GOVERNING THE ENERGY BOTTLENECK

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The electrical grid is falling short of its mandate to accommodate new generation—much of which happens to be "clean" zero-carbon generation—and to service load (demand). The bottleneck of grid access, which has vexed renewable energy developers, now affects industries seeking massive quantities of electricity to power single facilities—"large loads" such as data centers and other artificial intelligence operations.

Many of these highly capitalized loads seek clean energy generation; they could, in theory, fund an energy renaissance and provide scale-based benefits for all consumers. But loads that obtain service are negatively impacting other consumers' rates and, potentially, the reliability of service on a networked grid, not offering a renaissance.

The demands for new energy for large loads push the boundaries of what constitutes "just, reasonable, and not unduly discriminatory" electricity service provided by utilities and other grid operators. They raise critical questions about how to design electricity rates to make large loads pay for large load costs; how loads should be prioritized for interconnection; and how to realize the already-urgent task of connecting new, clean generation.

During World War II, federal leadership rapidly expanded energy generation and transmission. We are not in a world war—and we do not have an energy emergency caused by inadequate domestic energy. But more efficient and flexible loads, extensive investments in an expanded transmission grid and clean generation capacity, and updated governance for this grid are necessary, this time without top-down mandates.

New standards must ensure reliable delivery of electricity to all, fair allocation of large load costs to the loads causing these costs, and maximization of system benefits. The institutions responsible for these standards are not adapting quickly enough to implement these standards, however. This Article frames the central elements of this new electricity governance regime and proposes substantive policy pathways for a rapidly changing system.

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Introduction

The U.S. electric grid and its governance system have long been central to economic growth but are now at the epicenter of an energy-ravenous artificial intelligence (AI) economy powered by data centers.[1] Demand for electricity

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[1] Frederick S. Bresler, PJM Interconnection LLC, Statement of Frederick S. "Stu" Bresler on Behalf of PJM Interconnection at the Co-Located Load Technical Conference, Docket No. AD24-11-000, at 4–5 (Nov. 1, 2024), https://perma.cc/QA3U-YDUY (citing the North American Electric Reliability Corporation CEO for the proposition that "unprecedented growth in electric demand is outpacing available capacity to meet that demand"); Transcript of Large Loads Co-Located at General Facilities Technical Conference at 16–17, Docket No. AD24-11-000 (Nov. 1, 2024), https://www.ferc.gov/media/transcript-technical-conference-regarding-large-loads-co-located-generating-facilities [hereinafter "FERC Transcript"] (Commissioner See: "I see data centers and the promise of AI as critical for our economy, and for matters of national security, and I share an eagerness to find new ways to accommodate these important and increasing loads"); PJM Interconnection, LLC, 189 FERC ¶ 61,078 (2024) (Phillips, Chairman, dissenting, at 3) [hereinafter "FERC Order

("load") is skyrocketing, while generators of zero-carbon energy are clamoring to connect to the grid yet face long lags.[2] AI-driven data centers are the primary contributors to load growth, upending several decades of flat demand.[3] But they are joined by additional load growth from other large loads such as crypto mining and the electrification of transportation, buildings, and reshored manufacturing.[4]

In the face of rising demand, the private actors that own and operate the grid are falling short. They are struggling to rapidly interconnect new generation—most of it zero-carbon generation—and are not servicing new large loads such

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Rejecting Amendments"] (Commissioner Phillips: "I am deeply concerned that in failing to demonstrate regulatory leadership and flexibility we are putting at risk our country's pole position" on artificial intelligence).

[2] *See* Joachim Seel et al., Generator Interconnection Costs to the Transmission System 3 (2023) (observing that "[g]enerator capacity actively seeking transmission interconnection is rapidly increasing in most balancing areas"); Abraham Silverman et al., Outlook for Pending Generation in the PJM Interconnection Queue (2024), https://perma.cc/A85A-7Y8P (describing the long line for interconnection).

[3] Monitoring Analytics, Analysis of the 2026/2027 RPM Base Residual Auction Part A (2025), https://perma.cc/N5EX-MANG (PJM's independent market monitor observing that "data center load growth is the primary reason for recent and expected capacity market conditions, including total forecast load growth, the tight supply and demand balance, and high prices"); FERC Transcript, *supra* note 1, at 10–11 (Commissioner Christie: "Load has been flat most everywhere in American [sic] for certainly almost 20 years. But now we're seeing load forecasts shooting up, right? Depending on how much numbers you want to accept, they're either skyrocketing, or they're just rapidly increasing, whatever term you want to use . . .").

[4] Arman Shehabi et al., 2024 United States Data Center Energy Usage Report 5–6 (2024), https://perma.cc/RP8P-YYCN (reporting that data centers represented 1.9% (76 TWh [terawatt-hours]) of total US electricity consumption in 2018 and increased to 4.4% (176 TWh) in 2023, and projecting additional increases by 2028 to between 6.7% and 12% of total US electricity consumption); U.S. Energy Info. Admin., Electric Power Monthly (2025), https://perma.cc/464J-2YCH (showing that electric vehicle charging consumption over the same period grew from 1.58 TWh in 2018 to 7.60 TWh from 2018 to 2023); ERCOT, Large Loads – Impact on Grid Reliability and Overview of Revision Request Package 5 (2023), https://perma.cc/Y3GZ-GB8G ("ERCOT, like many grids around the world, is seeing an unprecedented amount of larger Loads interconnecting."); North American Electric Reliability Corp., 2024 Long-Term Reliability Assessment 8, 15, 33 (2025) [hereinafter "NERC 2024 Long-Term Assessment"] (noting that "[e]lectricity peak demand and energy growth forecasts over the 10-year assessment period continue to climb; demand growth is now higher than at any point in the past two decades" and observing that "New England is forecasting unprecedented demand growth [35% over current peak demand forecast] driven by electrification of heating and transportation," and forecasting large increases in peak demand forecasts throughout the United States due to the electrification of heating and transportation); T. Bruce Tsuchida et al., Electricity Demand Growth and Forecasting in a Time of Change v (2024), https://perma.cc/AFN3-4EEP (observing that data centers alone are projected to add new load equal to New York City's load "every five years or so"); FERC Transcript, *supra* note 1, at 25 (observing that for the New York grid operator—NY ISO—the "shift to increased electrification of heating and transportation" will "outweigh the large loads [large industrial operations and data centers] by the time you get out in the 10 year and 10 year plus horizon").

as data centers (in the 10s to 100s of megawatts range) as quickly as service is demanded.[5] As they strive to accommodate demands and address other system challenges such as growing weather extremes, electricity prices are rising, exacerbating current consumers' energy burdens.[6]

The physical limitations of a complex modern grid with inadequate transmission, and the piecemeal, siloed governance system split among federal, state, and private stakeholders guiding grid decisions, largely drive these challenges.[7]

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[5] Southwest Power Pool ("SPP") proposed to define "High Impact Large Loads" as "either (1) 10 MW or more if connected to the Transmission System at a voltage level less than or equal to 69 kV; or (2) 50 MW or more if connected to the Transmission System at a voltage greater than 69 kV." Michael Blackwell & Brittney Beetcher, *SPP Proposes to Speed Up Interconnection Process for High Impact Large Loads*, Husch Blackwell (Sep. 9, 2025), https://perma.cc/3A3W-42TF. As of September 30, 2025, the median threshold value for large-load and crypto tariffs tracked by SEPA was 25 megawatts; the highest was 500 megawatts. SEPA, *Database of Emerging Large-Load Tariffs (DELTa)* (2025), https://perma.cc/A8SZ-KMER. A single 100-megawatt "hyperscale" data center consumes as much electricity as 80,000 households—the equivalent of a small- or medium-sized city. EPRI, Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption 2 (2024), https://perma.cc/WH4Y-47NE. *See also* Martin C. Offutt & Ling Zhu, Cong. Rsch. Serv., R48646, Data Centers and Their Energy Consumption: Frequently Asked Questions 3–5 (2025), https://perma.cc/N4RS-545S. Some "exascale" data centers can potentially use up to 500 megawatts of electricity per facility. Phillip Marangella, *The Gigawatt Era: From Hyperscale to Exascale*, Forbes (Feb. 29, 2024), https://perma.cc/X5SK-FCKK. For generation interconnection delays, *see, e.g.*, Silverman et al., *supra* note 2, at 18 (describing PJM's generator interconnection queue and the large percentage of solar and battery projects in it). For load interconnection delays, *see, e.g.*, Ryan Quint et al., An Assessment of Large Load Interconnection Risks in the Western Interconnection 8, https://perma.cc/P6VD-K56Q (noting that for ten utilities in the Western Interconnection, the total load (demand) capacity waiting in queues is 44,650 megawatts, which is "nearly equivalent" to the total system peak demand for those utilities). In other words, this is a doubling in demand.

[6] *See, e.g.*, Molly Robertson, *Why Prices Soared in Recent Auction Held by a Major Electric Grid Operator*, Res. for the Future (Oct. 4, 2024), https://perma.cc/Y4WS-CXZY (describing the factors driving the regional grid operator PJM's unprecedented $14.7 billion auction for new generation capacity); Monitoring Analytics, *supra* note 3, at 1–2 (concluding that "data center load growth is the primary reason . . . for high prices" in PJM's most recent auction for new generation capacity, that "[i]nclusion of 11,993 MW . . . of existing and forecast data center load in the peak load forecast for 2026 resulted in a $7,271,197,971 or an 82.1 percent increase in capacity market revenues" over what revenues would have been without large load, and that "[h]olding aside all the other issues associated with the 2026/2027 BRA [base residual auction—the generation capacity auction], existing and forecast data center load by itself resulted in an increase in the 2026/2027 BRA revenue"). Capacity market costs are passed on to retail consumers. *See* Ashley J. Lawson, Cong. Res. Serv., R48553, PJM's Electric Capacity Market: Background and Current Issues 4 (2025), https://perma.cc/NPA3-S9BT (noting that in capacity auctions, "[u]tilities pay the clearing price for their expected demand and pass these costs on to consumers").

[7] For overall siloing governance challenges, *see generally* Alexandra Klass et al., *Grid Reliability Through Clean Energy*, 74 Stan. L. Rev. 969 (2022).

Indeed, the regulatory system is not keeping pace. In 2024, for example, the Federal Energy Regulatory Commission (FERC) denied a proposed increase in electricity service to a load center and similarly blocked special wholesale electricity rates to cover the costs of large loads—specifically crypto mining.[8] At the same time, some state utility commissions and regional grid operators oversaw major utility investments in generation and transmission capacity to serve large load, some of which will drive higher rates for existing customers.[9]

Inadequate federal and state governance for a changing grid will have far-reaching consequences. The federal government is preventing costly coal-fired power plants from retiring—citing AI needs—and has reached an $80 billion

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[8] FERC Order Rejecting Amendments, *supra* note 1, at 1; Basin Elec. Power Coop., 188 FERC ¶ 61,132 (2024), at 1 [hereinafter "FERC Order Rejecting Proposed Rate"]. The order rejecting Amazon's increased use of electricity from Talen's nuclear plant demonstrates how law impedes the growth of large load. The Basin Electric order rejecting higher rates for large load, and incentivizing the load to space itself evenly geographically, would have, if approved, been the path for large load but might have caused utilities—which requested the rate increase to accommodate this load—to find other ways to block it. The rejection of Basin Electric's proposal could also push any higher utility costs caused by large loads to other customer classes.

[9] *See* Monitoring Analytics, *supra* note 3, at 2 (showing $7.2 billion higher revenues in the regional grid operator PJM's 2026/2027 capacity market than would have been present in the absence of large load—costs that will be passed to retail ratepayers); Jacobs, *infra* note 226 (showing $4.3 billion in costs of new large load transmission passed to ratepayers in 2024); Eliza Martin & Ari Peskoe, Extracting Profits from the Public: How Utility Ratepayers Are Paying for Big Tech's Power 15 (2025) (noting that in Maryland and Virginia, "residential ratepayers are paying the majority of regional transmission costs that are tied to data center growth"); Joint Legislative Audit and Review Commission (JLARC), Commonwealth of Virginia, Report to the Governor and the General Assembly of Virginia, Data Centers in Virginia v (2024), https://perma.cc/498L-45P8 (observing that although staff found that current electricity rates "appropriately allocate costs to the customers responsible for incurring them, including data center customers," the sheer increase in demand will cause "new generation and transmission" to be "built that would not otherwise be built" and that utilities will have to import more electricity to serve all customers, resulting in an estimated $14 to $37 average monthly electricity bill increase in constant dollars by 2040 (not including inflation) for typical residential customers); Jack Brook & Sophie Bates, *Louisiana's $3B Power Upgrade for Meta Project Raises Questions About Who Should Foot the Bill*, AP News (Sep. 25, 2025), https://perma.cc/4TDM-LB3L (noting concerns about consumer costs associated with Meta's agreements—some of them under non-disclosure agreements—with Entergy for powering a $10 billion data center, approved by the Louisiana Public Service Commission). *See generally* Transcript of the Louisiana Public Service Commission (Aug. 20, 2025), https://perma.cc/N3W3-JFRA (vote on Entergy supply to Meta's data center). For some innovative utility approaches to-date, which seemingly better link the costs of new, large load to that load, *see generally* Andrew Satchwell et al., Electricity Rate Designs for Large Loads: Evolving Practices and Opportunities (2025), https://perma.cc/8PYK-BYNH; Stacy Sherwood, Review of Large Load Tariffs to Identify Safeguards and Protections for Existing Ratepayers (2025), https://perma.cc/82VX-779L.

deal to build more nuclear power, also to support AI.[10] Utilities could build too much new generation—much of it fossil-fueled—based on inaccurate demand projections.[11] Residential and commercial customers' energy costs could rise dramatically; in some areas, they already are rising.[12]

Emphasizing missed opportunities, some regulators argue that by demanding and building massive amounts of new generation, large load sources "could well anchor the development of the very energy infrastructure that our nation so sorely needs."[13] Indeed, many of these loads have deep pockets and are willing to pay for any generation that can be rapidly constructed, and sometimes the associated transmission.[14] As we explore here, however, much of the new capacity construction appears to primarily benefit the wealthy large load customers, failing to produce the synergies between industrial and retail load that previously arose from a networked grid.[15] Data center loads are simply so large that they often demand all or most of the electricity from new generation, rather than offering resources that can benefit all consumers.[16] Much of the new

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[10] Laila Kearney & Timothy Gardner, *Most Coal-fired Power Plants Will Delay Retirement to Feed AI Boom, Energy Secretary Says*, Reuters (Sep. 25, 2025), https://perma.cc/WA4F-DUWY describing the Department of Energy's use of Federal Power Act 202(c) authority to prevent coal-fired power plants from retiring in order to serve AI load); Antoine Gara & Malcolm Moore, *US Government and Westinghouse Strike $80bn Nuclear Reactor Deal*, Financial Times (Oct. 28, 2025), https://perma.cc/7Z87-27VS (describing an earmark of "up to $100bn for the US government to spend on Westinghouse reactors").

[11] *See, e.g.*, Maeve Allsup, *Microsoft Says Georgia May Be Overestimating Data Center Load Growth*, Latitude Media 4 (Apr. 12, 2024), https://perma.cc/25UF-6TQR; Moody's Ratings, Growing scale of new projects highlights overbuild, tech risks amid booming demand (2025), https://perma.cc/MR3N-98XN (noting that particularly for data centers in remote locations, "distance from major population centers may also limit their potential to be converted to other uses over time" and that "[m]any AI data center campuses are being built in relatively remote locations because of their access to reliable, cost-effective electricity").

[12] *See* all sources cited *supra* note 6.

[13] FERC Transcript, *supra* note 1, at 9.

[14] FERC Transcript, *supra* note 1, at 81 (comments of Senior Vice President, LS Power Development LLC: "We've talked to a lot of data centers, they're not really that price sensitive . . . .").

[15] Historically, utilities sought out complementary demand that would use generation around the clock—for example, industrial users that would consume electricity during the day, when electricity demand for trolleys and lighting in homes was not as high. Julie Cohn, The Grid: Biography of an American Technology 18 (2017). Data centers for AI, in contrast, demand large quantities of electricity, typically 24 hours a day. *Clean Energy Resources to Meet Data Center Electricity Demand*, U.S. Dep't of Energy, https://perma.cc/R6E7-RNGM (noting that data centers "often require firm power sources to operate continuously").

[16] *See, e.g.*, Casey Crownhart, *Why Microsoft Made a Deal To Help Restart Three Mile Island*, MIT Tech. Rev. (Sep. 26, 2024), https://perma.cc/7A42-YEAM (noting that Microsoft will use all of the power from the refurbished Three Mile Island plant); Jeff Dantre, *Georgia Power Projects Demand To Increase by 8,200 Megawatts by 2031*, WUGA (June 24, 2025),

construction to serve large load is also not predominantly zero-carbon "clean" energy, in part due to transmission interconnection lags for this energy.[17]

During the last surge of load growth—when the United States entered World War II—those responsible for providing a reliable and adequate supply of electricity came through.[18] Utilities that controlled transmission lines allowed new generators and users to interconnect with the transmission lines to send and receive electricity.[19] Much of this happened on the back of centralized

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https://perma.cc/TVN8-YQCQ (noting that in describing its integrated resource plan for increasing generation capacity and associated infrastructure to meet demand, "Georgia Power said around 80% of the projected demand is from data centers"); Letter from David E. Mills, Chair, PJM Board of Managers, to PJM Stakeholders 1 (Aug. 8, 2025), https://perma.cc/KQZ9-UTEW ("PJM's 2025 long-term load forecast shows a peak load growth of 32 GW from 2024 to 2030. Of this, approximately 30 GW is projected to be from data centers.").

[17] *See, e.g.*, *Engine No. 1, Chevron and GE Vernova to Power U.S. Data Centers*, Chevron (Jan. 28, 2025), https://perma.cc/U49M-TCX6; *see also* Transcript of Hearing at 226, Data Load Center Technical Conference, Case No. PUR-2024-00144 (Va. State Corp. Comm'n 2024) (noting a Virginia data center that built an on-site natural gas fired power plant) [hereinafter "Commonwealth of Virginia State Corp. Comm'n"]; *Entergy Louisiana to Power Meta's Data Center in Richland Parish*, Entergy (Dec. 6, 2024), https://perma.cc/972S-QCXZ (noting that to power Meta's largest data center, to be built in Louisiana, Entergy—an electric utility—will "[b]uild three combined-cycle [gas] combustion turbines with a combined capacity of 2,260 megawatts," although Meta is also supporting "1,500 megawatts of new solar and storage resources"). *But see* TPG, *Partnership with Google and TPG Rise Climate to Co-Locate Data Center Load and Clean Power Generation* (Dec. 10, 2024), https://perma.cc/WK67-SGWR (noting a partnership to "provide scaled renewable power and storage solutions to new data centers").

[18] Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 13 (describing current load growth due to data centers as a "once-in-a-generation challenge and the largest load growth scenario since the conclusion of World War II"); Cohn, The Grid, *supra* note 15, at 105–06 ("[A] [Federal Power Commission] survey [first published in 1935] . . . indicated that eastern and midwestern industrial centers of the country threatened to run short of power. . . . Further, the survey urged that 'careful planning under Federal supervision of new power plants and facilities for transmission is required to promote the safety and welfare of the Nation.' . . . [t]he survey concluded that interconnection and coordination could obviate the need for much of the new capacity otherwise required."); *see also* sources cited *infra* note 19 (describing extensive investments in transmission).

[19] *Orders of Commission in the Nature of Opinions*, 2 F.P.C. 531 (1939–1941) (showing World War II interconnection orders); Julie Cohn, Connecting Past and Future: A History of Texas' Isolated Power Grid 15 (2022), https://perma.cc/T9PK-9EYB (describing numerous Federal Power Commission orders and emergency orders requiring utilities and regions to interconnect to support wartime activity); Cohn, The Grid, *supra* note 15, at 112 ("The interconnections built through federal and private sector cooperation proved critical to meeting defense power demands. All told, . . . the government and private utilities together assured that hundreds of billions of kilowatt-hours of electricity traveled across roughly two hundred thousand miles of power lines to both defense and domestic users. With only a 25 percent increase of installed capacity from 1940 to 1945, the nation's power system generated nearly 60 percent more electricity during the war years.").

governance—federal mandates for generation and transmission expansions.[20] Federal leadership drove up energy production by approximately 60% through a combination of new generation and transmission capacity.[21]

Two executive orders in January of 2025, from two different administrations, as well as a new advance notice of proposed rulemaking, similarly call for increased federal involvement in expanding grid access in the name of national security—without increasing costs or reducing reliability for residential customers.[22] Top-down, centralized mandates akin to those of the 1940s are not advisable, however. We are not in the throes of a world war, and President Trump's declaration of an energy emergency, designed in part to spur federally subsidized construction of fossil-fueled energy for data centers, problematically steers U.S. energy development away from energy markets and low-carbon, lower-pollution generation.[23] Nor are the purported drivers of an energy emergency—inadequate production of fossil fuels and related infrastructure—present. The real emergency lies in high retail prices driven largely by expensive transmission and distribution investments by utilities; growing weather extremes; and, potentially, by rate governance that does not consistently allocate the costs of new, large demand to large loads.[24]

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[20] All sources cited *supra* note 19.

[21] Cohn, The Grid, *supra* note 15, at 112; *see, e.g.*, 2 U.S. Fed. Power Comm'n, Opinions and Decisions of the Federal Power Commission, July 1, 1939–December 31, 1941, 1096 (1943) (showing required interconnection of different power companies to "meet the emergency and serve the public interest").

[22] Exec. Order No. 14156, 90 Fed. Reg. 8433 (Jan. 20, 2025), https://perma.cc/Z82M-UEFJ (noting "high energy prices that devastate Americans"); Exec. Order No. 14141, 90 Fed. Reg. 5469 (Jan. 14, 2025), https://perma.cc/ZUW3-HZTM (noting the need to "maintain low consumer electricity prices"). *See also* Secretary of Energy's Direction that the Federal Energy Regulatory Commission Initiate Rulemaking Procedures and Proposal Regarding the Interconnection of Large Loads Pursuant to the Secretary's Authority Under Section 403 of the Department of Energy Organization Act [hereinafter "Secretary of Energy's Direction"], Oct. 23, 2025, https://perma.cc/9D4K-KMDB (directing FERC to initiate a rulemaking to initiate federal authority over large loads' interconnection to transmission lines).

[23] Exec. Order No. 14156, 90 Fed. Reg. 8433 (Jan. 20, 2025), https://perma.cc/Z82M-UEFJ; Exec. Order No. 14213 (Feb. 14, 2025), https://perma.cc/3HGR-8CDA; Exec. Order No. 14318, 90 Fed. Reg. 35385 (July 23, 2025), https://perma.cc/M6EZ-59VF (mandating an "initiative to provide financial support for Qualifying Projects" (data centers)). These orders prioritize fossil fuels and wholly omit solar, wind, and batteries, despite solar and batteries dominating recent additions of U.S. electricity generation capacity and (for photovoltaic utility-scale solar) offering one of the lowest levelized costs of energy. *See, Solar, Battery Storage to Lead New U.S. Generating Capacity Additions in 2025,* U.S. Energy Info. Admin. (Feb. 24, 2025), https://perma.cc/8XCT-K7RF; Lazard, Levelized Cost of Energy 8, 14 (2023), https://perma.cc/6AD3-76SA.

[24] Many factors contribute to rising electricity costs, but utilities' growing expenditures on aging distribution infrastructure—and to "harden" distribution infrastructure to withstand weather extremes—appear to be a major contributor. *See, e,g.*, *Grid Infrastructure Investments Drive Increase in Utility Spending Over Last Two Decades*, U.S. Energy Info. Admin.

We must find alternative ways for the electric grid to meet the mandate long placed on it—to provide all electricity demanded, all of the time, in a reliable fashion, and at a "just" (fair) and reasonable price.[25] At the same time, this grid must meet the urgent mandate of addressing climate change and reducing damaging air pollution. As it stands, we are notably short of that mark.[26]

The U.S. grid facing these challenges is a highly networked one. While the first electricity service was distinctly local, utilities quickly realized the economies of scale of interconnecting with each other to share power.[27] Three large, regional interconnected mazes of wires emerged in North America, and for a long time, this interconnection produced benefits; utilities built new generation that leveraged synergies between industrial load and retail demand.[28] But these benefits are waning: with inadequate transmission and slow processes for interconnection to the network, some large loads now view the network as a burden, not an opportunity.[29]

(Nov. 18, 2024), https://perma.cc/2TLC-KJP6 (noting that capital investment by electric utilities more than doubled between 2003 and 2023, and that "aging generation and delivery infrastructure were replaced or upgraded to resist fire and storm damage," among other expenditures such as investments for lines to connect renewable energy to the grid); MONITORING ANALYTICS, *supra* note 3, at 1–2 (concluding that data centers were the "primary reason" for high prices in PJM's most recent auction for new generation capacity); CONG. RES. SERV., *supra* note 6, at 4 (observing that utilities pass capacity costs on to consumers). Utilities have also focused on building localized transmission infrastructure rather than more efficient regional and interregional infrastructure, and they have passed the costs on to ratepayers (through "ratebase") rather than going through competitive processes. Ari Peskoe, *Is the Utility Transmission Syndicate Forever?* 42 ENERGY L.J. 1, 52–57 (2021). For sources addressing potentially higher rates due to residential ratepayers covering costs caused by data centers and higher capital investments generally, *see* all sources cited *supra* note 9.

[25] Federal Power Act, 16 U.S.C. §§ 824d, 824e (2018).

[26] Many utilities are proactively addressing a dynamic situation to accommodate large load, however, as we acknowledge and explore in our solutions in Part IV. For a survey of utilities' numerous and diverse strategies to modify rates and service for large loads, *see* SATCHWELL ET AL., *supra* note 9.

[27] *See infra* Part I.

[28] *Electricity Explained*, U.S. ENERGY INFO. ADMIN. (Apr. 16, 2024), https://perma.cc/4EMA-KE8L ("As the demand for electricity grew . . . utilities began to connect their transmission systems. These connections allowed utilities to share the economic benefits of building large and often jointly owned power plants to serve their combined electricity demand at the lowest possible cost. Interconnection also reduced the amount of extra generating capacity that each utility had to hold to ensure reliable service during times of high and peak demand. Over time, three large, interconnected systems evolved in the United States."). For former retail-industrial synergies, *see infra* Part I.

[29] *See infra* sources cited notes 31 and 32 (discussing data center flexibility and trends toward on-site, collocated generation). Note, however, that on-site generation does not always involve full "behind-the-meter" off-grid electricity. JLARC, *supra* note 9, at 131. *Cf.* MOODY'S RATINGS, *supra* note 11, at 4 ("Lengthening timelines to secure power grid connections are reducing the appeal of some areas to new data center development.") and at 3 ("The time required to construct reliable generation capacity and expand transmission assets will constrain data center growth beyond 2028."); Drew Robb, *Data Center Knowledge, Data Centers Bypassing*

When firms building new large loads—many of them data centers—cannot connect generation to, or access, existing electricity from the networked grid that serves numerous utilities and customers, some are proposing to revert to the highly localized, non-networked electricity system of the 1900s, opting for on-site (co-located) generation.[30] Some digital large loads, such as data centers for AI training or crypto mining facilities, are physically flexible—they can locate essentially anywhere.[31] To obtain on-site energy, some of these firms are proposing to build their own generation sources, or co-locate with existing generation and largely go "off-grid."[32] Yet these defections, too, powerfully affect the network. A large load that co-locates with an existing, operational power plant and purchases electricity from that plant causes less electricity to flow to the broader grid through shared transmission lines. And large loads that do not wholly disconnect from the grid and require back-up generation from utilities

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the Grid to Obtain the Power They Need, Data Center Knowledge (May 1, 2025), https://perma.cc/88JR-AU95 (citing a data center professional association (AFCOM) program chair, who indicated that 62% of data centers are considering on-site power generation).

[30] *See* all sources cited *supra* note 17; all sources cited *infra* note 32. *But see* Maeve Alsup, *Amazon's Data Center Strategy: 'Get Back to Being Grid-Tied'*, Latitude Media (Jan. 28, 2025), https://perma.cc/6AQZ-NCNF (noting that although Amazon has co-located with some generators to avoid grid interconnection, this is not "really representative" of Amazon's "broader data center power strategy"); JLARC, *supra* note 9, at 131 (observing that "only one data center site in Virginia [a locus of data center activity] appears to actively rely on on-site generation for a substantial share of its energy needs").

[31] Locational flexibility depends on the type of large load. Crypto mining firms primarily consider the cost of electricity and cooling; they do not need close connectivity to users. *See* Lumerin Protocol, *How Important is Geographic Location in Today's Bitcoin Mining Landscape?*, Lumerin Blog (Dec. 8, 2022), https://perma.cc/4GU7-Z6R9. For the trend toward off-grid generation, *see, e.g.*, all sources cited *supra* note 28. Data centers' locational needs vary depending on whether the centers are for training AI models or completing AI inference. *The AI Power Boom Means Rethinking Data Center Location Strategy*, CoreLogic (July 31, 2024), https://perma.cc/GK4Q-P5YU ("Data centers strategically positioned near key user bases, such as manufacturing regions or financial districts, can offer faster, more reliable access to data and services. In some cases, however, data center workloads are not sensitive to latency and therefore, building data center campuses in rural areas is more economical."). Latency refers to delays "between a data packet being sent from a source and its receipt at the destination." *Network Latency: Understanding and Minimizing Delays in Data Center Environments*, DATABANK (June 19, 2024), https://perma.cc/BA97-BRZR. For different energy uses of AI training versus inference, *see, e.g.*, Plutarco Naranjo & David Robinson, *The AI Arms Race and Electricity Needs*, 145 Oxford Energy J. 4, 6 (2025); *see also* FERC Transcript, *supra* note 1, at 14 (noting the trend toward co-location and behind-the-meter arrangements that are largely disconnected from the grid); JLARC, *supra* note 9, at ii (describing data center location constraints). The need for transmission access noted in the report is not present for truly off-grid centers, although "off-grid" projects so far are primarily proposed at old or operating grid-connected plants.

[32] For proposed off-grid projects with newly built generation, *see* Chevron, *supra* note 17 (noting that Chevron's and GE's natural gas-fired plants serving data centers are "not designed to flow initially through the existing transmission grid"); FERC Transcript, *supra* note 1 (noting other natural gas-fired co-generation).

still cause utilities to incur network-based costs, which could primarily flow to non-large load customers without proper rate design.[33]

The federal government agency tasked with this challenge, FERC, already has a broad mandate from Congress, under which it can generate consistent, integrated, fair approaches to address burgeoning demand.[34] The Federal Power Act of 1935 requires "just and reasonable" wholesale electricity rates and terms of service—the very values required to ensure equity on a rapidly transforming grid.[35] But as it stands, FERC has not yet provided new, comprehensive guiding standards for generation capacity and transmission interconnection in the era of large load.[36]

FERC has begun to acknowledge the herculean task of updating an old governance system through large loads—for example, holding a technical conference on large loads co-located with other large loads, and starting a docket to address some interconnection issues.[37] Yet FERC has not yet seized upon the mandate to comprehensively, proactively address the challenges looming before it for the co-located, grid-connected large load covered by its jurisdiction. It lacks standards that define different forms of large load, and how this load should interconnect with transmission lines and generation connected to these lines.[38]

The state law of rate making—electric utilities' establishment of retail rates (charges) for electricity, particularly for new large load customers seeking service from electric utilities—must also adapt to reflect new realities, yet it is not

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[33] JLARC, *supra* note 9, at 131 (noting that utilities, due to the obligation to serve all customers in their territory, "would still need to build the infrastructure necessary to provide power to these [data center] sites, even if they are only serving in a backup capacity," and that "[o]n-site generation could . . . shift new infrastructure costs to other customers, because infrastructure costs are recaptured through utility billings, and a data center using . . . on-site generation would not be regularly billed for services"); *see* Protest of Exelon Corp. and Am. Elec. Power Serv. Corp., FERC Docket No. ER24-2172, at 3 (June 24, 2024) [hereinafter "Protest of Exelon and AEP"] (arguing that generation that reduces supply to the network to serve more co-located load still benefits from network services yet would not pay its fair share under a modified interconnection agreement).

[34] *See* Federal Power Act, 16 U.S.C. § 824.

[35] *Id.* § 824(a).

[36] The U.S. Department of Energy has issued an advance notice of proposed rulemaking directing FERC to assert jurisdiction over large loads that connect to transmission lines and to address reliability and interconnection of these loads, among other issues. *See* Secretary of Energy's Direction, *supra* note 22.

[37] *See generally* FERC Transcript, *supra* note 1; Press Release, FERC, FERC Orders Action on Co-Location Issues Related to Data Centers Running AI (Feb. 20, 2025), https://perma.cc/ZZ9T-RY26.

[38] Some of these standards may emerge pursuant to the recent Secretary of Energy directive. *See generally* Secretary of Energy's Direction, *supra* note 22 (directing FERC to initiate a rulemaking on large loads' interconnection to transmission lines).

moving fast enough.[39] And both FERC and most states have skirted a central question underlying all large load governance: how should regulators design and implement a formal "queue" for the many large loads waiting to interconnect to retail utilities' or regional grid operators' wires?

The consequences of legal mal-adaptation are grim. We are already seeing them, with companies canceling contracts or scrambling to find new power sources and retail customers in some regions facing dramatically higher electricity rates.[40] Much of the new load fomenting these problems is not as essential as the industries historically necessary to support a world war. But the legal system must meet the challenge to ensure that the grid will provide adequate electricity to meet growing demand (within reason), at a just and reasonable price.[41] And critically, the system must protect retail consumers who are currently shouldering cost burdens caused by large loads and address concerns about the societal impacts of large load.[42]

This Article analyzes these challenges and proposes paths forward. It frames the vastly changed frontier of the law of electricity and then explores high-level solutions for more integrated, consistent, and effective legal approaches to providing electricity to meet growing demand. It leaves for future work the many related impacts of massive load growth, such as local land use, water use, and revenue-based challenges; other global environmental impacts; and the job displacement impacts of AI fueled by data centers.[43]

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[39] *See* Peter Freed & Allison Clements, *How to Reduce Large Load Speculation? Standardize the Interconnection Process*, Utility Dive (Feb. 19, 2025), https://perma.cc/L82D-ZZG8 ("We can haphazardly continue down the path of a fragmented and increasingly untenable approach to large load-side interconnection, or we can take the opportunity to introduce rational standardization to the process.").

[40] *See, e.g.*, Complaint at 13–15, Governor Josh Shapiro and the Commonwealth of Pennsylvania v. PJM Interconnection, LLC, Docket No. EL25-46 (Dec. 30, 2024), https://perma.cc/N5ZB-HEZV; Georgia Power Company's 2023 Integrated Resource Plan Update, Docket No. 55378, at 8, 14 (Ga. Pub. Serv. Comm'n 2024), https://perma.cc/T4AX-H9J3 (noting rising load from "large load customers" and showing the Georgia Public Service Commission eschewing competitive procurement due to "rapid deployment" necessary for needed new generation capacity); Tim McLaughlin, *Georgia Voters Oust GOP Utility Commissioners Over Rising Electricity Rates*, Reuters, Nov. 5, 2025 (noting that in Georgia, "[s]ummer electric bills for Georgia Power customers using 1,000 kilowatts have increased 41% to nearly $190 per month compared to the summer of 2021"); JLARC, *supra* note 9, at v ("A typical residential customer of Dominion Energy could experience generation- and transmission-related costs increasing by an estimated $14 to $37 monthly in constant (or real) dollars by 2040 . . . .").

[41] *See* Shehabi et al., *supra* note 4, at 5; Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 13 ("The load is here, it is being built now, and we must respond accordingly.").

[42] *See* Martin & Peskoe, *supra* note 9, at 2 (emphasizing cost burdens); Monitoring Analytics, *supra* note 3, at 1–2 (noting high costs in the most recent PJM capacity auction and attributing the costs to large load).

[43] *See generally* Kelly Aves, *Data Centers and Local Environmental Considerations*, Nat'l League of Cities (May 23, 2025), https://perma.cc/LR8M-6YEX; Adam Zewe, *Explained: Generative AI's Environmental Impact*, MIT News (Jan. 17, 2025), https://perma.cc/YY9W-ARW5;

Part I of the Article contextualizes the U.S. electric grid and frames the current stressors on the networked grid, focusing on largely unprecedented load growth. Part II analyzes the electricity governance system in the context of this growth, and Part III critiques the lack of guiding precedent from FERC on load growth challenges, focusing on three specific obstacles: (1) interconnecting new generation with the transmission grid, (2) interconnecting new large load with the transmission grid, and (3) approving modified wholesale electricity rates. Part IV then explores high-level options for paths forward, which fall far short of World War II national mandates but better integrate and comprehensively address networked challenges and impacts on non-large load consumers.

The U.S. electric grid—the backbone of our economy and way of life—is at a critical crossroads. The connection of generation and load through a complex web of wires was once the enabler of the booming economy, allowing critical pooling of risk.[44] But it is this sprawling, tightly interconnected network that is now failing the fastest-growing electricity users and non-large load customers. Any path forward must find a solution that makes the network an asset, not a risk, and that allows a new, energy-hungry industry to find a workable space within this network without sending irreparable shock waves through it.

I. Stressors on a Networked Yet Siloed Electric Grid

The electric grid of 1910—at the dawn of the commercialization of electricity—had few trappings of a "grid."[45] Electric utilities—firms responsible

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Peyton McCauley et al., *Powering Progress or Peril? The Hidden Environmental Costs of Data Centers and AI*, 51 Rutgers Comput. & Tech. L. J. SE1 (2025); JLARC, *supra* note 9, at i (noting that "[d]ata centers employ fewer employees than some other industries, but data center jobs tend to be high paying" and that "a typical 250,000-square-foot data center may have approximately 50 full-time workers, about half of which are contract workers" and that "[c]onstruction of an individual data center building usually takes about 12 to 18 months, and . . . at the height of construction, approximately 1,500 workers are on site from various construction-related industries."); World Economic Forum, Future of Jobs Report 2025 18–20 (2025) (estimating the displacement of 92 million jobs by 2030, with much of the displacement—at least in the clerical sector—stemming from "[b]roadening digital access, AI and information processing technologies, and robots," although estimating more jobs in sectors such as "Big Data Specialists" and "AI and Machine Learning Specialists"); Goldman Sachs, The Potentially Large Effects of Artificial Intelligence on Economic Growth 1 (2023), https://perma.cc/RA5H-VGHR (estimating that "roughly two-thirds of current jobs are exposed to some degree of AI automation, and that generative AI could substitute up to one-fourth of current work").

[44] *See* Cohn, The Grid, *supra* note 15, at 119–20 (describing the World War II and post-war economic boom supported by the networked U.S. grid).

[45] *See* Samuel Insull, *The Obligations of Monopoly Must Be Accepted* (Jan. 7, 1910) *in* Central Station Electric Service 118–22 (William E. Keilly ed., 1915) (observing that electricity supplied all of the railways in Chicago in 1910); *see also* Robert L. Bradley, Jr., *The Origins and Development of Electric Power Regulation*, *in* The End of a Natural Monopoly 43–44 tbl.1 (Peter Z. Grossman & Daniel H. Cole eds., 2003).

for building and operating electricity generation, transmission, and distribution lines to carry electricity to customers—built generation very close to the customers served. Chicago alone had nearly 45 utilities in 1907, some of which even competed for customers within neighborhoods or on individual streets.[46] This localized, largely disconnected grid rapidly expanded to a highly interconnected maze of wires, with three regional webs spanning Eastern North America, Western North America, and Texas.[47]

Framing and pinpointing the maladies of the modern electric grid requires substantial context—an understanding of the original, decentralized state of commercial electricity toward which some large users are again leaning, and the evolution of the modern networked grid.[48] This Part provides this framing and context, exploring the physical and governance-based factors that have shaped the grid and the perfect storm of stressors that threaten to tear apart this network.

A. The Early Decentralized Grid

Chicago of the early 1900s had a multiplicity of power plants for good reasons. The first commercialized generators and distribution circuits deployed in the 1880s used direct electrical current, which flows in one direction.[49] Its properties were well-understood after decades of experimentation. For example, engineers knew that the electrical power flowing through a wire equaled the product of its voltage and current, which were analogous to the pressure and volume of water flow through a pipe. Energy losses increased linearly with voltage, and higher voltages reduced losses per unit of energy transmitted.[50]

Despite these known benefits, early techniques for increasing direct current (DC) voltage were also inefficient.[51] These limitations necessitated the co-location of electricity generation near its end use. As a result, the first

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[46] Bradley, *supra* note 45, at 73; *see also* John Bauer & Peter Costello, Public Organization of Electric Power 16 (1949); Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 60 Emory L. J. 878, 886 (2010).

[47] *Electricity Explained: How Electricity is Delivered to Consumers*, U.S. Energy Info. Admin. (Apr. 16, 2024), https://perma.cc/KG7Z-CD2Y.

[48] *See* FERC Order Rejecting Amendments, *supra* note 1, at 8 (describing Talen Energy's FERC-rejected proposal to reduce electricity provided through the networked grid and sell the electricity to Amazon "behind-the-meter"—essentially disconnected from the grid); Chevron, *supra* note 17 (describing proposed off-grid "power foundries" for data centers).

[49] Allison Lantero, *The War of the Currents: AC vs. DC Power*, U.S. Dept. of Energy (Nov. 18, 2014), https://perma.cc/G9D9-EZV3.

[50] *See, e.g., On the Road to Increased Transmission: High Voltage Direct Current*, NREL (June 12, 2024), https://perma.cc/4UXD-WVBA (noting that modern high voltage direct current "lines can carry higher voltages on cables of comparable size to HVAC lines, meaning the lines heat up less and lose less energy to heat.").

[51] U.S. Dept. of Energy, *supra* note 49.

commercial electrical systems were distributed, isolated circuits that lacked the economies of scale needed to facilitate rapid growth.[52]

This localized U.S. electricity system changed dramatically at the advent of the twentieth century. Electrical transformers could efficiently convert alternating current (AC) electricity, which switched direction rapidly, to a high voltage. This advance unlocked economies of scale in electrical generation, transmission, and distribution, which made the modern electrical grid possible.[53] High-voltage, AC transmission of electricity became the norm, leading to a highly networked and interdependent system for generating electricity and delivering it to customers.[54]

B. Risk Pooling Through a Networked Grid

The local, decentralized grid of the early to mid-1900s was short-lived. Once long-distance transmission via AC proved feasible, electrical generation—at the time dominated by massive hydropower dams—could be connected to distant urban centers, where factories could access both the labor and materials needed for production.[55] Contrast this with the rapidly emerging large load era, in which many types of "digital foundries" with low labor requirements can locate virtually anywhere with flat ground.[56] The constraints posed by the now-centralized grid have caused a new war of networked versus localized generation, with some data centers seeking out 1900s-esque co-located, highly local generation.[57]

This Part explores the dynamics that originally spurred the transition to a centralized, networked grid. This foreshadows the contrasting forces pushing again toward localization and concerns about the limits of a networked grid in the digital era.

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[52] Cohn, The Grid, *supra* note 15, at 21 (noting industry's preference for "on-site generating facilities" in the "late 1890s and early 1900s" and how power companies at this time sometimes built small localized networks but did not tend to interconnect with each other); Gretchen Bakke, The Grid: The Fraying Wires Between Americans and Our Energy Future 45 (2016) (noting "basement power plant[s]" and similar localized power for factories, office buildings, and mansions).

[53] Cohn, The Grid, *supra* note 15, at 17–20; Bakke, *supra* note 52, at 48.

[54] Cohn, The Grid, *supra* note 15, at 17–20.

[55] *Id.* at 20; David P. Tuttle, et al., *The History and Evolution of the U.S. Electricity Industry*, Univ. of Tex. at Austin Energy Inst. 4 (2016), https://perma.cc/W93C-ZA2G; Bakke, *supra* note 52, at 53.

[56] *See* all sources cited *supra* notes 17, 32.

[57] FERC Transcript, *supra* note 1, at 29–30 (noting that in some respects, network grid operators are welcoming off-grid data center power solutions because they can avoid exacerbating growing network constraints).

1. Economies of Scale in Generation

As large utilities built transmission within their territories to connect with each other, they created three large "interconnected" regions of wires in North America, which sprawl throughout the United States, Canada, and parts of Mexico.[58]

Large, centralized power plants delivering power over long-distance AC lines to population (and thus load) centers and industry in the United States created both a challenge and an opportunity.[59] The electricity system has large fixed costs to fund physical assets, and lower costs associated with operation and maintenance.[60] A utility must build a generating unit; transmission lines to carry electricity to communities; transformers; and distribution lines to deliver electricity to homes, businesses, and industry regardless of whether it is delivering one megawatt (enough to power approximately 300 homes) or one gigawatt (1,000 megawatts, or 300,000 homes) of electricity.[61] Infrastructure costs increase in a step-wise fashion—above specific thresholds of consumption, new generation and wires are needed—but one power plant and transmission line can serve vastly different numbers of customers.[62]

Early in the development of the networked electrical grid, this cost structure required increasing the use of fixed-cost generation and transmission.[63] To decrease unit (per-kilowatt hour) costs, utilities sought out more customers who could use electricity at different times of day—particularly factories, which operated during the day and used power when residential and commercial sectors did not demand as much light.[64]

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[58] U.S. Energy Info. Admin., *supra* note 47 ("As the demand for electricity grew . . . utilities began to connect their transmission systems. These connections allowed utilities to share the economic benefits of building large and often jointly owned power plants to serve their combined electricity demand at the lowest possible cost. Interconnection also reduced the amount of extra generating capacity that each utility had to hold to ensure reliable service during times of high and peak demand. Over time, three large, interconnected systems evolved in the United States."); *Learn More About Interconnections*, U.S. Dep't of Energy, https://perma.cc/378Y-ZG4M (describing how grid interconnections extend into Canada and Baja, Mexico).

[59] Tuttle, et al., *supra* note 55, at 3.

[60] Jim Lazar, Electricity Regulation in the US: A Guide, The Regulatory Assistance Project 185 (2016), https://perma.cc/7YMP-BHWL (noting "fixed assets" in the form of utility infrastructure and differentiating this from the more nebulous term "fixed costs").

[61] Estimates of the number of homes powered by one megawatt of electricity vary widely because homes of different sizes, and with different energy efficiencies and appliances, consume vastly different amounts of electricity. 300 is somewhat low, although some experts put the number as low as 180. *See What is a Megawatt?*, UtiliPoint (Feb. 24, 2012), https://perma.cc/UWZ9-WKUH.

[62] Lazar, *supra* note 60, at 185.

[63] Tuttle et al., *supra* note 55, at 3.

[64] Cohn, The Grid, *supra* note 15, at 38.

As competing utilities pushed into more sectors, the disruption of public spaces caused by overlapping distribution wires prompted a backlash that threatened to limit the growth of the electric market. Utility magnate Samuel Insull saw this as an opportunity to strike a deal with potential regulators that would eliminate his competitors and gain public acceptance for utility infrastructure needed to deliver residential electric service. Insull toured the country with a soapbox speech aimed at further centralization of the electric utility structure.[65] Insull persuaded states that electric utilities would best operate as monopolies.[66] This would avoid wasteful competition over infrastructure, such as overlapping and unsightly distribution lines as firms fought for customers. Insull also assured the states that utilities would not have the upper hand within such a system.[67] He championed a system of regulated monopolies, in which one utility would gain exclusive access to a territory of customers, in exchange for a regulated rate and an obligation to serve all customers who could pay.[68]

All 50 states ultimately adopted Insull's model.[69] In the restructuring craze of the 1990s, some moved away from it, but the regulated monopoly structure still dominates U.S. retail electricity.[70] Insull's benevolent monopolies proved difficult to manage, however, with Insull himself buying up numerous generating companies and constructing a pyramid investment scheme.[71] But there were and are some risk-reducing benefits to centralization, both for customers and the utility. Customers avoided the risk of receiving an essential good from a small company that was more vulnerable to bankruptcy risk. Utilities, with the assurance that they would not be undercut by competitors, felt secure in investing in the costly infrastructure needed to serve all customers.[72]

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[65] *See* Forrest McDonald, *Samuel Insull and the Movement for State Utility Regulatory Commissions*, 32 Bus. Hist. Rev. 241, 241–42 (1958).

[66] *See* Insull, *supra* note 45, at 1.

[67] *See id.* at 1. Stein argues that the regulated monopoly model limits the "structural" power of utilities relative to that of their unregulated Big Tech customers, which have achieved monopolistic scale without regulatory oversight. *See* Amy L. Stein, *Shifting Structural Power: The Tech Energy Transition* 1 (SSRN Abstract 2025), https://perma.cc/22UB-G5ZF.

[68] See Bradley, Origins and Development, supra note 45, at 46–47.

[69] *See* Tracy Anders Greenlee, *History and Impact of the Public Utility Commission of Texas, Texas State Historical Association*, Texas State Historical Association, https://perma.cc/6FMP-ZRWQ (Nov. 1, 1995) (noting that Texas was the last state to establish a public utility commission in 1975). By 1940, forty states and Washington, D.C. had established public utility commissions. *See* Robert L. Bradley Jr., *The Origins of Political Electricity: Market Failure or Political Opportunism?*, 17 Energy L.J. 59, 66 (1996).

[70] EIA, *Investor-Owned Utilities Served 72% of U.S. Electricity Customers in 2017* (Aug. 15, 2019), https://perma.cc/RB9J-XTT3; *see Electricity Deregulation*, Electric Choice (Aug. 15, 2025), https://perma.cc/GU3V-ZAC3.

[71] Hon. Richard D. Cudahy, *Insull and Enron: Is There a Parallel?*, 43 Infrastructure 7, 7–8 (2003).

[72] *Id*. at 7.

With this security in hand, utilities expanded their service areas, offering services to more customers to the point where the cost to extend service exceeded profits. This left many rural customers unserved, as building distribution lines to limited numbers of far-flung customers is a losing economic proposition. Only governmental intervention in the Franklin D. Roosevelt era led to widespread rural electrification of unprofitable rural electric markets.[73]

2. The Benefits of a Tightly Networked System

As centralized monopolistic utilities grew in the early twentieth century, utilities built generation farther from load centers and began to transmit electricity longer distances to these centers. Utilities also began to purchase more generation from each other rather than building it themselves—particularly back-up generation or "reserves" (physical generating capacity).[74] These reserves were not necessary most of the time and were quite expensive to build solely to support one utility.[75] The sharing of this "spare tire" was far more efficient than building reserves for each generating plant. As utilities entered agreements to share generation and build transmission that enabled this sharing, formal regional entities called "power pools" emerged.[76] Through power pools, electric utilities contracted with each other to buy and sell electricity when needed, and particularly to share reserve capacity.

Utilities expanded transmission connections with each other until transmission-level links reached the point of reducing profits for both. Indeed, if a utility built out too much transmission, it risked providing pathways for competitors to undercut the utility's wholesale power prices.[77] As with rural electrification, governmental intervention was necessary in World War II, when a surge in demand for electricity to power the war machine required the massive expansion and interconnection of more transmission lines to service generation and load.[78]

C. The Breakdown of Centralization, Networking, and Retail-Industrial Synergies

Many of the dynamics that originally led utilities to build new, centralized generation for large load and to interconnect with each other have faded

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[73] Tuttle et al., *supra* note 55, at 6.

[74] Ari Peskoe, Power Over The Twenty-First Century Grid 2 (2018), https://perma.cc/XRK8-88CB.

[75] Marissa Hummon et al., Fundamental Drivers of the Cost and Price of Operating Reserves 3 (2013), https://perma.cc/AM5A-E6W3.

[76] Peskoe, *supra* note 74, at 2.

[77] *See, e.g.*, Otter Tail Power Co. v. United States, 410 U.S. 366, 371 (1973) (showing a utility's reluctance to allow competitors to access its transmission lines).

[78] Cohn, The Grid, *supra* note 15, at 106–09.

since the dawn of twenty-first century. After utilities grew to meet the surging demand of the early 1900s, a veritable web of wires and generation plants emerged, and this web became relatively stable. Unlike the early days of utilities rushing to build new infrastructure and transmission to keep up with demand, supply and demand rested in a relatively balanced state after World War II and the post-war expansion, with occasional disruptions.[79] But the old model also persists, with many large load customers still seeking out, and receiving, power from utilities.[80]

This subpart explores two trends that are moving in starkly different directions: first, decreased utility investment in generation and the defection of some large load customers from the networked grid with centralized generation, and second, the continued reliance of many large load customers on traditional, networked utility service.

1. Declining Incentives for New Generation

Within the balanced web of wires interconnecting utilities to the point of mutual economic benefit, and relatively even supply and demand, utilities were able to keep per-unit (kilowatt-hour) costs of electricity relatively low. To meet slow to moderate load growth, utilities could simply incrementally build cheap generation or purchase it from an increasingly competitive generation market.[81] The benefits of substantially expanding generation to serve both industrial and residential customers became slimmer. And regardless of any remaining benefits of complementary industrial and residential load, the opportunity to find new residential customer bases to complement industrial load shrank; most people already had access to electricity.[82]

Fast forward to the 2020s, when load growth began to surge.[83] Synergies between industrial large load, generation to serve that load, and residential customers are decidedly lacking for the modern data industry, which employs

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[79] Limited natural gas supply to the Northeast was one such disruption, solved in part by federal eminent domain for and regulation of interstate natural gas pipelines to expand access to gas. Alexandra Klass & Danielle Meinhardt, *Transporting Oil and Gas: U.S. Infrastructure Challenges*, 100 Iowa L. Rev. 947, 996–99 (2015).

[80] *See* all sources cited *supra* note 30.

[81] *See* 75 FERC ¶ 61,080 (1996) (requiring open access to the grid to enhance competition); *Power Sector Evolution*, EPA (June 3, 2025), https://perma.cc/82PJ-DXBV (noting declining costs in renewable and natural gas generation); Kennedy Maize, *What is the Future of Independent Power?*, Power Mag (Jan. 3, 2018), https://perma.cc/K2PC-SE4T (noting the flourishing of independent power producers); Tuttle et al., *supra* note 55, at 5 (noting cheap natural gas and solar and the struggle to finance larger, more expensive generation such as coal and nuclear, in part because "[t]oday [in 2016], the ability to add new generation capacity in smaller sized increments can be attractive for utilities in an era of low load growth").

[82] Tuttle et al., *supra* note 55, at 6 ("At the time of FDR's death in 1945, an estimated 90% of rural farms were electrified.").

[83] *See* all sources cited *supra* note 4.

relatively few people and can (and often needs to) run most of the time, thus not needing a complementary residential load.[84] And given substantial transmission constraints in some regions, new generation capacity, although desperately needed, is a headache—not a boon—for some utilities.[85]

Utilities that face transmission constraints and other impediments to constructing new generation can make profits by increasing the units (kilowatt-hours) of electricity that they sell to existing customers from under-utilized fixed assets. Alternatively, they can make minor modifications to assets to generate more electricity rather than rely on major new builds.[86] Until recently, many utilities have seen load increase relatively gradually with customers' purchases of electric vehicles and the electrification of homes. Electrification has only just begun to tax utility infrastructure, and in discrete regions, as its pace has risen.[87] This contrasts with the urgent demand that some utilities now face to build new generation to supply large load.

We do not mean to overstate utility disincentives for rapid utility build-out of large new generation. Some utilities, such as Georgia Power and Dominion Energy in Virginia, are accommodating large loads and building massive amounts of capacity to meet large load demands, as are some rural utilities with electricity to spare.[88] But it is also important to emphasize notable defections

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[84] JLARC, *supra* note 9, at i (describing relatively modest employment in data centers with the exception of the construction phase, and relatively flexible locations).

[85] For the challenge of a constrained, aging, and inadequate U.S. transmission grid, *see generally* U.S. Dep't of Energy, National Transmission Needs Study (2023), https://perma.cc/34SW-FU2C; Peskoe, *supra* note 24. Despite growing disincentives to build centralized generation for large load, the retail rate structure under which many utilities operate still pushes some utilities toward generation development and the construction of local transmission lines that benefit their service territory. This is because one method of increasing utility profits is to increase electric rates; utilities raise rates, in turn, by building more infrastructure and requesting a rate increase to cover the costs of this construction. This phenomenon is coined the "Averch-Johnson effect," in which utilities have incentives to *overbuild* infrastructure to increase profits, since profits emerge from higher rates charged for new infrastructure. *See generally* Peskoe, *supra* note 24 (describing utilities' construction of localized generation to increase profits and avoid competition within their service areas); H. Averch & L.L. Johnson, *Behavior of the Firm Under Regulatory Constraint*, 52 Am. Econ. Rev. 1053 (1952). Although rate-based incentives spur some utility construction of generation and transmission, many studies have questioned the power of the Averch-Johnson effect, and some have demonstrated that it does not apply when utilities experience increasing returns to scale. W. Davis Dechert, *Has the Averch-Johnson Effect Been Theoretically Justified?* 8 J. Econ. Dynamics and Control 1, 2–3 (1984) (citing the literature arguing that the Averch-Johnson effect is not empirically proven in some utility settings and asserting that even in the model itself, the effect does not apply for rate-regulated utilities with increasing returns to scale).

[86] Tuttle et al., *supra* note 55, at 5.

[87] NERC 2024 Long-Term Assessment, *supra* note 4, at 15, 33 (in the long-term reliability assessment, noting some regions experiencing more load growth from electrification).

[88] JLARC, *supra* note 9, at 36 (describing Dominion Energy's addition of data center loads but noting that Dominion has slowed the addition of these loads in some counties to ensure that

from the utility model. These defections may, as we explore in Part IV, ultimately protect consumers given that large load differs markedly from historically complementary classes of utility customers. Indeed, some utilities—and particularly state organizations and agencies that monitor agency behavior—are wisely hesitant to enable the build-out of millions of dollars of new capacity based on speculative demand projections.[89] Table 1 in Part IV shows examples of utilities that service large load requiring that load to pay for its own capacity or purchase its own electricity, for example, with the utility simply arranging for the distribution of electricity to the load.

When encountering utilities that cannot react quickly enough to demands for service—or that hesitate to accommodate demand under traditional service models—the highly capitalized data industry can go elsewhere. It does not require a large, monopolistic utility to provide a financially secure source of power. This is perhaps best evidenced by ventures such as Microsoft's proposal to re-start an expensive nuclear unit at the former Three Mile Island site and purchase all of the power from the unit.[90]

2. Networking Constraints

Just as utilities and grid operators have difficulty providing the new generation and wires that large loads need within the time frame demanded, some large load operators find only limited benefits—or even net costs—in traditional service from electric utilities and the networked grid as a whole. Whereas utilities historically benefited from interconnected transmission lines to share reserve capacity—generation primarily only needed during periods of peak demand[91]—large loads exhibit less peaky behavior; some of these loads run

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the reliability of its transmission system will not be compromised); Robert Walton, *Georgia Power's New IRP Keeps Coal Plants Online to Serve Data Centers*, Utility Dive, (July 16, 2025), https://perma.cc/Y6MP-6X8D (describing Georgia Power's integrated resource plan—the plan submitted to and approved by the state, which indicates how Georgia Power will build new generation, transmission, and distribution, and rely on energy efficiency or demand response, to meet future demand, and showing plans for stalled retirements and construction of new capacity to serve data centers); David Bush, Black Hills Energy Data Center Briefing 2 (2024), https://perma.cc/TC4L-MRKC (showing Black Hills Energy's use of tariffs to support large loads such as "data center and block chain energy demand").

[89] *See, e.g.*, JLARC, *supra* note 9, at x (recommending that Virginia "[d]irect Dominion Energy to develop a plan for addressing the risk of infrastructure costs being stranded with existing customers, and file that plan with the State Corporation Commission"). *See also infra* Table 1 (providing examples of provisions within utility tariffs that attempt to prevent or mitigate stranded costs from large loads).

[90] Crownhart, *supra* note 16.

[91] *See, e.g.*, Peskoe, *supra* note 74, at 2 (noting the emergence of reserve capacity sharing in power pools to address, among other issues, seasonal peaks).

around the clock, depending on the task performed.[92] They produce little need for peak-related pooling of generation capacity.

Large loads do receive some grid benefits, as utilities have argued when demanding that these loads pay for their fair share of benefits.[93] Even facilities that generate their own electricity sometimes receive back-up power from the grid when their generation fails, although many large loads are simply installing a second, independent back-up.[94]

The barriers to large loads seeking service from the grid take several forms. Two of the primary barriers are load interconnection and generator interconnection. Some attempts to connect large load to the networked grid—for example, by co-locating with a grid-connected generator, and using some of the generator's electricity on site—have failed. [95] Additionally, new generation that would help meet rising demand faces lengthy waits—several years—to interconnect to networked transmission lines.[96] In short, sharing electricity with others on a network is not always a benefit to new large loads; it can be an impediment.

Facing high barriers and a frenetic rush to remain competitive in rapidly growing fields such as AI, data companies have increasingly sought their own solutions—planning facilities to co-locate with existing generation and proposing to use all of that generation for their own purposes, or entering into special contracts with utilities.[97] Alternatively, they have sought to re-power retired facilities or build their own generation and, once again, connect directly to it.[98]

3. Persistence of the Network: Rising Demand for Utility Power

Despite the weakening of synergies between large load and grid-connected utilities, many data companies still seek service from utilities,[99] and many

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[92] *See, e.g.*, Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 226 (noting a data center company that built an on-site natural gas generator that runs 24/7).

[93] Protest of Exelon and AEP, *supra* note 33, at 9.

[94] *See* FERC Order Rejecting Amendments, *supra* note 1, at 6–7 (describing back-up measures installed by Amazon to avoid drawing power from the grid during interruptions in service from the co-located nuclear unit).

[95] *See, e.g.*, Protest of Exelon and AEP, *supra* note 33, at 6–8.

[96] *See supra* note 27, *infra* note 172, and accompanying text.

[97] *See supra* notes 29 and 27 and accompanying text (describing trends toward on-site generation). *But see* Alsup, *supra* note 30 (noting that most data centers still prefer grid-tied services). For a description of such special contracts, *see generally* Martin & Peskoe, *supra* note 9.

[98] *See supra* note 90 (proposed re-start of a nuclear generating unit at Three Mile Island); Jordan Blum, *How the AI Data Center Boom is Breathing New Life into Transforming Dirty, Old Coal Plants*, Fortune (Aug. 31, 2025), https://perma.cc/7B2W-C547 (repurposing of Homer City and other coal-fired power plants for gas-fired generation co-located with data centers).

[99] *See* Satchwell et al., *supra* note 9, at 4–10 (examining numerous utility rate and service changes in response to large load requests).

utilities have eagerly offered it.[100] The allure of utility-provided energy for large load arises in part because utilities have long been in the business of acquiring and delivering electricity.[101] Permitting hurdles to building new generation and transmission are high, and utilities have experience navigating those hurdles—albeit still facing a slower pace of construction than they historically did.[102]

In the majority of U.S. states, where retail utility service is regulated and rates are designed to cover utilities' cost of service, some utilities, too, are motivated to build new generation and offer it to large loads because new generation means that the utility can request rate increases from state utility commissions.[103] Further, although large load customers have deep pockets, if they can benefit by spreading the costs of new generation capacity among a larger pool of consumers through utility service, they will seize this opportunity, as evidenced in states such as Georgia and within PJM, the regional grid operator in the Mid-Atlantic and parts of the Midwest.[104]

In short, while some large loads are going it alone, many are still connecting to the grid, often posing challenges for other customers, rather than synergies. PJM has planned for new transmission lines to help support generation for large loads such as data centers amassed in Northern Virginia.[105] The Georgia Public Service Commission approved a rate increase for Georgia Power to

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[100] *See generally* Martin & Peskoe, *supra* note 9 (discussing utilities' special contracts with large load customers); *The Advantages of Building in Wyoming*, Black Hills Energy, https://perma.cc/8SQY-GB95 (encouraging large loads to purchase electricity from Black Hills Energy).

[101] Cohn, The Grid, *supra* note 15, at 38 (noting that in the 1910s, utilities in the United States "added industrial customers in large numbers"). Eschewing utilities and upgrading backup generation to support long-term power provision requires complex, costly upgrades with long lead times, and gas-fired cogeneration requires potentially expensive, slow, and geographically constrained interconnection to pipelines. *See* Shayle Kann, *When to Colocate Data Centers with Generation*, Latitude Media (Sep. 12, 2025), https://perma.cc/DK5Q-U97E; Chris Seiple & Ben Hertz-Shargel, *US Power Struggle: How Data Centre Demand Is Challenging the Electricity Market Model* 5, Wood Mackenzie (June 2025), https://perma.cc/V6M6-6RC6.

[102] *See* FERC Transcript, *supra* note 1, at 74 (noting permitting limitations); Matthew Eisenson et al., Opposition to Renewable Energy Facilities in the United States: June 2024 Edition 1 (2024), https://perma.cc/NJ76-ZKKH.

[103] *See supra* note 85 (discussing the Averch-Johnson effect and noting some economists' skepticism of the widespread prevalence of this effect).

[104] *Georgia Power's 2023 Integrated Resource Plan Update Supports Georgia's Extraordinary Economic Growth*, Georgia Power (Oct. 27, 2023), https://perma.cc/N7ST-8WHH ("Georgia Power today filed an update to its Integrated Resource Plan (IRP) that sets forth a flexible, comprehensive plan to support the state's extraordinary economic growth. . . . Georgia, long recognized as a top state in the country in which to do business, is attracting extraordinary customer growth."); Jacobs, *infra* note 226 (discussing utilities passing $4.3 billion in transmission costs for data centers to non-data center ratepayers in 2024).

[105] *PJM Reviews Initial Project Selections, Preliminary Short List of 2024 RTEP Window 1 Proposals*, PJM Insides Lines (Nov. 7, 2024), https://perma.cc/2SD2-DJJK;FERC Transcript, *supra* note 1, at 33 (describing the RTEP for data centers).

build new natural gas-fired and solar generation, approximately eighty percent of which would support large load.[106] Later, however, the Commission issued a state-wide rule in an effort to cause large load to shoulder more of the burden of rate increase that it causes.[107] The Georgia Legislature also voted for a two-year pause on tax exemptions for data centers, but the governor vetoed the bill.[108] In November 2025, the two incumbent Georgia public service commissioners up for election lost their seats, apparently due to voter concern over high electricity rates.[109]

The pushback in Georgia resembles reactions in many other states, where the digital industry has encountered resistance.[110] Some utilities and grid operators have balked at the prospect of investing in massive amounts of generation and transmission—unprecedented since the World War II era. But elsewhere, as in Virginia, large load is booming, and concerns about rising residential costs are paramount.[111] Virginia has not enacted statewide legislation to address these concerns, however.[112]

Despite some movement away from centralized generation and the networked grid—still with persistence of the utility-centric service model—there is hope that in seeking rapid, creative solutions to build massive amounts of new electricity generation, large load operators could create some positive spillover effects. For large loads that connect to the network, one benefit is the ability to use existing rather than newly-built generation—generation that sits idle except during peak demand periods. Because most large loads have their own backup generation, they can cut off their demand from the networked grid when needed, dramatically reducing demand during peak demand periods to support

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[106] Assoc. Press, *Utility Regulators Approve Plan for Geogia Power to Add New Generating Capacity*, WABE (Apr. 16, 2024), https://perma.cc/2PBG-BG4E.

[107] Ga. Pub. Serv. Comm'n, PSC Approves Rule to Allow New Power Usage Terms for Data Centers (2025), https://perma.cc/7QQQ-PRER.

[108] H.B. 1192, 157th Leg., Reg. Sess. (Ga. 2023), https://perma.cc/P2PC-BQKY; Jeff Amy, *Georgia Lawmakers Vowed to Restrain Tax Breaks. But the Governor's Veto Saved a Data-center Break*, Assoc. Press (May 8, 2024), https://perma.cc/BE32-F7PR.

[109] Jillian Magtoto, *Democrats Alicia Johnson and Peter Hubbard Unseat Incumbents for Public Service Commission*, Savannah Morning News (Nov. 4, 2025), https://perma.cc/5LT9-9FPK.

[110] *See, e.g.*, *CAC Calls for Data Center Moratorium*, Citizens Action Coal. (Oct. 15, 2024), https://perma.cc/BBV7-FKWJ; JLARC, *supra* note 9, at 88 (noting that "energy rates for all users are likely to increase" due to extensive energy demand from data centers and that "[i]f the General Assembly wishes to slow down the data center industry's growth in Virginia because it determines that energy concerns outweigh the industry's economic benefits, it could allow the sales tax exemption [for data centers] to expire in 2035").

[111] JLARC, *supra* note 9, at 47 (noting rising customer costs due to the sheer expansion in demand for generation capacity).

[112] *See Public Pressure Forces Virginia Legislature to Consider New Regulations Impacting Data Center Development*, King & Spalding (Oct. 9, 2025), https://perma.cc/CUE5-ESYB (discussing attempts in Virginia to enact data center legislation but no successful legislation to-date).

system reliability.[113] Grid operators, however, argue that certain loads—those involving national defense—should not take this risk, in the event that on-site back-up generation fails.[114] Large loads have also resisted efforts to force them to commit to curtailing load.

Beyond the ability to connect to the grid without demanding new capacity, large loads could potentially spur the construction of enough generation to benefit other customers, and a transmission grid expansion that will support the interconnection of this generation.[115] But currently, this load seems to be demanding all of the new resources—not sharing the benefits.[116] And the governance system that grew alongside the physical electricity system framed in this Part is largely impeding potential benefits, as we explore in Part II.

II. Electricity Governance: Non-Discriminatory, Just and Reasonable Rates, and The Obligation to Serve

The laws that emerged to govern the sprawling U.S. electric grid are as complex as the physical network itself. A foundational understanding of these laws is essential to critique their failure in the context of rapidly growing load that is negatively impacting the networked grid and its other customers, or defecting from the grid. This Part constructs this foundation and its failure to adapt to modern grid demands.

The electric utilities that pool generation resources, purchasing electricity from each other through a network of interconnected transmission lines, face both state and federal regulation, as framed here. Data centers attempting to go-it-alone through co-located generation face the same regulations, as most co-located generation still has some interconnection—albeit small—with the networked grid.[117]

In the large load context, a load such as a data center requests interconnection with a state-regulated retail electric utility. In restructured (competitive energy market) states, the customer may apply for interconnection directly to a regional transmission organization regulated by FERC, which in turn

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[113] For an analysis of the ability of large loads to use flexible demand—reducing demand during key periods—*see* Tyler H. Norris, et al., Environment & Sustainability, Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems 8–14 (2025), https://perma.cc/86MK-2GGP.

[114] FERC Transcript, *supra* note 1, at 44 (noting the critical nature of data centers that support, for example, the North American Air Defense System).

[115] *See, e.g.*, Nora Wang Esram & Neal Elliott, Turning Data Centers into Grid and Regional Assets 5 (2024).

[116] *See* sources cited *supra* note 16.

[117] *See* FERC Order Rejecting Amendments, *supra* note 1, at 1, 38 (noting Talen Energy's interconnection to the grid despite providing most of its electricity to Amazon behind the meter); FERC Transcript, *supra* note 1, at 31 (noting that PJM can deny behind-the-meter co-located load for reliability reasons).

coordinates with the utility that will interconnect the customer. FERC also regulates the process of allocating costs for transmission upgrades paid for by the customer. However, the retail rate for electricity consumed by the data center is still typically state-regulated, along with the cost of any facilities serving the customer that meet the jurisdictional tests for classification as distribution.[118] In non-restructured states, the state regulates the entire rate that the utility may charge the large load—the cost of the electricity itself, and of local transmission. The utility, in turn, may request additional or modified interconnections with federally regulated transmission lines in order to serve the new large load, triggering federal regulation of transmission interconnection.

The utility that serves the data center is also affected by federal regulation in its wholesale purchases of power. Wholesale prices are federally-regulated, and utilities that serve retail customers are required to purchase enough generation capacity—generating infrastructure available in the future—to meet future load. Thus, when federally-regulated grid operators such as PJM run capacity auctions—which utilities are required to participate in—the billions of dollars in revenues from those auctions are passed on as costs to the retail customers of utilities.

This Part explores in more detail the electricity regulatory framework into which large loads awkwardly fit.

A. State Regulation: Retail Rates and Infrastructure Approval

States are centrally responsible for regulating electric utilities' provision of retail electricity to loads of all sizes, including large loads. The majority of states are "non-restructured" (non-competitive), meaning that states treat electric utilities as natural monopolies—the approach originally advocated by Samuel Insull.[119] The states designate one utility to serve a designated geographic area called a service area or territory.[120] This is the only company allowed to distribute electricity to customers within this area. In exchange for the benefit of the monopoly, the state regulates: (1) the utility's investments in generation, transmission, and distribution infrastructure, with a mandate of ensuring that expenditures are prudent and not wasteful; (2) the retail rates that the utility may charge its customers; and (3) the terms of service that the utility must offer its customers, such as billing procedures and the notice required before

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[118] *See* Malcolm C. McLellan, *FERC Applies Order No. 773 to Exempt "Facilities Used in Local Distribution" from Mandatory Electric Reliability Standards*, Van Ness Feldman LLP (Jan. 8, 2016), https://perma.cc/Z9EV-DR3V.

[119] *Electricity Markets – 101*, Nat'l Governors Ass'n (2025), https://perma.cc/YTV6-YLYU (observing that "thirteen states have fully restructured their electricity markets").

[120] *See, e.g.*, Fla. Pub. Serv. Comm'n, Statistics of the Florida Electric Utility Industry 4 (2022), https://perma.cc/UKJ3-47S5 (showing service areas).

disconnection for a failure to pay.[121] Utilities are obligated to serve *all* paying customers within their service territory.[122] This poses a distinct challenge in the large load era, in which a single new load can demand as much electricity as a small- to medium-sized city.[123]

1. *Infrastructure Approval*

Unlike most competitive industries, in which firms make investments based on internal risk calculations, states dictate the infrastructure in which utilities may invest.[124] This is because utilities have captive customers—consumers of electricity who have no choice but to have their electricity delivered to them by one utility. In many states, consumers may not even choose which generator produces the electricity distributed by the utility.[125] Customers are also required to pay a state-approved rate charged by the utility to cover the utility's cost of providing service. States therefore want to ensure that the consumers do not pay for unnecessarily costly infrastructure.[126]

As the digital industry proposes to purchase large amounts of electricity from utilities, utilities are approaching states with requests for approval of new generation, transmission, and distribution infrastructure to serve this load.[127] States are struggling to determine how much infrastructure is necessary and prudent. When utilities build physical assets with long-term useful lives (and long-term depreciation), and kilowatt-hour consumption goes down because customers leave, this creates "stranded" infrastructure costs for the utility. These stranded costs typically must be shouldered by the utility's remaining customers.[128]

Some federal regulators, states, and utilities worry that the digital industry—a relatively mobile industry that can shop around for low electricity

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[121] PacifiCorp v. Public Service Comm'n of Wyo., 103 P.3d 862, 871 (Wyo. 2004) (describing rate regulation and prudency requirements); Lazar, *supra* note 60, at 14, 163.

[122] *See, e.g.*, Grice v. Vt. Electric Power Co., 184 Vt. 132, 140 (2008) (noting that an electric utility—a public service corporation—is "obligated to serve the public"); PPL EnergyPlus, LLC v. Hanna, 977 F.Supp.2d 372, 383 (D.N.J. 2013) (noting electric utilities' "obligation to serve all customers").

[123] EPRI, Powering Intelligence, *supra* note 5.

[124] Lazar, *supra* note 60, at 31.

[125] *Can Electric Utility Customers Choose Their Electricity Supplier?*, U.S. Energy Info. Admin. (Feb. 6, 2024), https://perma.cc/37HR-SNHN (observing that "[i]n 2022, retail choice was available for all utility customers served by IOUs in the District of Columbia and 13 states").

[126] *PacifiCorp*, 103 P.3d at 871.

[127] *See* sources cited *supra* note 85; Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 11–12 (describing the challenge of approving new generation to fulfill large load requests while maintaining state green energy mandates); Jacobs, *infra* note 226 (describing utilities' investments in transmission for large load).

[128] Kathryn Kline, Mitigating Stranded Asset Risks to Utility Customers: an Exploration of Securitization and Retiring Coal Generation 3 (2024), https://perma.cc/VLY6-HFBQ.

rates—may be pushing for too much infrastructure build-out based on exaggerated expectations for business (and electricity use), or on false promises that they will stay in a service territory for the long term.[129]

These types of concerns are highlighted by actions such as those taken by Georgia Power, a utility for which 80 percent of its new load is projected to be from data centers.[130] Utilities in states like Georgia periodically submit "integrated resource plans" (IRPs) to their state utility commission, detailing projected future load and how they will meet it. In 2023, Georgia Power filed an "updated" IRP outside of the normal IRP cycle to address "extraordinary customer growth"—namely, projected "energy growth of approximately 6,600 MW through 2030, up from approximately 400 MW previously forecasted in January 2022."[131] This plan included new contracts for power purchases from natural gas-fired power plants, construction of new solar resources, and construction of new natural gas-fired plants.[132] Even large load customers suggested that this filing overstated load growth. Companies such as Microsoft questioned Georgia Power's "load forecasting method, which includes large load projects that are considering but have not ultimately selected Georgia as a location and/or GPC [Georgia Power Corporation] as a service provider."[133]

Worries about over-stated future load are not new, but they are heightened given the pace at which large load growth is occurring and, perhaps, its recent and rapid ascent. Load loss has always been a risk for utilities, which experience regional trends, not national averages. Individual customers can move to other utility service areas, or service areas can experience substantial population declines, as has occurred in many rural areas. While utilities tend to single out the data industry as being speculative and mobile,[134] much of the actual load lost in rural areas over the past decades has been traditional industry that has fled offshore.[135] After decades of slow or no growth in demand, and local declines in demand, utilities and regulators became unaccustomed to the challenge of accommodating burgeoning load.[136]

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[129] *See, e.g.*, FERC Transcript, *supra* note 1, at 20–21 (comments of Commissioner Chang expressing concerns about boom and bust cycles in load); Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 9 (emphasizing the "load forecasting risk and the stranded cost risk.").

[130] *See supra* note 106 and accompanying text.

[131] *Georgia Power's 2023 Integrated Resource Plan Update Supports Georgia's Extraordinary Economic Growth*, Georgia Power (Oct. 27, 2023), https://perma.cc/N7ST-8WHH.

[132] *Id*.

[133] Microsoft, *Comment Letter on Georgia Power's 2023 Integrated Resource Plan Update Before the Georgia Public Service Commission* (Apr. 1, 2024), https://perma.cc/56HC-RXSD.

[134] FERC Order Rejecting Proposed Rate, *supra* note 8, at 9.

[135] S. Devaraj et al., Rural Job Loss to Offshoring and Automation, Rural Families and Communities in the United States 89 (Jennifer E. Glick et al. eds., 2020).

[136] *Cf.* Charles Cannon et al., *Rewiring Utility Planning for the Age of Rapid Load Growth*, Rocky Mountain Institute (Nov. 7, 2025), https://perma.cc/7GQM-9ZVK (observing that "[c]onventional utility integrated resource planning that rigorously assesses the right

Beyond concerns about exaggerated need for load and transmission, those in charge of accommodating new load worry that new load will raise costs for other customers, and this worry has proven true.[137] As foreshadowed in Part I, the synergies between industrial and residential load growth present in the early 1900s are not present for data industries, which operate during most hours of the day, thus using electricity when residential customers also need it—not complementing their load.

2. *Ratemaking*

States' assessment of the prudency of new infrastructure is directly linked to states' setting of the price (rates) that utilities may charge electricity customers. Specifically, states regulate utility rates through "cost-of-service" ratemaking.[138] If the utility operates similar to its operations in previous years and is permitted to charge the rate set by the state, the utility is likely to recover its capital and operating costs and be able to provide a rate of return to its investors.[139]

To calculate rates, states typically look at a representative, recent "test year" that shows the utility's typical costs; add new costs projected by the utility (such as new infrastructure); and subtract non-representative, unusual costs from the test year.[140] States then calculate a percentage rate of return on investment that the utility will need to provide to shareholders, and they establish a total revenue requirement that the utility will need.[141] Finally, states estimate the number of customers and the kilowatt-hours of electricity that they consume, and set a per-kilowatt-hour charge (rate). When one multiplies the per-kilowatt-hour rate by the total kilowatt-hours consumed, this is supposed to produce the total revenue needed by the utility.

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portfolios for investment is a slow process that could leave grid planners and regulators at a disadvantage in today's environment" and that some utilities are beginning to adopt more adaptive, rapid planning).

[137] Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 9–10 (emphasizing as two major question for load growth: "what and how can we be protecting our customers or taking risk-mitigating measures to protect ourselves from volatility or high prices" and "what is the fair allocation as we seek to serve these data center customers?"); FERC Transcript, *supra* note 1, at 41 (emphasizing questions around the "equitable nature of cost allocation."). For data suggesting that large load is causing rate increases, *see* Mike Jacobs, Connection Costs (2025), https://perma.cc/5A6B-BQCQ (in 2024, retail customers footing the cost of $4.3 billion in utilities' local transmission projects for data centers); Monitoring Analytics, *supra* note 3, at 2 ("Holding aside all the other issues associated with the [2026/2027 PJM capacity auction], existing and forecast data center load by itself resulted in an increase" in revenues to utilities—a $7.3 billion (or 82.1 percent increase) in utility revenues over the clearing price if the auction excluded large load actual and projected capacity).

[138] Lazar, *supra* note 60, at 5.

[139] *Id.*

[140] *Id.* at 50.

[141] *Id.* at 53.

This rate setting process shows how more load can often improve utility customers' well-being. The more kilowatt-hours consumed, the lower the potential rate, as costs will be spread out among more kilowatt-hours of use. However, when load gets too high, and substantial capital investments are rapidly needed, states and utilities worry more about whether the projections for more kilowatt-hours consumed (which will cover the cost of new capital) are accurate and guaranteed for the long-term, as noted in the stranded cost discussion above.[142]

Another complex aspect of the retail ratemaking process is the allocation of the total revenue requirement to rates charged to different types of customers.[143] Cost-of-service ratemaking is supposed to reflect the costs imposed on the system by different classes of customers.[144] Customers with highly variable load, for example, tend to create higher costs for utilities, as utilities must build or contract for back-up generation or other flexible resources to ramp generation up or down quickly as customers' loads rapidly change.[145] Based on the differences among types of customers, states set different rates that utilities may charge different classes of customers; they typically divide up the rates among industrial, commercial, and residential classes.[146] These classes also sometimes have subcategories, such as larger or smaller industrial or commercial customers.[147]

As explored in Part III, the allocation of rates among classes of customers is increasingly contentious as the data industry expands. Some utilities have argued that large loads impose more costs on utilities and should therefore have their own (higher) rate that other customers should not shoulder; some large loads disagree.[148] Several utilities have approved higher rates for large loads, and Georgia's Public Service Commission approved a rule in 2025 that allows utilities to charge higher rates for all large loads 100 megawatts and above.[149]

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[142] *See* all sources cited *supra* note 129 and accompanying text.

[143] Lazar, *supra* note 60, at 27–28.

[144] *Id.* at 176.

[145] *Id.* at 139.

[146] *Id.* at 5; *see also, e.g.*, Pa. Pub. Util. Comm'n, Rate Comparison Report 11–12 (2024), https://perma.cc/B38N-WQZX (showing separate residential, commercial, and industrial rate classes, as well as sub-categories of these classes).

[147] *See, e.g.*, Pa. Pub. Util. Comm'n, *supra* note 146, at 11–12 (showing different rate classes of small, medium, and large commercial customers).

[148] FERC Order Rejecting Proposed Rate, *supra* note 8, at 7–10, 16; *see also* Satchwell et al., *supra* note 9, at 4–10 (surveying utilities' approaches to unique rates or fees for large load); Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 31 ("With Dominion Energy, data centers also pay certain pre-connection costs, connection costs, and additional facility costs . . . . [S]ince 2020, residential customers' share of transmission costs have declined by 10 percent, while data centers and other customers' allocation have increased by 10 percent.").

[149] Ga. Pub. Serv. Comm'n, *supra* note 107.

Other states have similarly established requirements for large load rates or interconnection, or both.[150]

Approvals of higher charges for certain classes of electricity customers, such as large loads, can predictably encounter legal scrutiny. In most U.S. states, two key legal elements constrain retail ratemaking by state public utility commissions:[151] rates must be "just and reasonable" and "nondiscriminatory."[152] Just and reasonable rates are those that are fair (just) for both electricity consumers and utilities that provide electricity. They must not be unduly high for consumers (implicating both "fairness" and reasonableness), yet they also must not be so low that they make it financially infeasible for utilities to provide the service that they are obligated to offer. Utilities argue that if they cannot charge higher rates to accommodate large loads, they will not recoup their costs, whereas large load consumers, while often claiming to want to pay their share, do not want to over-pay.[153]

Nondiscriminatory rates, in turn, are those that avoid treating different classes of customers differently absent justification for differential treatment.[154] Some utilities and states have argued that higher retail rates for large load are justified because of the higher costs that the load imposes in the system, and some courts have agreed.[155] But in the federal wholesale context, this argument has

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[150] Quint et al., *supra* note 5, at 11. *But see, e.g.*, 2025 Tex. Sess. Law Serv. Ch. 953 (Texas S.B. 6) (West) (governing large load interconnection); S.B. 132, 2025 Leg., 66th Sess. (Utah 2025), https://perma.cc/3FWE-ZPK7 (establishing a separate process for large load interconnection); Interconnection and Tariffs for Large Load Customers, No. M-2025-3054271 (Pa. Pub. Util. Comm'n 2025) (proposing a model rule for utilities to potentially follow when setting large load rates); Order Approving Unanimous Settlement Agreement at 14, In the Matter of the Application of Evergy Kansas Metro, Inc., No. 25-EKME-315-TAR (Kan. Corp. Comm'n 2025); In the Matter of the Application of Consumers Energy Company for ex parte approval of certain amendments to rate GPD, No. U-21859 (Mich. Pub. Serv. Comm'n 2025).

[151] These are alternately called public service commissions, corporation commissions, commerce commissions, or railroad commissions, depending on the state.

[152] *See* Richard L. Revesz & Burcin Unel, *Managing the Future of the Electricity Grid: Modernizing Rate Design*, 44 Harv. Envtl. L. Rev. 43, 105 (2020) ("Most state legislatures historically have required retail electricity rates to be 'just and reasonable' and nondiscriminatory or to be set under a similar general standard . . . .").

[153] *See generally* Order Rejecting Proposed Tariff Revisions, 188 FERC ¶ 61,011 (2024) for examples of utility arguments on cost recovery; Jason Plautz & Jeffrey Tomich, *State Lawmakers Grapple with Energy Demand for Data* Centers, Politico (Mar. 3, 2025), https://perma.cc/DWK6-PAKJ (statements from the Data Center Coalition affirming a willingness to pay for cost associated with serving data centers).

[154] *See* Blocktree Properties, LLC v. Public Utility District No. 2 of Grant County Washington, 380 F.Supp.3d. 1102, 1118 (E.D. Wash. 2019).

[155] *See generally* FERC Transcript, *supra* note 1 (arguments for different rates for large load); *Blocktree Properties, LLC*, 380 F.Supp.3d at 1118–19 ("The District argues that RS-17 [a class of customers including cryptocurrency customers] is based on both direct and indirect costs to the District in servicing cryptocurrency miners. . . . [T]he District has provided justifications for every element of RS-17.").

failed when utilities do not provide adequate evidence of higher costs imposed by large loads, as we explore below.

B. *Federal Regulation: Wholesale Rates, Capacity Investments, and Transmission Interconnection*

While states regulate the rates that electric utilities may charge their retail customers, FERC governs three critical aspects of large loads. First, FERC governs the planning for and operation of the transmission system—the backbone of the grid. This includes planning for needed new lines and their approximate location, determining who may interconnect with and use the lines, designing the rates for the users of lines, and allocating those rates among different users.[156] Second, FERC oversees the North American Electric Reliability Corporation (NERC)—the entity that regulates the reliability of the grid. This includes, among many other tasks, regulating how grid operators should plan for needed physical generation capacity and other infrastructure to meet near-term and future needs of utilities that serve retail customers.[157] And finally, FERC regulates the rates that utilities charge when buying wholesale electricity from each other or from independent generators.[158] In this sense, FERC serves as the primary gatekeeper for most new digital industry energy acquisition.

All of this regulation occurs under the broadly worded Federal Power Act of 1935, which gives FERC jurisdiction over "the transmission of electric energy in interstate commerce and . . . the sale of electric energy at wholesale in interstate commerce," but not over "any other sale of electric energy" (retail sales), "facilities used for the generation of electric energy" or "facilities used in local distribution" or wholly intrastate transmission.[159] Few transmission lines are deemed wholly intrastate, as even within-state lines eventually connect to out-of-state lines, with the exception of Alaska, Hawaii, and Texas.[160]

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[156] *See generally* Order No. 1920, 187 FERC ¶ 61,068 (2024) (transmission planning and cost allocation).

[157] NERC does not set specific generation capacity requirements, but it prescribes the test that must be used by grid operators to determine sufficient capacity, and FERC reviews and approves the capacity minimums set by regional grid operators. For an overview of FERC's and NERC's roles in reliability, *see* Joshua Macey et al., *Grid Reliability in the Electric Era*, 41 Yale J. Reg. 164, 226–27 (2024).

[158] In areas where there is adequate competition in generation, FERC allows wholesale electricity rates to be set by the market but still monitors markets for any concerns, such as market power issues. *See Electric Market-Based Rates*, FERC (Dec. 4, 2023), https://perma.cc/QL9F-S588.

[159] Federal Power Act, 16 U.S.C. §201(b)(1).

[160] *See, e.g.*, FERC, *ERCOT* (Jan. 27, 2025), https://perma.cc/9P6Q-E2DQ ("The transmission grid that the ERCOT independent system operator administers is located solely within the state of Texas and is not synchronously interconnected to the rest of the United States.").

1. Transmission Governance

Transmission lines are the most critical component of the grid, also called the "bulk power system." While states regulate utilities' provision of electricity to retail customers, FERC regulates the entire system of getting wholesale electricity to utilities, including the generation and transmission lines necessary to deliver that electricity. On a networked grid, power does not flow without the "highways" (physical wires) necessary for its transport. As we explore in Part I, transmission constraints, which are blocking new generation, have driven some large loads' defection from the networked grid.

Private utilities build the bulk of transmission lines on the North American grid.[161] Some independent companies called "merchant" transmission companies and some federally owned power authorities also build and operate these lines.[162] At FERC's (and some states') urging, although private, investor-owned utilities still *own* the bulk of U.S. transmission lines, many of them have handed operational control of the transmission lines to private organizations called regional transmission organizations (RTOs) or independent system operators (ISOs).[163] FERC governs these RTOs and ISOs (simply called "RTOs" throughout the rest of the Article). Two-thirds of electricity customers in the United States are served by utilities within the service territory of an RTO.[164] Outside of RTO territories, private utilities that own transmission also plan for new transmission and operate the transmission lines.[165]

RTOs and other grid operators are central players in large load governance because they do much of FERC's transmission governance work, including planning for transmission lines that may be needed to support large load, reliability, and state policies for clean energy; determining which generation may interconnect with or disconnect from the grid, and when; and establishing how

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[161] *See Transmission*, Am. Elec. Power, https://perma.cc/8YQU-D7WH ("We own the nation's largest electricity transmission system — 40,000-miles — with more 765-kilovolt extra-high voltage transmission lines than all other U.S. transmission systems combined."). *See generally* Peskoe, *supra* note 24.

[162] Zach Hale, *Merchant Developers Fill "Void" in US Interregional Grid Build-Out*, S&P Global (Oct. 6, 2023), https://perma.cc/YJF2-QBAT; EIA, *Federal Power Marketing Administrations Operate Across Much of the United States* (June 12, 2013), https://perma.cc/875R-N8HU.

[163] 75 FERC ¶ 61,080, at P 280–87 (1996) (enabling the formation of independent system operators (ISOs) and specifying required factors for an organization to be an ISO, including that "[a]n ISO is an *operator* of a designated set of transmission facilities" (emphasis added)); *see also* 90 FERC ¶ 61,201, at 323–25 (1999) (doing the same for regional transmission organizations (RTOs)—a term that replaced ISOs—and noting that an RTO performs various functions for all transmission facilities "under its *control*" (emphasis added)); U.S. Gov't Accountability Off., GAO-08-987, Electricity Restructuring 13 (2008) (observing that "RTOs operate, but do not own, electricity transmission lines").

[164] ISO/RTO Council, *ISO/RTO Council* (2024), https://perma.cc/9JQ6-GC4Q.

[165] Klass et al., *supra* note 7, at 1065; U.S. Dep't of Energy, How It Works: Electric Transmission & Distribution & Protective Measures 2, https://perma.cc/7PLT-L939.

much generation capacity and other infrastructure is needed to provide a reliable supply of electricity to utilities and other grid users.[166]

In the realm of transmission planning to carry the electricity needed by large loads, some RTOs are taking an active role. PJM—the midwestern and mid-Atlantic RTO that serves more electricity users than any other grid RTO—has already ramped up planning for new transmission lines to support the concentration of load centers in Northern Virginia.[167] There are concerns, however, that non-large load customers are bearing too many of these costs.[168]

Once transmission lines are planned for and (if the stars align) constructed, detailed procedures apply to new generator interconnection. RTOs and other grid operators require that generators proposing to interconnect with transmission complete expensive studies to examine how their proposed new flow of electricity will impact the grid and whether it will pose reliability concerns.[169] If the flow will contribute to congestion and other problems, the generator proposing to interconnect must pay for the necessary upgrades to alleviate those problems. RTOs and other grid operators conduct similar studies for generator disconnections—a growing issue as generators propose to defect from the grid to serve more lucrative co-located large load.[170]

Beyond conducting studies, generators in the queue must demonstrate (through payments) an actual commitment to interconnecting if approved, proof that they control the generation site where they propose to build, and other measures.[171] As new generators have lined up to serve large load users and other customers that have contracted for generation—primarily clean generation—many queues have become unreasonably long. In 2022, the PJM queue peaked at over 2,700 generators and energy storage companies.[172] PJM placed a moratorium on new interconnection approvals while sorting out the mess, and in November of 2022, FERC approved new PJM interconnection rules.[173]

Despite these reforms, the pace of interconnection remains slow. After adding 5,000 megawatts of generating capacity in 2023, new additions had only reached 2,000 megawatts as of September of 2024.[174] These figures do not

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[166] Klass et al., *supra* note 7, at 1057–59.

[167] *Planning: Reform & Strengthen*, PJM, https://perma.cc/9X48-U2D3 (noting PJM's planning for and approval of new transmission projects to support load growth, "driven in part by data center load additions and the electrification of vehicles and building heating systems").

[168] *See infra* note 226 and accompanying text.

[169] *See generally* N. Am. Elec. Reliability Corp., FAC-002-2 – Facility Interconnection Studies (2014), https://perma.cc/8FEC-JKTS [hereinafter "NERC, *FAC-002-2*"].

[170] *See, e.g.*, *Explaining Power Plant Retirements in PJM*, PJM, https://perma.cc/NR8J-28QZ (highlighting types of studies required before disconnection).

[171] Order No. 2023, 184 FERC ¶ 61,054, at P 5 (2023).

[172] Aaron Bryant et al., *FERC Approves PJM Generator Interconnection Queue Reforms*, White & Case (Dec. 8, 2022), https://perma.cc/99PK-2PCD.

[173] *See generally* PJM Interconnection, LLC, *Order Accepting Tariff Revisions*, 181 FERC ¶ 61,182 (2022).

[174] Ethan Howland, *PJM Says 'Concerns are Growing' After Less Than 2 GW Added This Year*, Utility Dive (Sep. 26, 2024), https://perma.cc/P5BZ-8LTU.

reflect lower effective load carrying capacities (ELCC) of renewables compared to conventional generation—meaning the fact that renewable generation does not constantly generate power to serve load, whereas fossil fuel-fired sources can run almost constantly. When these factors are applied, the 2024 figures for PJM's interconnections approved represent only "a few hundred megawatts" of peak load.[175]

The same ELCC limits apply to PJM's entire interconnection queue—while Lawrence Berkeley National Laboratory (LBNL) estimated that PJM's total active interconnection queue at the end of 2023 had reached 287 gigawatts of nameplate capacity, this represented less than 200 gigawatts of peak load carrying capacity.[176] In other words, PJM must process interconnection requests much faster, and at a sustained rate, if projected peak loads materialize.

Large load customers and utilities serving large load, scrambling to connect their generation to the grid and willing to pay for upgrades, are trying to find ways to "jump" the queue, but are not yet succeeding.[177]

Beyond governing the interconnection of new generation, RTOs and other grid operators have a role in approving—or at least planning for—the interconnection of new *load*. Large loads served by utilities are within the province of state regulation preserved by the Federal Power Act.[178] But utilities report their projected loads to grid operators, since grid operators plan for new capacity and transmission lines needed to serve these utilities.[179] Additionally, large loads that co-locate with existing generators affect these generators' interconnection agreements with the federally-regulated grid operator—an RTO or utility—since the generators propose to offer less energy to the grid and more to the single load.[180] And finally, because large load impacts the reliability of the grid as a whole,

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[175] *Id.*

[176] Joseph Rand et al., Queued Up: 2024 Edition, Status and Drivers of Generator Interconnection Backlogs 14 (2024), https://perma.cc/X5PH-NGTF.

[177] The regional transmission organization PJM has proposed an interconnection process through which large loads could "bring your own generation with the incentive for faster interconnection," but FERC has not yet approved this type of approach. Answer of PJM Interconnection, LLC at 13, Allegheny Electric Cooperative, Inc. v. PJM Interconnection, LLC, No. EL25-49-000 (2025), https://perma.cc/QH5A-NSEN.

[178] 16 U.S.C. § 824(b)(1) (FERC lacks jurisdiction over "any other sale of electric energy"—non-wholesale sales).

[179] FERC Transcript, *supra* note 1, at 27–28 (noting that PJM relies "on a significant amount of interaction and coordination with our transmission owners because these [large load] requests typically come in through our transmission owner interconnection request processes. And so, our load forecasting team spends quite a bit of time vetting, frankly, what is coming in through our transmission owners. . .").

[180] *See, e.g.*, FERC Order Rejecting Amendments, *supra* note 1, at 4–5, 42 (FERC rejecting a PJM revised interconnection agreement under which Amazon, co-located with an existing nuclear power plant, would have drawn additional megawatts of power from on-site generating units, thus reducing the megawatts flowing to the grid); Ethan Howland, *FERC Rejects Interconnection Pact for Talen-Amazon Data Center Deal at Nuclear Plant*, Utility Dive (Nov. 4, 2024), https://perma.cc/T3UU-YNM5.

some grid operators require large load system impact studies and the inclusion of large loads in grid operators' forecasts for future peak demand.[181]

Not all grid operators have policies for governing new large load interconnection—yet another gap in the governance system, which we highlight in Part IV. Some have limited policies. New York's regional grid operator, NY ISO, has three paragraphs somewhat vaguely addressing large load interconnection, and system impact studies needed for this load, within their transmission regulations (called a "tariff").[182] The ISO has proposed and completed more detailed updates to its procedures for forecasting peak load and identifying system impact.[183] The Electric Reliability Council of Texas (ERCOT) has also implemented large load interconnection guidance,[184] and PJM has proposed co-located large load interconnection procedures.[185]

2. *Capacity Mandates for a Networked Grid*

Beyond monitoring and policing the interconnection of new load and generation to the grid, another key component of reliability is ensuring that enough physical generating infrastructure will be available to meet all load—today, tomorrow, and several years from now. A variety of generating units and services are necessary to fulfill this tall reliability mandate, as load varies throughout the day and during different seasons.[186] Grid operators must meet this load by relying on baseload plants—those that run nearly all of the time to meet the base level of constant demand—and various types of reserves, such as peaker plants that can turn on during periods of high demand.[187] Grid operators also deploy "ancillary services"—very last-minute changes to generation output, or services such as rerouting the flow of electricity in congested wires—to address instantaneous changes in supply or load.[188] Additionally, grid operators supply "reactive power" resources necessary to address changes in voltage, which can negatively impact

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[181] *See, e.g.*, New York Independent System Operator [hereinafter NYISO], November 2022 Update of Load Forecasting Manual: Large Load Interconnection Reporting and Forecasting (2022), https://perma.cc/9JGP-AMM3 (summarizing revisions and proposed revisions to the inclusion of large load in peak load forecasting and requirements for large load facility system impact studies).

[182] *E.g.*, FERC Transcript, *supra* note 1, at 63; NYISO, NYISO Open Access Transmission Tariff 2150–51 (2025), https://perma.cc/DQQ3-UUWS.

[183] *See* NYISO, *supra* note 181, at 4.

[184] *Large Load Integration*, ERCOT, https://perma.cc/M9AU-FT47.

[185] Tim Horger, *Large Load Additions CIFP Update*, PJM (Oct. 1, 2025), https://perma.cc/BZ8P-AW9J.

[186] *Electric Generators' Roles Vary Due to Daily and Seasonal Variation in Demand*, U.S. Energy Info. Admin. (June 8, 2011), https://perma.cc/7G9K-T9AP.

[187] *Id.* (generators' roles vary); Todd S. Aagaard & Andrew N. Kleit, Electricity Capacity Markets 11 (2022).

[188] Aagaard & Kleit, *supra* note 187, at 32.

the entire system.[189] And finally, "black start services" are the last-ditch but critical service of grid operators, involving electricity that would be necessary to get the entire grid back up and running in the event of a total, widespread blackout.[190]

All of these services are increasingly critical as large amounts of load come online. As we explore in Part III, for large loads that co-locate with generation, but the generation remains connected to the grid, other utilities argue that these large loads are receiving ancillary and black start services from the grid but may not be paying their fair share.

Grid operators typically plan for and acquire capacity by conducting detailed studies of projected future load, population changes, and other factors, and then requiring utilities to acquire capacity based on these projects. Several RTOs address capacity requirements through auctions. They assign each load serving entity (typically a utility) a requirement to acquire a specific amount of capacity to meet projected load and additional capacity as a buffer for unexpected load changes. These entities must purchase this capacity in an auction, self-build their capacity, or both.[191]

Rapidly rising load and other factors, such as the need for generation during extreme weather events and the challenge of connecting new generation to congested transmission lines, have caused some auctions to spiral out of control. In July of 2024, PJM—the grid operator that serves the largest electricity market in the United States—ran a capacity auction that resulted in $14.7 billion in total costs to customers, as compared to $2.2 billion in total costs in the previous capacity auction.[192] Electricity customers will ultimately bear this cost. Governor Shapiro of Pennsylvania sued, arguing that this auction would unacceptably harm customers.[193] The governor and PJM have reached a settlement

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[189] Reactive power is sometimes described as a component of ancillary services. *See* Luigi Viola et al., *Ancillary Services in Power System Transition*, 236 Elec. Power Sys. Rsch. 1, 2–4 (2024) (noting reactive power as part of ancillary services markets and describing reactive power as providing voltage stability).

[190] N. Am. Energy Reliability Corp., Report on the FERC-NERC-Regional Entity Joint Review of Restoration and Recovery Plans Recommended Study: Blackstart Resources Availability (BRAv) 1 (2018), https://perma.cc/VT6Y-BLG6.

[191] *See* Hughes v. Talen Energy Marketing, LLC, 578 U.S. 150, 155–58 (2016); Aagaard & Kleit, *supra* note 187, at 57; Jay Morrison, *Capacity Markets: A Path Back to Resource Adequacy*, 37 Energy L.J. 1, 3–4 (2016), https://perma.cc/784Q-YQP9 (noting that "LSEs have numerous options for acquiring . . . capacity resources" and that "[m]any LSEs own some of their capacity," and exploring how LSE-owned capacity is treated in different capacity markets).

[192] Ethan Howland, *PJM Capacity Prices Hit Record Highs, Sending Build Signal to Generators*, Utility Dive (July 31, 2024), https://perma.cc/227Q-HNVH.

[193] Complaint of Governor Josh Shapiro and the Commonwealth of Pennsylvania at 14–15, Shapiro v. PJM Interconnection, LLC, No. EL25-46 (Dec. 30, 2024), https://perma.cc/N5ZB-HEZV (observing that "[e]lectrification and rapidly growing interest in generative AI and associated data centers have upended a 30-year trend of relatively flat load forecasts" and critiquing PJM's design and operation of its capacity market).

to cap auction prices as load continues to grow and other stressors hammer the grid.[194]

Despite this settlement, the 2025/26 auction resulted in still more revenues for utilities—$7 billion in utility revenues (82.1% percent) more than the revenues that would have accrued if the auction had cleared without actual or projected capacity needed to serve large load.[195] Large load is, in short, wreaking havoc on the price of wholesale electricity in regions such as PJM.

3. *Wholesale Ratemaking*

The cost of the generation capacity built to ensure a reliable supply of electricity—even as demand rapidly rises—is borne by utilities, through wholesale rates, and ultimately utility customers, through retail rates. There are growing concerns that non-large-load customers are bearing—or will ultimately bear—the costs of the substantial increase in capacity required for large load.[196]

A variety of utilities serve U.S. electricity customers—investor-owned utilities with publicly traded stocks, municipal (local government-owned) utilities, federal (government-owned) power utilities, and electric cooperatives.[197] Whenever any of these types of utilities are selling or buying electricity that will later be sold retail—electricity that is wholesale, or a "sale for resale"—FERC jurisdiction applies (with the exception of federal power authorities).[198]

For the most part, FERC allows wholesale rates to be set in the competitive market, through auctions or contracts between utilities or between utilities and generators.[199] However, in areas where FERC deems there to be inadequate competition for generation, FERC still regulates wholesale rates through the same cost-of-service approach described for retail ratemaking.[200] As explored in Part III, FERC has rejected some proposed wholesale rates charged by utilities facing new, large loads from digital customers. This creates uncertainty for utilities attempting to make new generation investments to serve these customers, and for the digital customers deciding how much to invest in a given geographic area.

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[194] *Commonwealth of PA, Governor Josh Shapiro Reaches Agreement with PJM*, Commonwealth of Pennsylvania (Jan. 28, 2025), https://perma.cc/5F7M-278U.

[195] Monitoring Analytics, *supra* note 3, at 2.

[196] *See* sources cited *supra* note 110.

[197] EIA, *supra* note 70.

[198] *See, e.g., How Two FERC Orders Revolutionized the Power Utility Industry*, Bonneville Power Admin. (Dec. 20, 2024), https://perma.cc/HC7W-4XUU ("As a federal power marketing administration, BPA is not subject to FERC's jurisdiction . . . .").

[199] *In re* California Wholesale Electricity Antitrust Litigation, 244 F. Supp. 2d 1072, 1076–77, 1079 (S.D. Cal. 2003).

[200] *Electric Market-Based Rates*, Fed. Energy Reg. Comm'n (Dec. 4, 2023), https://perma.cc/U454-K35D ("The Commission grants market-based rate authorization for wholesale sales of electric energy, capacity and ancillary services by sellers that can demonstrate that they and their affiliates lack or have adequately mitigated horizontal and vertical market power.").

The complexity of the networked grid and its governance system—which focuses centrally on capacity and planning for transmission lines to which capacity can interconnect—is expanding with the rapid growth of large load. As FERC commissioners have acknowledged, the governance system has not yet caught up, [201] although it is changing daily as policymakers and regulators scramble to address the opportunities and benefits posed by large load. The following Part emphasizes the technical and regulatory gaps in this out-of-date governance system.

III. The Technical and Governance Failures of the Modern Electric Grid

As we explore in Part I, electricity is an unusual good, and the difficulty of effectively governing electricity grows as the physical system changes. There is only one way to transport electricity—through wires—and the quantity of the good supplied must constantly and exactly match the quantity of the good consumed.[202] Absent each electricity user supplying their own electricity—the expensive approach historically used[203]—electricity suppliers and customers are unavoidably intertwined. Increases or decreases in generation and load (demand) necessarily impact all grid suppliers and users. This is the case from the neighborhood level to the national level.

The networked electricity grid has always been unique, but the realities of the interdependency of networked electricity supply and use are now starker than ever. The rise of a capital-rich digital industry, poised for massive growth and hungry for nearly unprecedented amounts of electricity, places new strains on this system.

The failure of the modern networked grid to rapidly and adequately accommodate rising demands for energy is evident throughout the United States. We analyze several of the most prominent examples of this failure in this Part,

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[201] FERC Order Rejecting Amendments, *supra* note 1, at P 3 (Phillips, Chairman, dissenting) (expressing deep concern regarding what Commissioner Phillips views as FERC's failure to "demonstrate regulatory leadership and flexibility"); FERC Transcript, *supra* note 1, at 19–20 (comments of Commissioner Chang, asking, "are there near-term solutions that we must take on now because the load is already here and being built, versus are there longer term solutions that we need to really examine, such as developing new grid codes that will support new sets of customers" and stating that "[m]aybe our OATT [open access transmission tariff] has been around since before deregulation, is it time to relook at some of the rules that we have to accommodate new types of customers?"); *id.* at 14–15 (comments of Commissioner Rosner: "I think it's really, really important for the Commission to make sure that we [get] the transmission rate design, and electricity market rules right").

[202] *See* Alexandra von Meier, Electric Power Systems: A Conceptual Introduction 299 (2024).

[203] *See* Cohn, The Grid, *supra* note 15; Bakke, *supra* note 52.

highlighting the challenges of interconnecting new supply and load and accommodating new load without producing inequities for existing electricity consumers. As this Part explores, federal energy regulators, regional grid operators, and state utility commissions are scrambling to update this governance system, but they are not in all cases moving fast enough.[204] Good governance of the new large-load grid requires a uniform analytical framework for electricity governance in the era of large load—an effort we take up in this Part—and clear policy pathways for filling this gap, explored in Part IV.

The current governance approach—in which FERC, transmission operators, and state regulators make patchwork, case-by-case decisions without a guiding framework—threatens to impede the growth of burgeoning industries and generate regional inequalities in electricity service and costs.[205]

A. New Load, New Supply, and Insufficient Transmission Capacity: The Challenge of Transmission Interconnection

The primary physical and financial challenge of rapidly adding massive amounts of new load to the grid is the challenge of transmission. The amount of transmission lines connecting electric utilities' generating units to each other (for shared generation reserves) and to customers is limited due to cost—transmission lines cost millions of dollars per mile to build.[206] Other primary barriers to transmission include public opposition to the aesthetic and environmental impacts of new wires, and anti-competitive behavior by utilities.[207] This section explores transmission constraints as a key impediment to large load and analyzes the Talen Energy case to highlight these challenges.

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[204] *Cf.* Commonwealth of Virginia State Corp. Comm'n., *supra* note 17, at 12 ("[W]e cannot lose sight of the urgency of the moment . . . Taking years to perfect our [regulatory] approach is not an option.").

[205] *See, e.g.*, FERC Order Rejecting Amendments, *supra* note 1, at P 78 (2024) (Pennsylvania Governor Josh Shapiro regarding the impacts of large electrical off-takers, co-located at generating facilities, etc., arguing against a governance solution that involves a "patchwork of different rules for different utilities in Pennsylvania"); Freed & Clements, *supra* note 39 (criticizing the "fragmented" approach to large load).

[206] Daniel DeSantis et al., *Cost of Long-distance Energy Transmission by Different Carriers*, 24 iSCIENCE 103495 (2021) ("[T]he capital costs of construction of electrical transmission lines and the pipelines are . . . between about $1.5M and $4M per mile.").

[207] *See generally* Peskoe, *supra* note 24; Alexandra B. Klass & Elizabeth J. Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, 65 VAND. L. REV. 1801 (2019). *See, e.g.*, NECEC Transmission LLC v. Bureau of Parks and Lands, 281 A.3d 618 (Me. 2022) (preliminarily enjoining a Maine voter initiative that blocked a transmission line to carry hydroelectric power from Quebec to Massachusetts).

1. Transmission Constraints

The United States has too few transmission lines to carry competitively-priced generation to customers—even without the recent load surge.[208] Additionally, new users who want to draw electricity from the grid are constrained in two ways. The wires have physical constraints on the quantity of electricity that they can carry. Wires are rated for specific capacities, and too much electricity flowing through wires causes congestion similar to that on a highway.[209] Congestion can also interfere with the functioning of the grid, requiring special technologies to alleviate the congestion, such as power flow devices.[210]

With the emergence of a new, powerful industry demanding existing and new generation, we need new generation and transmission, and we need it fast. Yet the regulatory bottleneck for building transmission and generation (including renewable generation to address climate and environmental goals[211]), and for interconnecting new generation to transmission, is hindering the market.

With respect to building transmission lines, even when ambitious firms propose to take on the financial risk of building new wires that would connect new generation to load across large areas, arguments over which users should shoulder which costs of the new wires abound.[212] These cost allocation disputes delay transmission construction. Additionally, states control the siting (location) of the wires—even interstate lines—and often deny siting certificates due to public opposition to ugly infrastructure.[213] Finally, many large utilities only build transmission within their own service territories, avoiding new regional wires that would allow other utilities and generators to access customers, thus increasing competition.[214]

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[208] U.S. Dep't of Energy, National Transmission Needs Study v (2023), https://perma.cc/34SW-FU2C (noting areas where "transmission constraints are preventing lower-priced energy from reaching . . . high-priced areas").

[209] Aaron Larson, *Electric Transmission Grid Problems and Solutions*, POWER Mag. (Aug. 3, 2020), https://perma.cc/2CPC-TXTW.

[210] *Grid-Enhancing Technologies Improve Existing Power Lines*, U.S. Dep't of Energy, https://perma.cc/QKC8-X5YH.

[211] Many large loads seek out renewable generation. *See, e.g.*, Ben Gomez & Katie Brandt, *Our 2024 Environmental Report*, Google (July 2, 2024), https://perma.cc/VQ4E-CQPY (goal of net-zero emissions by 2030); *Climate*, Meta, https://perma.cc/H4AW-53ZJ (same commitment); *Microsoft Will be Carbon Negative by 2030*, Microsoft (Jan. 16, 2020), https://perma.cc/CY25-UZUE.

[212] *See, e.g.*, Ill. Com. Comm'n v. FERC, 576 F.3d 470 (7th Cir. 2009); Ill. Com. Comm'n v. FERC, 756 F.3d 556 (7th Cir. 2014) (inadequate FERC numbers to demonstrate even allocation of benefits of new transmission lines and therefore inadequate support for "postage stamp" rates that would have charged all line users the same increased fee to cover the costs of the new transmission lines).

[213] Alexandra B. Klass, *The Electric Grid at a Crossroads: A Regional Approach to Siting Transmission Lines*, 48 U.C. Davis L. Rev, 1895, 1916–17 (2015).

[214] *See* Peskoe, *supra* note 24, at 2.

Local governments, in turn, are slowing the construction of new generation—including renewable energy generation. Local moratoria or rejections of solar farms—the fastest growing source of new generation—are growing.[215]

Thousands of gigawatts of solar energy and battery providers—new generation—are stuck in PJM's interconnection queue, waiting for the very sort of interconnection agreement that Talen Energy's Susquehanna nuclear plant already has and unsuccessfully attempted to revise.[216] PJM has revised its generator interconnection standards, and FERC has approved them, but interconnections are still moving too slowly to meet growing load.[217]

Facing constraints on the amount of transmission lines available, and the long interconnection delays on crowded lines, new users have limited options. They can try to locate in areas with ample generation and ample room in the wires to transport electricity. Data center requirements depend upon their primary use: training AI models and mining cryptocurrency requires large amounts of energy, but proximity to end users via low-latency internet connections is less critical.[218] Conversely, consumer-facing services like e-commerce and hosting of already-trained AI models may prioritize low latency over energy availability.[219] Companies with mixed needs, like financial institutions that want secure, long-term data storage along with fast customer-facing services, may split their usage between data centers with attributes that best suit each application.[220]

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[215] *See* Matthew Eisenson et al., Opposition to Renewable Energy Facilities in the United States: June 2024 Edition 5 (2024), https://perma.cc/NJ76-ZKKH; *Solar, Battery Storage to Lead New U.S. Generating Capacity Additions in* 2025, EIA (Feb. 24, 2025), https://perma.cc/MV6V-HMQT.

[216] *See* Rand et al., *supra* note 176, at 9, 11. For other discussion of queue challenges, *see PJM Queue Scope Evaluator*, PJM, https://perma.cc/3WDT-UFJX; Morgan Meaker, *The Big-Tech Clean Energy Crunch is Here*, Wired (June 3, 2024), https://perma.cc/R5RG-25LH (discussing Amazon's contract for half of the wind power from an 880-megawatt wind farm in Scotland).

[217] *See* Order Accepting Tariff Revisions, *supra* note 173.

[218] *AI Data Center Growth: Meeting the Demand*, McKinsey & Company (Oct. 29, 2024) https://perma.cc/J3LF-ZZFD ("When AI models are being trained, typical performance factors such as low latency and network redundancy are less important. It is only when the model is put into operation—during the inferencing workload—that these factors become crucial for optimal performance. Hence, data centers dedicated to training AI models are being built in more remote locations in the United States, such as Indiana, Iowa, and Wyoming, where power is still abundant and grids are less strained.").

[219] *See* Frank Khan, *The Cost of Latency*, Digital Realty (Mar. 10, 2015), https://perma.cc/2PHM-283L ("Almost seven years ago, Amazon published a remarkable statistic: the online retail giant found that every 100ms of latency cost them 1% in sales. Around the same time, a study by Tabb Group revealed that a broker could lose as much as $4 million in revenues per millisecond if its electronic trading platform was only 5ms behind the competition.")

[220] The Weekly Take from CBRE: *Hungry Like the Wolf: Data Centers and New Power-intensive Tech* at 20:53 (Apple Podcasts, Oct. 30, 2023), https://perma.cc/QR5S-9KGE ("The clients, be them banks, insurance companies, they're bifurcating their requirements, right? So there's things that absolutely have to be in Northern Virginia or New Jersey.

Large loads with relatively broad flexibility may spring for traditional electricity service in the relatively rare areas with excess electricity waiting to be "absorbed" by new users. Indeed, utilities such as Black Hills Energy in Wyoming are advertising their services to large loads, offering renewable energy, special tariffs for large loads, and a separate "interruptible" tariff for "blockchain" users that do not need steady power.[221]

In the event that the digital industry and its large loads cannot find areas with *both* ample generation and physical space in existing transmission lines—as is the case in much of the United States—they have at least three remaining options. First, they can attempt to find areas where retail utilities are willing to invest in more transmission and generation to meet their needs. Data center operators in Georgia are following this approach. They are working with a vertically integrated utility—Georgia Power—to interconnect large amounts of new load. Georgia Power, in turn, is building new generation and transmission to service that load.[222]

Data centers face a similar situation (limited transmission and generation, but utility willingness to expand) in Virginia, which hosts approximately 25 percent of U.S. data center capacity.[223] PJM, the grid operator that controls the transmission lines in Virginia and other states, has approved transmission expansions costing more than $6 billion, in part to service growing large loads.[224] And Dominion Energy in Virginia has invested in large amounts of new generation and transmission, also to serve large load.[225] The Union of Concerned Scientists estimates that in 2024, customers of utilities in seven states within

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It's been a market that's actually, we've seen a lot of demand over the last few years. Those are often times low latency requirements that have to be in a specific location. And I'm using US markets, but I could have the same conversation about London or Singapore. And alternatively, less latency sensitive may migrate to a place that has low-cost power, low-cost in the data center space for the occupiers, its utility cost and taxes, predominantly personal property and sales taxes. So I'll take the opportunity to plug my hometown of Omaha, Nebraska, right? They just allocated, I think it's a $2 billion utility expansion to accommodate some large Fortune 20 companies that have a footprint there. It's a great location, center of the country, low cost. You're not gonna do low latency banking in that market, but you will do large storage, potentially some AI components that are less latency sensitive.").

[221] Black Hills Corp., *supra* note 100.

[222] *See* Assoc. Press, *supra* note 106; *2025 Integrated Resource Plan Fact Sheet*, Georgia Power, https://perma.cc/43ZL-WCX2 (summarizing Georgia Power's integrated resource plan, which includes 1,000 miles of new transmission lines).

[223] JLARC, *supra* note 9, at i.

[224] *See PJM 2024 Regional Transmission Expansion Plan*, PJM (Apr. 17, 2025), https://perma.cc/58BP-8E9M ("Beginning in 2023, PJM began to identify trends encompassing large load increases in specific areas, driven primarily by the construction of new data centers, and these were incorporated in PJM's 2024 RTEP [regional transmission expansion plan] cycle analyses for five-year (2029) and eight-year (2032) study year models. The large load increases are driving heavier, increased regional transfers and consequent need for significant system reinforcement."); *PJM Reviews Initial Project Selections*, *supra* note 105.

[225] JLARC, *supra* note 9.

PJM paid more than $4.3 billion for local utility transmission upgrades to service data centers.[226]

A second approach is for data companies to contract for their own new generation *and* new transmission—an expensive proposition. This does not appear to be the path most commonly followed for data center operators. Despite their deep pockets—and even their willingness to contract for restarting expensive generation such as nuclear power plants—data companies have not yet extensively invested in transmission projects.[227] This may be due to the numerous hurdles to new transmission lines noted above—not just cost, but also strong public opposition and a regulatory morass, in which states frequently block proposals for new transmission lines. Even those lines that are approved take years—even decades—to build.[228] Data companies, grasping for quick supply to maintain a competitive edge in a rapidly changing industry, do not have the leisure of time. Data center development timelines are typically under three years.[229]

The final solution for data companies is to go off-grid (or mostly off-grid) and self-supply generation by physically locating data centers next to existing or new generation, an approach called "co-location."[230] This return to decentralization is the strongest indicator of the constraints posed by the highly networked grid—a grid that cannot rapidly supply large amounts of new electricity to those who need it. Some data companies view the costly yet relatively quick approach of going it alone—building their own generation on site or contracting for it and directly consuming the electricity—as the most feasible approach.[231]

Even co-located generation, however, is encountering hurdles, because some data companies have sought to locate near *existing* generation that is currently connected to the networked grid, or recently was.[232] One or several

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[226] Jacobs, *supra* note 137.

[227] Data centers are investing in their own distribution infrastructure, however. Kyle Julian, *Why Forward-Looking Data Centers are Taking Control of Their Own Grids*, POWER (Aug. 22, 2025), https://perma.cc/K5LM-EPVC. And global investors, betting generally on the business of transmission to serve new load, are also partnering with utilities to invest in new transmission in areas of data center growth, such as Ohio. *See KKR and PSP Investments Acquire Minority Stake in Two American Electric Power Transmission Companies*, PSP (Jan. 9, 2025), https://perma.cc/6F4T-55G6.

[228] Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 18 (noting the challenge of data centers wishing to connect to the grid within one to three years, new generation projects taking two to eight years, and "transmission even takes much longer than that").

[229] *Id.* (noting that data center loads can "come onto the system onto the grid within one to three years' time frame").

[230] Protest of Exelon and AEP, *supra* note 33, at 10.

[231] *See, e.g.*, Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 196–97 (noting that Google prefers co-location with newly built generation not to avoid generation or transmission costs but rather due to the need for "speed to market" and the constrained generation resources available on the network, such as PJM's network).

[232] FERC Order Rejecting Amendments, *supra* note 1, at 1 (introducing a case in which a data center, already co-located with an existing grid-connected nuclear power plant, sought to draw more electricity from that plant); Crownhart, *supra* note 16.

existing electric utilities, with an obligation to serve existing customers, previously invested in this generation with the expectation that it would be available for their customers.[233] Grid operators allowed the generation to be interconnected to constrained transmission lines with the expectation that the generation would flow through those transmission lines, contributing to the constant and delicate balance of electricity required for the grid to function properly. Proposals to withdraw this infusion of electricity from the wires threaten to upend this delicate physical balance, as well as the vested interests of utilities and their customers.[234] The Talen Energy case highlighted in Section III.A.3 shows the challenges posed by this approach—when data center operators propose to take existing generation largely off-grid and use the electricity themselves.

Alternatively, some data companies are proposing to revive mothballed plants, such as nuclear reactors that closed for financial reasons, or self-build generation that is not connected to the grid.[235] But even these approaches have implications for the networked grid. Due to supply chain constraints and other economic forces, there is only so much new generation to go around.[236] When data centers contract for new, off-grid supply or propose to revive old plants, they are competing with utilities that serve other customers that would otherwise benefit from this new supply.

As we will highlight in this Part, large, entrenched utilities serving existing customers have made this very argument about co-location of data centers with generation. They argue that there is simply not enough capacity available, and that, due to regulatory bottlenecks in building new generation capacity and transmission, there will be problematic scarcity.[237] These utilities argue for a first-come, first-served approach, in which existing utilities and customers should have priority access to this scarce supply over new large load.[238] This, of course, is purely an economic problem of supply and demand (with strong equity implications baked in). But in the absence of changes to these stubborn regulatory bottlenecks, the question of load priority on constrained transmission lines is a real one that must be addressed.

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[233] *See, e.g.*, sources cited *infra* note 377 (noting state-subsidized nuclear plants now proposing to largely defect from the grid to serve load).

[234] *See generally* FERC Order Rejecting Amendments, *supra* note 1; FERC Transcript, *supra* note 1, at 94 (FERC Commissioner Christie comparing co-locating data centers with new load to the (impliedly more negative) approach of co-locating data centers with existing nuclear units for which ratepayers have already paid, and having those nuclear units serve the data center under a power purchase agreement (PPA)).

[235] *See*, e.g., Crownhart, *supra* note 16.

[236] Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 18 (emphasizing supply chain issues).

[237] *See* Elevate Energy Consulting, An Assessment of Large Load Interconnection Risks in the Western Interconnection 8, at 11 ("One IAG member highlighted that even a speculative phone call regarding load interconnection is subsequently treated as a formal request and the utility will conduct cursory studies to explore the potential interconnection.").

[238] *See Id.*

2. *A Lack of Uniform Interconnection Standards*

Amidst burgeoning demand from large loads connecting to the grid, there are no uniform *load* interconnection standards at the state or federal levels. At the state level, utilities must approve large loads' requests to be served, and most are using simple first-requested, first-served (if at all) principles.[239] In the western United States, the process for large load to enter a utility's queue is as informal as someone from the large load customer calling the utility and indicating that they will be requesting service.[240] (Large load customers often propose multiple potential locations for one source of load as they shop around for electricity rates, permitting, and tax and other incentives, therefore often making the same request of multiple utilities.)[241]

A bill enacted in Utah sets out some uniform interconnection procedures for large load requests made to utilities. The bill specifies uniform content for large load service requests, including the proposed location of the interconnection, megawatts of electricity demanded and peak demand requirements, "information sufficient to demonstrate the financial capability to complete the project," proposed service commencement date, and other information.[242] The bill also details procedures that utilities must follow after receiving interconnection requests, including the completion of a feasibility study, notification of denial or approval of the requested service within fifteen days after completion of the study, and notification of any system upgrades or improvements necessary to accommodate the request, among other steps.[243] Texas also enacted uniform large load interconnection standards in 2025,[244] as did Kansas for the utility Evergy.[245]

Transmission operators following federal regulation by FERC might also have to approve changes to the terms of service for *generation* interconnection when a generator revises the amount of power flowing to the grid to serve a new, co-located large load. This review of a generator's modified provision of power to the grid is essentially an approval or rejection of service to load itself. [246]

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[239] *See Id.*

[240] *See Id.*

[241] FERC Transcript, *supra* note 1, at 26 (representative of an RTO noting that one load might appear in the forecasts of numerous utilities who are members of the RTO, "so in reality I could have many members submitting loads that are all the same").

[242] *See* Utah S.B. 132, *supra* note 150, at § 54-26-201.

[243] *Id.* at § 54-26-202.

[244] Texas S.B. 6 (2025), *supra* note 150.

[245] Order Approving Unanimous Settlement Agreement, *supra* note 150, at 21–22.

[246] *See, e.g.,* Order Instituting Proceeding Under Section 206 of the Federal Power Act and Consolidating with Other Proceedings, 190 FERC ¶ 61,115 at P 3 (2025) https://perma.cc/LKS7-LWB6 (finding that PJM's Open Access Transmission Tariff "appears to be unjust, unreasonable, unduly discriminatory or preferential" and inadequately addresses co-located loads, and requiring PJM to either show that the tariff is not unjust and discriminatory or explain what changes would resolve the problems with the tariff); FERC, Order Rejecting

DOE has directed FERC to write load interconnection standards,[247] but the only federal load interconnection standards to-date come from NERC. These standards are quite vague, lacking specificity in terms of modern large load issues.[248] (RTOs such as PJM and the Southwest Power Pool are also working on such standards, and ERCOT, the RTO for much of the grid in Texas, has approved standards.[249]) After noting "widespread and unexpected customer-initiated load reduction of large loads," which occurred in 2024 and 2025 and threatened grid reliability, NERC also issued industry recommendations for safer interconnection and required a response, asking grid operators, utilities, and other entities associated with the grid to respond with solutions.[250]

NERC is a private entity overseen (with a light touch) by FERC, and it issues mandatory reliability standards that all generators and transmission operators associated with the "bulk power" (non-retail) electricity system must follow. NERC has interconnection standards that apply to *all* entities interconnecting generation, transmission, or "electricity end-user Facilities" to the bulk power system, but these do not provide the sorts of uniform details that will be needed to create an orderly process for large loads associated with the networked grid.[251]

FERC has initiated a proceeding directing grid operator PJM to either change its tariff (rates and terms of service) for interconnecting large loads co-located with generation or show why its existing tariff is "just and reasonable,"

Amendments, *supra* note 1, at 2, 42 (observing that "Order No. 2003 requires interconnection agreements that do not conform to the transmission provider's *pro forma* interconnection agreement to be filed with the Commission," although finding that PJM failed to show that reducing a nuclear plant's provision of electricity to the grid to send that electricity to a co-located data center necessitated a non-conforming tariff).

[247] Secretary of Energy's Direction, *supra* note 22.

[248] FERC has only held a technical hearing and issued the PJM Section 206 "show cause" order for large load interconnection; it has not established a pro forma large load interconnection standard. *See supra* sources cited in notes 1, 246; John Bernecker, *Review of Existing Load Interconnection Requirements*, ERCOT (Mar. 3, 2022), https://perma.cc/H953-XYFV (describing relevant NERC standards). *See generally* NERC INDUSTRY RECOMMENDATION: LARGE LOAD INTERCONNECTION, STUDY, COMMISSIONING, AND OPERATIONS, NERC (2025), https://perma.cc/6PAX-CQUM.

[249] *SPP's High-Impact Large Load Interconnection Solutions*, SOUTHWEST POWER POOL, https://perma.cc/KJY4-V9HK; Horger, *supra* note 185; ERCOT, *Large Load Integration*, https://perma.cc/M9AU-FT47.

[250] NERC, *supra* note 248, at 1–2.

[251] NERC, *FAC-002-2*, *supra* note 169, at 2 ("Each Transmission owner, each Distribution Provider, and each Load-Serving Entity [typically a utility] seeking to interconnect new transmission Facilities or electricity end-user Facilities, or to materially modify existing interconnection of transmission Facilities or electricity end-user Facilities, shall coordinate and cooperate on studies with its Transmission Planner or Planning Coordinator . . . ."); N. AM. ELEC. RELIABILITY CORP., FAC-001.3 – FACILITY INTERCONNECTION REQUIREMENTS 1, https://perma.cc/99UZ-HFHH ("Each Transmission Owner's Facility interconnection requirements shall address interconnection requirements for . . . end-user Facilities.").

making it clear that FERC does not view the existing tariff as just and reasonable. This proceeding will also fold in proposed tariff revisions from large utilities that address large load.[252]

Beyond this progress, the interconnection process is largely haphazard, lacking uniform guidance. As Peter Freed and Allison Clements observe, "Moving up or down the list of loads being studied can seem arbitrary or come down to other factors like how high an economic development priority the project is for the state."[253]

The following case highlights how this haphazard interconnection process plays out. It also pinpoints the substance of the network-based challenges associated with co-located large loads that attempt to go mostly off-grid, taking existing generation with them.

3. *The Talen Energy Interconnection Failure*

Amazon's struggle to acquire hundreds of megawatts of new electricity for a data center shines a stark spotlight on the interconnection challenges facing new load. In 2021, Susquehanna Nuclear, LLC—a division of Talen Energy—informed its transmission grid operator, PJM, that it planned to increase the sale of electricity from its nuclear power plant to "large data center loads" (Amazon), which had already co-located with the nuclear plant and were already using power from the plant.[254] Talen proposed that these loads would be "behind the meter," meaning that electricity from the nuclear plant would flow directly to the data centers, not through the networked grid.[255] The loads would have their own back-up units in the event of a loss of power from the Talen plant.[256] The nuclear plant and data centers would not wholly disconnect from the grid, however. It is not clear, for example, that the data centers would wholly avoid drawing back-up power from the grid if the nuclear plant had to temporarily shut down for maintenance or temporarily decrease its megawatt-hours of output.[257]

PJM proceeded to study the impact of this proposed behind-the-meter arrangement. The arrangement would require Talen Energy to reduce the amount of electricity flowing into the networked grid from its two nuclear

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[252] Order Instituting Proceeding under Section 206 of the Federal Power Act and Consolidating with Other Proceedings, 190 FERC ¶ 61,115, at 2–3 (Feb. 20, 2025); *see also* FERC Orders Action on Co-Location Issues Related to Data Centers Running AI, *supra* note 37 (citing Order Rejecting Tariff Revisions, 190 FERC ¶ 61,109 (Feb. 20, 2025), https://perma.cc/38LC-HE7V).

[253] Freed & Clements, *supra* note 39.

[254] FERC Order Rejecting Amendments, *supra* note 1, at 5. *See also* Howland, *supra* note 180 (also describing aspects of the Talen-Amazon arrangement rejected by FERC).

[255] FERC Order Rejecting Amendments, *supra* note 1, at 5.

[256] *Id*. at 21.

[257] *Id*. at 10–11.

units.[258] This electricity would instead flow directly to large co-located data centers. This change required modification to Talen's interconnection service agreement (ISA) with PJM.[259] ISAs include commitments to interconnect specific amounts of capacity that will be available to the networked grid—capacity that other grid users could benefit from. By reducing the capacity available to dispatch (flow into) the grid, Talen was changing the services that it provided to the grid.

a. Reducing Capacity Available to the Network

A fundamental concern of utilities opposing the interconnection of new, large co-located load like the Talen-Amazon arrangement is that the data industry is "stealing" existing capacity that would otherwise be available to the other, existing users on the grid. Existing users (which historically invested in the capacity) think that they should have the superior claim to capacity supply—particularly capacity already interconnected to the shared grid. Indeed, Exelon and American Electric Power, in opposing PJM's approval of Talen Energy's amended ISA, bluntly state that they view themselves as more important market players than new large loads due to their obligations to existing customers:

> The number of expecting, non-conforming ISAs that [Talen's] filing anticipates could have a profound effect on the market. Should large quantities of load rush to co-locate with generation . . . PJM capacity markets will have *steadily decreasing volume* as the capacity resources flee to serve load that uses and benefits from—but does not pay for—the transmission system and the ancillary services that keep the system running. This will harm existing customers. Given the challenges in interconnection, siting, and approval of both generation and transmission, replacement capacity will take years to develop. The *inevitable consequence will be scarcity* resulting in rising energy and capacity prices . . . . "[260]

These types of arguments from utilities might also have anti-competitive undertones. As Eliza Martin and Ari Peskoe observe, "Co-location threatens [utilities'] control over power delivery by allowing data centers to take energy directly from a large power producer."[261] But utilities' concerns about higher wholesale costs from increasingly scarce generation also appear valid. When utilities acquire energy for their customers in a wholesale competitive market operated by an RTO such as PJM, PJM dispatches (directs power to flow from) the cheapest marginal cost generators first, then the next cheapest, and so on. The Independent Market Monitor for PJM worries that utilities, due to large load co-location, will now have to acquire more expensive energy higher on the

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[258] *Id.* at 1, 5 (showing proposed increases to behind-the-meter load serviced at each nuclear generating unit).

[259] *Id.* at 4–5.

[260] Protest of Exelon and AEP, *supra* note 33, at 3 (emphasis added).

[261] Martin & Peskoe, *supra* note 9, at 21.

supply curve.[262] And independent state commissions have suggested that the sheer scarcity of generation capacity will impact rates.[263]

Utilities have some reasonable arguments for the stance that they should have higher priority in the queue for scarce new generation capacity given their existing customer base. Utilities have a regulatory, state-based obligation to serve customers, and they made historic investments in capacity to meet this obligation. If capacity partially funded by utilities flees for the greener, more lucrative pastures of serving large load, how should utilities be compensated for the loss of future benefit from this load? Proper rate design can cover this compensation issue, but if there simply is not enough capacity to go around, rate design and more formal priority-based queues for new load will be necessary.

Utilities to some degree acknowledge that large loads could enter the grid if they paid their fair share. For example, AEP and Exelon state that new large load is taking capacity off the grid while failing to pay for the "transmission system and the ancillary services that keep the system running."[264] But other aspects of AEP's and Exelon's argument suggest that no amount of money would satisfy these entrenched utilities and persuade them of the merits of new large load served by competitors, given the high regulatory obstacles to getting new generation and transmission built and grid connected.[265]

Those responsible for grid governance have so far allowed this capacity to be taken offline and assumed that capacity markets will fill the gap for network-connected customers. For example, earlier PJM guidance stated that co-located customer facilities such as data centers may elect for a designation of "Behind the Meter Generation," but that this amount of electricity no longer counts as capacity provided to the network from the co-located generator.[266] In the case of Talen, however, FERC blocked the proposed exit of grid-connected generation to serve large load. FERC cited insufficient justifications by PJM for allowing Talen's nuclear unit to revise its interconnection agreement with PJM and reduce the amount of electricity flowing to the grid.[267]

The standard for departing from the *pro forma* interconnection agreement that applies to all generators is a high bar—requiring a showing that operational or other changes are necessary. FERC only approves departures in "extraordinary" circumstances.[268] In rejecting PJM's efforts to modify Talen's interconnection agreement for co-located large load, FERC commissioners laid bare

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[262] PJM's Answer and Motion for Leave to Answer of the Independent Market Monitor at 6–7, PJM Interconnection, LLC, No. ER24-2172-000 (July 10, 2024), https://perma.cc/KVV9-4W5P.

[263] JLARC, *supra* note 9, at 5.

[264] Protest of Exelon and AEP, *supra* note 33, at 3.

[265] *See supra* text accompanying note 260 (noting hurdles to building new generation).

[266] PJM, PJM GUIDANCE ON CO-LOCATED LOAD 1–2 (2024), https://perma.cc/X4JB-5DHQ.

[267] FERC Order Rejecting Amendments, *supra* note 1, at 39–40.

[268] *Id*. at 39.

the challenges of amending old policies to fit new circumstances. Chairman Phillips, dissenting, argued that FERC's rejection of the revised tariff stalled the necessary process of developing new interconnection standards for new large load conditions, "creating unnecessary roadblocks to an industry that is necessary for our national security."[269] The majority acknowledged that its rejection of the revised agreement "leaves multiple important questions unresolved" but kicked the can down the road, leaving the status of co-located large load interconnections uncertain at the federal level.[270] The DOE's directive to FERC to write interconnection rules, and FERC's similar order to PJM, may provide clarity.[271]

b. Using Network Services Without Paying?

In addition to changing the amount of electricity available to the users on PJM's vast network, Talen Energy's proposal also involved issues of *load* interconnection. Amazon—the existing load—was proposing to use the nuclear plant's existing interconnection to draw additional electricity from the nuclear units, and, potentially, back-up electricity from the grid. Talen and Amazon indicated that they would be almost entirely "islanded" from the grid, providing their own backup electricity rather than relying on the grid, but other network users were skeptical of this promise.[272] They pointed to a past incident in which Talen's nuclear units temporarily stopped generating electricity, yet the data centers continued using electricity, suggesting they were relying on the grid and should be paying for its services.[273]

Rejecting contentions that Talen and Amazon retained some network services for which they should pay, Talen and PJM argued that in the revisions to the ISA, they had ensured that the large load would not draw any back-up power from the grid. They pointed to a variety of technologies installed to wholly island the load from the grid and supply backup power.[274]

Prior to approving Talen's ISA, PJM had issued brief guidance for co-located large load, which was reflected in the ISA. PJM's guidance proposed a seemingly simple solution to the issue of proving grid disconnection, allowing generators such as Talen to designate themselves as Behind the Meter Generation Facilities and avoid claims that they owe money for network benefits.[275] Under this proposed approach, the consumption of electricity (in megawatts) by the large load connected to the BTMG had to be measured,

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[269] *Id.* at 1–2 (Chairman Phillips, dissenting).

[270] *Id.* at 41.

[271] Secretary of Energy's Direction, *supra* note 22; Order Instituting Proceeding under Section 206 of the Federal Power Act, *supra* note 246.

[272] FERC Order Rejecting Amendments, *supra* note 1, at 12.

[273] PJM, PJM GUIDANCE ON CO-LOCATED LOAD, *supra* note 266, at 11.

[274] *Id.* at 7.

[275] *Id.* at 1–2. Different prices are charged at different "nodes" on the transmission grid. *Id.* at 2.

as did the output of the BTMG.[276] If the large load facility used more megawatts than the output of the BTMG connected to the load, then PJM would assume that this additional electricity came from the grid and would charge the large load facility for the new usage, at the same price charged of other users at that general location.[277]

Following FERC's rejection of PJM's first attempt to modify regulations for large load co-located with grid-connected generation,[278] PJM has continued to consider options, most recently indicating that it will apply its existing interconnection standards to large load[279] but also commencing a stakeholder process to develop new rules.[280] PJM suggests that the BTMG approach—although already followed for some load interconnections—was designed for more moderately-sized loads and accordingly does not recommend this approach for large loads.[281] Instead, PJM prefers a system where the large load connects to the network as a network load (with associated obligations to contribute to grid reliability, such as curtailing electricity use when necessary), and the co-located large load generation is grid-connected and treated as a capacity resource.[282] Capacity resources are generating units that are grid-connected and are obligated to supply electricity to the grid at certain times. If they fail to do so, they are subject to penalties.[283]

PJM has also issued information on an intended "fast path" for interconnecting large load, including proposed requirements for more data center flexibility—ability to shut down when needed—and incentives for "bring your own generation" (BYOG) for large loads that do not rely on back-up capacity from the grid.[284] PJM's original attempt to modify the Talen-PJM interconnection services agreement is also still at play. In January 2025, Talen Energy appealed FERC's order rejecting the modified interconnection services agreement.[285]

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[276] *Id.* at 2.

[277] *Id.*

[278] *See* FERC Order Rejecting Amendments, *supra* note 1, at 1.

[279] Answer of PJM Interconnection, LLC, *supra* note 177, at 4 ("The record will support a finding that PJM's existing Tariff remains just and reasonable, although improvements and clarifications may be appropriate based on Commission guidance. Multiple existing pathways are available to facilitate co-location arrangements.").

[280] Letter from David Mills, PJM Chair, to PJM Stakeholders 2 (Aug. 8, 2025), https://perma.cc/7CBM-5J53.

[281] Answer of PJM Interconnection, LLC, *supra* note 177, at 11–13.

[282] *Id.* at 9.

[283] Capacity Market & Demand Response Operations, PJM Manual 18: PJM Capacity Market 16, 42 (2025), https://perma.cc/T3XT-WCZH (defining capacity resources and describing penalties for non-performance (non-performance charges).

[284] Tim Horger, Large Load Additions 4 (2025) https://perma.cc/T549-D3CD.

[285] *Talen Goes to Court over FERC's Amazon Co-located Data Center Rejection*, Reuters (Jan. 28, 2025), https://perma.cc/8EW8-2CCV.

B. Allocating the Costs of New Load

Beyond the challenges of transmission interconnection, another major facet of electricity governance for the large load era is determining the costs and benefits that a large load causes for retail utilities (state-regulated) that supply generation and localized transmission and distribution, and for grid operators (federally regulated) that supply transmission. Identifying these costs allows grid operators to set appropriate rates when utilities or grid operators raise rates to fund new generation, transmission, and distribution—or all of these forms of infrastructure—to serve large load.

As higher electricity prices and transmission expansions increase costs, they are a boon to utilities and generators eager to grow their revenues. States seeking an expanded tax base and economic development are also eager to capitalize on these opportunities.[286] At least in some cases, utilities claim that they are more fully utilizing idle capacity rather than causing new system costs, and that they can decrease costs to average customers by spreading fixed costs among more loads.[287] But as we have documented, many utilities and transmission operators are planning for and implementing major expansions to serve large load rather than adding large load to under-utilized energy infrastructure.[288]

Regardless of the overall efficiency and welfare effects of expanded load and grid infrastructure, the *distribution* of the costs of new infrastructure—covered through higher rates charged by utilities—raises powerful equity issues. Residential ratepayers could shoulder an undue portion of the new costs caused by large load, and growing evidence suggests that indeed, they are. The Commonwealth of Virginia estimates that customers of Dominion Energy could see *monthly* bills increase by $14 to $37 in real dollars by 2040, and Eliza Martin and Ari Peskoe document numerous incidences of cost shifting from an analysis of utility rate cases for large load.[289]

This subpart explores: (1) rates for expanding the federally-regulated transmission grid to support large load, and (2) rates supporting utilities' service to large loads (generation, transmission, and distribution). In each context, it

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[286] *Cf.* Husch Blackwell, Tax Incentives for Data Centers 50 State Survey, https://perma.cc/H4LL-UQ2V (showing tax incentives to attempt to attract data center development).

[287] PG&E Corp., *Surging Data Center Growth to Help Lower Energy Costs for PG&E Customers* (May 27, 2025), https://perma.cc/Z3C6-TJAN; Order Adopting Stipulated Agreement at 7, In re: Georgia Power Company's 2023 Integrated Resource Plan Update, No. 55378 (Ga. Pub. Serv. Comm'n Apr. 26, 2024) ("This provision provides significant benefits for customers, as it will ensure that, as part of that next rate case filing, the incremental revenue from new large load customers will have downward pressure on rates of at least $2.89 for the typical residential customer using an average of 1,000 kWh per month.").

[288] *See supra* notes 222–226 and accompanying text.

[289] Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at v ("real" means inflation-adjusted); Martin & Peskoe, *supra* note 9, at 16.

focuses on the challenge of ensuring that the general population of electricity consumers does not shoulder—through higher rates—the new costs caused by large load, netted for any systemic values offered by large load.

1. *Transmission Cost Allocation*

Setting rates that adequately reflect the costs that large loads impose on transmission is critical, yet the project of identifying large loads' costs and benefits to the grid and accordingly setting transmission rates is a difficult one. The rapid addition of large amounts of concentrated load such as hyperscale data centers, which generally require a direct connection to transmission-level voltages through dedicated substations, makes new, expensive transmission appear load-specific, rather than as a backbone that supports all grid users.[290]

a. *The Limits of "Beneficiary Pays" in the Large Load Context*

When utilities construct new transmission lines within a large, regional grid, a grid operator proposes to FERC new transmission fees for all users of the regional grid. These fees are designed to allow the utility builders and owners of transmission lines to recover the costs of building new lines. FERC, which regulates the rates charged for new transmission lines, enshrines a "beneficiary pays" approach to these transmission fees in FERC Orders No. 1000 and 1920.[291] This approach matured in the era of expanding transmission to support zero-carbon renewable energy. It provides that if all utilities benefit equally from expanded transmission lines (say, through the availability of cheaper renewable power throughout the region), all of them should pay an equally higher transmission fee to cover the cost of the new lines.[292] But if benefits vary, utilities using the wires should pay different fees. "Beneficiary pays" skeptics have argued that secondary, region-wide benefits of transmission lines built within only portions of a regional grid fail to materialize and serve primarily as a justification for excessive cross-subsidization from some utilities (and their customers) to others.[293] This concern is powerful in the large load context, as grid operators such as PJM expand wires for the benefit of large load, and many non-large-load customers shoulder these costs.[294]

Even when transmission lines promise significant overall benefits, individual stakeholders such as utilities may oppose projects that benefit consumers

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[290] Ryan Quint et al., Practical Guidance and Considerations for Large Load Interconnections 13 (2025), https://perma.cc/G8RF-AR2C.

[291] FERC Order No. 1920, 187 FERC ¶ 61,068 (2024); FERC Order No. 1000, 136 FERC ¶ 61,051 (2011).

[292] Ill. Com. Comm'n v. FERC, 721 F.3d 764 (7th Cir. 2013).

[293] Order No. 1920, 187 FERC ¶ 61,068 (2024) (Christie, Comm'r, dissenting, at P 19); Ethan Howland, 5 *Utility Commissions Ask FERC to Undo MISO's $22B Multi-value Transmission Portfolio*, Utility Dive (July 31, 2025), https://perma.cc/N2G2-U8MG.

[294] Jacobs, *supra* note 226, at 1.

but reduce their profits on generation. A new transmission line can increase or decrease the value of generation assets by linking low-cost generation to new markets and potentially undercutting higher-cost incumbent generators, particularly when overall load growth is low. Utilities may take seemingly contradictory stances, defending transmission projects when they increase their generation revenues and rate base while opposing them when new competition helps consumers but hurts their own bottom line.[295]

These multiple lines of conflict can drive utilities to focus on in-state transmission where stakeholders' goals are more closely aligned, even if the overall net benefits appear smaller on paper.[296] However, the return of load growth and the emergence of large, concentrated loads that connect directly to the transmission system flips the geometry and politics of the beneficiary pays debate. Now it is new load, not new renewable generation, that drives the need for and benefits from transmission expansion. While transmission for renewables can plausibly be justified by system-wide savings on electricity generation, and at least in some contexts on the basis of carbon reduction, new transmission for large loads imposes the direct cost of construction and the secondary cost of higher wholesale electricity prices, without any direct environmental benefits.[297]

2. Parallels to Natural Gas Pipeline Rates

The challenge of allocating rates among customer classes—rates that cover the cost of new generation or transmission constructed for large load—lies in the two-way nature of the benefits and costs of new infrastructure. Although large load directly "causes" the need for the new generation and transmission, aspects of this new infrastructure may benefit existing customers, in which case they should cover some of its costs.[298] To date, however, there appear to be few collateral benefits of newly built generation for large load, with Virginia customers' rates poised to skyrocket simply due to the sheer demand for load.[299]

These same types of challenges arise in the context of interstate natural gas pipelines, for which FERC has applied a strict principle—not deployed in the electricity context—stating that existing pipeline customers should not have to shoulder *any* new costs imposed by new users.[300] For example, in *Antero Resources*

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[295] Alissa Jean Schafer & Anderson Dave, *NextEra Spent $20 Million to "Ban" Clean Energy Transmission Project in Maine*, Energy and Policy Institute (Nov. 3, 2021), https://perma.cc/ADV2-RVLT.

[296] Peskoe, Transmission Syndicate, *supra* note 24.

[297] JLARC, *supra* note 9, at v.

[298] For potential benefits, *see, e.g.*, Casey Crownhard, *AI is Changing the Grid. Could It Help more than It Harms?*, MIT Technology Review (Sep. 9, 2025), https://perma.cc/BZR8-HWA5 (discussing potential benefits to other users of rising data center energy demand).

[299] JLARC, *supra* note 9, at v.

[300] Brief for Respondent at 6, Antero Res. Corp. v. FERC, No. 24-1076 (Dec. 16, 2024) (describing the incremental pricing principle).

Corp. v. FERC, a producer of natural gas sought "firm" capacity in a natural gas pipeline that had existing customers.[301] "Firm" capacity is a guarantee that the producer will be able to ship gas through the pipeline whenever it needs to do so.[302] To guarantee this capacity, the pipeline built four new compressor stations to more efficiently "push" more gas through the pipeline, and it charged the producer a higher rate than other pipeline users.[303] Yet these compressors, installed on an existing pipeline, are more efficient and likely benefit all users. FERC justified charging the producer the higher rate based on its long-used principle that existing pipeline users, through rates, should not pay for costs imposed by new users.

This strict principle against cross-subsidization of new users by existing users is absent in electricity and electricity transmission rates. Rather, rates must only be "just and reasonable" and "nondiscriminatory," and FERC has not interpreted these principles to wholly prohibit cross-subsidization.[304] As noted in Part II, "nondiscriminatory" simply means that a utility may only charge different classes different rates if it demonstrates that those classes impose different costs on the utility system.[305]

For transmission line rates, federal courts consistently require that rates charged of utilities using the lines be "roughly commensurate" with the costs that those utilities impose on the lines. Put another way, the benefits that the utilities receive from the lines such as reduced losses of electricity during transmission, enhanced reliability from shared reserves, and lower costs due to reserve sharing should be reflected in the transmission rate charged of utilities.[306]

Numerous utilities have developed creative methods to attempt to require large load to cover its full costs imposed on transmission and other utility infrastructure.[307] The best methods, as we explore further in Part IV, are those that charge large loads fixed rates for the fixed costs that they impose, thus better ensuring that dollar-for-dollar, large loads cover the cost of new generation. Other utilities do not require large load to directly cover its costs, but they impose exit fees in the event that utilities build generation and transmission for large load that then skips town, leaving the utility's customers with stranded costs.

In addition to the utility-by-utility approaches described in Part IV, some states have imposed state-wide requirements designed to match the costs that large load imposes on the system with the rates that large load pays. Georgia has approved utilities' per-unit higher rates to cover the costs of "upstream"

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[301] *Id.* at 14.

[302] *Id.* at 4.

[303] *Id.* at 15.

[304] 16 U.S.C. § 824d.

[305] *See supra* note 154 and accompanying text.

[306] *See, e.g.*, Ill. Com. Comm'n v. FERC, 721 F.3d 764, 775 (7th Cir. 2013).

[307] SATCHWELL ET AL., *supra* note 9, at 4–10; SHERWOOD, *supra* note 9, at 2–3 (reviewing existing tariffs and special contracts related to large loads); *supra* note 129; *supra* note 148 (note describing Dominion's special fixed fees for large load).

generation, transmission, and distribution built to serve large load centers.[308] Legislation enacted in Utah requires utilities contracting with large load to "ensure that all large load incremental costs are allocated to and paid by the large load customer."[309] Texas, in turn, requires standards that ensure that a large load customer "contributes to the recovery" of a utility's costs to interconnect with the large load.[310] Additionally, a federal district court affirmed a Washington state utility's higher rates for blockchain, finding that the utility "provided justifications for every element" of the higher rate.[311] Other attempts to mandate higher rates for large load have failed, however, as reflected in the following Basin Electric case.

3. The Basin Electric Cost Allocation Failure

The challenges of equitably allocating costs among customer classes came to the fore in the Basin Electric Power Cooperative order issued by FERC in 2024.[312] Basin Electric Power Cooperative is a member-owned utility (a cooperative business structure) that sells wholesale electricity to other electric cooperatives that generate and transmit (or solely transmit) electricity to retail customers in nine Midwestern and Western states.[313] Basin Electric is therefore regulated by FERC, as it sells electricity to other providers, and these providers then resell the electricity retail.[314]

Many of Basin's wholesale customers—retail electricity cooperatives, municipal providers of electricity, and the like—have faced demands to serve new large loads from crypto mining companies. Basin accordingly proposed to modify its wholesale rates charged to the utilities that would be serving these loads, and the utilities would pass on these rates to their retail customers.[315] Specifically, Basin Electric proposed two new rates—one Crypto Block Chain Rate Schedule and one Large Load Rate Schedule for other non-crypto large users (many in the digital industry). Basin proposed to *not* charge its utility customers the Crypto Block Chain Rate unless they had more than twenty-five megawatts of crypto-based load.[316] But any crypto load that exceeded this cap would be subject to the Crypto Rate Schedule.

Basin Electric attempted to justify these differential rates through cost causation, arguing that the uncertain nature of crypto-load, in particular, and its

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[308] Ga. Pub. Serv. Comm'n, *supra* note 107, at 1.

[309] Utah S.B. 132, *supra* note 150, at § 54-26-301.

[310] Texas S.B. 6, *supra* note 150, at § 1 (c-1).

[311] *Supra* note 155.

[312] FERC Order Rejecting Proposed Rate, *supra* note 8.

[313] *See id*. at 1–2 n. 3; About Us, Basin Electric Power Coop., https://perma.cc/3HK7-CQDE.

[314] *See* 16 U.S.C. § 824d (granting FERC authority over sales for resale).

[315] FERC Order Rejecting Proposed Rate, *supra* note 8, at 4–5.

[316] *Id.* at 6 (explaining that one district served by Basin Electric had a 27-megawatt cap).

high mobility led to large administrative costs for planning for and implementing load, and potentially covering stranded costs.[317]

Large loads objected to these rates, arguing that their business is not very mobile, did not impose many new infrastructure costs on the grid, and offered valuable demand response services to the grid (reducing large amounts of load during peak demand) that should be reflected in their rates.[318] FERC concluded that there was insufficient evidence of higher costs caused by large loads, with too much speculation about the likely mobility of crypto mining firms and the stranded costs that they would leave behind.[319] Basin Electric had therefore failed to demonstrate that treating large loads differently from others was "just and reasonable" and "not unduly discriminatory or preferential."[320]

FERC was correct to question broad assumptions about higher large load costs—particularly future stranded costs from firms projected to exit Basin Electric's territory—without solid data proving such costs. But its decision leaves many open questions. How much evidence will be enough to show that large load does in fact impose larger costs? How will utilities muster this evidence? Although utilities have long served large loads, there may be real differences in crypto and data center load that utilities have not yet encountered, making it more difficult to accurately project costs. How will utilities also incorporate in rates the system benefits provided by grid-connected large load, such as the ability to quickly reduce a large quantity of demand (through "demand response") during periods of system-wide peak demand? We explore potential solutions to this challenge in the data collection and rate-making discussions in Part IV.

The FERC decisions to date reject proposed solutions for interconnecting large load and setting rates that accurately reflect the costs that this load imposes on the grid, thus leaving utilities and customers hanging in the balance. At the same time, the decisions fail to identify solutions—rejecting revised interconnections and crypto rate standards with no indication of alternative approaches. These decisions, along with failed efforts to reach consensus within grid governance processes,[321] leave a hole in modern grid governance. Part IV synthesizes the major unresolved issues that must evolve into a comprehensive framework for large load governance, and suggests pathways within this framework.

IV. Pathways Forward: Governance for New Grid Demands

The challenge of large loads demands a new grid governance framework—one built upon orders issued by FERC; revised interconnection agreements crafted by transmission operators and approved by FERC; updated regional

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[317] *Id.* at 8.

[318] *See, e.g.*, *id.* at 16–17 (discussing Aurum's protest).

[319] *Id.* at 38–39.

[320] *Id.*

[321] Bresler, *supra* note 1, at 1 (noting an "impasse" after PJM attempted to find stakeholder consensus on large load policy issues).

transmission organization standards approved by FERC; state statutes and public utility commission regulations; and other formal and informal guidance for all grid users, existing and new. As it stands, utilities and transmission operators are struggling to accommodate burgeoning data centers and other novel, large energy users. They are operating with no uniform governance standards for going off-grid or partially off-grid through co-location, changing interconnection agreements, modifying transmission rates, or tailoring new wholesale or retail electricity rates to large load costs. Flexibility is needed as large load rapidly evolves, but the lack of a guiding framework threatens grid reliability, the growth of the U.S. economy, and consumer protection.

There is merit in leaving some uncertainty and "mud," rather than crystals, in the law as new industries emerge and new risks and opportunities become clearer, with ample room for adaptation.[322] But grid operators and utilities are already demanding guidance—citing the need for certainty.[323] Further, large load is not entirely new, and grid governance needs to step up to the plate, creating something between crystals and mud to enable the massive transition afoot while ensuring that all users have access to adequate, reliable, equitably priced energy. This Part argues for four pathways toward better grid governance for larger load: (1) data collection and analysis, (2) generator interconnection to transmission, (3) large load interconnection, and (4) rate design. To improve both transmission expansion and interconnection, and to design electricity rates that adequately capture the costs of large loads, better large load data are necessary. Data will guide the initial governing framework and will enable subsequent governance adaptation with lessons learned.

Beyond the focus on improved data, this Part charts governance pathways for generator interconnection with transmission to supply more power for growing demand, and for large load interconnection. Finally, it explores pathways to ensure that the rates paid by large loads match the costs and benefits of large load to the U.S. electricity system.

A. Improving Data Collection, Dissemination, and Modeling

A central component of modern grid governance to address large load bottlenecks—and the systemwide impacts of large load—is better collection, curation, publication, and use of data. As we explore here, informational conflict has dominated some of the highest-profile large load decisions. Decisions about whether to allow the interconnection of new generation to serve load,

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[322] Carol Rose, *Crystals and Mud in Property Law*, 40 Stan. L. Rev. 577, 580 (1987–88) (describing "mud" as "the blurring of clear and distinct property rules with the muddy doctrines of 'maybe or maybe not'" and crystals as trying to "clear up the blur with new crystalline rules"). *See generally, e.g.,* Amy Stein, *Reconsidering Regulatory Uncertainty: Making a Case for Energy Storage*, 41 Fl. St. U. L. Rev. 698 (2014) (arguing that there were benefits in relatively loose and uncertain law when commercial energy storage was first emerging).

[323] *See* FERC Transcript, *supra* note 1, at 66–67.

modified interconnection for co-located generation to "defect" from the grid, and distinct rates for large load all centrally depend on information regarding the impacts of large load on the grid—both positive and negative. FERC and other entities responsible for approving or rejecting transmission interconnection requests, rates, and planning and construction of new transmission lines and capacity need a uniform approach to guide: (1) the specific types of data that matter; (2) how the data should be collected and publicized for those who make grid decisions; and (3) how the data will be consistently used in different types of decisions, such as allowing a higher wholesale or retail large load rate, or approving modified interconnection requests for large loads co-located with grid-connected generation.

This section explores these needs in the context of two types of data central to the modern electricity grid: the challenge of projecting load and its location, and the difficulty of understanding how large load, including co-located "behind-the-meter" load, uses grid services and impacts grid reliability.

1. *Projecting Load*

One of the most critical challenges to electricity governance at the federal, regional, and state levels is to develop a uniform system for collecting and recording large load requests. This is important to avoid over- and under-projections of the amount of new generation capacity and transmission investments necessary to serve load, misprojections of the ideal locations of these additions, and associated impacts on consumers and the reliability of the network.

a. *The Need for Better Load Data*

A centralized information center for projected load, with uniform reporting criteria, is important for governmental and non-governmental entities associated with the grid. Utilities need this data to plan for the construction of the proper amount of generation capacity and transmission. States need this data for their own capacity planning through integrated resource plans, and for their approval of utility rates to cover the costs of new generation and transmission infrastructure. Regional grid operators, in turn, need the data for transmission planning, interconnection approvals, capacity markets, and similar programs that ensure that generation will match load and ensure a reliable grid. Finally, FERC needs this information for its approvals and rejections of regional grid operators' interconnection decisions, utilities' wholesale rates, and utilities' and regional grid operators' transmission plans for critical new transmission lines under FERC Order No. 1920.

In FERC Order No. 1920, FERC requires transmission providers to conduct "long-term regional transmission planning" and use "transparent selection criteria" to determine whether to include regional transmission facilities in their long-term transmission plans for new, needed lines.[324] This will potentially encourage transmission providers to build regional lines instead of less efficient localized transmission. Transmission providers are also required to file a default method for allocating the cost of new lines among line users.[325] Advance notice of cost allocation methods will provide more certainty for entities building new lines and will increase the likelihood of building new transmission lines.[326]

These transmission planning mandates are important for grid reliability and long-term energy affordability.[327] A modern challenge highlighted in FERC's large-load technical conference, however, is transmission grid operators' lack of "visibility" into the amount of load that will need to be served and its location.[328] There are concerns about "double counting" by regional grid operators, in which one large load operator—considering locating in, for example, five different electricity service areas—speaks with five different utilities that will potentially serve that load.[329] These utilities might all report this same projected load to the grid operator, leading the grid operator to assume larger needs than actually exist. As a grid operator has noted, "[I]n many cases, these [proposed] data centers are showing up in multiple places, so in reality I could have many members [utilities] submitting loads that are all the same. So how do we have more clarity around that to understand what the actual true load is?"[330]

Other inaccuracies in load projection—whether over- or under-counting—involve the difficulty of projecting the quantity of load, even if the proposed load centers are known and not double counted. Some experts have expressed concerns that there is over-optimism surrounding the number of data centers that will actually be built, or how long built loads will last.[331] Some "digital foundries" will produce more popular services and goods than others, and there will be inevitable bankruptcies and market corrections. And data center

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[324] Off. of Pub. Participation, FERC, Explainer: Transmission Planning and Cost Allocation Final Rule 4 (2025).

[325] *Id.* at 7.

[326] *Id.* at 8.

[327] *Cf.* Nat'l Renewable Energy Lab'y, National Transmission Planning Study Executive Summary 2 (2024), https://perma.cc/FNZ2-UPDM (highlighting cost savings and reliability benefits of interregional transmission to support zero-carbon electricity generation).

[328] FERC Transcript, *supra* note 1, at 113.

[329] *Id.* at 30 (comparing large load reporting to the era of numerous new natural gas turbines interconnecting).

[330] *Id.* at 26.

[331] Sean Michael Kerner, *Analysts Warn of Overbuild Risks as AI Data Centers Reshape Industry*, DataCenterKnowledge (May 12, 2025), https://perma.cc/J5U7-JXV3; Cathy Kunkel & Dennis Wamsted, *Institute for Energy Economics and Financial Analysis, Risk of AI-Driven, Overbuilt Infrastructure is Real,* Inst. for Energy Econ. & Fin. Analysis (June 3, 2025), https://perma.cc/5GXB-CUXU.

energy efficiency is improving.[332] These uncertainties could lead to boom and bust cycles, in which utilities or data companies build or contract for existing capacity, only to abandon that capacity within a relatively short time frame.[333]

A related concern is accurate projection of the *location* of load and new generation, as transmission lines must be planned and built to serve these resources. Constructing generation capacity closer to load can reduce transmission needs and increase efficiencies, as transmission lines lose electricity as it flows over long distances.[334]

Basin Electric's proposed policy for serving large load would have incentivized relatively even geographic allocation of large load by allowing a set quantity of large load to locate within each of its designated service areas without paying higher rates.[335] But above a defined threshold of added capacity, Basin Electric proposed higher rates for large load—specifically crypto mining—because it believed that this load might abandon the service territory quickly, leaving stranded costs.[336]

The importance of avoiding over- or under-projection of load and its location through more uniform, centralized, and comprehensive data collection cascades through the entire electricity governance system. Regional grid operators, states, and utilities all have formalized processes to plan for the need for new transmission and capacity.[337] FERC mandates transmission planning by all transmission operators with interstate lines; the federal government and several states have programs to incentivize or mandate new transmission; and grid operators and states are approving transmission expansions for large load, causing consumers to shoulder new, higher rates.[338]

The construction of more transmission to serve new large load could benefit all consumers, especially if this construction leads to inter-regional lines that

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[332] *See, e.g.*, Steven Nadel, *Opportunities to Use Energy Efficiency and Demand Flexibility to Reduce Data Center Energy Use and Peak Demand*, ACEEE (Oct. 7, 2025), https://perma.cc/PC3P-K7JY (noting "substantial improvements in data center cooling and power system efficiency").

[333] FERC Transcript, *supra* note 1, at 19.

[334] Jignesh Parmer, *Total Losses in Power Distribution and Transmission Lines*, Elec. Eng'g Portal (Mar. 28, 2025), https://perma.cc/Z58N-JLXK.

[335] *See* FERC Order Rejecting Proposed Rate, *supra* note 88, at 6.

[336] Id. at 7.

[337] For a state program that mandated new transmission lines to connect wind energy zones to populated areas, *see generally* Warren Lasher, *The Competitive Renewable Energy Zones Process*, ERCOT (Aug. 11, 2014), https://perma.cc/8D64-4WY9. For the most recent FERC interregional transmission planning mandate, *see generally* FERC Order No. 1920, 187 FERC ¶ 61,068 (2024). For court decisions addressing regional grid operators' attempts to allocate the costs of new transmission lines among different users' of those lines, *see* Ill. Com. Comm'n v. FERC, 576 F.3d 470 (7th Cir. 2009); Ill. Com. Comm'n v. FERC, 721 F.3d 764 (7th Cir. 2013).

[338] *See* JLARC, *supra* note 9; Julian, *supra* note 227; Commonwealth of Virginia State Corp. Comm'n, *supra* note 228–229 and accompanying text.

carry new, cheaper wind and solar energy to consumers.[339] Interregional transmission could also reduce the risk of stranded assets by increasing the capacity to share generation resources across regions. This could partially mitigate the consequences of uncertainty regarding the specific locations of new large loads. But utilities tend to favor constructing *localized* transmission, and overbuilding of localized transmission to serve large load—load that may not materialize or might quickly flee the service territory—will leave other consumers with stranded costs.[340]

For generation capacity, the federal government steers the process of regional planning for adequate capacity—setting default "reserve margins" that essentially require grid operators to ensure that there will be excess generation available above the peak demand amount.[341] Grid operators then run auctions or lead other processes through which utilities must secure specific amounts of generation. Without adequate data, assumptions of higher-than-actual load can cause capacity auctions to balloon out of control. The grid operator PJM's $14.7 billion auction in 2024 is a case in point; although this capacity appears actually necessary in PJM (absent commitments to large load curtailment during peak demand periods), PJM may have set price caps higher than necessary to attract bids.[342] States, too, might over-project capacity needs in their long-term plans, and this could lead them to approve too much generation, again potentially leading to stranded costs.

Building too little capacity based on under-projections of load could also negatively impact all consumers—in the worst case, leading to grid reliability issues, including blackouts. Under- and over-projections could also impede effective planning for transmission lines to transport electricity from added capacity.

A system requiring uniform reporting by operators projecting large load, which published this data in an accessible format, would help to address all of these concerns, benefitting federal, regional, and state regulators; utilities; grid operators; and other stakeholders advocating for reliable electricity and equitable rates.

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[339] *See Ill. Com. Comm'n*, 721 F.3d at 774 (affirming the regional grid operator MISO's allocation of costs for new transmission lines that connect wind farms to customers and noting that MISO estimated "that there would be cost savings of some $297 million to $423 million annually because western wind power is cheaper than power from existing sources, and that these savings would be 'spread almost evenly across all Midwest ISO Planning Regions'"); Nat'l Renewable Energy Lab'y, National Transmission Planning Study Executive Summary, *supra* note 327, at 2 (finding that "[a]pproximately $1.60 to $1.80 is saved for every dollar spent on transmission," largely due to lower fuel costs because transmission connects renewable energy (which has zero fuel costs) to consumers).

[340] Peskoe, *supra* note 24, at 58.

[341] Macey et al., *Grid Reliability in the Electric Era*, 41 Yale J. Reg. 164, 218 (2024); NERC, *M-1 Reserve Margin*, https://perma.cc/J6AW-U3SC.

[342] Robertson, *supra* note 6; Complaint, *supra* note 40.

b. Policy Pathways

We recommend a policy pathway through which all large loads report planned load, the amount of load, and potential locations of the planned load to FERC, for entry in a national database accessible to all grid users and consumers. Each unique *quantity* of projected load—say, one 30-megawatt data center—should have its own identifier (anonymized to protect competitive planning) such that if the large load operator is considering several locations, it will not appear as additional load in each location. Texas has enacted a system with some elements of this proposal, requiring disclosure if the large load is considering multiple locations and allowing procedures to "withhold or anonymize competitively sensitive details."[343] For large loads seeking a "fast path" to interconnection, PJM has similarly proposed to require utilities to indicate "whether any load interconnection requests they've received are duplicative."[344]

Some might challenge FERC's jurisdiction to require such reporting for all large loads. FERC seemingly has authority over large loads co-located with grid-connected generators, as those generators have interconnections with the FERC-regulated transmission grid, and large loads change the characteristics of those interconnections.[345] Even large loads served by utilities through local transmission and distribution are arguably within FERC's authority, as the utilities (load-serving entities) are regulated by FERC in their wholesale sales and purchases of power and their ownership of long-distance transmission lines.[346] These utilities, and large loads, also impact the reliability of the inter-state grid. Indeed, cases affirming federal jurisdiction over capacity markets (generation) and electricity consumers' participation in wholesale energy markets support a broad reading of FERC's authority to require large load reporting.[347]

Another potential pathway would involve regional grid operators collecting and publicizing projected load data, since they already receive utility data on load requests, but this might involve duplicative effort. For example, developers might report to multiple grid operators if they were planning one large load facility to be potentially located on either side of grid operator boundaries. With uniquely assigned numbers for planned projects, however, grid operators could simply delete duplicate numbers or flag the issue that one facility was planned for multiple potential locations. Although PJM has proposed to ask utilities to determine whether customers requesting interconnection have duplicate

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[343] Texas S.B. 6, *supra* note 150, § 2(d).

[344] Tim Horger, PJM CIFP Package Stage 3 Large Load Additions 3 (2025), https://perma.cc/SUW4-ATQD.

[345] *See* Talen Energy discussion in *supra* Part III.A.

[346] *See supra* note 159 and accompanying text.

[347] Hughes v. Talen Energy Marketing, 578 U.S. 150 (2016) (affirming FERC jurisdiction over generation capacity); FERC v. Elec. Power Supply Ass'n, 577 U.S. 260, 260 (2016) (affirming FERC jurisdiction over electricity consumers that offer demand response products in wholesale energy markets, thus "affecting" wholesale prices).

requests elsewhere, PJM worries that they likely lack the authority to require this information.[348] This may be an overly cautious reading of the authority of a FERC-regulated entity such as PJM. Provided that PJM is requesting information about alternate large load locations that might be grid-connected, this relates to PJM's planning for transmission and interconnection to ensure just and reasonable transmission and wholesale electricity services.

2. Quantifying System Impacts

Beyond better *projecting* load growth to avoid stranded costs or reliability issues, federal, regional, and state governance entities need to collect more uniform and accurate data about large load that is actually built and the impacts of large load on the electricity system. These will include data comparing projected loads and their locations to their constructed capacity and location; data on negative and positive impacts of large load to grid reliability; and data showing whether co-located load is truly disconnected from the grid or still periodically benefits from it. All of this data will support more accurate determinations of large loads benefits and costs to the grid, and, accordingly, better rate design and reliability regulation. This section highlights the need for retrospective data on large load impacts, and potential pathways toward better quantification.

a. The Need for System Impacts Data

The cases highlighted in Part III show the difficulty of approving new rates for the interconnection of large load—or its defection from the grid—without a full understanding of its system-wide impacts. In the case of Talen Energy's Susquehanna nuclear plant, FERC rejected PJM's proposal to allow more electricity to be pulled from the grid and delivered to Amazon in lieu of other customers. FERC's rejection of the proposal vindicated utilities' arguments that Amazon, although proposing to go "off grid" or "behind the meter" entirely, had not demonstrated that it would avoid drawing upon valuable grid "ancillary" services such as last-minute backup power or, in the case of a systemwide blackout, black start services allowing the electricity delivery system to start up again.[349] In the case of Basin Electric, FERC determined that Basin—proposing higher rates for unpredictable large load—had failed to provide concrete evidence of the costs that such load imposed on the system.[350]

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[348] While PJM proposed that utilities ask customers if interconnection requests were duplicative, Horger, *supra* note 344, at 3, they doubted their authority to require it: "ClearView quoted PJM Executive Vice President Stu Bresler, speaking at the Sept. 26 meeting, as saying that 'to be perfectly blunt,' the disclosure request to utilities is 'not something whether we know we can actually actively enforce.'" Peter Behr, *Data Center Boom Sparks Sticker Shock for PJM Ratepayers*, E&E News by POLITICO (Oct. 3, 2025), https://perma.cc/6JSZ-UGNY.

[349] For the utilities' arguments, *see* Protest of Exelon and AEP, *supra* note 33, at 8. For the FERC order, *see* FERC Order Rejecting Amendments, *supra* note 1.

[350] FERC Order Rejecting Proposed Rate, *supra* note 8, at 38.

Better data about the extent to which co-located behind-the-meter load does or does not benefit from system resources, and the impacts of all large load on the system, will enable better governance of interconnection, rates, and reliability. For interconnection, if new generation to serve load (or a modified interconnection that pulls generation off of the grid) will increase transmission congestion or threaten reliability with too little infusion of electricity, the generation typically must pay for the grid upgrades needed to address these impacts before it can interconnect.[351] And for both wholesale and retail rates, utilities may only "discriminate" in rates—charging more for one class of customer than another—if they can demonstrate that the class paying higher rates does in fact have greater impacts on the system.[352] And finally, if large loads are causing reliability threats, reliability regulators should write and enforce standards requiring technologies and operations that reduce these threats.

b. Policy Pathways

Data reporting on the system impacts of large load will be more complex than reporting projected load. The entities that need this data—utilities and state public utility commissions, regional transmission operators, FERC, and NERC, in particular—need to agree on the types of data critical to interconnection, transmission planning, reliability actions, and transmission and wholesale electricity rates. Based on the cases so far, these data should likely include: (1) specific equipment and operations that will fully "island" load tied to grid-connected generation; (2) information about the types of grid services that partially islanded load will likely continue to receive from the grid, if any, such as ancillary services and the types of services received; (3) information about the capacity that the load has proposed to disconnect from the grid, if it is co-locating and islanding; and (4) uniform, detailed information about each reliability disruption caused by large load, such as incidents when large load unexpectedly tripped offline due to voltage changes.

The information needed for setting transmission rates (which cover the costs of transmission expansion for large load) and wholesale electricity rates is complex. As shown by the Basin Electric case, to prove that large loads—specifically cryptocurrency—imposed more costs on the system, Basin Electric relied on assumptions about the mobility of crypto (as opposed to other large loads with what it then viewed as secure federal funding, such as grants for

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[351] *See* 184 FERC ¶ 61,054, at P 13 (2023) (explaining that transmission providers conduct studies to determine the impacts of new generation on the grid, "network upgrades needed to reliably interconnect the generating facility," and the "customer's cost responsibility for these facilities"). The Order requires that new generators waiting to interconnect be "clustered" in the interconnection queue and studied together. The generators in the cluster then share network upgrade costs based on their "proportional impact" on the grid. *Id.* at P 453.

[352] *See supra* note 154 and accompanying text.

hydrogen electrolyzers).[353] Basin cited to scant employment needs and the ease of constructing crypto mining in any location with electricity, while crypto mining companies argued that local permitting hurdles and community benefits contracts with local governments made them less mobile.[354] Continued collection and compilation of actual information, such as information on permitting times, expenditures to accommodate new large load, and exit rates, by utilities, local governments, and state economic and employment agencies will support more accurate assessments. So, too, will regular reporting of this information to FERC and state public utility commissions at technical conferences addressing large load, or perhaps through a shared database.

For reliability disruption data, there are clear precedents to build from. NERC—the entity that regulates North American grid reliability under FERC's authority—maintains generator and transmission availability data systems, which already track outages in these spheres.[355] NERC should maintain a similar large load availability system to document all large load "trips" and similar reliability incidents. NERC likely needs to require large loads to install more sophisticated sensor technologies to enable this sort of reporting, as "few loads" currently have the types of measurement units necessary to allow "system operator[s] to analyze events after they occur."[356] A database of grid reliability threats posed by large load—enabled by better monitoring technologies and data reporting—will support stronger, much-needed reliability standards.

3. Modeling

Beyond collecting and disseminating better data on projected loads and the costs and benefits of loads on the system, using this data for improved modeling will be critical. Numerous grid operators, regulators, and grid users have stressed the need for better models that will help more realistically project load growth in the short and long term and identify actual system impacts of large loads over time, thus refining rate design and cost allocation among classes of customers.[357] The ability to simulate with confidence the complex behavior of new loads and generation is now essential not only to grid planning, but to the equitable resolution of disputes over the costs and benefits of expanding the grid.

Similar efforts beyond the large load context demonstrate the value of this type of modeling. For example, in 2024, California funded work on grid modeling software to speed up the assessment of the capacity of electricity

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[353] FERC Order Rejecting Proposed Rate, *supra* note 8, at 9–10.

[354] *Id*. at 7.

[355] NERC, *Generating Availability Data System*, https://perma.cc/7E5F-6SJK; NERC, *Transmission Availability Data System*, https://perma.cc/MAJ7-84Z9.

[356] NERC, Characteristics and Risks of Emerging Large Loads 15 (2025), https://perma.cc/V6EE-LS5Z.

[357] Commonwealth of Virginia State Corp. Comm'n, *supra* note 17, at 19, 81; Microsoft, *supra* note 133, at 1; FERC Transcript, *supra* note 1, at 35.

distribution circuits.[358] The aim was to better assess requests to host additional behind-the-meter solar photovoltaic (PV) installations without triggering costly grid upgrades. This information was made public so that PV developers could understand where to direct their efforts.

A parallel approach to modeling large load and the transmission system might reduce shot-in-the-dark interconnection requests and transmission queues for both generation and large loads, and also preemptively resolve some of the conflicts over what types of interconnections, and where, will trigger significant costs to existing customers. ARPA-E and the National Science Foundation have also supported the development of advanced transmission grid modeling software being tested by Southwest Power Pool (SPP), which can reduce time required to model certain interconnection impacts from over a month to less than one week.[359]

B. Incentivizing Demand Response and Streamlining Generation Capacity and Interconnection Regulation to Address Scarcity

Policies for improved data collection, dissemination, and modeling will be critical to a new large load governance regime that is currently highly uncertain, piecemeal, and in need of adaptation as lessons are learned. But substantive policies will be equally critical to address the core technical and governance challenges explored in Part III—constraints that lead to inadequate transmission capacity, too few generator interconnections, and uncertain principles for regulating new large load interconnection.

The clearest answer to the challenge of large load lies in the simple dynamics of economic supply and demand—building more generation, or obtaining commitments from large load to rely on current generation capacity and reduce demand during peak periods.

Many large loads are seeking the former route—seeking out new generation—rather than committing to flexibility during peak demand periods. This suggests that mandates or strong incentives for flexibility are likely needed; indeed, some state large load tariffs are including these types of incentives,[360] and PJM is working to design payments for large load flexibility as part of its Critical Issue Fast Path initiative.[361]

As many large loads seek out new generation rather than connecting to the existing system and committing to curtail use during peak periods, coal-fired

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[358] Nat'l Renewable Energy Lab'y, Modeling Distributed Generation in California 2 (2024), https://perma.cc/8QMN-33ZA.

[359] Jeff St. John, *New Software Can Find More Room for Clean Energy on Transmission Grids*, Canary Media (Aug. 23, 2022), https://perma.cc/5XVK-LKVV.

[360] *See, e.g.*, Order Approving Unanimous Settlement Agreement, *supra* note 150, at 11–12 (creating a new interruptible demand response program through a Demand Response Generation Rider).

[361] Horger, PJM CIFP Package, *supra* note 344, at 5.

power plants that would have retired are now staying online to serve large load.[362] Some large loads are also taking existing capacity off the grid—or, in Exelon's and AEP's words—existing generators are fleeing to serve large load that uses and benefits them.[363] This new load—the wealthy data industry—is willing to pay more than other utilities that serve customers with limited resources, so this new load is winning out in markets.

Large load is also building its own new generation or paying utilities to build, but there is only so much new generation to go around. As experts in Virginia have observed, the sheer increase in demand is leading to higher customer rates, even if the costs of new large load are technically passed directly to that load.[364]

There are ready, though controversial, solutions to the problems of inadequate generation and transmission lines, and slow processes for connecting new generation to existing transmission lines. Some federal and state policies aim to increase the amount of transmission and generation available to meet growing demand. For transmission siting, Congress has increased some federal authority over siting,[365] but federal agencies have been slow to exercise this authority, and states continue to resist it.[366] And to hasten the construction of new generation, a limited number of states such as Michigan and New York have constrained local governments' authority to ban new solar or wind farms, but the majority of states still leave control in municipal hands.[367]

A growing mountain of proposed (and enacted) federal and state legislation, law review articles, and white papers have argued for these types of solutions to

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[362] Kearney & Gardner, *supra* note 10 (describing federal orders to delay retirements of coal-plants to support AI data centers); David Erickson, *Details Emerge on Coal-Fired, Electricity-Powered Data Centers*, Government Technology (Mar. 11, 2025), https://perma.cc/4SY7-UPQY (observing that "NorthWestern Energy has responded to an inquiry from Montana regulatory officials about its plan to supply enormous amounts of coal-fired electricity to two proposed data centers near Butte").

[363] Protest of Exelon and AEP, *supra* note 33, at 3.

[364] JLARC, *supra* note 9, at v–vi.

[365] *National Interest Electric Transmission Corridor Designation Process*, U.S. Dep't of Energy, https://perma.cc/Q4FN-XUVC.

[366] Klass et. al, *supra* note 7, at 1039–40.

[367] Mich. Pub. Act 233, § 231(1) (2023); N.Y. Pub. L. § 138; Anthony Lopez et al., *Impact of Siting Ordinances on Land Availability for Wind and Solar Development*, 8 Nature Energy 1034, 1034 (2023) ("Within the United States, most wind and solar ordinances reside at the county or township level."); Shawn Enterline & Andrew Valainis, Laws in Order 14 (2024), https://perma.cc/WV47-5NAR (noting that for all forms of energy siting, "[o]ur research found that 37 states (73%) give jurisdiction to set siting standards—either exclusively or conditionally—to local authorities"). We do not advocate here for full preemption. For alternatives, *see generally* Hannah Wiseman et al., *Renegotiating the Energy Transition*, 97 U. Colo. L. Rev. 635 (2026) (arguing for community benefits agreements that move renewable energy generation projects forward while more effectively addressing community concerns).

the regulatory bottleneck holding up the construction and interconnection of new grid capacity,[368] but solutions are very slow in coming.

Despite efforts to expand the transmission grid and enable the construction of more electricity generation capacity, massive amounts of new transmission capacity will not realistically be built quickly. Updated transmission interconnection standards are needed to enable interconnection of generation and large load, both grid-connected and islanded, with existing transmission lines and the new lines slowly being built. FERC has mandated revised generator interconnection procedures through Order No. 2023—requiring, for example, that grid operators consider new generation interconnection requests in clusters, rather than individually, and that operators ensure that generators in the queue are actually committed to building.[369] Commitments are measured through updated financial deposit requirements and evidence that generators actually have "site control" where they propose to build.[370] Even these requirements, though—implemented by grid operators such as PJM—are not adequately speeding up generator interconnection to meet looming demand.[371]

For improved generator interconnection beyond the types of steps mandated by Order No. 2023, ERCOT appears to have the most promising approach. ERCOT allows new generators to interconnect but grants the interconnection on the condition that it may need to be modified in the future if grid reliability issues emerge, such as too much congestion caused by new, additional electricity flowing through wires.[372] The grid operator that covers most of the U.S. Midwest—MISO—also proposed, and received FERC approval, "a streamlined pathway for a limited number of generation projects that are tied to urgent grid

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[368] *See, e.g.*, Klass & Wilson, *supra* note 207, at 1857–67; Klass et al., *supra* note 7, at 1022; Alexandra Klass, *The Electric Grid at a Crossroads: A Regional Approach to Siting*, 48 U.C. Davis L. Rev. 1895, 1900–01 (2015); U.S. Dep't of Energy, *Transmission Siting and Permitting Efforts*, https://perma.cc/GQ4X-9AAL; Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, § 40105, 135 Stat. 429 (2021) (providing somewhat more federal authority for some interstate transmission line siting); Infrastructure Investment and Jobs Act § 40106 (providing financial support for interstate transmission line siting).

[369] 184 FERC ¶ 61,054 at P 6 (2023).

[370] *Id.*

[371] PJM, Energy Transition in PJM 2 (2023), https://perma.cc/M5UP-BZTU (a report showing multiple causes of insufficient capacity—including the need for more interconnection queue reform, supply chain issues, lower total capacity of intermittent renewables, and other impediments to new generation and its interconnection—and concluding that "[t]he projections in this study indicate that the current pace of new entry would be insufficient to keep up with expected retirements and demand growth by 2030"); *supra* notes 174–176 and accompanying text.

[372] William Driscoll, *Bringing ERCOT's Speedy Interconnection Process to the Rest of the U.S.*, PV Magazine (Sep. 5, 2023), https://perma.cc/2Z5V-8SJ7; ERCOT, Resource Interconnection Handbook 38 (Vers. 1.94 2023), (requiring proof, through testing, that generators will be able to curtail their electricity dispatched to the grid when instructed to do so); *id.* at 9 (summarizing the interconnection process).

needs."[373] PJM, too, has, instituted a one-time "Reliability Resource Initiative" to prioritize limited generation projects that will have much shorter interconnection study times.[374] From a climate perspective, though, this initiative falls short; most of the megawatts of capacity prioritized come from fossil fuels.[375] Other regional grid operators should follow aspects of these leads, finding ways to move generation more quickly through the interconnection queue while also considering pressing societal considerations such as climate risk.

Hastening generator interconnection to transmission is only half of the solution to large load governance. Grid operators and utilities must also develop uniform, predictable, and transparent processes to choose which loads may connect to the grid, while focusing on the impacts of load interconnections to *all* consumers. The following section explores policy pathways for improved large load interconnection.

C. Governing Large Load Interconnection, Transmission Rates, and Energy Rates

Beyond enhancing the availability of transmission and generation, and processes for connecting new generation to transmission, FERC and states must quickly update standards for connecting *load* with transmission and distribution wires. Indeed, the U.S. Department of Energy has directed FERC to develop such standards for federally-regulated wires.[376] These standards at the federal and state levels must address the many gray areas of large load—such as load co-located with grid-connected generation—which confound regulators as they address the impacts of load on the networked grid. This Part constructs proposed policy pathways for these issues.

1. Transmission Interconnection and Rates

Uniform interconnection standards for large loads, which create new costs and benefits for the grid and pose new reliability issues, are necessary in two realms: (1) states, for retail utilities receiving large load service requests, and (2) FERC, for transmission operators receiving requests from co-located large load or large load connecting directly to transmission under federal jurisdiction. FERC should likely take the lead in issuing interconnection standards to create a foundation from which states can build. Indeed, some experts have asserted that "Commission leadership is desperately needed" and that states are looking

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[373] Ka'lena Cueves, *In Our ERAS Era: MISO Launches Temporary Process to Accelerate Critical Power Projects*, MISO (Aug. 7, 2025), https://perma.cc/8SHN-XJR4.

[374] PJM, *PJM Chooses 51 Generation Resource Projects To Address Near-Term Electricity Demand Growth* (May 2, 2024), https://perma.cc/A9E7-R85D.

[375] *Id*. (showing mostly natural gas, and one coal resource prioritized).

[376] Secretary of Energy's Direction, *supra* note 22.

"to FERC for [its] leadership" on grid interconnection/disconnection and transmission rate issues.[377] The DOE's directive to FERC will likely push FERC toward a leadership position, although some states have already acted to address large load interconnection.[378]

In providing needed clarity for interconnection and offering guidance to states, FERC must first develop clear definitions of the major types of large load and the risks and benefits that it poses for a networked grid. Specifically, FERC must identify facilities that should classify themselves as large load to be included in a national database for the purposes of FERC-regulated transmission and capacity planning, and state-regulated utility planning. Large load should be defined by a minimum threshold quantity of electricity that can be drawn from generation. Further, FERC should define different large load "profiles"—meaning how and when these loads use electricity—to determine how they should be regulated when interconnecting, and to plan for needed transmission expansions if they are grid connected.

There are five (or more) primary ways in which large loads are receiving electricity from generators or the larger grid or both, and FERC should specify these categories and develop interconnection standards for them, which grid operators should then implement within their interconnection rules. PJM has suggested such categories in its response to FERC's show-cause order for just and reasonable co-located large load interconnection standards.[379]

We define these categories as including: (1) large loads that co-locate with existing generation, for which the generation disconnects from the grid; (2) large loads that co-locate with existing generation that remains grid-connected;

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[377] FERC Transcript, *supra* note 1, at 67 (Statement of Stacey Burbure, FERC and RTO Strategy and Policy, American Electric Power); *id.* at 155 (Statement of Sarah Moskowitz, Executive Director, Citizens Utility Board of Illinois, referring to issues associated with state-subsidized nuclear being pulled off grid to serve a single large load).

[378] *See infra* text accompanying notes 391–395.

[379] PJM defines different interconnection categories as "options," which include: (1) load connects to grid at a different point than the generation serving the load connects to the grid—similar to load receiving service from a utility; (2) grid-connected large load co-located with generation, where load is considered to be grid connected ("network load"), as is generation ("capacity resource" with obligations to provide power when called upon, and penalties for a failure to provide power); (3) grid-connected large load co-located with existing grid-connected generation (load treated as network load, which must pay for any power that it draws from the grid, as measured through behind-the-meter netting, which subtracts electricity used by load from electricity provided by co-located generator); (4) grid-connected large load co-located with generation, with physical protections to ensure that load does not draw electricity from the grid; (5) grid-connected large load co-located with generation, with physical protections to ensure that load does not draw electricity from the grid, but a promise of backup service from the PJM network if PJM gives permission; (6) grid-connected large load that chooses to be network load and "brings its own generation"); (7) grid-connected co-located large load that agrees to be curtailed in emergencies; and (8) grid-connected co-located load that agrees to participate in demand response (reducing demand during peak demand periods). Answer of PJM Interconnection LLC, Inc., *supra* note 177, at Exh. A.

(3) large loads that build their own, co-located generation that they also connect to the grid; and (4) large loads that build their own, co-located generation that is off grid. We define policy pathways for these categories below. The fifth category, which poses reliability and ratemaking issues but does not introduce new generation interconnection challenges, includes large loads that receive electricity from a utility (which in turn shares electricity on the networked grid).

> **1. Existing generation, wholly grid-disconnected:** Some large loads have co-located with existing generation facilities that currently provide electricity to the networked grid. It is conceivable that some large loads, which have deep pockets, will persuade generators to wholly disconnect from the grid and provide all electricity to the large co-located load. Here, FERC already has procedures. Grid operators, following FERC rules, receive deactivation notices from generators.[380] They assess whether the retirement of the generating unit will interrupt grid reliability. If it will, the grid operator may delay or prevent the unit from retiring.
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> These procedures for reviewing proposed grid disconnections typically apply to units that are retiring due to financial distress, such as coal-fired power plants now outcompeted by cheap natural gas, solar, and wind generation. But FERC will likely need to update rules to allow units that are retiring for greener financial pastures (higher payment from co-located large loads) to pay their way off of the grid. Just as new generation requesting new interconnection must pay for system upgrades necessary to accommodate the new generation and ensure reliability, units retiring to serve co-located large load should have the option to provide similar system upgrades to ensure ongoing reliability despite the unit's grid departure. Indeed, wealthy large loads are likely more than willing to pay these system upgrade costs if it gives them direct access to already-running generation.
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> **2. Existing co-located generation, partially grid-connected:** As we analyze in Part III in the Talen case, some large loads have co-located with existing, grid-connected generation, such as nuclear power plants, and have proposed to use just some of the generation for themselves. This means that the generation is reducing the flow of electricity to the shared grid. Rather than terminating its interconnection agreement with the grid operator, this generation must modify its interconnection agreement. This is the regulatory arrangement that requires the most regulatory work. FERC should identify and regulate several subcategories of this form of generation. We provide potential subcategories here:
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> *Retaining network services*: Large load co-located with generation that remains grid-connected may sometimes draw valuable services from that generation—services that flow from the larger grid. For example, if some of the capacity at the generating plant stopped working, and the load's back-up generators also failed, the load (through the connected generator) could draw additional electricity from the grid. And in the event of a large blackout and the need for black start—starting up all generating units at the same time, and re-starting the flow of power—this load would also benefit. Even if the load could rely on

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[380] *What Happens When and Owner Wants to Close Its Plant?*, PJM Inside Lines (July 11, 2019), https://perma.cc/H898-22SD.

its back-up generating units during a blackout, it would want to restore access to the co-located generating unit and the benefits that that unit receives from the larger grid. For this arrangement, FERC should provide a new uniform interconnection agreement procedure that specifies the network services that the large load (or the co-located generating unit) must pay for, thus ensuring that the large load or the generating unit cover their fair share for network services.

PJM's behind-the-meter-generation approach discussed in Part III, which simply measures the difference between large load's receipt of energy from the co-located generated and from the grid, seems sensible.[381]

Disclaiming network services: Large load co-located with grid-connected generation sometimes disclaims any network support. This was the case for the Talen-Amazon arrangement discussed in Part III. Amazon claimed that it drew *no* services from the grid to which Talen, the generator, was connected. Rather, Amazon had its own back-up generation and the capacity to island from the grid. Thus, in the event that the co-located generating unit went down, rather than drawing additional electricity from the grid, Amazon asserted that it supplied its own power. Other utilities disagreed, arguing that during a Talen outage, Amazon continued operating and did not rely wholly on back-up generation.[382] FERC should provide guidance for what "islanding" really means and should specify the types of equipment that large loads must install to prove that they can wholly disconnect from co-located generation and the grid.

PJM has proposed to prioritize these types of large loads in the interconnection queue, giving "Non-Capacity Backed Load"—load that does not rely on back-up generation capacity from the grid—priority status.[383]

3., 4. New co-located generation, wholly or partially grid-disconnected. Many of the same issues that we raise for existing generation apply to new generation built by large load—generation that either connects to the grid in a limited way (for back-up power or services) or is wholly off-grid. For new generation, FERC and grid operators should apply many of the same interconnection standards for limited-connection *existing* generation. The grid interconnection agreement between the grid operator and the co-located generator should include proof of physical equipment that allows islanding and means of measuring any back-up network services drawn from the grid, thus ensuring that the generator or its co-located large load pay for these grid services through transmission rates.

Grid operators will, as with the reduction of grid-provided electricity from generators, need to conduct system impact studies—in this case, due to the infusion of some new electricity into the grid and the use of some grid services. These system impact studies, and the interconnection of the new generation itself, should likely be expedited, as the new generation will infuse less electricity into the grid and use fewer grid services. This is because the bulk of electricity from the new generating plant will flow directly to the large load.

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[381] *Supra* notes 275–277.

[382] Protest of Exelon and AEP, *supra* note 33, at 7.

[383] Horger, *supra* note 284, at 5.

> For wholly off-grid, newly built generation, FERC may lack jurisdiction.[384] With no physical connection between the interstate transmission grid and the generating facility, there is no Federal Power Act transmission hook for jurisdiction.[385] This is also not a wholesale sale of electricity—there is no sale, followed by a re-sale.[386] Some states will still regulate this transaction, though. In Florida, when an industrial facility attempted to contract directly with co-located, off-grid generation, the Florida Public Service Commission designated the generation as a state-regulated "public utility," and the Florida Supreme Court agreed.[387] States should likely maintain a light regulatory touch here, given that large loads should be able to choose their own level of risk with respect to the reliability and price of off-grid co-located generation.

After defining large load for interconnection purposes, and clearly identifying the benefits and costs that it may cause based on its characteristics, FERC should develop a more uniform approach to large load interconnection processes. FERC is slowly moving in this direction with its 2025 "show cause" order to PJM. This order declares that PJM's open access transmission tariff as applied to the interconnection of co-located large loads "appears to be unjust, unreasonable, unduly discriminatory or preferential."[388] FERC indicates that its order "is initially focused on PJM, the nation's largest grid operator, because of the number of proceedings arising in PJM from co-location of generators with large load customers such as data centers."[389] This statement suggests that future proceedings may initiate more uniform load interconnection standards for other operators. But further progress is needed.

FERC—governing the interconnection of large load co-located with grid-connected generation—and states governing large load interconnections to utilities should follow the leads of states such as Texas and Utah. They should require that specific information be provided by each large load beyond the basic attributes noted above, such as the extent to which the load will be grid-interconnected.[390] As proposed in Part IV.A., one informational component should include a listing of all of the locations at which the load may locate, which will help avoid double counting. Interconnection standards should require information such as the peak capacity of the load, the capacity of back-up generation on

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[384] Some parties to FERC proceedings have even argued that FERC lacks jurisdiction over certain co-located large load that receives minimal services from the networked grid. *See* 190 FERC ¶ 61,115, *supra* note 246, at P 17–21.

[385] 16 U.S.C. § 824(b)(1) (in granting power to FERC—at that time the Federal Power Administration—providing "The provisions of this subchapter shall apply to the trans-mission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but except as provided in paragraph (2) shall not apply to any other sale of electric energy or deprive a State or State commission").

[386] *See id.*

[387] *See generally* PW Ventures, Inc. v. Nichols, 533 So.2d 281 (Fla. 1988).

[388] 190 FERC ¶ 61,115 at P 3.

[389] FERC, *FERC Orders Action on Co-Location Issues Related to Data Centers Running AI* (Feb. 20, 2025), https://perma.cc/7L97-APD4.

[390] Utah S.B. 132, *supra* note 150, at § 54-26-201; Texas S.B. 6, *supra* note 150, at § 2.

site and the associated ability of the load to "curtail" (reduce) demand during peak demand periods, the source of generation for the load (if there is a power purchase agreement with another generator, or co-location), and the technology to be installed to ensure grid reliability, such as voltage ride-through equipment that prevents the load from tripping during changes in grid voltage.

Based in part on the more detailed information on interconnecting load, interconnection standards must also determine how the order of service for large load will be established. This should include addressing requests in clusters and addressing the less speculative requests first, as is occurring in the generation queue context by prioritizing "build-ready" projects.[391] To speed up load interconnection queues, some states are already moving toward the cluster study approach for large load interconnection. For example, the large utility AEP Ohio has reached a Joint Stipulation and Recommendation agreement with the Ohio Public Utilities Commission in which the utility "will group [large load] customers from the queue into tranches based on the expected capacity increase associated with each regional [distribution line and generation capacity upgrade] project."[392] Under this approach, "AEP Ohio will make reasonable efforts to prioritize [large load] customers on a 'first come, first served' basis."[393] The AEP Ohio agreement also requires proof of site control. For a large load customer to sign a contract with and receive service from AEP Ohio, "the customer must designate a specific site at which its Data Center Project will be constructed" and "must own or have the exclusive right to use the land" for a data center.[394]

Texas, in a statewide move toward more uniform and transparent large load interconnection processes, now requires large loads (seventy-five megawatts or more) to disclose whether they are considering interconnecting at multiple sites.[395] This addresses the concern that a single load will be double

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[391] 184 FERC ¶ 61,054, 6 ("First, in order to implement a first-ready, first-served cluster study process, this final rule requires: (1) transmission providers to publicly post available information pertaining to generator interconnection; (2) transmission providers to use cluster studies as the interconnection study method; (3) transmission providers to allocate cluster study costs on a pro rata and per capita basis; (4) transmission providers to allocate network upgrade costs based on a proportional impact method; (5) interconnection customers to pay study and commercial readiness deposits as part of the cluster study process; (6) interconnection customers to demonstrate site control at the time of submission of the interconnection request; and (7) transmission providers to impose withdrawal penalties on interconnection customers for withdrawing from the interconnection queue, with certain exceptions. We also require transmission providers to adopt a transition process to move from the existing serial interconnection process to the new cluster study process.").

[392] Joint Stipulation and Recommendation, *In re* Application of Ohio Power Company for New Tariffs Related to Data Centers, No. 24-508-EL-ATA 8–9 (Pub. Util. Comm'n of Ohio 2024) https://perma.cc/9GWV-HYT2 [hereinafter "Ohio Power Company"] (showing minimum demand charges).

[393] *Id*. at 9.

[394] *Id*. at Exh. A, 7.

[395] Texas S.B. 6, *supra* note 150, at § 2 (c),(d).

counted in utilities' planning for new infrastructure. It also helps to avoid loads requesting interconnection at a site without committing to build there. Texas further increases the credibility of large load interconnection requests by requiring all large loads entering the queue to pay a flat $100,000 study fee, provide additional financial commitment, and demonstrate site control.[396]

Beyond ensuring that large loads proposing to interconnect at a specific location will in fact spur new generation and potentially transmission and distribution needs, the importance of information about these loads' back-up generation capacity is paramount during interconnection considerations. This information is critical for determining how flexible these loads can be by, for example, reducing or eliminating demand during peak demand periods and grid stress, and in *requiring* these loads to offer flexibility, as Texas appears to lean toward.[397]

Considered together, all of the information provided by large loads in the interconnection queue is critical to determine the services that this load should receive or provide to the grid, and how much it should pay—through rates—for new grid infrastructure and services that it will demand.

We explore rate-based issues in the following section.

2. Energy Rates: Wholesale and Retail

For the many large loads that seek electricity from utilities, new rate designs are essential to ensure that loads pay for the costs that they cause for utilities. As we explore in Part II, FERC regulates the wholesale rates for electricity (typically called "energy" rates) that generators and utilities charge when they sell electricity to other utilities. States regulate the rates that utilities charge when they supply retail electricity to customers, including large load customers. The changes needed in setting wholesale and retail rates are the same. FERC and state utility commissions must better quantify and define the benefits that large loads provide to the system and the costs that they impose on it. And large loads must shoulder these costs.

Two considerations are important here: first, rate design—how rates or other fees should be designed so that loads actually pay for the costs that they cause; and second, rate allocation—the extent to which large loads should pay higher rates as compared to other customer classes.

For rate design, large loads impose risks on utilities (and on generators that provide wholesale electricity to utilities). There are risks that the loads will make plans to build within a utility's territory and not follow through, or build but then quickly leave, with a trail of stranded costs discussed in Part II. Large loads also place higher administrative burdens on retail utilities and wholesale generators, requiring them to project short- and long-term loads in more detail;

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[396] *Id*. at § 2(f),(g).

[397] *Id*. at § 2(e).

plan for more generation, transmission, or distribution; and study and address impacts on the system as a whole. Additionally, utilities and generators must have better grid support services in the event of a sudden increase or decrease in demand from large loads, or sudden outages that affect system voltage.[398] These types of costs are to a large degree fixed and should be covered by fixed fees, not rates that vary by the quantity of electricity consumed.

The larger issue of overall rising demand causing higher customer prices—as in Virginia—is more difficult and cannot solely be solved through rate design. Rather, improved generation interconnection queues that allow cheaper, clean generation to come online more quickly, and building more regional and interregional transmission lines to give customers wider access to cheap pools of generation, will be essential.[399] (So, too, will ongoing improvements in data center energy efficiency and flexibility.[400])

Although rising demand is one driver of higher electricity rates for all customers, better rate design is an important first step to avoid passing large load costs to other customers. Many utilities are already employing a variety of fixed fees or non-traditional fees, as we briefly summarize and recommend in Table 1.[401] These examples were initially identified by LBNL's survey of Electricity Rate Designs for Large Loads, and we researched the tariffs and settlement agreements identified by LBNL. In Table 1 we include examples that we believe will best cover the costs imposed by large loads on utilities and generators serving utilities, and avoid passing these costs to other consumers.

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[398] SATCHWELL ET AL., *supra* note 9, at 2; FERC Transcript, *supra* note 1, at 72 (noting the potential for "instantaneous loss of load" and "instantaneous changes up and down the system").

[399] NAT'L RENEWABLE ENERGY LAB'Y, NATIONAL TRANSMISSION PLANNING STUDY EXECUTIVE SUMMARY, *supra* note 327, at 2 ("Approximately $1.60 to $1.80 is saved for every dollar spent on transmission.").

[400] *See* EPRI INITIATIVE, OPTIMIZE DATA CENTER OPERATIONAL FLEXIBILITY TO HELP STRENGTHEN THE GRID (2025); U.S. DEP'T OF ENERGY, RECOMMENDATIONS ON POWERING ARTIFICIAL INTELLIGENCE AND DATA CENTER INFRASTRUCTURE (2024); *see also* TYLER H. NORRIS, ET AL., RETHINKING LOAD GROWTH: ASSESSING THE POTENTIAL FOR INTEGRATION OF LARGE FLEXIBLE LOADS IN US POWER SYSTEMS 1–3 (2025), https://perma.cc/86MK-2GGP.

[401] "[U]tilities across several PJM jurisdictions have filed large load tariff revisions similar to those approved in Indiana that have either been accepted by state regulators or are pending regulatory approval. By the end of this year, it is likely that more than half of the PJM footprint (based on load), and the utilities with the largest current or expected concentration of data center load, will have stringent rules at the retail level governing new large load interconnection requests." BRIAN GEORGE, CRITICAL ISSUE FAST PATH - LARGE LOAD ADDITIONS, STAKEHOLDER COMMENTS 4, https://perma.cc/JVJ7-ZPAD.

Table 1: Examples of Retail Rates and Policies for Large Loads

Risk or benefit addressed	**Sample rate or policy**
Risks	
Stranded costs	Monthly demand charge: load must pay "minimum specified percentage" of "forecasted maximum demand" or of highest previous bill during eleven months.[402] Requirements that large loads directly pay for capacity through minimum charges ($/kilowatt consumed) or upfront payments.[403] Requirements that above a specific load threshold, utilities will purchase power, not build capacity.[404] Long-term energy supply contracts for large loads to avoid stranded costs (five to twenty years).[405] Exit fees—e.g., payment equaling three years of minimum charges previously paid by large loads.[406]
Demand exceeding projected load	Fee if usage exceeds contracted threshold.[407] Requirement for back-up power generation (for example, in the event that load exceeds contracted amount and threatens grid stability).[408]

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[402] Satchwell et al., *supra* note 9, at 4 (Indiana Michigan Power); Submission of Unopposed Settlement Agreement and Unopposed Motion for Acceptance of Out of Time Filing at 2, *In re* State of Indiana, Cause No. 46097 (Ind. Util. Regul. Comm'n Nov. 22, 2024) [hereinafter "Submission of Unopposed Settlement"]. *See also* Ohio Power Company, *supra* note 392, at 6, https://perma.cc/9GWV-HYT2 (showing minimum demand charges).

[403] Satchwell et al., *supra* note 9, at 6 (Indiana Michigan Power); Submission of Unopposed Settlement, *supra* note 402, at 2–3 (embedded capacity charges; Ohio Power—minimum charges; Montana-Dakota—upfront payments); *see also* Abraham Silverman et al., A State Playbook for Managing Data Center-Driven Load Growth 26 (2025), https://perma.cc/NJ8M-HHJR (recommending requiring "'bring your own' energy or capacity requirements).

[404] Satchwell et al., *supra* note 9, at 6 (Black Hills Energy); Jerrad Hammer, Black Hills Energy, Large Power Contract Service Rate Schedule LPCS (2024), https://perma.cc/4PJB-7A47.

[405] Satchwell et al, *supra* note 9, at 8 (Nevada Clean Energy Transition Tariff, 15-year term; Indiana Michigan Power 12-year term; Portland General Electric 5- to 20-year term).

[406] Satchwell et al., *supra* note 9, at 9 (Indiana Michigan Power).

[407] Ohio Power, under its Data Center Tariff settlement agreement, is allowed to "suspend service" if load "exceeds its contract capacity" by a certain amount. Satchwell et al., *supra* note 9, at 6; Ohio Power Company, *supra* note 392, at Schedule DCT, Exhibit MSM-1, p. 7. We recommend a fee instead, as suspension would seem to incentivize defection of large load from the network. This impact can likely be priced rather than wholly prohibited.

[408] Satchwell et al., *supra* note 99, at 7 (Black Hills Energy); Large Power Contract Service, *supra* note 404, at 1.

Risk or benefit addressed	**Sample rate or policy**
Bill non-payment if large load is financially distressed	Requirement that data centers prove minimum credit rating.[409] Requirement for deposit or performance guarantee letter—"large power."[410] Proof of collateral—industrial or data center loads.[411]
Planning costs for capacity, voltage support	Direct payment for "cost of full planning studies."[412]
Benefits	
Demand response to reduce peak demand	"High Density Contracted Demand Response Rate"—specific payments for reduced demand offered by large load.[413]

For wholesale ratemaking for generators and associations of generators that serve utilities, which in turn serve large load, FERC should follow these state examples. It must better specify the data that will justify higher rates for large loads. And it must also be more open to departures from traditional cost-of-service wholesale ratemaking, allowing mechanisms such as demand charges (regular charges to large loads regardless of the quantity of electricity consumed, to cover fixed costs caused by new large load). This will help ensure that large loads pay their fair share of costs and avoid shifting them to other customers.

A final critical consideration in large load governance is access to the governance process. This is important in light of equity concerns, including that large loads (among other factors) are contributing to rising costs for all consumers and could compromise overall grid reliability. The following section outlines key considerations for access to and participation in large load governance.

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[409] Satchwell et al., *supra* note 9, at 4 (Indiana Michigan); In the Matter of the Verified Petition of Indiana Michigan Power, at 5–6.

[410] Satchwell et al., *supra* note 9, at 5 (Black Hills Energy); Ohio Power Company, *supra* note 392, at 3.

[411] Satchwell et al., *supra* note 9, at 5 (Indiana Michigan Power and Ohio Power); In the Matter of the Verified Petition of Indiana Michigan Power, at 3; Ohio Power Company, *supra* note 392, at 6.

[412] Satchwell et al., *supra* note 9, at 5 (Indiana Michigan Power).

[413] *Id.* at 5 (Montana-Dakota Utilities); *see generally* Montana-Dakota Utilities Co., High Density Contracted Demand Response Rate 45, https://perma.cc/XV63-6NAR.

D. Enhancing Participatory Processes for Large Load Governance

A growing literature documents the importance of balancing the necessarily technocratic, engineering-based foundations of grid governance with deliberative, participatory features.[414] It would be costly to provide the general public with enough resources to fully understand and engage in complex debates about maintaining frequency and voltage in a grid of interconnected resources. But as we have highlighted, decisions about integrating large load into this technically complex grid are value-laden. They involve explicit or implicit assumptions about existing versus new users and their priority, about the societal value of different types of load—such as crypto mining versus hydrogen electrolyzers—and about the electricity consumers who should bear the cost of increasingly scarce capacity.

These types of values demand some degree of deliberative or participatory governance—a system in which members of the public have meaningful opportunities to discuss and debate, not merely comment on, these weighty decisions.[415] And this discussion must influence RTOs' and FERC's substantive governance decisions.

Debates about the adequacy of public participation in large load governance have already arisen and will expand. In the Talen Energy interconnection case, the utilities opposing Talen's proposal to expand its provision of electricity to large loads argued that PJM, in approving the interconnection, was adopting PJM guidance on co-located load.[416] This guidance emerged after a failed effort at PJM to develop consensus-driven, stakeholder principles for co-located load. And the guidance has never been finalized.[417] In other words, utility stakeholders argued that following engagement that resulted in conflict, PJM charted its own course and attempted to impose that course through interconnection agreements.

In the case involving higher proposed rates for utilities that serve crypto, Basin Energy, in contrast, argued that Basin Energy had wholly engaged its stakeholders, since Basin Energy is a cooperative governed by its own members. Basin and others arguing in favor of the rates asserted that nearly all of Basin's stakeholders agreed to the crypto mining and large load rates that FERC rejected.[418]

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[414] *See generally* Shelley Welton, *Grasping for Energy Democracy*, 116 Mich. L. Rev. 581 (2018); Shelley Welton & Joel Eisen, *Clean Energy Justice: Charting an Emerging Agenda*, 43 Harv. Envtl. L. Rev. 308 (2019). *See also* Krasniqi et al., Centering Electricity Affordability in the Utility Ratemaking Process 6–7 (2025), https://perma.cc/5P3V-66KC.

[415] Welton, *supra* note 414, at 584–85; Welton & Eisen, *supra* note 414, at 365–66.

[416] Protest of Exelon and AEP., *supra* note 33, at 20.

[417] *Id*.

[418] FERC Order Rejecting Proposed Rates, *supra* note 88, at 18.

FERC, regional operators, and state public utility and service commissions must consistently and extensively engage stakeholders in future proceedings. Although many public stakeholders will not have the technical knowledge necessary to engage in some of the conversations, these stakeholders will provide important understanding of the public's primary concerns, and the results sought by the public as large load increases. Decisionmakers must deploy the types of participatory tools that extend beyond the "inform-defend" model of engagement—holding focus groups, conducting surveys, "mapping" stakeholders to ensure that all important groups are invited to the process, and developing mechanisms for meaningful consideration of input, such as comment and response.[419] Technical planners and policymakers alone cannot effectively govern the massive issue of large load. The public will provide the essential results-oriented perspective that must guide and provide vision for the governance road ahead.

As it stands, entities who wish to participate in FERC proceedings must intervene, which is a complex and expensive process.[420] FERC's Office of Public Participation should continue to work to enhance participatory options.

E. Summary of Policy Suggestions

The solutions proposed here for addressing the impacts of large loads on electricity rates and grid reliability—better data and modeling, improved transmission construction and interconnection policy, new rate structures for large load, and enhanced public participation in large load governance—construct a broad foundation for more nuanced developments that must emerge. Table 2 summarizes some of the key components of this foundation.

Table 2: Governance Changes Needed to Address Large Load

Data collection, dissemination, and use	Develop centralized FERC database with large load interconnection requests, megawatts of load capacity, potential locations. Require unique identifier codes for each proposed large load facility inputted within centralized database. Model systemic impacts—see California approach to distributed generation.

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[419] *See generally* Sherry R. Arnstein, *A Ladder of Citizen Participation*, 35 J. Am. Inst. Planners 216 (1969).

[420] *How to Intervene*, FERC, https://perma.cc/7M9Y-QGSS.

Transmission expansion and improved large load interconnection	Implement a comprehensive suite of existing transmission grid expansion proposals (large load adds urgency). Develop a new federal interconnection standard for large loads and means of efficiently modifying this standard for different load configurations. Implement priority standards for the queue, such as elevating "build ready" requests to the front. States: Designate similar uniform interconnection standards for utilities receiving large load requests. Define behind-the meter and interconnected generation; enable and encourage onsite back-up generation and other services that reduce the need for grid services on already-congested grids. Define large loads and define different load profiles that necessitate different interconnection standards—co-located with existing generation that is partially grid-connected, co-located with existing generation wholly off-grid, or new co-location (grid connected or off grid). For partially grid-connected, specify technologies needed for islanding and proof of back-up power sufficiency.
Rate design and amounts	Use system impacts data to support separate energy and transmission rates for large load, incorporating negative impacts and grid services such as demand response. Implement innovative structures to directly cover differential costs of large load, such as fixed demand or exit fees (see Table 1). Encourage or mandate more flexible and efficient large load through demand response rates and other incentives or mandates.
Energy democracy	Include rate payers, members of environmental NGOs, and other non-expert stakeholders in technical information sessions and regulatory decisions; move toward notice-and-comment or other procedures that do not require formal intervention.

Changing U.S. energy governance to adapt to a rapidly changing grid is only the beginning of the large-load project. As digital firms rush to build new capacity and meet net-zero carbon commitments, empirical analysis of the systemic environmental impacts of large load growth and the impacts on rates shouldered by other customers is critical. So, too, is consideration of the potentially expansive justice-based implications if firms with low labor needs continue to move to localized, co-located generation and load independent of the transmission grid. The ability of some types of digital firms to build anywhere could introduce new burdens and benefits in far-flung communities.[421] But getting the energy governance right is a critical first step because the digital industry is building large loads now, impacting other consumers' rates and introducing some degree of chaos into an energy system accustomed to relatively flat growth. The physical growth of the grid will not pause as the governance system races to catch up.

Conclusion

It is not yet clear whether the U.S. AI industry powered by data centers will produce the globally transformative results and economic growth projected by some experts. Indeed, while AI promises new discoveries and efficiencies, some products have been underwhelming, as evidenced by generative AI's production of fake legal cases, which have made their way into court opinions.[422] Nor is it clear that large load will grow as expansively as it is projected to.[423] Yet as we have highlighted here—and grid operators and utilities have stated—substantial growth already has occurred, and is placing real pressures on the fragile network of the modern U.S. electric grid.

The era of large load—regardless of how big this load ultimately becomes—is upon us, and it raises numerous questions that demand further analysis. Should utilities' "duty to serve" all load continue, or, given the environmental and social impacts of building seemingly endless capacity, should we more directly debate the merits of different types of load? And given the limitations of the network and the digital industry's need for generation now, how far will grid defections proceed; are we truly returning to a 1900s-style localized grid? As digital companies build more co-located natural gas generation, are commitments to net-zero energy eroding?

Large load opens up a Pandora's Box, but also opportunity. As grid operators have observed, the digital industry, with seemingly unlimited wealth, could lead the grid toward the places that many policymakers hope it will go—toward cleaner energy interconnected by long-distance transmission lines that improve reliability.[424] Yet without better governance, large load could also steer us toward darker places.

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[421] *See supra* notes 31, 218–219, 106 and accompanying text.

[422] *See* Shahid v. Esaam, 376 Ga. App. 145, 146 (Ga. Ct. App. 2025); Joe Patrice, *Trial Court Decides Case Based on AI-Hallucinated Caselaw,* ABOVE THE LAW (July 1, 2025), https://perma.cc/K3NA-YFSU (discussing *Shahid*)*; see also* SUPREME COURT OF THE UNITED STATES, 2023 YEAR-END REPORT ON THE FEDERAL JUDICIARY 5–6 (2023) https://perma.cc/9G5U-RLBW (noting lawyers' submission of hallucinated cases in briefs).

[423] *See* GREG MANDELMAN, LOAD FORECASTING FOR LARGE LOADS 4, (June 3, 2025), https://perma.cc/UF7L-4LXD (noting the "overall level of uncertainty" of data center load forecasts).

[424] FERC Transcript, *supra* note 1, at 9 (statement of FERC Chairman Phillips observing that "these companies [data centers] could well anchor the development of the very energy

We have focused on the electricity governance aspects of large load here given grid regulators' immediate mandate to accommodate this load—and the lag so far in the emergence of guiding principles. But we hope that future literature will continue to explore the many questions that we leave untouched here. In this new electric era dominated by large, wealthy digital customers and other populous classes of customers concerned about rising energy costs, we must get this governance right. Better large load governance will enable an industry that many deem essential to ongoing U.S. global competitiveness while mitigating adverse effects on the interconnected grid essential to millions of customers.

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infrastructure that our nation so sorely needs" and that "[i]n recent months, we've also seen proposals to unretire or restart several nuclear plants to mobilize the development of nuclear facilities, to commercialize small, modular reactors, to develop utility scale renewable energy resources, to build new gas plants, even to extend the plant life of existing fossil facilities").