.scc.virginia.gov/docketsearch/DOCS/86qq01!.PDF

[90] PacifiCorp, 2025.

[91] Nevada Power Company. (n.d.). *Joint application of Nevada Power Company and Sierra Pacific Power Company for approval of their joint 2025-2044 integrated resource plan, for the three year Action Plan period 2025-2027*. Volume 6 of 29. Filing in Public Utilities Commission of Nevada Docket No. 24-05. https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/about-nvenergy/rates-regulatory/recent-regulatory-filings/irp/IRP-Volume-6.pdf

[92] Energy Systems Integration Group, Large Loads Task Force, 2025.

[93] Georgia Power Company, 2025.

regulator should require utilities to model flexibility options in utility planning in addition to full build-out to meet maximum data center load requests. Demand flexibility offers at least two benefits. First, it could mitigate overbuilding risk: If data centers can avoid exacerbating system peaks, they are less likely to drive substantial infrastructure expenditures that could become stranded if load fails to materialize or is later shut down. Second, if data center demand does materialize, flexibility is key to quickly and effectively incorporating it into the grid. In fact, the International Energy Agency has identified load flexibility as one of the essential strategies for addressing data center demand globally.[94]

Opponents argue that it is very difficult or impossible to shift energy usage at data center facilities. They also assert that modeling unrealistic levels of flexibility could create misleadingly low load forecasts that jeopardize long-term resource adequacy. Proponents counter that facilities are becoming increasingly flexible (see text box on the next page), and data center flexibility can provide significant grid benefits that should be studied.[95] For example, Google's commitment to flex its machine learning workloads when requested by Indiana Michigan Power will offset the need to construct new generation. According to Indiana Michigan Power's regulatory director, "Having this commitment [from Google] is a valuable tool so that when the grid does get stressed, we've got a single place to go to relieve a meaningful amount of demand on the system, which in turn helps us support reliability and lower costs."[96]

Even a little flexibility could go a long way. A study from Duke University found that curtailing only 0.25% of the maximum annual energy consumption from large loads could enable 76 GW of new load to be integrated without adding any new grid resources.[97] Disruptions were only 1.7 hours on average, and loads still received at least half of their requested capacity most of the time. Even at 1% curtailment — which could unlock 126 GW, nearly enough to meet LBNL's high-end 2028 data center forecast[98] — the average curtailment duration of 2.5 hours is well within the window of a four-hour battery. Although this study represents only a first-order analysis, the results are powerful. Given the substantial potential benefits, regulators should ensure that utilities model data center flexibility and understand the value it could provide to the grid. Policymakers should ensure regulators have the authority to do so.

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[94] International Energy Agency, n.d.

[95] Batra, L., Harris, D., Katsigiannakis, G., Mackovyak, J., Parmar, H., & Scheller, M. (2025). *Rising current: America's growing electricity demand*. ICF. https://www.icf.com/-/media/files/icf/reports/2025/energy-demand-report-icf-2025_report.pdf?rev=c87f111ab97f481a8fe3d3148a372f7f

[96] Plautz, J. (2025, August 19). *How data centers can learn to turn off and help the grid*. EnergyWire. https://subscriber.politicopro.com/article/eenews/2025/08/19/how-data-centers-can-learn-to-turn-off-and-help-the-grid-00508258

[97] Norris, T. H., Profeta, T., Patino-Echeverri, D., & Cowie-Haskell, A. (2025). *Rethinking load growth: Assessing the potential for integration of large flexible loads in US power systems* (Report NI R 25-01). Nicholas Institute for Energy, Environment & Sustainability. https://nicholasinstitute.duke.edu/publications/rethinking-load-growth

[98] Shehabi et al., 2024.

Data center flexibility in the real world

Industry is consistently demonstrating that data center flexibility is possible. EPRI's DCFlex initiative has developed flexibility profiles for data centers based on a range of characteristics.[99] Google is already using its new Carbon Aware tool to shift workloads in real time to facilities with the lowest emissions profiles.[100]

Flexibility can come from shifting workloads or deploying other on-site resources (batteries) to offset grid demand. Both are demonstrating success. Emerald AI[101] (which shifts workloads) and Verrus[102] (which integrates battery storage) have both completed demonstration studies verifying their ability to reduce demand significantly without hurting data center performance. Other companies like Carrier,[103] Calibrant[104] and ABB[105] are innovating business models and technology to offer flexibility services to data centers. Requiring utilities to model flexible data centers will signal to these companies and others that there will be an ongoing and growing market for their products and may catalyze further innovation.

Implementation strategies:

Regulatory options

- Request load flexibility modeling during load forecasting or the IRP process.
- Establish rules that require data centers and other large loads to adopt and implement minimum load flexibility capabilities to support utility and bulk power system reliability requirements.

Policymaking options

- Ensure regulators have tools to request load flexibility modeling (i.e., through an IRP process).
- Require data centers and other large loads to adopt and implement minimum load flexibility capabilities to support utility and bulk power system reliability requirements.

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99 Electric Power Research Institute. (2025, June 4). *Grid flexibility needs and data center characteristics*. https://www.epri.com/research/programs/063638/results/3002031504

100 Koningstein, R. (2021, May 18). *We now do more computing where there's cleaner energy*. Google. https://blog.google/company-news/outreach-and-initiatives/sustainability/carbon-aware-computing-location/

101 Emerald AI. (2025, June 6). Comments of Emerald AI in Pennsylvania Public Utility Commission Docket No. M-2025-3054271, in response to March 27, 2025, en banc hearing on interconnection and tariffs for large load customers. https://www.puc.pa.gov/pcdocs/1882178.pdf. See also: Spieler, M. (2025, July 1). *How AI factories can help relieve grid stress*. NVIDIA. https://blogs.nvidia.com/blog/ai-factories-flexible-power-use/

102 Vaidhynathan, D., Prabakar, K., Martin, G., Ramesh, A., Wheeler, B., Coco, C., Clidaras, J., Monsch, M., Kim, S., Talukdar, S., & Marti, S. (2025). *Vulcan test platform: Demonstrating the data center as a flexible grid asset* (Report NREL/TP2C00-94844). National Renewable Energy Laboratory. https://docs.nrel.gov/docs/fy25osti/94844.pdf

103 Burns, J. (2035, February. 12). *Carrier unveils data center strategy, growth in A4 HVAC sales*. Utility Dive. https://www.utilitydive.com/news/carrier-unveils-data-center-strategy-growth-hvac-sales-q4-quantum-leap/740038/

104 Calibrant Energy. (2025, June 5). Comments of Calibrant Energy in Pennsylvania Public Utility Commission Docket No. M-2025-3054271, en banc hearing concerning interconnection and tariffs for large-load customers. https://www.puc.pa.gov/pcdocs/1882162.pdf

105 ABB. (n.d.). *What if you could take control of energy?* https://bess-as-a-service.abb.com/data-centers

Examples of load flexibility requirements:

- Duke Energy Carolinas requires large loads to meet certain performance standards, including "mandated interruptible requirements for a specified period of time."[106]
- Texas S.B. 6 establishes voluntary and mandatory curtailment.[107] It establishes a competitive reliability service for loads of at least 75 MW that must include 24-hour advance notice. It also requires noncritical large loads to have curtailment capability; ERCOT can order large loads with backup generation to curtail in emergencies.

Evaluate Existing System and Resource Options

At a high level, after forecasting demand, utilities must evaluate what tools and strategies are available to meet that demand. Regulators and policymakers should ensure they have sufficient information and modeling to understand system capabilities, including existing resources and expansion opportunities. By taking stock of the existing system and its ability to absorb new load, regulators and policymakers will be better able to respond to requests for new data centers quickly and effectively. While we cannot distill here best practices in all utility planning, we highlight the elements of resource planning that are critical to meeting data center demand but vulnerable to being overlooked. Figure 3 on the next page summarizes these elements and provides examples of technology solutions.[108]

Resource analysis steps

1. Forecast demand.
2. Assess the system's ability to meet demand.
3. Assess the tools, strategies and resources available to meet demand.
4. Assess the costs, risks and trade-offs of those tools, strategies and resources.
5. Determine the least-regrets pathway for the next increment of investments or decisions.

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106 Duke Energy. (2025, July 24). *Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's reponses to commission's questions regarding large load customers order initiating proceeding and requesting comments*. Filing in North Carolina Utilities Commission Docket No. E-100, Sub 208. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=a125fc82-ee3a-40c7-b899-323b46d77217

107 S.B. 6. 89th Legislature. Reg. Sess. (Tex. 2025). Enrolled version. https://capitol.texas.gov/tlodocs/89R/billtext/pdf/SB00006F.pdf#navpanes=0

108 Adapted from: U.S. Department of Energy. (n.d.). *Clean energy resources to meet data center electricity demand*. https://www.energy.gov/gdo/clean-energy-resources-meet-data-center-electricity-demand

Figure 3. Strategies and tools to address growing electricity demand

	Systemwide flexibility	Systemwide energy efficiency	Transmission innovations	Utility-scale clean resources
Example technology solutions *(not exhaustive)*	• Virtual power plants • Distributed energy resources • Demand-side management • Microgrids	• Building efficiency • Residential low-income efficiency support • Targeted commercial and industrial efficiency programs	• Advanced reconductoring • Grid-enhancing technologies • Point-to-point high-voltage DC • Dynamic line ratings	• Solar • Onshore wind • Offshore wind • Storage (batteries)

Adapted from: U.S. Department of Energy. (n.d.). *Clean Energy Resources to Meet Data Center Electricity Demand*

Evaluation in the four common scenarios

Individual application. Although individual special contracts or tariff proceedings may prompt more limited or urgent review, regulators can still utilize discovery tools (data requests, commissioner letters) to request information such as updates to elements of planning analysis. For applications seeking approval of specific resource additions (e.g., a new gas plant), regulators can press for information about lower-cost or cleaner alternatives as part of their public interest review. Regulators can also utilize decisions on individual applications to signal their intent to require or scrutinize more robust analysis of resource options in upcoming proceedings.

Multiple applications. As with individual applications, regulators may utilize discovery tools to request information, and gathering consistent information across multiple applications will offer a better landscape view.

Systemic change needed. The necessity for system change can and should include this inventory of the existing system and resource options.

Unregulated development. Municipalities and co-ops, especially those with policy goals, can also benefit from this type of analysis. Even basic inventories could help identify gaps or determine which clean resources represent low-hanging fruit that could enhance the system's ability to meet new demand.

Systemwide Flexibility Can Deliver Reliability at Least Cost

In addition to energy efficiency, regulators should ensure that utilities consider load flexibility as a potential resource to meet growing demand. This includes requiring utilities to model load flexibility in the system writ large, in addition to assessing flexibility of individual data center facilities. Traditional load flexibility programs have taken the form of demand response offerings, wherein a utility compensates customers for reducing demand during peak periods. In recent years, load flexibility has shifted to include virtual power plants (VPPs) that aggregate distributed energy resources (DERs), especially rooftop solar and batteries, into dispatchable resources. New products are targeted especially at providing capacity from accredited load flexibility to support data centers coming online.[109] Considerations of load flexibility should evaluate the full range of offerings, from demand response to VPPs. This assessment is important for three main reasons.

First, load flexibility can quickly provide substantial capacity and reliability to the grid.[110] Load flexibility can offset the need to add system capacity, alleviating interconnection pressure and reducing stranded cost risks.[111] Because VPPs build on existing assets, they may be able to come online faster than large, centralized power plants.[112] In the summer of 2025, for example, a test of *existing* home batteries in California provided 535 MW to the California ISO's grid during evening peak hours (7-9 p.m.) in July, and a different test produced 325 MW in June.[113] Even *new* distributed energy resources can be installed and connected in a short time frame (less than one year). Recent data from Wood Mackenzie confirms that VPPs are growing in North America: The number of "monetized VPP programs — which pay distributed energy resource owners to dispatch energy or curtail consumption" increased by 35% from 321 in 2024 to 433 in 2025.[114] Although the existing capacity of VPPs remains relatively small, the total VPP capacity increased 13.7% over the same period.

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109 Voltus. (2025, September 30). *Voltus launches "Bring Your Own Capacity" product to support data center growth and grid resiliency* [Press release]. https://www.voltus.co/press/bring-your-own-capacity-data-centers. See also: Wyent, C., Verma, M., & Kanj, W. (2025, September). *Homegrown energy: How household upgrades can meet 100 percent of data center demand growth*. Rewiring America. https://www.rewiringamerica.org/research/homegrown-energy-report-ai-data-center-demand

110 Hogan, M. (2016, September). *Hitting the mark on missing money: How to ensure reliability at least cost to consumers*. https://www.raponline.org/wp-content/uploads/2023/09/rap-hogan-hitting-mark-missing-money-2016-september.pdf. See also: Downing, J. (2025, October 6). *Distributed energy resources can accelerate data center interconnection*. Utility Dive. https://www.utilitydive.com/news/distributed-energy-resources-can-accelerate-data-center-interconnection/801964/; and Giacobone, B. (2025, October 29). *Can VPPs unlock grid capacity for data centers?* Latitude Media. https://www.latitudemedia.com/news/can-vpps-unlock-grid-capacity-for-data-centers/

111 Norris et al., 2025.

112 CPower. (2025, March 14). *The need for virtual power plants heats up when the weather cools down*. https://cpowerenergy.com/the-need-for-virtual-power-plants-heats-up-when-the-weather-cools-down/

113 Krause, D. (2025, August 5). *Home batteries provide 535 MW to CAISO grid on VPP test day*. RTO Insider. https://www.rtoinsider.com/111779-home-batteries-provide-535mw-caiso-grid-vpn-test-day/

114 Martucci, B. (2025c, September 22). *Data center demand drives 33% jump in VPP deployments: Wood Mackenzie*. Utility Dive. https://www.utilitydive.com/news/data-center-vpp-virtual-power-wood-mackenzie/760731/

Second, load flexibility can deliver solutions at low cost. According to The Brattle Group, the net cost to the utility of providing resource adequacy from a VPP is roughly 40% to 60% of the cost of the alternative options, such as construction of new plant.[115] California alone could achieve $13.7 billion in savings from intelligently applying load flexibility.[116]

In addition to utility-run programs, it may be possible to enable data centers themselves to bring load flexibility (and/or energy efficiency) to the table. These could include expanding "bring your own power" policies to enable data centers to partner with verified third-party aggregators or enabling green tariff frameworks to funnel funding from data center customers into utility-run load flexibility programs.

Third, load flexibility programs can broaden energy affordability by directing investments toward existing customers. Unlike traditional bulk system plant, load flexibility and VPP programs compensate customers for reducing demand, which occurs through increasingly automated programs with little disruption to a customer's comfort or needs. Utilities are expected to invest more than $1.1 trillion between 2025 and 2029 to meet power demand for data centers.[117] Directing even a portion of that investment toward programs that compensate customers could result in substantial energy affordability benefits. As Wood Mackenzie explains, "Homeowners and business owners [with on-site energy resources] might actually earn revenue from the connection of new data centers, offsetting potential bill increases."[118]

Although load flexibility and VPPs will not materialize overnight, policymakers and regulators should begin assessing VPPs and DERs as resource options now. This includes ensuring that these flexibility options compete on equal footing with bulk system resources in planning. Evaluating the current deployment of load flexibility offerings is a foundational step. Understanding the potential to expand these resources will help orient regulators and policymakers toward realistic, cheap and quick solutions to meet the needs of new high-impact loads.

115 Hledik, R., & Peters, K. (2023, May 2). *Virtual power plants (VPPs) could save US utilities $15-$35 billion in capacity investment over 10 years*. The Brattle Group. https://www.brattle.com/insights-events/publications/real-reliability-the-value-of-virtual-power/

116 Kevala. (2025, August). *California load management standard avoided distribution grid upgrade study*. Prepared for GridLab. https://gridlab.org/ca-load-mgmt-standard/

117 Walton, R. (2025a, October 9). *Investor-owned utilities could spend $1.1T between 2025 and 2029: EEI*. Utility Dive. https://www.utilitydive.com/news/investor-owned-utilities-spending-more-than-ever-eei/802315/

118 Martucci, 2025c.

Implementation strategies:

Regulatory options

- Utilize transparent, integrated system planning that addresses bulk power and distribution planning.
- Require utilities to evaluate and implement DERs and VPPs in system planning.
- Evaluate the status of DER deployment tools such as interconnection processes, customer incentives and time-of-use rates.
- Evaluate DER aggregation models, including VPP pilots.
- Proactively assess and resolve key barriers to DERs and VPPs, including supportive data access models and incentive structures that compensate VPPs for the full stack of system benefits (e.g., capacity, reliability, avoided transmission and distribution costs).
- Assess whether demand charges pose a barrier to data center demand response options.

Policymaking options

- Review grid modernization and other VPP-enabling requirements.
- Require utilities and PUCs to evaluate VPP programs and supportive tariffs.
- Analyze incentives for demand-side solutions.

Systemwide load flexibility examples:

- Evergy Kansas' large-load tariff expressly allows large customers to opt to receive service and pay for electricity provided by resources — including DERs, demand response and energy efficiency — considered in the utilities' resource plan that were not selected in its "preferred plan."[119]

- New York's Value of Distributed Energy Resources mechanism compensates DERs for a wide range of system benefits.[120]

- Colorado's S.B. 24-218 requires Xcel Energy to submit a VPP plan to the PUC.[121]

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[119] Evergy Kansas Metro, Evergy Kansas South, & Evergy Kansas Central. (2025, August 18). *Joint motion for approval of unanimous settlement agreement*. Filing in State Corporation Commission of Kansas Docket No. 25-EKME-315-TAR. https://estar.kcc.ks.gov/estar/ViewFile.aspx/S20250818120216891 5.pdf?Id=9e907841-85a6-49d2-8321-59acf777cfd6

[120] New York State. (n.d.). *The value stack*. Solar Program (NY-Sun). https://www.nyserda.ny.gov/All-Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources

[121] S.B. 24-218. 2024 Reg. Sess. (Colo. 2024). https://leg.colorado.gov/bills/sb24-218

- The Virginia State Corporation Commission ordered Dominion Energy to include greater consideration of systemwide demand response programs in its next IRP.[122]
- New Jersey A.B. 5462 (reported favorably from committee in 2025) would create a suite of ratepayer protections and financial transparency requirements, subject to a discretionary waiver from the Board of Public Utilities if the data center commits to grid flexibility measures.[123]
- Virginia H.B. 2578 (introduced in 2025) would direct utilities to petition the State Corporation Commission for approval of a large-load demand response program.[124]
- Constellation Energy is increasing its demand response program, supplemented with AI software, citing the Duke University study about the value of load flexibility.[125]
- Illinois S.B. 25 would incentivize 1.8 GW of energy storage, demand response and similar resources to form a virtual power plant.[126]

Systemwide Energy Efficiency Is a Key Building Block

Energy efficiency has always been a valuable resource; with increasing energy scarcity, it is a must-have.[127] According to the American Council for an Energy-Efficient Economy, energy efficiency remains our nation's least-cost energy resource that simultaneously delivers grid reliability and resilience.[128] Efficiency can quickly and durably free up existing capacity to serve new data center customers while keeping costs low for existing ratepayers. It is therefore critical that states ensure they fully understand the status of existing energy efficiency programs — as well as opportunities to strategically and cost-effectively expand programs to unlock headroom for new high-impact loads.

Some states are recognizing the role energy efficiency plays in keeping energy affordable, particularly with rapidly rising energy prices and electricity bills.[129] Total utility spending on

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[122] Virginia State Corporation Commission, Docket No. PUR-2024-00184, Final Order on July 15, 2025. https://www.scc.virginia.gov/docketsearch/DOCS/86qq01!.PDF

[123] A.B. 5462. 221st Legislature. (N.J. 2025). https://pub.njleg.gov/Bills/2024/A5500/5462_R1.PDF

[124] H.B. 2578. 2025 Reg. Sess. General Assembly. (Va. 2025). Introduced — Dead. https://legiscan.com/VA/text/HB2578/2025

[125] Constellation. (2025, July 31). *Constellation and GridBeyond launch AI-powered demand response program in PJM to improve grid flexibility and save customers millions*. https://www.constellationenergy.com/newsroom/2025/constellation-and-gridbeyond-launch-ai-powered-demand-response-program-in-pjm.html

[126] S.B. 25. 104th General Assembly. (Ill. 2025). https://www.ilga.gov/documents/legislation/104/SB/PDF/10400SB0025enr.pdf

[127] Mackovyak, J. (2025, October 24). *Renewing the case for energy efficiency: A grid resource, customer trust tool and economic engine*. Utility Dive. https://www.utilitydive.com/news/renewing-the-case-for-energy-efficiency-a-grid-resource-customer-trust-to/803722/

[128] Kresowik, M., Subramanian, S., Specian, M., Bradley-Wright, F., Ghosh, D., Mooney, P., Sosa-Kalter, S., Fraser, A., Fadie, B., & Mauer, J. (2025). *2025 state energy efficiency scorecard*. American Council for an Energy-Efficient Economy. https://www.aceee.org/sites/default/files/pdfs/the_2025_state_scorecard.pdf

[129] Kresowik et al., 2025.

efficiency programs reached $8.8 billion in 2023, up 6% from 2019.[130] Given that utilities are expected to invest more than $1.1 trillion between 2025 and 2029 to meet power demand,[131] energy efficiency will need to continue scaling up to keep rates affordable.

Regulators should therefore evaluate how much, and how quickly, existing energy efficiency programs can expand. Most states and utilities have developed successful energy efficiency programs through years (if not decades) of experience. Expanding these programs, while not immediate, could free up capacity sooner than securing new generation.[133]

While energy efficiency programs are typically funded through federal or state programs or by utility customers, funding could also come from large-load customers. A new Minnesota law, H.F. 16 / S.F. 19, will take the proceeds from a new annual fee on large-load customers to fund energy conservation programs for low-income households.[132] States could explore whether assessing fees that support low-income households or targeted energy efficiency programming could yield needed energy savings, customer savings and critically needed flexibility.

A few targeted areas of energy efficiency have the potential to realize needed headroom in the system. Focused attention on affordability is particularly warranted now, and states should simultaneously expand efficiency programs that support the low-income customers most vulnerable to rising energy costs. While bill assistance is helpful, low-income energy efficiency programs can produce durable bill reductions for energy-burdened customers while providing system benefits.[134]

Scaling targeted energy efficiency programs — such as those for commercial and industrial customers — may provide even greater savings in a shorter time frame than traditional energy efficiency programs. On average, commercial and industrial customers contribute 55% of total energy efficiency program savings.[135] For some utilities or states, this can be higher. For one major New England utility, only 2% of customers account for about 80% of total energy demand.[136] It may thus be possible to expand commercial and industrial programs quickly, via outreach to a small number of customers, while achieving outsized energy savings. Identifying

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130 Walton, R. (2025b, March 19). *Utility energy efficiency investment hit record $8.8B in 2023: ACEEE*. Utility Dive. https://www.utilitydive.com/news/state-energy-efficiency-investment-hit-record-88-billion-2023-aceee/742963/

131 Walton, 2025a.

132 H.F. 16. 94th Legislature. 2025 1st Special Session. (Minn. 2025). https://www.revisor.mn.gov/bills/text.php?number=HF16&version=0&session=ls94&session_year=2025&session_number=1

133 Webb, S., & Plautz, J. (2025, March 11). *CERAWeek: Natural gas pitched as tonic for power-hungry AI*. E&E News. https://www.eenews.net/articles/ceraweek-natural-gas-pitched-as-tonic-for-power-hungry-ai/

134 Pfeifenberger, J., Lam, L., Graham, K., Northrup, N., & Hledik, R. (2025, July). *Optimizing grid infrastructure and proactive planning to support load growth and public policy goals*. The Brattle Group. Prepared for Clean Air Task Force. https://www.catf.us/wp-content/uploads/2025/07/grid-utilization-planning.pdf

135 American Council for an Energy-Efficient Economy. (n.d.). *Industrial efficiency programs can achieve large energy savings at low cost*. https://www.aceee.org/sites/default/files/low-cost-ieep.pdf

136 American Council for an Energy-Efficient Economy, n.d.

these opportunities can help states determine whether and how much capacity could be freed up to incorporate new high-impact loads.

Targeted energy efficiency measures that shave peak demand will also provide even more value to the grid and to consumers in the current environment. Ensuring time-of-use requirements are in place for electric vehicles and other moveable load can decrease peaks on the system.[137] Likewise, measures focused on activities that exacerbate peaks, such as heating and water heating, can also decrease peaks.[138]

Given energy efficiency's potential to cheaply, quickly and equitably address load growth, it is critical to include energy efficiency, including untapped scaling opportunities, in any assessment of resources available to meet the demand from high-impact loads.

Implementation strategies:

Regulatory options

- Require utilities to assess cost-effective ways to rapidly expand existing energy efficiency programming.
- Require utilities to evaluate new energy efficiency programming for high-impact savings with commercial or industrial customers.

Policymaking options

- Require efficiency to be analyzed in utility planning.
- Evaluate whether to implement an energy efficiency resource standard or update targets in an existing energy efficiency resource standard.
- Implement a tax or fee on large load that goes to a state energy efficiency or weatherization fund.
- Require new large loads to meet specific demand response and efficiency load reduction goals. Consider establishing pathways to support loads to meet these requirements, such as by running or hiring program delivery entities, buying credits from others or even establishing a statewide efficiency and demand response implementation agency.

137 Mims Frick, N., Hoffman, I., Goldman, C., Leventis, G., Murphy, S., & Schwartz, L. (2019). *Peak demand impact from electricity efficiency programs.* Lawrence Berkeley National Laboratory. https://eta-publications.lbl.gov/sites/default/files/cost_of_saving_peak_demand_20200902final.pdf

138 Walker, C. (2016, May 19). *Scaling the peak: How efficiency programs can leverage the growing value of peak demand*. Northeast Energy Efficiency Partnerships. https://neep.org/blog/scaling-peak-how-efficiency-programs-can-leverage-growing-value-peak-demand

Systemwide energy efficiency examples:

- Evergy Kansas' large-load tariff expressly allows large customers to opt to receive service and pay for electricity provided by resources — including DERs, demand response and energy efficiency — considered in the utilities' resource plan that were not selected in its "preferred plan."[139]
- Minnesota H.F. 16 / S.F. 19 will assess an annual fee on large customers based on their peak-demand MW usage.[140] This fee will be used to fund energy conservation programs for low-income households.
- The Virginia State Corporation Commission ordered Dominion Energy to include greater consideration of systemwide energy efficiency programs in its next IRP.[141]
- Pennsylvania H.B. 1834 (introduced) would require commercial data centers to pay into a "LIHEAP enhancement fund" for low-income energy assistance on a sliding scale, ranging from $250,000 to $500,000 annually.[142]

Transmission Innovations Make the Most of Investments

Building new transmission infrastructure is both costly and time-consuming, and capital spending on transmission now surpasses spending on energy production.[143] Optimizing existing transmission infrastructure can minimize the need for upgrades or additions while quickly opening up capacity and helping to address significant load growth.[144] The International Energy Agency, for example, has found that deploying remote sensors and AI-based management tools could open up 175 GW of new transmission capacity globally by 2030 — more than forecast new data center demand during that period — without any new lines being built.[145] President Donald

139 Evergy Kansas Metro et al., 2025.

140 H.F. 16. 94th Legislature. 2025 1st Special Session. (Minn. 2025). https://www.revisor.mn.gov/bills/text.php?number=HF16&version=0&session=ls94&session_year=2025&session_number=1

141 Virginia State Corporation Commission, Docket No. PUR-2024-00184, Final Order on July 15, 2025. https://www.scc.virginia.gov/docketsearch/DOCS/86qq01!.PDF

142 H. B. 1834. 2025-2026 Regular Session. (Pa. 2025). https://www.palegis.us/legislation/bills/2025/hb1834

143 U.S. Energy Information Administration. (2024, November 18). *Grid infrastructure investments drive increase in utility spending over last two decades*. https://www.eia.gov/todayinenergy/detail.php?id=63724

144 Pató, 2024.

145 International Energy Agency, n.d.

Trump's recent AI strategy encourages implementing "strategies to enhance the efficiency and performance of the transmission system" including through "advanced grid management technologies and upgrades to power lines that can increase the amount of electricity transmitted along existing routes."[146] Studying the current deployment and future potential of these resources is a key first step.

Optimization of the existing transmission system falls into three categories: (1) improving transmission system efficiency relative to existing infrastructure;[147] (2) freeing up "surplus interconnection" to maximize utilization rates of the existing system; and (3) rationalizing existing electricity use with energy efficiency, demand response, VPPs and better integration of distribution and transmission system and resource planning.

- **Grid modernization/efficiency technologies:** Regulators should evaluate a range of technologies capable of optimizing transmission system efficiency. According to a recent Energy Systems Integration Group report,[148] advanced transmission technologies (ATTs) — including advanced conductors (installed in new lines or via reconductoring existing lines) and high-voltage DC lines — transmit electricity drastically more efficiently than traditional technology. Grid-enhancing technologies, such as dynamic line ratings and advanced power flow control, enable more sophisticated means of managing power flow across a dynamic grid. Other grid modernization technologies include advanced sensors and advanced distribution management systems that enable more visibility into and control of the existing system. Proponents argue that ATTs and other grid modernization tools are fast, scalable and cheap. Although these technologies have failed to achieve commercial deployment so far, the technologies are generally well-established.[149] As such, regulators and policymakers should consider requiring utilities to evaluate grid modernization technologies as part of their resource and transmission planning.

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[146] Executive Office of the President of the United States. (2025, July). *Winning the race: America's AI action plan*. https://www.whitehouse.gov/wp-content/uploads/2025/07/Americas-AI-Action-Plan.pdf

[147] White, L., Agrawal, E., Bohman, A., Gopstein, A., Hua, C., Sepulveda, I., & Tian, L. (2024, April). *Pathways to commercial liftoff: Innovative grid deployment*. U.S. Department of Energy. https://web.archive.org/web/20250304233546/http://liftoff.energy.gov/wp-content/uploads/2024/05/LIFTOFF_Innovative-Grid-Deployment_Updated-2.5.25.pdf

[148] Energy Systems Integration Group, Grid-Enhancing Technologies User Group. (2025, July). *Utility perspectives on making grid-enhancing technologies work*. https://www.esig.energy/wp-content/uploads/2025/10/ESIG-Grid-Enhancing-Technologies-report-2025.pdf. This report also provides an informative summary of relevant FERC orders.

[149] White et al., 2024. Additional resources with recommendations on how to encourage grid modernization include Deese, B., Gramlich, R., & Pasnau, A. (2024, September). *A roadmap for advanced transmission technology adoption*. MIT Center for Energy and Environmental Policy Research. https://ceepr.mit.edu/wp-content/uploads/2024/09/MIT-CEEPR-RC-2024-06.pdf; and London Economics. (2025, August 6). *Use of advanced transmission technologies and innovative practices in power systems: Potential benefits, lessons learned, and recommendations*. Prepared for WIRES. https://wiresgroup.com/wp-content/uploads/2025/08/Use-of-Advanced-Transmission-Technologies-and-Innovative-Practices-in-Power-Systems-Report.pdf

- **Surplus interconnection:** Regulators should also consider increasing utilization of the existing grid by unlocking access to surplus interconnection capacity. According to GridLab, "surplus interconnection" refers to transmission capacity that may go unused because it is tied up by contractual agreements.[150] Researchers at the University of California, Berkeley, found surplus interconnection could cost-effectively add up to 850 GW of new clean energy in specific areas. By 2030, surplus interconnection could enable roughly 1,000 GW of cost-effective clean energy while saving roughly $85 billion in interconnection costs.[151] For PJM alone, surplus interconnection could enable 106 GW of new solar, wind and battery capacity even after the rollback of clean energy incentives.[152] Critics note that surplus interconnection will not expand grid capacity during peak hours and thus will not resolve the critical supply crunch during those periods. Proponents argue that optimizing utilization of existing grid resources could reduce system costs and quickly connect cheap, clean new resources to the grid. Surplus interconnection is already being implemented;[153] GridLab identifies policy recommendations to advance its deployment.[154] A first step for regulators and policymakers is to understand the existing deployment and expansion potential of surplus interconnection. Doing so will establish the foundation for understanding whether and how the existing system could expand to address requests from high-impact loads.

- **Integrate energy efficiency, demand response and VPP assumptions in distribution system planning:** If distribution system planners exclude or discount the impact of managed energy efficiency, demand response and VPP programs, they will continue to call for investment in the system that could otherwise be avoided. Similarly, if load forecasters or resource planners exclude or discount the impact of these programs, they will continue to produce load forecasts that are too high and resource plans that call for more investment in generation than is necessary. It is essential, therefore, to ensure that the impact of energy efficiency, demand response and VPP programs is appropriately integrated into distribution system and resource planning.

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[150] Farmer, M., & Silverman, A. (2025, February 21). *Unlocking the power of surplus interconnection*. GridLab. https://gridlab.org/portfolio-item/surplus-interconnection-report/. RMI similarly recommends developing "power couples" that pair new load with renewable energy parks, located at an existing plant. Transmission priority would go to the existing plant, while the renewable energy park and/or new load could utilize the connection during other times. Engel, A., Varadarajan, U., & Posner, D. (2025, February 20). *How "power couples" can help the United States win the global AI race*. RMI. https://rmi.org/how-power-couples-can-help-the-united-states-win-the-global-ai-race/

[151] Paliwal, U., Chojkiewicz, E., Abhyankar, N., & Phadke, A. (2024, November). *Existing fossil fuel plants sharing grid access with renewables can rapidly and cost-effectively double US generation capacity* [Working paper]. Goldman School of Public Policy, University of California, Berkeley. https://gspp.berkeley.edu/assets/uploads/page/Surplus_Interconnection.pdf

[152] Howland, E. (2025, August 21). *PJM surplus interconnection can support 153 GW of solar, wind, storage: UC Berkeley researchers*. Utility Dive. https://www.utilitydive.com/news/pjm-surplus-interconnection-sis-solar-wind-storage/758121/

[153] See, for example: Federal Energy Regulatory Commission, Docket No ER25-778-000, Order 845 on February 11, 2025, accepting revisions to PJM's open access transmission tariff to facilitate greater integration of surplus interconnection opportunities. https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250211-3121&optimized=false

[154] Farmer & Silverman, 2025.

Implementation strategies:

Regulatory options

- Consider requiring evaluation of ATTs, grid-enhancing technologies and other grid modernization strategies in planning.
- Establish guidelines or rules for the fair consideration of enhanced grid technologies.
- Consider approving pilots if larger-scale deployments are unavailable.
- Evaluate incentives (performance incentive mechanisms, capitalization) for tools that optimize the existing transmission grid.
- Ensure surplus interconnection opportunities are included in transmission and resource planning or in competitive clean energy procurement requests.

Policymaking options

- Require, or ensure regulators have the authority to require, consideration of ATTs, grid-enhancing technologies and other grid modernization tools in utility planning.
- Consider creating a fund to support pilots, with requirements for successful pilots to develop into programs.
- Require consideration of surplus interconnection in integrated resource planning, or ensure regulators have the authority to do so.

Grid-enhancing and advanced transmission technologies examples:

- The Virginia State Corporation Commission ordered Dominion Energy to include greater consideration of grid-enhancing technologies and ATTs in its next IRP,[155] consistent with state planning requirements.[156]
- As Energy Systems Integration Group explains,[157] California S.B. 1006 requires electric transmission utilities to conduct biannual studies on the feasibility of using grid-enhancing technologies and advanced reconductors, starting January 1, 2026.[158]
- As researchers with the Massachusetts Institute of Technology have explained,[159] at least two states have legislation requiring consideration of or incentivizing ATTs: Minnesota and Montana.

155 Virginia State Corporation Commission, Docket No. PUR-2024-00184, Final Order on July 15, 2025. https://www.scc.virginia.gov/docketsearch/DOCS/86qq01!.PDF

156 Va. Code Ann. § 56-599. Integrated resource plan required. https://law.lis.virginia.gov/vacode/title56/chapter24/section56-599/

157 Energy Systems Integration Group, Grid-Enhancing Technologies User Group, 2025.

158 California Public Utilities Code div. 1, pt. 1, ch. 3. https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PUC&division=1.&title=&part=1.&chapter=3.&article=1

159 Deese et al., 2024.

Surplus interconnection examples:

- Google and conductor manufacturer CTC are offering financial, technical and workforce training support to states, utilities and transmission developers interested in partnering to deploy advanced conductors in areas that will benefit Google's data center demand.[160]
- Berkeley researchers lay out example sites for surplus interconnection in their California report.[161]
- California A.B. 1408 requires each utility and local publicly owned utility to use available grid infrastructure through surplus interconnection, such as the addition of renewable energy resources or battery energy storage.

Utility-Scale Clean Resources Remain Cheap and Fast to Deploy

States must also assess the availability of bulk system resources that could be deployed quickly and cost-effectively to meet new energy demand. It is especially critical to pursue "least-regrets" resources that are cost-effective given the uncertainty in data center load projections. Continuous analysis of resources will be critical, as demand and supply-chain issues are affecting the price of many resources. For example, data demonstrates that renewable energy and battery storage are quick to deploy and cheap; as a result, regulators should ensure utilities evaluate these resource options.

Lazard's June 2025 levelized cost of energy report finds that renewable energy remains the most cost-competitive form of generation on an *unsubsidized* $/MWh basis.[162] As a consequence, Lazard notes, renewable energy will continue to be a key U.S. generation resource, particularly in light of high demand for electricity.[163] Although there is limited time for new renewable energy projects to qualify for federal incentives, states can and are taking steps to secure renewable energy incentives before they expire.[164] Even after those subsidies expire, Lazard concludes utility-scale solar PV and wind remain cost-competitive with current gas costs.[165] This analysis is consistent with recent analysis from Jefferies.[166]

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160 DiGangi, D. (2025, June 16). *Google, CTC Global partner to deploy advanced conductors.* Utility Dive. https://www.utilitydive.com/news/google-ctc-global-advanced-conductors-transmission/750878/

161 Paliwal, U., & Phadke, A. (n.d.). *Existing power plants sharing grid access with new resources can lower costs and double California's generation capacity*. Goldman School of Public Policy, University of California, Berkeley. https://gspp.berkeley.edu/assets/uploads/page/Surplus_Interconnection_California.pdf

162 Lazard. (2025, June). *Lazard's levelized cost of energy+.* https://www.lazard.com/research-insights/levelized-cost-of-energyplus-lcoeplus/

163 Lazard, 2025.

164 S2 Strategies. (2025, July 29). *Federal energy tax credit resources for states.* https://www.s2strategies.org/federal-energy-tax-credit-resources-for-states

165 Lazard, 2025.

166 Nilsson, H. (2025, August 27). *Solar and battery cheaper than gas, Jefferies finds*. RTO Insider. https://www.rtoinsider.com/113502-solar-and-battery-lower-lcoe-than-gass-jefferies-finds/

> Clean resources remain cost-effective even with an added "firming cost" — that is, the incremental cost to provide additional monthly capacity payments to a firming resource. Specifically, firm solar and wind remain cost-competitive with gas combined-cycle levelized cost of energy in MISO, the Southwest Power Pool and ERCOT, with firm solar remaining cost-competitive in PJM.[167]

Utility-scale battery storage also remains a critical bulk system resource, providing potential savings compared with gas peaking capacity. According to S&P, "[b]attery storage is emerging as a viable alternative to gas turbines, as costs decline due to technological advancements."[168] A recent study by Aurora Energy Research on behalf of the American Clean Power Association concluded that battery storage could reduce MISO's price spikes during evening hours by 60% by 2035, and full deployment of batteries would save $4.5 billion by 2035 compared with a "no batteries" scenario, with savings from deploying batteries up to $27 billion by 2050.[169] Aurora found similar benefits from battery deployment in the Southwest Power Pool: From 2029 to 2035, deploying roughly 3.3 GW of additional economic battery storage would cut system costs by $7 billion and avoid a roughly 10% price increase, compared with scenarios without added storage.[170] S&P forecasts that, by 2035, gas capacity (primarily peaker plants) will decrease by roughly 60 GW while roughly 80 GW of storage is added to the grid.[171]

In contrast to renewable energy and battery storage, gas turbine prices are forecast to increase with surging demand and supply chain limitations. According to McKinsey, new gas plant prices are projected to more than double, from approximately $1,000 per kilowatt to between $2,000 and $2,500 per kilowatt.[172] S&P estimates gas turbine costs may nearly triple by 2030.[173] And according to GridLab, these costs for gas turbines are "likely to persist rather than decline,

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167 Lazard, 2025. Anecdotally, many markets have sufficient firming resources already online to accommodate much greater renewable energy resources than are currently online. The urgent push for new load may drive consideration of utilizing greater amounts of renewable energy in an effort to affordably and reliably meet surging demand.

168 S&P Global Market Intelligence. (2025). *The future of energy: Balancing reliability and rising costs*. https://pages.marketintelligence.spglobal.com/rs/565-BDO-100/images/the-future-of-energy-balancing-reliability-and-rising-costs.pdf?version=0

169 Cook, A. (2025, August 3). *New report: Battery storage pivotal for MISO savings*. RTO Insider. https://www.rtoinsider.com/111602-new-report-battery-storage-pivotal-miso-savings

170 Aurora Energy Research. (2025, August 12). *Battery storage could save SPP customers $7 billion by 2050, Aurora finds*. https://auroraer.com/company/press-room/battery-storage-could-save-spp-customers-7-billion-by-2050-aurora-finds. See also: Cropley, J. (2025, August 13). *Report urges 5-GW battery storage buildout in SPP*. RTO Insider. https://www.rtoinsider.com/112474-report-urges-5gw-storage-buildout-spp/

171 S&P Global Market Intelligence, 2025.

172 Shenk, M. (2025, July 21). *Rush for US gas plants drives up costs, lead times*. Reuters. https://www.reuters.com/business/energy/rush-us-gas-plants-drives-up-costs-lead-times-2025-07-21/. Wood Mackenzie has reached similar estimates. Seiple, C., & Hertz-Shargel, B. (2025, June). *US power struggle: How data centre demand is challenging the electricity market model*. Wood Mackenzie. https://www.woodmac.com/horizons/us-data-centre-power-demand-challenges-electricity-market-model/. And GE Vernova's CEO recently confirmed $2,500 per kW as "a practical illustration of where the market is today." Martucci, B. (2025d, October 23). *GE Verona bullish on electrical infrastructure as turbine backlog grows*. Utility Dive. https://www.utilitydive.com/news/ge-vernova-bullish-on-electrical-infrastructure-as-turbine-backlog-grows/803631/

173 S&P Global Market Intelligence, 2025.

at least in the short-to-medium term."[174] These price implications reinforce the need to continue to analyze opportunities to integrate clean energy to protect affordability.

Beyond cost, speed also supports considering quick-to-deploy resources. The supply chain for gas turbines is becoming overwhelmed; nationally, about 80 GW of gas-fired plants are planned for 2030, almost triple the gas capacity constructed in the past five years.[175] As a result, wait times for gas turbines are increasing. According to S&P Global, new combined-cycle plants will take five to seven years before they become operational.[176] In contrast, a utility-scale solar PV project can take up to four or five years from beginning to end, of which up to three years may be spent negotiating permitting and interconnection.[177] A survey of wind and solar developers found that most projects take four to six years from the initial public announcement.[178] PJM may have up to 7 GW of storage capacity that could materialize quickly enough to be meaningful in the next two capacity auction periods.[179]

Jefferies cited the potentially drastically faster timelines for renewables paired with batteries (relative to gas plants), especially combined with low costs, as giving paired resources a leg up: "With gas equipment increasingly inflationary, while renewable technology continues to improve AND get cheaper (holding tariffs constant), we see hybrid generation as an increasingly viable solution to meet power demand/supply gap on a timely basis…. As data centers begin to explore paths to work with interruptible service (which is happening), expect these tailwinds to strengthen."[180] Understanding these timelines and their implications for the system's ability to meet new load is an important step.

Beyond considering clean resource additions, regulators and policymakers could require them. Recognizing the need for resources, Illinois is considering legislation that would require new data centers and other large energy users to bring their own renewable energy to the grid or pay a higher fee into the state budget that would fund other renewable projects.[181] In other states, data centers are voluntarily procuring clean energy. In Maryland, Amazon repurposed a

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174 GridLab, Energy Futures Group & Halcyon. (2025, September). *The new reality of power generation: An analysis of increasing gas turbine costs in the U.S.* https://gridlab.org/portfolio-item/gas-tubine-cost-report/

175 Shenk, 2025.

176 Anderson, J. (2025, May 20). *US gas-fired turbine wait times as much as seven years; costs up sharply*. S&P Global. https://www.spglobal.com/commodity-insights/en/news-research/latest-news/electric-power/052025-us-gas-fired-turbine-wait-times-as-much-as-seven-years-costs-up-sharply. See also Seiple & Hertz-Shargel, 2025.

177 Energy I-Spark. (n.d.). *Utility solar project development & EPC — innovative outcomes*. Lawrence Berkeley National Laboratory. https://ei-spark.lbl.gov/generation/utility-scale-pv/project/innov/

178 Nilson, R., Hoen, B., & Rand, J. (2024, January). *Survey of utility-scale wind and solar developers*. Lawrence Berkeley National Laboratory. https://eta-publications.lbl.gov/sites/default/files/w3s_developer_survey_summary_-_011724.pdf

179 Howland, E. (2025, October 23). *PJM poised to add more storage following surplus interconnection reform*. Utility Dive. https://www.utilitydive.com/news/climate-first-bank-energy-storage-virginia-pjm/803584/

180 Nilsson, 2025.

181 Wright, A.. (2025, May 28). Illinois mulls energy policy updates to address data centers. *Chicago Tribune*. https://www.govtech.com/policy/illinois-mulls-energy-policy-updates-to-address-data-centers

brownfield site of a former coal mine into a solar farm.[182] New Jersey recently required its Board of Public Utilities to procure and incentivize transmission-scale energy storage.[183]

Implementation strategies:

Regulatory options

- Require utilities to model a variety of resource options, including renewables, in IRPs or certificate of public convenience and necessity requests for new load that show the timeline to implementation and cost comparisons.

Policymaking options

- Require large loads to bring their own clean power or contribute to a state fund.
- Set increasing benchmarks for data center renewable energy usage to support state goals.

Examples:

- The Virginia State Corporation Commission ordered Dominion Energy to include greater consideration of energy storage resources in its next IRP.[184]
- Oregon (POWER Act)[185] and Minnesota (H.F. 16)[186] require that any electricity used to serve data centers must comply with the states' clean energy targets.
- New Jersey S. 5267 requires the Board of Public Utilities to procure and incentivize transmission-scale energy storage.[187]
- New Jersey S. 4143 (reported favorably from committee in 2025) would require data centers to derive all their energy from renewable or nuclear sources.[188]
- New York S.B. 6394A (introduced in 2025) would set benchmarks for data center renewable energy usage, with a requirement for 100% renewables by 2040.[189]

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182 Amazon. (2024, January 16). *Amazon is the world's largest corporate purchaser of renewable energy for the fourth year in a row* [Press release]. https://www.aboutamazon.com/news/sustainability/amazon-renewable-energy-portfolio-january-2024-update

183 A.B. 5267. 221st Legislature. 2025 Reg. Sess. (N.J. 2025). Introduced. https://pub.njleg.state.nj.us/Bills/2024/A5500/5267_I1.PDF

184 Virginia State Corporation Commission, Docket No. PUR-2024-00184, Final Order on July 15, 2025. https://www.scc.virginia.gov/docketsearch/DOCS/86qq01!.PDF

185 H.B. 3546. 83rd Legislative Assembly. 2025 Reg. Sess. (Or. 2025). Enrolled. https://olis.oregonlegislature.gov/liz/2025R1/Downloads/MeasureDocument/HB3546/Enrolled

186 H.F. 16. 94th Legislature. 1st Special Session. (Minn. 2025). https://www.revisor.mn.gov/bills/text.php?number=HF16&version=0&session=ls94&session_year=2025&session_number=1

187 S. 5267. 221st Legislature. (N.J. 2025). https://pub.njleg.state.nj.us/Bills/2024/A5500/5267_I1.PDF

188 S. 4143. 2024-2025 Sess. (N.J. 2024). https://www.njleg.state.nj.us/bill-search/2024/S4143

189 S.B. 6394A. 2025-2026 Leg. Sess. (N.Y. 2025). https://www.nysenate.gov/legislation/bills/2025/S6394/amendment/A

- Pennsylvania H.B. 1834 (introduced) would require utilities with contracts to serve commercial data centers over 25 MW to obtain at least 25% of the electricity to serve the data center from renewable energy.[190]

- An Illinois bill would require new data centers and other large energy users to bring their own renewable energy to the grid or pay a higher fee into the state budget that would fund other renewable projects.[191]

Conclusion

Load growth driven by high-impact loads, especially data centers, is reinforcing long-standing lessons in energy regulation, including the importance of collaboration and transparency for effective oversight. Many regulators and policymakers are already taking critical steps to understand the landscape in their states. These efforts will lay the foundation from which energy regulators and policymakers can protect the public interest while responding to data center demand. Decision-makers will need to identify opportunities to leverage new resources to build a cleaner, more reliable and safer electric grid while managing the significant risks posed by uncontrolled utility expenditures. Although many existing regulatory pathways offer a good place to start, modifications and expansion of these tools will be appropriate and necessary. We recommend regulators and policymakers begin the process for these modifications now, even if intermediate decisions on discrete applications may be required in the interim.

Load growth driven by data centers and other high-impact loads will doubtless continue to dominate energy regulation for years. This paper has addressed one aspect of the challenge; subsequent publications will focus on other key strategies and tools that decision-makers can use to address high-impact loads.

[190] H. B. 1834. 2025-2026 Reg. Sess.. (Pa. 2025). https://www.palegis.us/legislation/bills/2025/hb1834

[191] Wright, 2025.

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