Meeting Forecasted Growth in Electricity Demand

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About Analysis Group

Analysis Group is one of the largest private economics consulting firms, with over 1,500 professionals across 15 offices in North America, Europe, and Asia. Since 1981, Analysis Group has provided expertise in economics, finance, analytics, strategy, and policy analysis to top law firms, Fortune Global 500 companies, government agencies, and other clients. The firm's energy and climate practice area is distinguished by its expertise in economics, finance, market modeling and analysis, economic and environmental regulation, analysis and policy, and infrastructure development. Analysis Group's consultants have worked for a wide variety of clients, including energy suppliers, energy consumers, utilities, regulatory commissions, other federal and state agencies, tribal governments, power system operators, foundations, financial institutions, start-up companies, and others.

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I. Executive Summary

The White House, Department of Energy (DOE), and Environmental Protection Agency (EPA) have issued executive orders, reports, and proposed regulations stating or implying that emergency action is needed for power system reliability as a result of current factors driving an increase in the demand for electricity and a changing supply mix. These actions include reversing energy and environmental policies established over time, including steps taken recently by the Biden Administration, as well as issuing orders under emergency authorities. In this report, we review the key factors driving current and forecasted electricity demand (e.g., data centers, electrification, industrial growth, etc.), and technologies and practices used to mitigate and manage demand growth and shifts in electric generation. We also review existing market and regulatory structures designed and administered to meet the needs of a changing energy system over time. We summarize these factors of supply and demand and industry regulatory structures, and use them to test the current administration's premise that emergency actions are needed to maintain power system reliability. We also evaluate the potential drawbacks of taking the proposed actions from consumer cost, economic efficiency, climate, and environmental perspectives.

There is no "energy emergency." Forecasted conditions of supply and demand in the electric industry are not out of line with historical experience. Existing wholesale markets and resource planning processes are well suited to ensure that demand growth is met through a strong supply (and demand) response. While the industry is changing, a careful review of the underlying drivers of demand and supply suggests the administration's declarations and regulatory actions are unwarranted, for at least the following reasons:

- Forecasts of growth in demand reflect current expectations around growth in large loads (data centers) and growth due to electrification of the vehicle and building sectors, as a result of both customer choice and policy drivers. Yet there remains a significant degree of uncertainty around the pace of growth in these areas, the ultimate magnitude of demand that will materialize, and the impact of price-responsive demand at wholesale and retail levels. Further, the history of electricity demand forecasts demonstrates that forecasting tends to be conservative – that is, electricity demand forecasts typically overstate expected future demand growth.

- The actual level of expected growth in demand – inclusive of large load and electrification expectations – is high relative to the past decade, which was characterized by significant demand modification from increasing efficiency, demand response, and economic factors. Yet while the expected growth in demand is higher than in the immediate past, it is well within actual demand growth rates that the industry has reliably met for many decades.

The expected growth rate in total energy consumption and winter and summer peak demand over the next ten years remains lower than that experienced on multiple occasions over the past several decades.

- The actual level of demand growth that will materialize will be mitigated by several factors, including at least the following:
  - Tightening reserve margins and increasing costs not only spur investment in supply (see below), it necessarily results in an increase in price-responsive demand, through (a) consumer response to increasing prices, (b) an increase in demand response activated in wholesale electricity markets, and (c) an increase in demand response programs administered by regulated utilities, municipal light companies, and electric cooperatives.
  - Active, ongoing efforts at the state level are focused on fundamental changes to rate designs to empower consumers to actively manage energy budgets through, e.g., timing their vehicle charging and other electric end use activities to increase use in low cost, low load hours and decrease consumption during peak periods.
  - Continued declines in the cost of distributed generation and other "virtual power plant" technologies and strategies will moderate the net load on the bulk power system.
  - Increases in efficiency of operations at large load facilities and a plateauing of demand in the industry will likely flatten demand relative to levels assumed in the more aggressive forecasts of demand from these sources. Similarly, electrification of the vehicle and building sectors has been, and is likely to continue to be, coming at a pace slower than anticipated.

- Regardless of the actual level of demand growth that materializes, there is evidence that the supply response will be sufficient, for at least the following reasons:
  - Levels of growth in capacity – net of retirements – has occurred in the past at rates more than adequate to meet the rates built into current forecasts of electricity demand growth.
  - Continued rapid declines in the cost of major grid connected solar, wind, and storage resources is prompting strong investment and development interest in these resources in all regions; increasingly, the reliability contribution value of variable renewable resources will be supported through the significant amount of battery storage capacity planned for development and/or sponsored through state policies.

  - The amount of development interest expressed through projects included in interconnection queues is vast relative to expected demand, and Federal Energy Regulatory Commission (FERC), other policymakers, Regional Transmission Organizations (RTO), and industry stakeholders are all actively pursuing improvements in interconnection processes to reduce barriers to entry and the time to development.
  - A significant and potentially growing portion of data center and other large load projects in planning or under development incorporate co-location of new, incremental generation capacity, and policymakers are actively considering how to allow for data center growth while ensuring continued reliable system operations and fair allocation of costs to the developing entities.
  - There is a healthy pipeline for major transmission investment to access more distant resources, increase the output and capacity value of such resources, and improve the reliability of the bulk power system on an interstate and interregional bases. Policymakers are increasingly planning for and pursuing transmission investment for reliability, economic, and resource/policy reasons.

- Technological change, rapid growth in demand, changing sources of supply, and adaptation to new policies that affect power sector investment and operation are nothing new in the electric industry. A century of developed federal and state policies, and electric company and RTO planning and operational practices and procedures has ensured reliable system operations on a continuous basis throughout periods of rapid changes in supply and demand, major overhauls of industry structure and regulation, and constantly changing drivers of demand and sources of supply.

Finally, the executive and agency actions all have one thing in common: a deep blind spot to the very real consumer, economic efficiency, public health, and climate impacts of the "command and control" actions they propose to address the alleged energy emergency. The actions proposed by the administration are neither appropriate nor necessary.

II. Introduction and Background

A. Summary of Federal Regulatory Landscape

Over the past several years, the United States energy sector has experienced shifts in the drivers of supply and demand. Forecasts of electricity demand are beginning to incorporate the potential impact of growth in data centers and AI, and efforts to electrify the transportation and building sectors. Simultaneously, supply dynamics are beginning to reflect declining costs of new solar, wind and energy storage resources, state policies to support low/no-carbon generation, and growth in the development of interstate transmission capability.

Under President Biden, the federal government established carbon dioxide and other emission reduction requirements and supported a transition to a lower-carbon economy through legislation and agency rulemakings focused on power plant emissions and investment in new energy infrastructure. In contrast, the current Trump administration has initiated or proposed changes in energy and environmental policy citing an "energy emergency," emphasizing postulated declines in reliability and increased reliance on fossil fuels, while creating roadblocks for the development of renewable energy resources and energy storage. This section summarizes some of the key federal energy and environmental regulatory and policy actions undertaken over the past two administrations.

1. President Biden-Era Agency Regulations

Between 2021 and 2025, the Biden administration implemented legislation and a range of environmental policies and regulations aimed at accelerating the transition to low/zero-carbon energy, reducing fossil fuel emissions, and strengthening air quality protections. Key measures include:

- **Carbon Standards for Fossil Fuel Power Plants (2024)**: EPA issued greenhouse gas performance standards for new and existing fossil fuel-powered plants, targeting reductions in CO_2 emissions through phased adoption of cleaner technologies.[1] This rule was established with the goal of reducing greenhouse gas emissions and protecting public health.[2] Within the regulations, EPA highlighted the flexibility built into the structure of the

[1] "Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants," EPA, available at https://www.epa.gov/stationary-sources-air-pollution/greenhouse-gas-standards-and-guidelines-fossil-fuel-fired-power.
[2] "Biden-Harris Administration Finalizes Suite of Standards to Reduce Pollution from Fossil Fuel-Fired Power Plants," EPA, April 25, 2024, available at https://www.epa.gov/newsreleases/biden-harris-administration-finalizes-suite-standards-reduce-pollution-fossil-fuel; "New Source Performance Standards for Greenhouse Gas Emissions From New, Modified,

rules, and the rules focus on ensuring reliable, affordable electricity.[3] Key provisions of the carbon standards include the following forward-looking requirements on emitting facilities:

- **New natural gas plants**: The emission standards for natural gas plants vary by usage. Base load turbines (operating at least 40% capacity) are required to implement efficient design measures and to achieve 90% capture of CO_2 by 2032. Lower capacity factor units face less stringent standards.
- **Existing coal plants**: Emissions limits are based on retirement schedules. Units retiring by 2032 are exempt, while units that do not commit to retire before 2039 are required to achieve 90% capture of CO_2 by 2032.

- **Mercury and Air Toxics Standards (MATS) Amendments (2024):** The Biden EPA also introduced changes to the existing MATS that tightened the emissions standard for toxic metals and mercury for coal-fired power plants.[4] The original MATS were established under the Clean Air Act in 2012, with the goal of reducing emissions of mercury and other hazardous air pollutants from coal and oil-fired power plants.[5] In issuing the rule, EPA completed a power sector analysis indicating that the rule would result in little to no significant impacts on the power sector in terms of retail electricity prices or available power plant capacity.[6] Changes included the following measures:
  - The 2024 revision reduces allowable filterable particulate matter – a proxy for toxic metals – by two-thirds for existing coal units.
  - Standards for lignite-fired coal units were aligned with other coal units by tightening their mercury limits by 70%.

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and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule," Federal Register, May 9, 2024, available at https://www.federalregister.gov/documents/2024/05/09/2024-09233/new-source-performance-standards-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed.

[3] "Fact Sheet: Carbon Pollution Standards for Fossil Fuel-Fired Power Plants," EPA, available at https://www.epa.gov/system/files/documents/2024-04/cps-111-fact-sheet-overview.pdf.

[4] "Mercury and Air Toxics Standards (MATS) for Coal-Fired Power Plants," EPA, April 25, 2024, available at https://www.epa.gov/system/files/documents/2024-04/presentation_mats_final-2024-4-24-2024.pdf.

[5] "Biden-Harris Administration Finalizes Suite of Standards to Reduce Pollution from Fossil Fuel-Fired Power Plants," EPA, April 25, 2024, available at https://www.epa.gov/newsreleases/biden-harris-administration-finalizes-suite-standards-reduce-pollution-fossil-fuel.

[6] "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review," Federal Register, May 7, 2024, available at https://www.federalregister.gov/documents/2024/05/07/2024-09148/national-emission-standards-for-hazardous-air-pollutants-coal--and-oil-fired-electric-utility-steam.

  - Monitoring and compliance requirements for coal- and oil- fired units were expanded through mandatory continuous emissions monitoring systems.[7]

- **Good Neighbor Plan (2023):** Under the Clean Air Act's interstate pollution provisions, EPA promulgated a Federal Implementation Plan (FIP) to curb ozone-forming nitrogen oxide emissions from 23 upwind states.[8] The purpose and status of the Good Neighbor Plan is as follows:
  - The plan targeted nitrogen oxide emissions from power plants and industrial sources, projecting a reduction of about 70,000 tons by 2026 and a 50% cut from 2021 levels by 2027.[9]
  - Multiple states challenged the FIP in 2023, resulting in partial stays.[10]
  - In June 2024, the U.S. Supreme Court issued a nationwide stay, temporarily halting enforcement of the plan across all 23 states pending the outcome of ongoing proceedings.[11]

- **Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA):** In 2021 and 2022, President Biden signed into law the IIJA and the IRA, respectively. Together, these laws represented historic federal investments in clean energy, transmission, Electric Vehicle (EV) infrastructure, and climate resilience. Specifically:
  - The IRA was established in 2022 for the purpose of supporting a clean energy economy, supporting American workers, and reducing pollution. The main funding

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[7] "Fact Sheet: EPA's Final Rule to Strengthen and Update the Mercury and Air Toxics Standards for Power Plants," EPA, available at https://www.epa.gov/system/files/documents/2024-04/fact-sheet_mats-rtr-final_rule_2024.pdf;"National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review," Federal Register, May 7, 2024, available at https://www.federalregister.gov/documents/2024/05/07/2024-09148/national-emission-standards-for-hazardous-air-pollutants-coal--and-oil-fired-electric-utility-steam.

[8] "Federal 'Good Neighbor Plan' for the 2015 Ozone National Ambient Air Quality Standards," Federal Register, June 5, 2023, available at https://www.federalregister.gov/documents/2023/06/05/2023-05744/federal-good-neighbor-plan-for-the-2015-ozone-national-ambient-air-quality-standards.

[9] "EPA Announces Final 'Good Neighbor' Plan to Cut Harmful Smog, Protecting Health of Millions from Power Plant, Industrial Air Pollution," EPA, March 15, 2023, available at https://www.epa.gov/newsreleases/epa-announces-final-good-neighbor-plan-cut-harmful-smog-protecting-health-millions.

[10] "Good Neighbor Plan for 2015 Ozone NAAQS," EPA, available at https://www.epa.gov/Cross-State-Air-Pollution/good-neighbor-plan-2015-ozone-naaqs.

[11] "Good Neighbor Plan for 2015 Ozone NAAQS," EPA, available at https://www.epa.gov/Cross-State-Air-Pollution/good-neighbor-plan-2015-ozone-naaqs.

mechanisms provided by the IRA were tax credits, grants, and loans. This funding was slated to provide $370 billion in investments.[12]

- The IIJA was enacted in 2021 with the goal of improving American infrastructure. This act addressed the energy sector by supporting grid modernization, clean energy technology, energy efficiency, and workforce development. The act was set to provide almost $60 billion for energy specific investments.[13]

The Biden Administration also took steps to accelerate the development of electric infrastructure and interconnection of resources to the grid. FERC issued several major orders to improve infrastructure development processes and timelines, including Order 2023 regarding generator interconnection, Order 1920 regarding transmission planning and cost allocation, and Order 1977 regarding siting and permitting of transmission projects subject to FERC authority.[14] DOE, in addition to administering transmission financing and funding programs authorized by the IIJA and IRA, established the Coordinated Interagency Transmission Authorizations and Permits Program to streamline federal approvals of transmission projects, started the process of identifying National Interest Electric Transmission Corridors, created new categorical exclusions to support upgrades of existing transmission lines and co-location of projects, and published a number of reports regarding transmission needs and opportunities for further accelerating interconnection processes.[15]

[12] "Building a Clean Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action," Version 2, The White House, January 2023, available at https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Guidebook.pdf, at pp. 5-6.

[13] "Building a Better America: A Guidebook to the Bipartisan Infrastructure Law for State, Local, Tribal, and Territorial Governments, and other Partners," The White House, May 2022, available at https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/05/BUILDING-A-BETTER-AMERICA-V2.pdf, at pp. 5-7, 150-152.

[14] "FERC Affirms Generator Interconnection Rule, Acts on Compliance Filings," FERC, March 21, 2024, available at https://www.ferc.gov/news-events/news/ferc-affirms-generator-interconnection-rule-acts-compliance-filings; "FERC Takes on Long-Term Planning with Historic Transmission Rule," FERC, May 13, 2024, available at https://www.ferc.gov/news-events/news/ferc-takes-long-term-planning-historic-transmission-rule; "FERC Unanimously Approves Backstop Transmission Siting Procedures," FERC, May 13, 2024, available at https://www.ferc.gov/news-events/news/ferc-unanimously-approves-backstop-transmission-siting-procedures.

[15] "Biden-Harris Administration Announces Final Transmission Permitting Rule and Latest Investments to Accelerate the Build Out of a Resilient, Reliable, Modernized Electric Grid," DOE, April 25, 2024 available at https://www.energy.gov/articles/biden-harris-administration-announces-final-transmission-permitting-rule-and-latest; "Biden-Harris Administration Announces Three High-Priority Areas Advancing in National Interest Electric Transmission Corridor Designation Process," DOE, December 16, 2024, available at https://www.energy.gov/gdo/articles/biden-harris-administration-announces-three-high-priority-areas-advancing-national; "National Environmental Policy Act Implementing Procedures," DOE, April 30, 2024, available at https://www.federalregister.gov/documents/2024/04/30/2024-09186/national-environmental-policy-act-implementing-procedures; "National Transmission Planning Study," DOE, 2024, available at https://www.energy.gov/gdo/national-transmission-planning-study; "National Transmission Needs Study," DOE, October 2023, available at https://www.energy.gov/sites/default/files/2023-12/National%20Transmission%20Needs%20Study%20-%20Final_2023.12.1.pdf.

2. Current Administration Executive Orders and Agency Actions

On January 20, 2025, the Trump administration declared a "national energy emergency" under the National Emergencies Act. In this emergency order, the administration states that "the energy and critical minerals ('energy') identification, leasing, development, production, transportation, refining, and generation capacity of the United States are all far too inadequate to meet our Nation's needs." The order proceeds to direct federal agencies to use any lawful emergency authorities available to them to expedite domestic energy production and mineral processing.[16]

On the same day, the administration also issued the "Unleashing American Energy" executive order, which encourages the exploration and production of energy on federal lands and requires the review of existing agency actions, identifying and rolling back those that hinder development of domestic energy.[17] This order also revoked 12 executive orders from the Biden administration and paused the disbursement of funds from the Inflation Reduction Act and Infrastructure Investment and Jobs Act.[18]

On June 17, 2025, EPA announced the following two regulatory actions:

- **Repeal of Carbon Standards for Fossil Fuel Power Plants (2025)**: The proposed repeal of the fossil fuel power plant standards included elimination of specific standards focused on reducing carbon emissions due to alleged impacts of the standards on electricity affordability and reliability.[19] Specifically:
  - The proposed rule would eliminate 2015 and 2024 rules for emissions standards.

[16] This order specifically excludes many renewable energy sources by defining "energy" as "crude oil, natural gas, lease condensates, natural gas liquids, refined petroleum products, uranium, coal, biofuels, geothermal heat, the kinetic movement of flowing water, and critical minerals." As a result, renewable energy projects, such as wind and solar, are not eligible for expedited treatment, despite their potential to contribute significantly to energy supply in the declared "energy emergency." *See* "Declaring a National Energy Emergency," The White House, January 20, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/01/declaring-a-national-energy-emergency/.

[17] "Unleashing American Energy," The White House, January 20, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/.

[18] The delay in disbursement of funds from the IRA and IIJA has since been un-paused by a federal judge on April 15, 2025. However, there have been significant delays in projects and hesitancy in beginning projects due to the uncertain landscape. Lawrence, R. G., "Judge Unfreezes Billion in IRA, IIJA Funds," Industry Dive, April 16, 2025, available at https://www.smartcitiesdive.com/news/judge-unfreezes-billions-trump-ira-iija-funds/745545/; Johnson, Lamar, "IRA Funding Freeze Has Put 'Many' Clean Energy Projects on Pause," Utility Dive, March 7, 2025, available at https://www.utilitydive.com/news/ira-funding-freeze-caused-clean-energy-projects-to-pause/741945/.

[19] "Repeal of Greenhouse Gas Emissions Standards for Fossil Fuel-Fired Electric Generating Units," EPA, June 17, 2025, available at https://www.federalregister.gov/documents/2025/06/17/2025-10991/repeal-of-greenhouse-gas-emissions-standards-for-fossil-fuel-fired-electric-generating-units.

- The proposed rule would require new evidence demonstrating that targeted emissions from fossil fuel power plants contribute to dangerous air pollution before regulations can be implemented.
- The proposed rule includes an alternative repeal option that would remove only the most stringent carbon capture and storage requirements for existing coal plants and new base load gas turbines.
- The explanation for the rule, provided by EPA, is that the existing rule is "overreaching and an attempt to shut down affordable and reliable electricity generation."[20]
- According to EPA's Regulatory Impact Analysis, repealing the standards is estimated to reduce compliance costs by $19 billion over twenty years but is projected to increase health-related costs from ozone and particulate matter pollution by $130 billion over that same time period.[21]

▪ **Repeal of Certain Amendments to MATS (2025)**: EPA's proposed MATS repeal would in effect reverse the increased stringency promulgated during the Biden Administration on the basis of alleged regulatory uncertainty and higher control costs.[22] Specifically:

- This proposed rule would revert MATS back to 2012 standards.
- The proposal argues that the MATS rule "has caused significant regulatory uncertainty, especially for coal plants" and that these costs are large and unnecessary.

▪ The proposal would repeal strengthened filterable particulate matter emissions standards for coal-fired electric generating units (EGUs), strengthened mercury standards for lignite fired EGUs and requirements for continuous emissions monitoring systems.[23]

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[20] "EPA Proposes Repeal of Biden-Harris EPA Regulations for Power Plants, Which, If Finalized, Would Save Americans More than a Billion Dollars a Year," EPA, June 11, 2025, available at https://www.epa.gov/newsreleases/epa-proposes-repeal-biden-harris-epa-regulations-power-plants-which-if-finalized-would.

[21] These values are assuming a 3% discount rate. "Regulatory Impact Analysis for the Proposed Repeal of Greenhouse Gas Emissions Standards for Fossil Fuel Fired Electric Generating Units," EPA, June 2025, available at https://www.epa.gov/system/files/documents/2025-06/utilities_ria_proposal_111_repeal_2025-06.pdf, at pp. 1-2, 4-8.

[22] "EPA Proposes Repeal of Biden-Harris EPA Regulations for Power Plants, Which, If Finalized, Would Save Americans More than a Billion Dollars a Year," EPA, June 11, 2025, available at https://www.epa.gov/newsreleases/epa-proposes-repeal-biden-harris-epa-regulations-power-plants-which-if-finalized-would.

[23] "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units," EPA, June 17, 2025, available at https://www.federalregister.gov/documents/2025/06/17/2025-10992/national-emission-standards-for-hazardous-air-pollutants-coal--and-oil-fired-electric-utility-steam.

- According to EPA's Regulatory Impact Analysis, this proposed repeal is estimated to reduce compliance costs by $1 billion dollars while increasing harmful mercury emissions by 9,500 pounds between 2028 and 2037.[24]

Further, the reconciliation bill, Public Law No. 119-21, signed into law on July 4, 2025, includes provisions that significantly impact the energy industry, particularly by rolling back key initiatives from the IRA and IIJA.[25]

- **Public Law No. 119-21 (2025):** This sweeping legislation aims to reduce energy costs by expanding domestic fossil-fuel production and reversing what it calls "Biden's war on American energy."[26]
  - The law eliminates funding and policy support for a wide range of pollution reduction activities.[27]
  - Permitting and regulatory requirements for oil, gas, and coal development are relaxed while financial incentives for fossil fuel extraction are enhanced.[28]
  - Clean energy investment incentives, including production and investment tax credits are phased out or made more restrictive, limiting long-term deployment of wind, solar, and storage projects.[29]
  - Energy efficiency credits are terminated.[30]

Additional executive orders and actions of the current administration include, but are not limited to:

[24] "Regulatory Impact Analysis for the Proposed Repeal of Amendments to National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Steam Generating Units," EPA, June 2025, available at https://www.epa.gov/system/files/documents/2025-06/ria-for-mats-rtr-repeal-proposal.pdf, at pp. 3-10.
[25] Cavanaugh, J. et al., "Assessing the Energy Impacts of the One Big Beautiful Bill Act," Center on Global Energy Policy at Columbia, July 14, 2025, available at https://www.energypolicy.columbia.edu/assessing-the-energy-impacts-of-the-one-big-beautiful-bill-act/; "Assessing Impacts of the 'One Big Beautiful Bill Act' on U.S. Energy Costs, Jobs, Health, and Emissions," Energy Innovation, available at https://energyinnovation.org/wp-content/uploads/Impacts-Of-The-One-Big-Beautiful-Bill-On-U.S.-Energy-Costs-Jobs-Health-And-Emissions_FINAL.pdf.
[26] "Energy Dominance," The White House, available at https://www.whitehouse.gov/issues/american-energy-dominance/. "President Trump's One Big Beautiful Bill is Now the Law," The White House, July 4, 2025, available at https://www.whitehouse.gov/articles/2025/07/president-trumps-one-big-beautiful-bill-is-now-the-law/.
[27] Title VI, H.R. 1, 119th Congress (2025), Public Law No. 119-21.
[28] Title V, H.R. 1, 119th Congress (2025), Public Law No. 119-21.
[29] Title VII, Chapter 5, H.R. 1, 119th Congress (2025), Public Law No. 119-21.
[30] Title VII, Chapter 5, H.R. 1, 119th Congress (2025), Public Law No. 119-21.

- **Halt on Wind Development:** Temporary moratorium on all new or renewed offshore wind energy leasing across the U.S. Outer Continental Shelf and a pause on permitting of offshore wind projects.[31]
- **Tightening of Renewable Permitting:** The Department of the Interior (DOI) announced an end to "preferential treatment towards unreliable energy sources like wind," imposing stricter permitting requirements and revoking incentives for renewable development, making it harder and costlier to advance wind and solar projects on public lands.[32]
- **Attempts to Preempt State Policies:** Order directing the U.S. Attorney General to identify and challenge state and local laws the administration deems unconstitutional or preempted by federal law.[33]
- **Coal Protections:** Classification of coal as a mineral, development of coal reserves on public land, prioritization of coal leasing, and review of regulations and policies that hinder coal development.[34]
- **MATS Extension:** Delay of the compliance deadline for MATS by two years, for certain facilities.[35]
- **Review of Coal Ash Rules:** In March, EPA announced its review of coal ash regulations, prioritizing state ownership over regulation implementation.[36] In July, EPA announced a

[31] "Temporary Withdrawal of All Areas on the Outer continental Shelf from Offshore Wind Leasing and Review of the Federal Government's Leasing and Permitting Practices for Wind Projects," The White House, January 20, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/01/temporary-withdrawal-of-all-areas-on-the-outer-continental-shelf-from-offshore-wind-leasing-and-review-of-the-federal-governments-leasing-and-permitting-practices-for-wind-projects/.
[32] "SO 3437 – Ending Preferential Treatment for Unreliable, Foreign Controlled Energy Sources in Department Decision-Making," DOI, July 29, 2025, available at https://www.doi.gov/document-library/secretary-order/so-3437-ending-preferential-treatment-unreliable-foreign.
[33] "Protecting American Energy from State Overreach," The White House, April 8, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/04/protecting-american-energy-from-state-overreach/.
[34] "Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241," The White House, April 8, 2024, available at https://www.whitehouse.gov/presidential-actions/2025/04/reinvigorating-americas-beautiful-clean-coal-industry-and-amending-executive-order-14241/.
[35] "Regulatory Relief for Certain Stationary Sources to Promote American Energy," The White House, April 8, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/04/rregulatory-relief-for-certain-stationary-sources-to-promote-american-energy/. The specific list of exempted were provided in a July version of the executive order. *See* "Regulatory Relief for Certain Stationary Sources to Further Promote American Energy," The White House, July 17, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/07/regulatory-relief-for-certain-stationary-sources-to-further-promote-american-energy/.
[36] "EPA Announces Swift Actions on Coal Ash Program (Coal Combustion Residuals)," EPA, March 12, 2025, available at https://www.epa.gov/newsreleases/epa-announces-swift-actions-coal-ash-program-coal-combustion-residuals.

rule and proposal to extend the compliance deadlines for coal ash management requirements.[37]

- **Elimination of Federal Clean Energy Subsidies:** Order aiming to tighten rules from Public Law No. 119-21 in order to eliminate federal subsidies and incentives for wind and solar, deemed unreliable and foreign-controlled.[38]
- **Federal Power Act 202(c) Orders:** DOE blocked the retirement of a coal plant in Michigan and an oil and gas plant in Pennsylvania using emergency powers.[39]

Among these executive orders and regulatory actions, there have been common themes related to domestic fossil fuel production, grid reliability, and national economic security. Notably, these orders frame energy policy in urgent, alarmist terms, portraying the current state of U.S. energy capacity as an imminent crisis. For example, two separate Executive Orders note:

> "The policies of the previous administration have driven our Nation into a national emergency, where a precariously inadequate and intermittent energy supply, and an increasingly unreliable grid, require swift and decisive action."[40]

> "We must encourage and support our Nation's coal industry to increase our energy supply, lower electricity costs, stabilize our grid, create high paying jobs, support burgeoning industries, and assist our allies."[41]

In response to Executive Order 14262 "Strengthening the Reliability and Security of the United States Electric Grid," DOE released a Resource Adequacy Report in July of 2025. This report reinforces the administration's narrative of an unreliable grid and inadequate energy supply, emphasizing the "national energy emergency." The report evaluates resource adequacy under

[37] "EPA Announces Next Set of Actions for Coal Ash Program," EPA, July 17, 2025, available at https://www.epa.gov/newsreleases/epa-announces-next-set-actions-coal-ash-program.
[38] "Ending Market Distorting Subsidies for Unreliable, Foreign Controlled Energy Sources," The White House, July 7, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/07/ending-market-distorting-subsidies-for-unreliable-foreign%E2%80%91controlled-energy-sources/.
[39] Dabbs, B., "Coal Plant Ordered to Stay Open Cost $29M to Run in 5 Weeks," EnergyWire, August 1, 2025, available at https://subscriber.politicopro.com/article/eenews/2025/08/01/coal-plant-ordered-to-stay-open-cost-29m-to-run-in-5-weeks-00487542; "DOE Orders Pennsylvania Power Plant to Delay Closure," EnergyWire, June 2, 2025, available at https://www.eenews.net/articles/doe-orders-pennsylvania-power-plant-to-delay-closure/.
[40] "Declaring a National Energy Emergency," The White House, January 20, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/01/declaring-a-national-energy-emergency/.
[41] "Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241," The White House, April 8, 2024, available at https://www.whitehouse.gov/presidential-actions/2025/04/reinvigorating-americas-beautiful-clean-coal-industry-and-amending-executive-order-14241/.

various scenarios, concluding that the planned retirement of coal plants will jeopardize the grid's ability to meet system demand, particularly in the context of projected AI and datacenter growth.[42]

B. Current State of the Electric Industry

The Trump administration executive orders and proposed regulations claim expected changes in electricity demand and supply factors necessitate emergency action to ensure power system reliability. Specifically, the administration argues "increasing demand for data processing; cryptocurrency, and AI capabilities; electrification of heavy industry; and continued economic and population growth" will result in substantial growth in electricity demand.[43] To meet this rising demand, the administration is prioritizing the development of oil, natural gas, coal, hydropower, biofuels, critical mineral, and nuclear energy resources.[44] It places a particular emphasis on the "reinvigoration" of coal, describing it as critical to meeting demand.[45] The administration claims an "energy emergency" that should be addressed through, among other things, the repeal of air pollution standards for greenhouse gases and other pollutants to incentivize further fossil fuel development and production. While contrary to the stated need to meet rising demand, the administration also is taking steps to *reduce* energy and capacity contributions from various other resources (i.e., solar and wind).

The electric industry will change in the coming decades with the evolution of new supply sources, demand management techniques, and demand growth due to the new influence of electrification and large industrial loads. Yet the nature and pace of that change and the timing and magnitude of its impact on the industry is far from clear at this time. Growing interest among states and individuals to reduce carbon emissions and air pollution from electricity generation has led to new policies and technological advancements focused on electrifying transportation and heating – sectors that have historically relied on fossil fuels. In tandem, the growing commercialization of AI and corresponding electricity-intensive data centers will likely accelerate overall demand trends.

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[42] These conclusions are inconsistent with DOE's April 2024 report, which noted the increase in demand but also noted "relying solely on additional fossil fuel resources as the default option to meet reliability needs is risky." "The Future of Resource Adequacy," DOE, April 2024, available at https://www.energy.gov/sites/default/files/2024-04/2024%20The%20Future%20of%20Resource%20Adequacy%20Report.pdf.

[43] "The Economic Benefits of Unleashing American Energy, The Council of Economic Advisers," The White Paper, July 2025, available at https://www.whitehouse.gov/wp-content/uploads/2025/03/The-Economic-Benefits-of-Unleashing-American-Energy.pdf, at p. 3.

[44] "Unleashing American Energy," The White House, January 20, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/.

[45] "Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241," The White House, April 8, 2025, available at https://www.whitehouse.gov/presidential-actions/2025/04/reinvigorating-americas-beautiful-clean-coal-industry-and-amending-executive-order-14241/.

While electricity demand may grow faster in the coming years than it has over the past decade, the key question is whether investment and development interest, technological change, competitive market incentives and utility planning and development processes are sufficient to address the growth to come. Of note, the range of forecasted demand growth is not out of line with historical periods of demand growth that the industry has reliably and efficiently managed through competitive markets, regulatory structures, and timely supply response.[46]

[46] As discussed further in Section III, peak demand is expected to grow 1.5-2% annually over the next decade, which is on par with average annual peak demand growth over the last 30 years.

III. Forecasting Electric System Changes

A. Introduction

As described in Section II, the current administration's bases for regulatory action and executive orders are rooted in fairly dramatic depictions of electricity affordability and reliability. Yet to date most of these bases for action are tied to declarative statements, without supporting assessments of the future evolution of supply and demand, or the adequacy of traditional industry and regulatory structures designed to guide such change. Is there a real reliability challenge or not? Will the expected growth in demand due to data centers materialize as expected, and if so, where and at what pace? To the extent such demand materializes will it be partly addressed through co-location of or dedicated contracting for new generating capacity? What will be the pace and locational features of demand growth associated with electrification of the transportation and building sectors over time? How do the various conflicting forecasts of demand growth over the next ten years compare with historical growth in electricity demand? Is there any reason to believe resource planning at vertically integrated utilities and/or competitive wholesale market incentives are inadequate to address future demand growth? And what are the potential cost, economic, climate, and public health impacts associated with the proposed shifting of course in energy policy?

In this report, we review the underlying historical and forecast data to answer these questions. We evaluate what current data and analytics say about the future of electricity supply and demand, evaluate the various technologies and flexible demand response approaches that could be marshalled to mitigate peak demand growth, and assess the adequacy of the market and regulatory structures that have guided the evolution of the electric industry for many decades.

In this section, we first review current forecasts of electricity demand in light of traditional economic growth factors, the evolution of energy efficiency and demand response, the varied expectations for growth due to data centers, and the range of policies in some states that will influence the pace and extent of electrification in the vehicle and building sectors. We evaluate these expectations relative to historical electric industry growth trends, and the emergence of technologies and practices to moderate growth in peak demand and annual energy consumption.

We then review factors related to the evolution of power supply in the near and intermediate term, including the rapid growth in energy production from grid-connected and distributed solar and wind resources, the growth in development of battery storage in key locations, the emergence of efforts to accelerate review of resource development projects in interconnection queues, and the likely co-location of incremental generating resources with large data centers and other industrial loads. We then compare expectations of supply and demand in the industry against the backdrop of historical data on efforts to ensure resource adequacy.

B. Electricity Demand Growth

1. Introduction

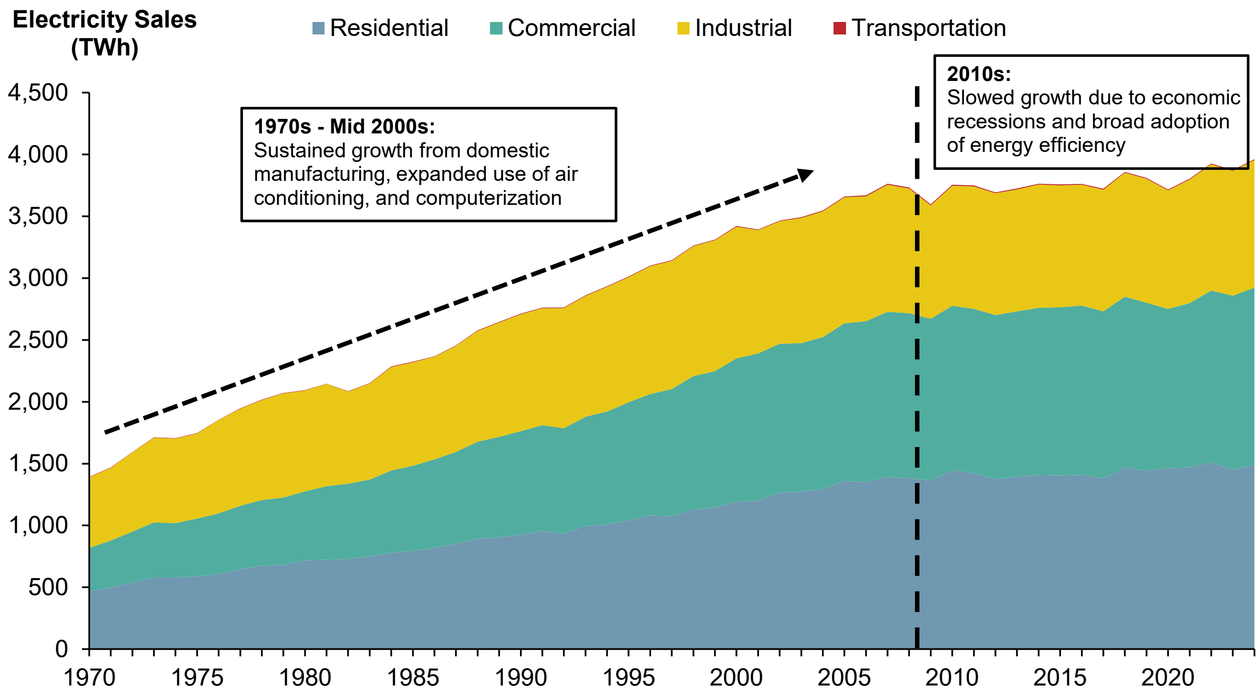
Key factors in forecasts of electricity demand growth include the technical evolution and uptake of electricity consuming technologies, demographic and economic factors, and increasingly the degree to which energy efficiency and demand response moderate growth in peak demand and total energy consumption. However, in recent years, two new factors have emerged as important considerations in the forecasting of electricity demand. First, technological change, declining costs, and consumer choice, along with laws and policies in many states to mitigate the risks of climate change, are spurring electrification of the transportation and building sectors, and to some extent other industries. To the extent this trend continues in the coming decades, demand for energy will increase over time as more and more consumers and businesses adopt electric vehicles for transportation and heat pumps for heating and air conditioning.

Second, recent plans for growth in major industrial load sources (such as data centers from the growing adoption of artificial intelligence) – to the extent they do not include co-located or dedicated energy supply sources – could have incremental impacts on electricity demand over time. While growth in demand due to each of these factors is only just beginning, it is important to consider over the planning horizon (e.g., next ten years) whether and to what extent these factors could meaningfully add to forecasted growth based on technological, demographic, and economic factors.

2. Historical Growth in Electricity Demand

Over the past 50 years, the growth in US electricity demand has varied based on economic changes, shifting end uses across industries, and the adoption of energy efficiency. **Figure 1** and **Figure 2** below illustrate similar historical patterns for U.S. electricity consumption by sector, and peak hourly summer and winter demand. Consistent growth from the 1970s through the early 2000s was driven by the increased use of air conditioning across sectors, significant growth in manufacturing and other industries with significant electricity needs, and technological innovation and computerization.[47] Demand growth slowed in the 2010s as energy efficiency was adopted broadly and the domestic economy shifted away from energy-intensive manufacturing.[48]

Figure 1: U.S. Electricity Sales by End-Use Customer Sector[49]



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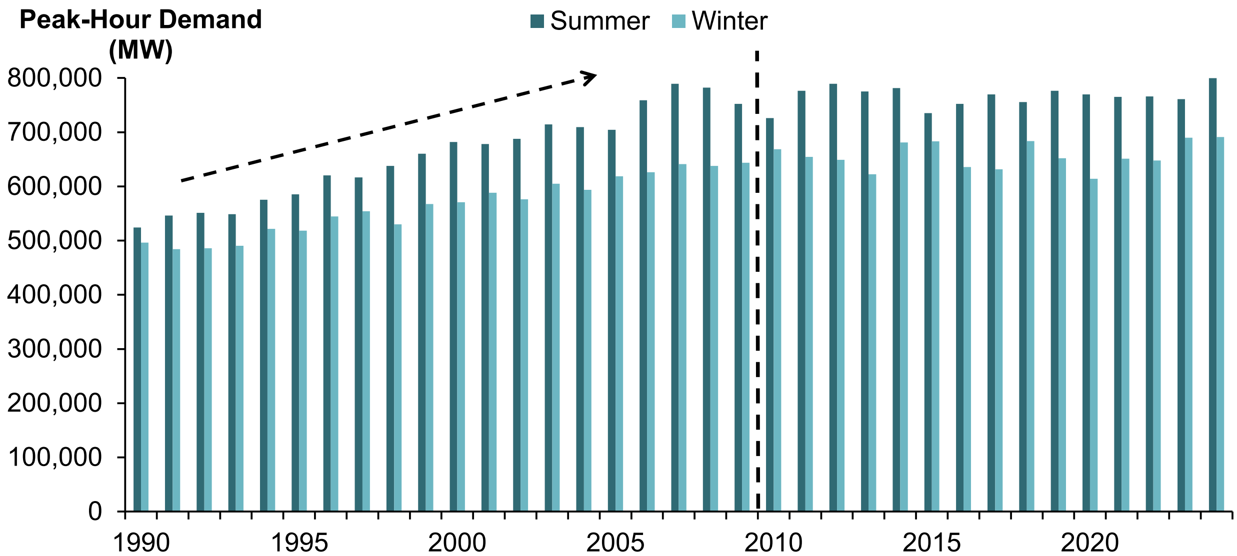
[47] Historical electricity demand growth prior to the early 2000s was largely driven by economic and population growth, along with rising adoption of electric technologies such as air conditions and computers. According to the DOE, demand increased by as much as 30% during that period, before leveling off due to improved energy efficiency and a decline in domestic manufacturing. *See* "Clean Energy Resources to Meet Data Center Electricity Demand," DOE, available at https://www.energy.gov/gdo/clean-energy-resources-meet-data-center-electricity-demand.

[48] For nearly two decades, U.S. electricity consumption remained flat, as demand growth from population and economic expansion was offset by energy efficiency gains and structural shifts in the economy. "After More Than a Decade of Little Change, U.S. Electricity Consumption is Rising Again," U.S. Energy Information Administration (EIA), May 13, 2025, available at https://www.eia.gov/todayinenergy/detail.php?id=65264.

[49] Electricity Sales data are sourced from EIA's Monthly Energy Review and are originally reported in trillion BTUs, converted to TWh for consistency. "Annual Energy Review - Table 2.1a Energy Consumption: Residential, Commercial, and Industrial Sectors," EIA, available at https://www.eia.gov/totalenergy/data/browser/index.php?tbl=T02.01A#/?f=M; "Annual Energy Review – Table 2.1b Energy Consumption: Transportation Sector, Total End-Use Sectors, and Electric Power Sector," EIA, available at https://www.eia.gov/totalenergy/data/browser/index.php?tbl=T02.01B#/?f=M; "Per Capita Residential Electricity Sales in the U.S. Have Fallen Since 2010," EIA, 2017, available at https://www.eia.gov/todayinenergy/detail.php?id=32212; "Clean Energy Resources to Meet Data Center Electricity Demand," DOE, available at https://www.energy.gov/gdo/clean-energy-resources-meet-data-center-electricity-demand.

Figure 2: U.S. Peak Summer and Winter Demand[50]



3. Electrification and Data Center Growth Considerations

As noted earlier, the two most significant new drivers of electricity demand growth are vehicle and building electrification and data center growth. Recent trends in electrification have been driven by technological change, consumer choice, and federal and state policy initiatives that focus on electrification of the transportation and building sectors alongside decarbonization of the power sector to reduce carbon emissions economy-wide.

However, the pace of growth in electrification of the vehicle and building sectors has been measured, and is expected to be less significant than data center demand growth, at least in the near term.[51,52] Moreover, the proposed phase out of tax credits and incentives in the

[50] **Figure 2** displays seasonal peak-hour demand summed across all U.S. North American Electric Reliability Corporation (NERC) regions. In some years, U.S. NERC regions overlap with Mexican and Canadian regions. "Electricity Supply & Demand," NERC, December 2024, available at https://www.nerc.com/pa/RAPA/ESD/Pages/default.aspx, at tab "Peak Hour Demand-Seasonal" ("NERC 2024 LTRA Backup").

[51] NERC's LTRA present reliability risks and resource adequacy projections over a 10-year period. This horizon reflects industry-submitted planning data, and acknowledged that "forecasts cannot precisely predict the future" and "represent the expected midpoint of possible future outcomes." "2024 Long-Term Reliability Assessment," NERC, December 2024, available at https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_Long%20Term%20Reliability%20Assessment_2024.pdf ("NERC 2024 LTRA"), at pp. 5, 6. In contrast, EIA's Annual Energy Outlook (AEO) presents projections to 2040, but those are typically based on assumed long-run growth rates and policy conditions held constant beyond the near term. "Annual Energy Outlook 2025," EIA, April 15, 2025, available at https://www.eia.gov/outlooks/aeo/.

[52] Muratori, M. and A. Yip, "Projecting Electric Vehicle Electricity Demands and Charging Loads," NREL, available at https://docs.nrel.gov/docs/fy24osti/89775.pdf, p. 7.

administration's Public Law No. 119-21 presents potential drags on the market penetration rate of electrification technologies and, thus, their impact on electricity demand growth.[53]

Thus the impact on electricity demand associated with growth of data centers has already emerged, and is expected to be more significant than the impact of electrification over the coming decade. To ensure continued advancements in artificial intelligence, companies rely on large data centers with continuous electricity supply to support training, deployment, and refinement of large language models (LLMs), and corresponding system cooling needs. Data center load profiles (i.e., hourly electricity demand during a day) are currently uniform as training[54] is run throughout the day, but these profiles could shift away from training towards more standard daily patterns as customer queries increase and cooling systems expand.[55] LLMs are expected to continue to require more electricity as they evolve and expand into more applications, but the magnitude of this growth is far from certain. For example, a Lawrence Berkeley National Laboratory (LBNL) study in coordination with DOE estimates a very large range of uncertainty in potential growth in data center demand, from 176 TWh in 2023 to between 325 and 580 TWh in 2028.[56]

With these uncertainties, national electricity demand forecasts demonstrate considerable variation in expectations for the impact of electrification and data centers on electricity demand growth. Each forecast embeds different assumptions of demand-side drivers, such as electrification growth rates, data center load growth, and risk uncertainties. For example, analysis recently completed by the National Renewable Energy Lab (NREL) reflects a wide range of uncertainty around electrification growth assumptions,[57] while North American Electric Reliability Corporation

[53] Buckberg, E. and C. Cole, "Trump EV Policy Overhaul: What Will Happen to EV Adoption, Emissions, and the Fiscal Balance?" March 18, 2025, available at https://salatainstitute.harvard.edu/quantifying-trumps-impacts-on-ev-adoption/; McGuire, P., "Trump's Policy Bill Would Eliminate Home Efficiency Incentives," Maine Public, July 1, 2025, available at https://www.mainepublic.org/climate/2025-07-01/trumps-policy-bill-would-eliminate-home-efficiency-incentives.

[54] Currently, around 30% of AI's total energy footprint is tied to the training process, which involves processing vast datasets to enhance predictive capabilities and decision-making. "Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption," EPRI, May 28, 2024, available at https://www.epri.com/research/products/3002028905, at p. 15.

[55] "Data Centers and the Power System: A Primer," New England States Committee on Electricity, Spring 2024, available at https://nescoe.com/wp-content/uploads/2024/06/Data-Centers-Primer-Spring-2024.pdf, at pp. 3, 5, 30.

[56] Arman, S., et al., "2024 United States Date Center Energy Usage Report," Lawrence Berkeley National Laboratory (LBNL), 2024, available at https://doi.org/10.71468/P1WC7Q.

[57] The NREL study has two growth scenarios: Accelerated demand electrification case (ADE) and Long-Term Strategy of the US (LTS). In the ADE case, demand growth in demand is driven by aggressive electrification of end uses, including space and water heating, and deployment of electric vehicles. In contrast, the LTS case accounts for uncertainties for end-use decarbonization pathways, assumes greater energy efficiency. "Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035," National Renewable Energy Laboratory (NREL), 2022, available at https://www.nrel.gov/docs/fy22osti/81644.pdf ("NREL Study").

(NERC)[58] and the U.S. Energy Information Administration's (EIA) 2025 Annual Energy Outlook (AEO 2025)[59] forecasts reflect a narrower range of load growth, incorporating both data center demand growth and continued improvements in energy efficiency (see **Figure 3**).

4. Current Forecasts

Looking ahead, electricity demand is forecasted to grow more rapidly compared to the past decade. But importantly, the level of expected demand growth is well within historical patterns of growth in electricity demand. Primary growth drivers include further electrification of transportation and heating, continued innovation in AI, and reshoring of manufacturing. In addition, other large industrial loads, cryptocurrency mining, and continued demographic changes (e.g., population growth in Texas and Florida) will contribute to load growth. Current forecasts are more uncertain than in the recent past due primarily to uncertainty in forecasting the short and long-term demand impacts of electrification and data centers, alongside the uncertainty inherent in the more traditional drivers of demand.

Figure 3 illustrates the range of possibilities for growth in electricity consumption over the next 10 years. NERC estimates peak summer and winter demand to grow between 1.5% and 2% per year over the next 10 years, and total electricity consumption to grow from approximately 4,100 TWh in 2024 to approximately 5,300 TWh in 2034.[60] In comparison, EIA's AEO 2025 forecasts more moderate growth, with total electricity sales reaching approximately 4,500 TWh in 2034.[61] The NREL study modeled scenarios that span this range: the Long-Term Strategy of US (LTS) case projects slower demand growth similar to AEO's outlook, while the High Electrification Scenario (ADE) forecasts electricity consumption rising to approximately 6,000 TWh in 2034.[62] It is

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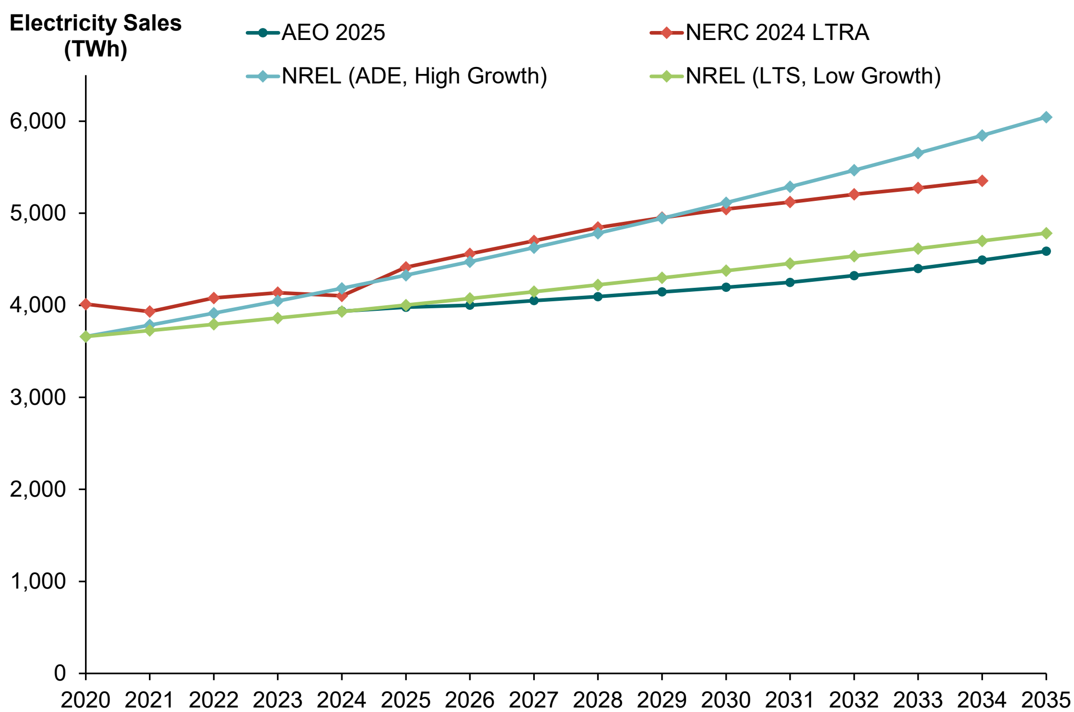
58 NERC's Long-Term Reliability Assessment projects net energy for load through 2034. However, its methodology has been criticized by market monitors for potentially overstating regional risks (e.g., in MISO). *See* "Statement on NERC's 2024 LTRA," NERC, June 17, 2025, available at https://www.nerc.com/news/Pages/Statement-on-NERC%E2%80%99s-2024-Long-Term-Reliability-Assessment.aspx; NERC 2024 LTRA.
59 EIA's 2025 Annual Energy Outlook (AEO 2025) forecasts energy consumption reflecting "business-as-usual trends, given known technological and demographic trends and current laws and regulations, and so provides a policy-neutral reference case and an accompanying set of core side cases that can be used to analyze policy initiatives." "Annual Energy Outlook 2025," EIA, April 15, 2025, available at https://www.eia.gov/outlooks/aeo/. As such, AEO 2025 accounts for commercial computing in electricity consumption, including computation from data center servers. "Electricity use for commercial computing could surpass space cooling, ventilation," EIA, June 25, 2025, available at https://www.eia.gov/todayinenergy/detail.php?id=65564,
60 NERC defines peak demand as the expected demand during average peak weather conditions, incorporating the "assumed forecast economic activity at the time of submittal". In **Figure 3**, we use NERC's net energy for load forecasts to represent electricity consumption. NERC 2024 LTRA Backup; NERC 2024 LTRA.
61 EIA's AEO 2025 defines electricity consumption as total retail sales of electricity to ultimate end-use customers. "Table 2. Energy Consumption by Sector and Source," EIA AEO 2025 Reference case, available at https://www.eia.gov/outlooks/aeo/data/browser/#/?id=2-AEO2025&sourcekey=0.
62 NREL Study.

important to note that these levels of expected growth are (i) based upon a base of declining demand growth over the past decade, and (ii) not out of line with historical growth in electricity demand that the industry has reliably absorbed for many decades in both competitive wholesale market and regulated utility planning contexts. For example, average annual growth in energy consumption in the 1990s was 2.3%, compared to 1.3% expected over the coming decade. Similarly strong growth (relative to current forecasts) was experienced in other decades over the past half century. See **Figure 10** and **Figure 11**.

Figure 3: Comparison of U.S. Electricity Consumption Forecasts[63]



The uncertainty in the pace and location of electricity demand growth is accentuated by the level of uncertainty in the impact of data center and electrification growth. Historically, electricity demand forecasts tend to overestimate projected growth relative to realized demand growth over time. This may reflect a tendency to forecast "conservatively" – i.e., to over-forecast to ensure that markets and utility planning achieve resource growth sufficient to meet expected demand with a margin of

[63] The starting points and assumptions incorporated across forecasts differ significantly. The NREL study states that the "ADE trajectory assumes significant electricity demand growth (3.4%/year), and the LTS sensitivity trajectory is between AEO and ADE (1.8%/year)," and uses the AEO 2021's 2020 demand projection as a starting point. As such, we replicate this by exponentially interpolating values with the formula of Next Year Value = Current Year Value * (1+CAGR). NERC's forecast includes the U.S. region overlapping Mexico. NREL Study; EIA AEO 2025; NERC 2024 LTRA.

error. It may also at times reflect unexpected changes in underlying technological, demographic, or economic factors, including underestimation of improvements in energy efficiency, continued adoption of distributed generation, federal and state policy shifts, and technological innovation outpacing expectations. Nevertheless, this bias is real and persistent – in reviewing the past 20 years of EIA forecasts in their Annual Energy Outlook relative to realized electricity demand, EIA notes that total electricity sales "have historically been overestimated more than they were underestimated" with 71% of projections overestimated, and an average annual absolute percentage difference of 7.4% between forecasted demand and actual demand.[64] Looking at the most recent five years available, this overestimation is even higher, reaching 11.4%.[65] Some have recently suggested that there may be a similar tendency to over forecast the level of data center demand growth that will be actually realized.[66]

Finally, electricity demand drivers and corresponding growth have differed significantly by region, and the highly varied circumstances related to the drivers of future growth ensure this trend in geographic variation will continue. **Figure 4** below illustrates the highly varied regional factors anticipated to drive demand growth (e.g., little or no data center demand, but greater levels of electrification in the Northeast, population growth in the south (e.g. Texas and Florida), etc.). As **Figure 5** illustrates, Texas is anticipated to see the most significant growth over the next 10 years as the state grows in population and provides favorable conditions for data centers, while other regions are projected to grow at a slower rate.[67]

[64] "Annual Energy Outlook Retrospective Review", EIA, September 14, 2022, available at https://www.eia.gov/outlooks/aeo/retrospective/, at Table 1, Table 16,
[65] "Annual Energy Outlook Retrospective Review", EIA, September 14, 2022, available at https://www.eia.gov/outlooks/aeo/retrospective/, at Table 16.
[66] *See, e.g.*, Martucci, B., "A Fraction of Proposed Data Centers Will Get Built. Utilities are Wising Up," Utility Dive, May 15, 2025, available at https://www.utilitydive.com/news/a-fraction-of-proposed-data-centers-will-get-built-utilities-are-wising-up/748214/.
[67] ERCOT attributes Texas' projected load growth to "strong economic and population growth…as well as growth by large consumers such as data centers, industrial oil and gas production facilities, and cryptocurrency mining operations." Moreover, this level of growth is well above other regions. NERC's LTRA stated that "ERCOT's summer peak demand is forecast to increase by 4.6% per year from 2025 through 2029. In comparison, the five-year summer peak demand growth projection for the 2023 LTRA was 1.1%. This high growth level is driven by a large amount of newly contracted loads planned for interconnection during this period." "ERCOT Releases Capacity, Demand and Reserves Report; Planning Reserves Pressured as Texas Economy Grows," ERCOT, February 13, 2024, available at https://www.ercot.com/news/release/02132025-ercot-releases-capacity; NERC 2024 LTRA.

Figure 4: Primary Demand Drivers by NERC Region[68]

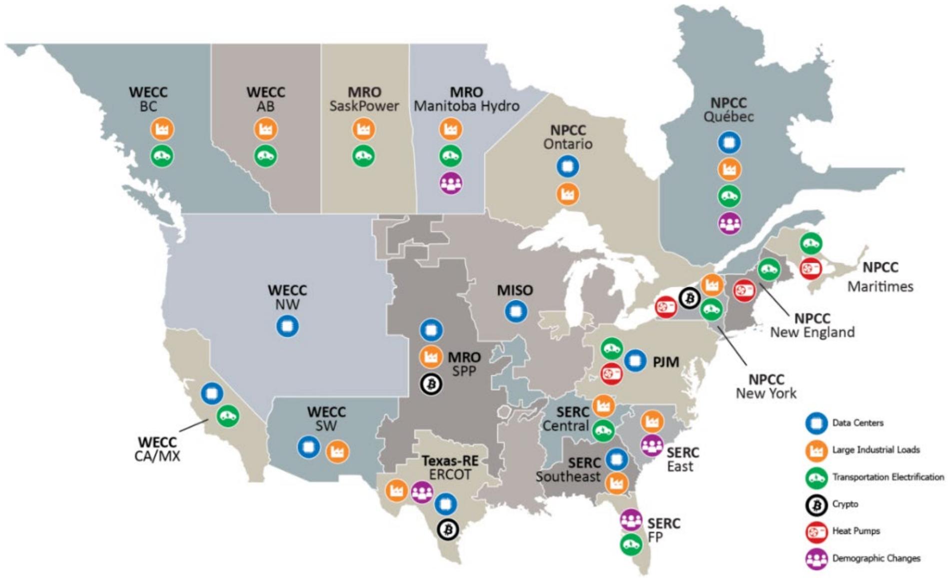
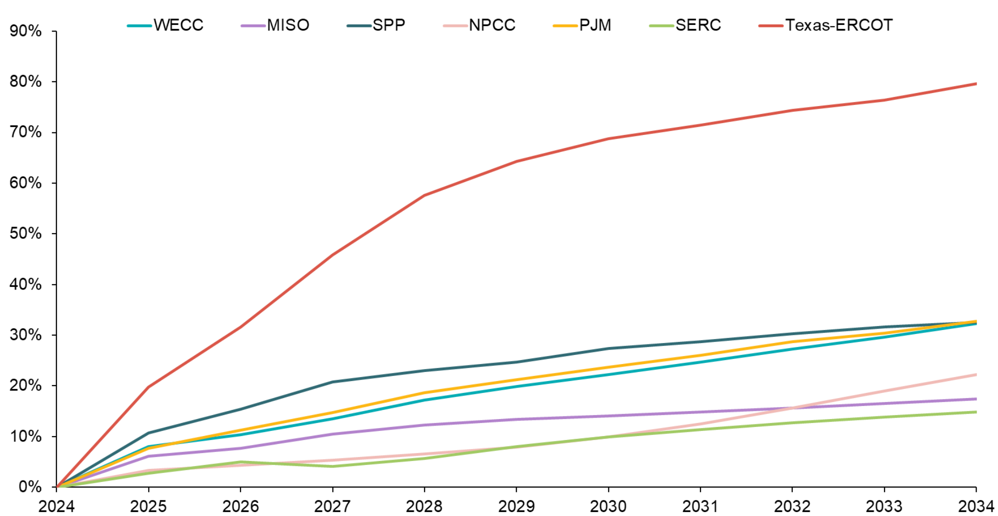


Figure 5: Projected Cumulative Electricity Consumption Growth by NERC Region[69]



[68] NERC 2024 LTRA, Figure 19, at p. 32.
[69] Electricity consumption is represented using Net Energy for Load, as defined by NERC. Projections include the U.S. region overlapping Mexico. NERC 2024 LTRA Backup.

5. Measures and Programs to Mitigate Demand Growth Impacts

Regulators and utilities continue to plan innovative and creative ways to incentivize new solutions to offset electrification demand increases and ensure reliability. This includes evaluation and implementation of rate design reforms aimed at managing the evolving challenges of increasing and shifting localized peak demands. As electrification and the proliferation of distributed energy resources (DERs) reshape load profiles, utilities are considering shifts away from traditional volumetric rates toward greater reliance on fixed and demand-based charges that more accurately reflect underlying cost drivers – namely, peak system usage, capacity constraints, and the need for local infrastructure investments.[70] Concurrently, investments into advanced metering infrastructure (AMI) will allow broader adoption of time-of-use (TOU) rate structures and enable consumers to better align electricity consumption with system conditions, particularly in relation to emerging electricity end uses such as vehicle charging, space heating, and cooling. In parallel, programmatic investments are expected to transition from generalized consumption-reduction energy efficiency initiatives toward more targeted efforts focused on mitigating localized peak demand growth, deferring capital-intensive infrastructure upgrades, and enhancing overall grid flexibility.

In short, while there has always been a strong rationale to move rate design towards more variable and demand-focused structures, with the onset of data center growth and electrification, states are now actually moving aggressively to adapt rate designs.[71] These adaptations are driven by two main factors: (1) the need to mitigate and reduce the overall level of investment needed in generation, transmission, and distribution infrastructure to reliably absorb increased penetration of data centers, electric vehicles, and heat pumps (thus lowering electricity costs overall); and (2) giving consumers a far greater level of control over their total energy budget, allowing them to align when they heat, cool, plug in their cars and wash and dry clothes with times when wholesale and retail prices for electricity are at their lowest.

[70] "Interagency Rates Working Group," Commonwealth of Massachusetts, August 12, 2024, available at https://www.mass.gov/info-details/interagency-rates-working-group.

[71] For example, states like California, Ohio, Virginia, and Georgia are actively exploring and implementing flexible rate designs with focuses on ensuring large customers pay proportionate infrastructure costs, decarbonization goals are integrated are into ratemaking, and load flexibility supports grid reliability. *See* Von Kaenel, C. and T. Katzenberger, "Abundance Clashes with Affordability in California's Data Center Debate," Politico, June 17, 2025, available at https://www.politico.com/news/2025/06/17/tech-savvy-california-is-still-figuring-out-data-centers-00411668; Brooks, E. and J. Stevens, "Adapting Utility Tariffs for Data Center Driven Load Growth," Utility Dive, July 14, 2025, available at https://www.utilitydive.com/spons/adapting-utility-tariffs-for-data-center-driven-load-growth/752706/.

Beyond rate design, utilities and system operators are focused on other demand-side solutions and "non-wire alternatives" in ensuring reliability as demand grows.[72] Expansion of energy efficiency and traditional demand response will assist in reducing system-wide demand.[73] Decentralized, load-sited energy systems can be called upon to store or release energy as well as alter overall grid demand (e.g., BTM solar/storage, smart technologies such as thermostats and EV charging stations).[74] Increasing reliance on virtual power plants (VPPs) – utility or third-party DERs that can provide capacity, energy, or ancillary services – can provide flexible load management tools for utilities.[75] In addition, flexible EV load and controllable demand can significantly reduce the need for additional capacity and transmission buildout. For example, ISO New England (ISO-NE) estimated 100% flexible EV load would reduce capacity buildout costs by more than 14%.[76] The combination of rate design reforms and technological innovations allows regulators and utilities to reduce or delay significant capital costs from building out generation and distribution systems by leveraging existing infrastructure and shifting financial incentives to ensure affordability for customers.

Compared to other sources of demand, data center load profiles could provide more hourly flexibility as a portion of their electric demand can be shifted away from peak hours. Energy costs, capacity markets, and transmission and supply build out are driven by localized demand in peak hours, which will be further amplified in future years from other less flexible demand sources. Recent studies have demonstrated that significant demand from large new loads like data centers could be integrated into the grid with limited impacts on reliability and affordability if they are able to commit to flexibility and shift their demand away from peak hours in a relatively small number of hours throughout the year.[77]

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[72] "Non-Wires Alternatives: Case Studies from Leading U.S. Projects," E4 The Future, PLMA, SEPA, November 2018, available at https://e4thefuture.org/wp-content/uploads/2018/11/2018-Non-Wires-Alternatives-Report_FINAL.pdf.

[73] *See e.g.* "New Year, Bigger Incentives: As Temperatures Fall in the Carolinas, Duke Energy Increases Financial Incentives for Customer Energy Efficiency and Demand Response Programs," Duke Energy, January 6, 2025, available at https://news.duke-energy.com/releases/new-year-bigger-incentives-as-temperatures-fall-in-the-carolinas-duke-energy-increases-financial-incentives-for-customer-energy-efficiency-and-demand-response-programs.

[74] *See e.g.* "Energy Storage," ConEdison, available at https://www.coned.com/en/our-energy-future/our-energy-vision/where-we-are-going/energy-storage; "SmartAC™ Program," PG&E, available at https://www.pge.com/en/save-energy-and-money/energy-saving-programs/demand-response-programs/smartac.html.

[75] Brehm, K. et al., "Virtual Power Plants, Real Benefits," RMI, January 2023, available at https://rmi.org/wpcontent/uploads/dlm_uploads/2023/01/virtual_power_plants_real_benefits.pdf, at p. 15; Hledik, R. et al., "Distributed Energy, Utility Scale: 30 Proven Strategies to Increase VPP Enrollment," Energy Technologies Area, Berkeley Lab, December 2024, available at https://emp.lbl.gov/publications/distributed-energy-utility-scale-30.

[76] Lamson, J., "ISO-NE Analysis Details Benefits of Demand Flexibility," RTO Insider, July 23, 2025, available at https://www.rtoinsider.com/110748-iso-ne-analysis-shows-benefits-demand-flexibility/.

[77] "Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems," Nicholas Institute for Energy, Environment & Sustainability, Duke University, February 2025, available at https://nicholasinstitute.duke.edu/publications/rethinking-load-growth.

Finally, forecasting efforts often fail to anticipate the level of technological and efficiency improvements over time, and this is particularly relevant with new technology development. For example, as data centers continue to adopt faster computer chips and optimize algorithms to perform tasks, significant improvements in efficiency of AI training, deployment, and refinements can be expected, lowering overall demand relative to current expectations. Similarly, most forecasts of demand growth impact associated with electrification will fail to incorporate technological improvements that are difficult to anticipate, e.g., heat pump and vehicle charging efficiencies, as well as the potential for app-based or retail supplier-based demand management to rapidly rationalize the distribution of such demand on the bulk power system.

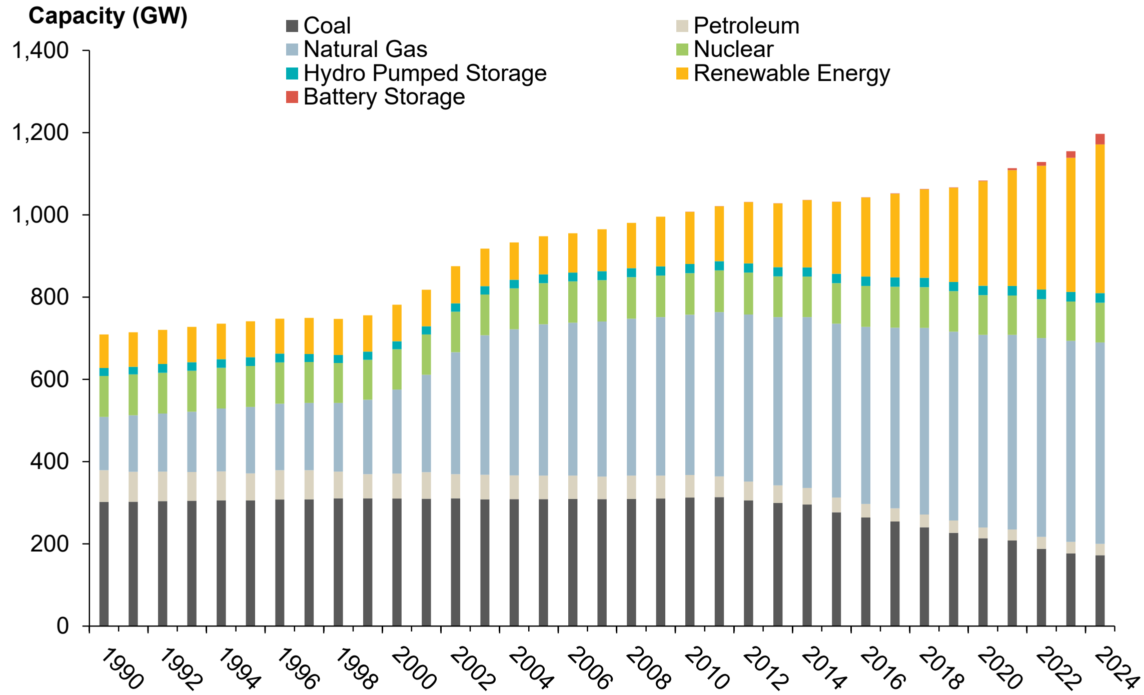
C. Resource Additions and Supply Side Solutions to Meet Demand Growth

Several factors suggest that the supply response to the expected increase in demand over the next decade will be robust. The vast amount of potential new capacity in interconnection queues indicates that investment interest is high, capacity market pricing has increased in anticipation of demand growth in several regions, the continued growth in distributed resource installations is reducing the amount of demand that must be met through grid-connected generation sources, and creative approaches to the co-location of supply with large industrial sources of demand (e.g., data centers) are emerging. While the accredited capacity contributions of new variable resources, distributed solar, and storage are affected by technological and weather factors, they are contributing to meeting both resource adequacy and annual energy needs. Operators are growing more familiar with the integration of variable and storage resources and the design and administration of demand response programs, major transmission development is underway, and regulators are actively exploring rate design and programmatic measures to efficiently mitigate demand growth.

1. Historical Capacity Growth

Historical data show that total electricity generation capacity in the U.S. has continued to grow steadily, even as older, less efficient power plants retire. According to EIA, total U.S. generating capacity grew from approximately 700 GW in 1990 to 950 GW in 2005, and to 1,200 GW in 2024 as illustrated in **Figure 6**. This indicates that total generating capacity expanded by more than 70% over three decades, reflecting continuous additions of newer resources to meet evolving demand.

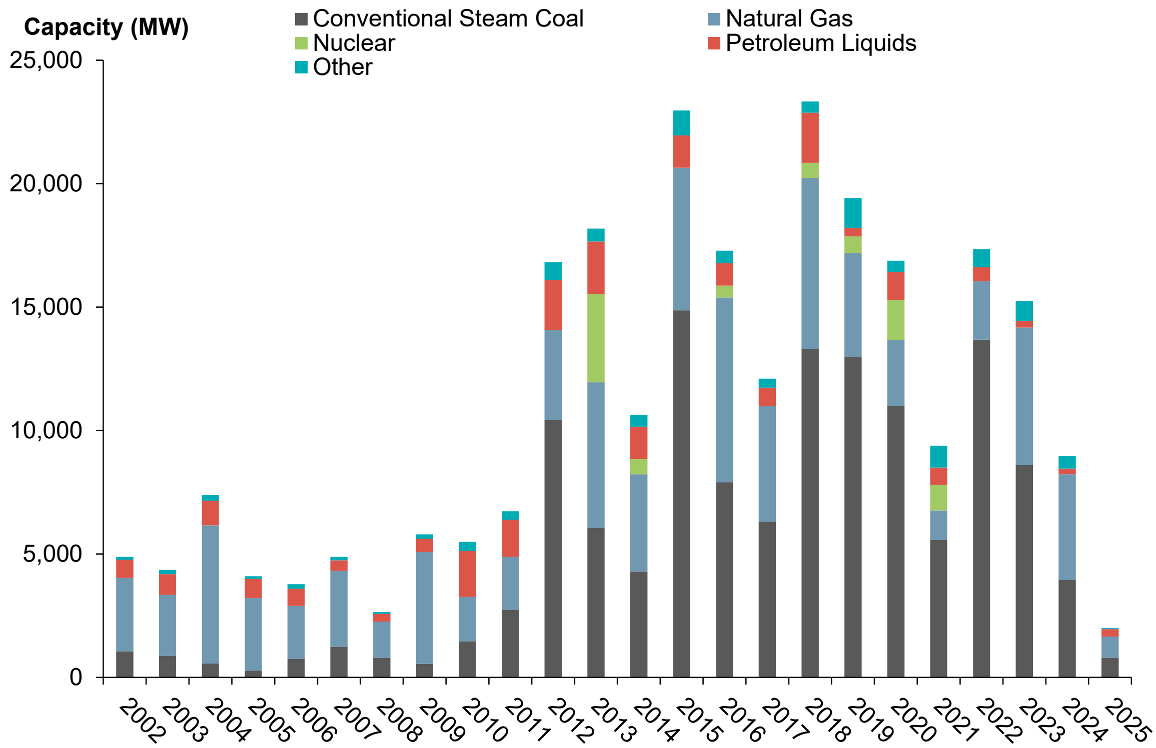
Figure 6: Annual Existing Net Summer Capacity, by Source[78]



This long-term capacity growth has occurred despite frequent generator retirements. Retirements have persisted throughout the period of total capacity growth, mostly due to increasing operations and maintenance costs and lower conversion efficiencies – and thus declining economics – relative to newer resources being added in competitive and vertically-integrated states and regions. As shown in **Figure 7** below, since 2002, approximately 260 GW of generating capacity has retired, including roughly 130 GW coming from coal plant retirements, 88 GW from natural gas plants, and the remainder primarily from oil-fired and nuclear generating capacity.

[78] Net summer capacity is the maximum output that generating equipment can supply to system load at the time of summer peak demand. This metric is a standardized way to measure and compare how much a generator can reliably produce when the grid is typically most stressed. Renewable energy includes conventional hydroelectric power, wood and waste biomass, geothermal, solar, and wind. Inventory of retired generators as of June 2025 is used. "Table 7.7b Electric Net Summer Capacity: Electric Power Sector," EIA, June 2025, available at https://www.eia.gov/totalenergy/data/browser/?tbl=T07.07B#/?f=A&start=1949&end=2024&charted=7-17-15-4.

Figure 7: Retired Net Summer Capacity by Source[79]



Between 2002 and 2021, the capacity-weighted average retirement age of coal plants was 50 years old.[80] In 2023, the average operating coal plant was 45 years old, underscoring the aging profile of the remaining fleet.[81] As EIA explains, "retirements largely occur either when the cost of operating a plant exceeds expected revenue or when operating costs exceed the plant's value to the power system, such as its value in providing reliability to the electric grid. These situations can

[79] Retired capacity refers to the net summer capacity of generating units that have been permanently removed from service, limited to facilities with at least 1 MW of capacity. This data reflects retirements as of June 2025. This metric captures the scale and composition of power plant retirements overtime and reflects structural changes in the generation mix. Form EIA-860, "Preliminary Monthly Electric Generator Inventory, June 2025," EIA, July 24, 2025, available at https://www.eia.gov/electricity/data/eia860m/.

[80] "Of the Operating U.S. Coal-Fired Power Plants, 28% Plan to Retire by 2035," EIA, December 15, 2021, available at https://www.eia.gov/todayinenergy/detail.php?id=50658.

[81] "Power Sector Evolution," EPA, June 3, 2025, available at https://www.epa.gov/power-sector/power-sector-evolution.

occur when lower-cost or more efficient technologies enter the market, when fuel prices change, or when new regulations require additional investment in the unit to remain in compliance."[82, 83]

The continued expansion of U.S. capacity appropriately reflects a market evolution towards more efficient, cost-effective, and lower-emission resources, while resulting in a continuous increase in overall U.S. generating capacity. Plants that retire are typically older, less efficient, and more polluting than their replacements, and their departure makes room for technologies better suited to the current and future needs of the power grid.[84]

2. Recent Rapid Growth in Grid-Connected and Distributed Solar, Wind, Storage

Part of the dramatic surge in capacity in the past 30 years is associated with the continued reduction in cost and increasing competitiveness of renewable energy technologies, which have nearly tripled in capacity over the past 20 years (see **Figure 8**). In 2022, renewables provided more electricity than coal sources for the first time.[85] Solar and wind in particular have experienced significant growth, driven by declining technology costs, supportive policies, and a rising demand by consumers and businesses for cleaner electricity.

In the past decade, utility-scale solar capacity rose from just under 1 GW of summer electric capacity in 2010 to roughly 120 GW in 2022, as illustrated in **Figure 8**. Wind capacity similarly expanded from negligible levels in the early 2000s to over 150 GW in 2024. In 2023, solar, wind, and battery storage together accounted for 82% of all newly installed utility-scale capacity.[86]

Parallel to renewables' surge, battery storage deployment is accelerating, with the U.S. adding over 10 GW of firm capacity in 2024, a 60% increase from 2023, bringing battery storage to 26 GW.[87] Adding storage infrastructure supports the intermittent nature of wind and solar by enabling energy shifting, grid balancing, and reliability.

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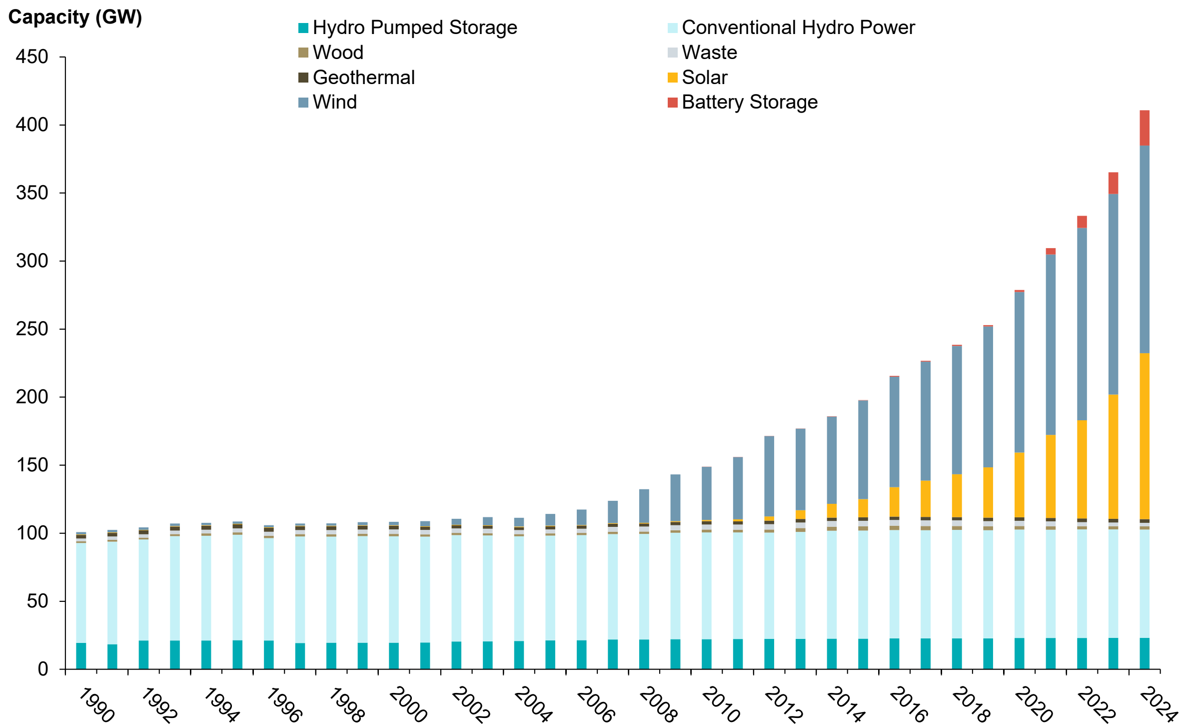
[82] "Of the Operating U.S. Coal-Fired Power Plants, 28% Plan to Retire by 2035," EIA, December 15, 2021, available at https://www.eia.gov/todayinenergy/detail.php?id=50658.
[83] Many or most coal plants may economically retire in the coming years. By one estimate, about two-thirds of the U.S. coal fleet had negative operating margins relative to electricity prices in regional markets in 2017, highlighting their economic vulnerability. Celebi, M. et al., "Managing Coal Plant Retirements for an Orderly Transition to Decarbonization," https://www.brattle.com/insights-events/publications/managing-coal-plant-costs-for-an-orderly-transition-to-decarbonization/.
[84] Mills, A. et al., "Power Plant Retirements: Trends and Possible Drivers," LBNL, November 2017, available at https://eta-publications.lbl.gov/sites/default/files/lbnl_retirements_data_synthesis_final.pdf, at p.3.
[85] "Power Sector Evolution," EPA, June 3, 2025, available at https://www.epa.gov/power-sector/power-sector-evolution.
[86] "Wind, Solar, and Batteries, Increasingly Account for More New U.S. Power Capacity Additions," EIA, March 6, 2023, available at https://www.eia.gov/todayinenergy/detail.php?id=55719.
[87] *See* **Figure 8.**

Figure 8: Annual Existing Net Summer Capacity for Renewable Energy and Storage[88]



3. <u>Expectations for Supply Going Forward</u>

While the administration's new rules, regulations, and laws have erected new barriers to deployment of certain clean energy resources (particularly solar and wind) and exacerbated uncertainty around the exact timing and makeup of resource additions and retirements, it is clear that significant solar, battery storage, wind, and natural gas will continue to be added to the resource mix over the next 10 years to meet growing demand and offset continued retirements of coal-fired generation and other dispatchable resources.[89] For example, EIA estimates that over

[88] Net summer capacity refers to the maximum output that generating equipment can supply to the grid under typical summer peak conditions, as reported to the EIA. While this metric is useful for comparing generation potential across technologies, it does not necessarily equate to the capacity used in resource adequacy planning or capacity markets, which can change over time. In the context of renewable energy, growth in net summer capacity reflects increased deployment of wind, solar, hydro, and other clean energy technologies, as well as grid enhancements. *See* "Table 7.7b Electric Net Summer Capacity: Electric Power Sector," EIA, June 2025, available at https://www.eia.gov/totalenergy/data/browser/?tbl=T07.07B#/?f=A&start=1949&end=2024&charted=7-17-15-4.

[89] As of 2024, 65 GW of coal-fired generation was expected to retire by 2030, with an additional 15 GW by 2035, though some of these plants may opt to extend their lives or convert to natural gas. *See* "Meeting Unprecedented Load Growth: Challenges & Opportunities," Brattle Group, April 2025, available at https://www.brattle.com/wp-content/uploads/2025/04/Meeting-Unprecedented-Load-Growth-Challenges-Opportunities.pdf, at pp. 3-5.

900 GW of renewable capacity will be installed by 2035.[90] Battery energy storage systems are gaining traction both on a stand-alone basis and when co-located with solar and other variable resources, helping to improve the value of output from these resources, and improving their contribution to meeting total energy demand.[91] To that end, utility-scale battery storage is expected to more than double over the next two years and reach 65 GW by 2027 as costs continue to decline,[92] driven in part by continued cost declines and supported by production and investment tax credits available under sections 45Y and 48E of the Inflation Reduction Act.[93]

More broadly, as shown in **Figure 9**, NERC estimates total planned Tier 1 and Tier 2 resource additions through 2034, which are driven by solar and storage, but also include incremental additions from wind, natural gas, and hybrid resources.[94] Importantly, resource projections are incomplete and may underestimate the actual resources that will be added. Tier 3 resources are excluded, as they have generally not commenced development other than placement in the interconnection queue, but it is expected that at least some portion of these resources will reach operational status.

[90] The reference case was used for this value. "Table 9. Electricity Generating Capacity," EIA AEO 2025 Reference case, available at https://www.eia.gov/outlooks/aeo/data/browser/#/?id=9-AEO2025&cases=ref2025&sourcekey=0.

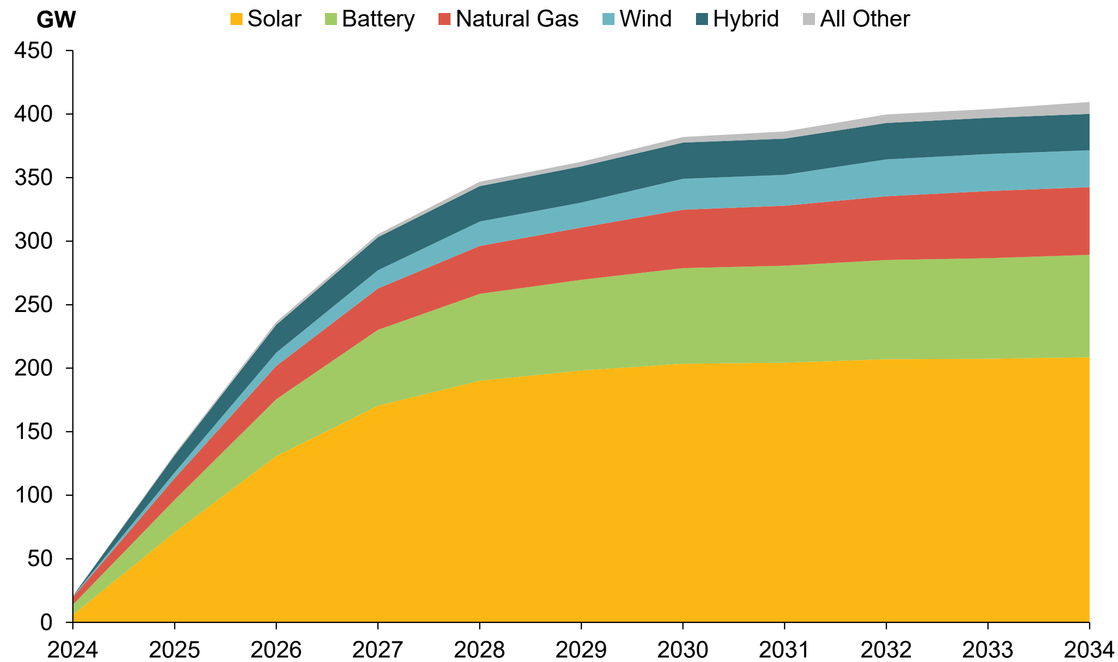
[91] "Energy Storage for Electricity Generation," EIA, August 28, 2023, available at https://www.eia.gov/energyexplained/electricity/energy-storage-for-electricity-generation.php; "Battery Storage in the United States: An Update on Market Trends," EIA, April 25, 2025, available at https://www.eia.gov/analysis/studies/electricity/batterystorage/, at 2024 Battery Storage Figures, Figure 8.

[92] Walton, R., "US utility-scale energy storage to double, reach 65 GW by 2027: EIA", Utility Dive, June 10, 2025, available at https://www.utilitydive.com/news/us-utility-scale-energy-storage-to-double-reach-65-gw-by-2027-eia/750338/.

[93] Energy storage qualifies for both the § 48E clean electricity Investment Tax Credit and the § 45Y clean electricity Production Tax Credit, effective for projects placed in service after 2024. *See* "Section 45Y Clean Electricity Production Credit and Section 48E Clean Electricity," Internal Revenue Service, 26 CFR Part 1, June 3, 2024, available at https://public-inspection.federalregister.gov/2024-11719.pdf.

[94] Tier 1 resources are those in the final stages of connection, while Tier 2 and 3 resources are further from completion but will be available to provide capacity contributions. Specifically, Tier 1 resources are constructed, under construction, or have a signed an Interconnection Service Agreement (ISA), Power Purchase Agreement, Interconnection Construction Service Agreement, or Wholesale Market Participant Agreement, or are included in an integrated resource plan. Tier 2 resources have a signed/approved completion of a feasibility study, system impact study, facilities study, or requested an ISA. Tier 3 resources are additional units in the interconnection queue that do not yet meet a Tier 1 or Tier 2 requirement. *See* "Demand Assumptions and Resource Categories," NERC 2024 LTRA, at p. 137.

Figure 9: Tier 1 and 2 Planned Resources Projected through 2034[95]



While there is uncertainty in any forecast, DOE's recently released Resource Adequacy Report includes methodological flaws in which both resource additions are underestimated and resource retirements are overestimated. Specifically, DOE assumes just 22 GW of "firm" capacity will be added through 2030, excluding battery storage and limiting additions to Tier 1 projects, which the report acknowledges "results in minimal capacity additions beyond 2026."[96] This implies a scenario in which the nation effectively stops building new generating resources in 18 months, a premise that is both implausible and guaranteed to produce a reliability crisis. When Tier 2 resources and battery storage are appropriately included, total firm resource additions through 2030 rise to 111 GW.[97] On the retirement side, DOE assumes 104 GW of coal and natural gas retirements through 2030, based on both confirmed and announced retirements.[98] This approach is inconsistent with their conservative treatment of additions, and contrasts with NERC's forecast of

[95] This data includes all NERC regions, some of which overlap with Canada and Mexico. NERC 2024 LTRA, Supplemental Charts and Graphs, tab "Table A," available at https://www.nerc.com/pa/RAPA/ra/Pages/default.aspx.
[96] "Evaluating the Reliability and Security of the United States Electric Grid," DOE, July 2025, available at https://www.energy.gov/sites/default/files/2025-07/DOE%20Final%20EO%20Report%20%28FINAL%20JULY%207%29.pdf, at pp. 1, A-5.
[97] NERC 2024 LTRA is the source of capacity data used by DOE for the Resource Adequacy Report. NERC 2024 LTRA, Supplemental Charts and Graphs, tab "Table A," available at https://www.nerc.com/pa/RAPA/ra/Pages/default.aspx.
[98] "Evaluating the Reliability and Security of the United States Electric Grid," DOE, July 2025, available at https://www.energy.gov/sites/default/files/2025-07/DOE%20Final%20EO%20Report%20%28FINAL%20JULY%207%29.pdf, at pp. 5, A-5.

44 MWs of confirmed retirements through 2030.[99] As summarized in a report by the NYU Institute for Policy Integrity, "there are better and worse ways to pick resource adequacy targets, to evaluate whether the system has achieved and will maintain them, and to understand the resource adequacy impacts of a particular resource entering or exiting the system. The DOE Study uses some of these best practices but not other important ones, undermining the accuracy of its predictions."[100]

The Electricity Reliability Council of Texas (ERCOT), which faces the highest projected peak demand growth in the country,[101] is also seeing substantial capacity expansion. Between 2025 and 2029, over 23 GW of Tier 1 new resources are expected in Texas, with solar accounting for the majority, to help maintain healthy reserve margins despite rapid load growth.[102]

Beyond resource and capacity contributions, supply-side expectations going forward need to include considerations for system-wide improvements. Specifically, interconnection processes can be reformed and made more efficient to reduce delays, continued expansion of intra- and inter-regional transmission capacity can better allocate supply to demand, and co-location models can be adopted to address large loads without significant incremental cost.

4. <u>Interconnection Queue Resources and Reforms</u>

Interconnection queue studies have always introduced potential delays in the development of generating resources that otherwise are ready to move forward. As of 2023, more than 11,000 projects totaling more than 1,500 GW of generator capacity and more than 1,000 GW of storage were awaiting interconnection across the U.S. with renewable resources making up 95% of the total active queue capacity.[103] Queued capacity is distributed across the country, including more than 1,200 GW in the California Independent System Operator (CAISO) and Western

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[99] NERC 2024 LTRA is the source of retirement data used by DOE for the Resource Adequacy Report. NERC 2024 LTRA, Supplemental Charts and Graphs, tab "Table C," available at https://www.nerc.com/pa/RAPA/ra/Pages/default.aspx.

[100] Danis, J. et al., "Enough Energy: A Review of DOE's Resource Adequacy Methodology," New York University Institute for Policy Integrity, July 2025, available at https://policyintegrity.org/files/publications/IPI_EnoughEnergy_FinalReport.pdf, at p. 31.

[101] NERC's LTRA stated that "ERCOT's summer peak demand is forecast to increase by 4.6% per year from 2025 through 2029. In comparison, the five-year summer peak demand growth projection for the 2023 LTRA was 1.1%." *See* NERC 2024 LTRA, at p. 109.

[102] NERC states that the anticipated reserve margin is expected to peak at 34.7% by Summer 2026, "reflecting the expected addition of about 23,680 MW of Tier 1 capacity, most of which is solar PV." ERCOT's net projected solar capacity is expected to increase from 29.56 GW in 2025 to 47.16 GW in 2029, a 17.6 GW total increase in nameplate capacity. NERC 2024 LTRA, at p. 109.

[103] "Queued Up: 2024 Edition, Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2023," LBNL, April 2024, available at https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_R2.pdf, at p. 3.

Interconnection Areas combined, 311 GW in Midcontinent Independent System Operator (MISO) region, and more than 250 GW in both the Pennsylvania-New Jersey-Maryland Interconnection (PJM) and ERCOT regions.[104] These growing queues reflect increased development interest in renewables as well as other resource types, but the sheer volume of development interest lining up in interconnection queues can increase the delays in the interconnection process. On average, the interconnection study process currently takes between 30-50 months for most regions across the US.[105]

FERC, DOE, state regulators, the RTOs, developers, and industry stakeholders have all recognized challenges with managing the interconnection study processes and are actively exploring regulatory and operational reforms.[106] FERC Order No. 2023 introduced new rules aimed at streamlining the interconnection process through implementation of a first-ready, first-served cluster study approach, standardization of timelines, and improvement in cost allocation transparency.[107] Similarly, DOE initiatives, such as the Grid Deployment Office and the Interconnection Innovation e-Xchange (i2X), are focused on technical assistance and collaborative problem-solving to reduce delays and enhance grid flexibility.[108]

More broadly, a recent study identifies additional interconnection reforms that will improve the efficiency of the interconnection process, including: providing upfront cost certainty by adopting an entry fee – paid by interconnecting resources – that reflects the actual cost of transmission upgrades needed to accommodate the interconnection of those resources; implementing fast-track processes to quickly use existing and pre-planned interconnection capacity; further optimizing the interconnection study process to identify the available headroom on the system; increasing study efficiency; and speeding up transmission project construction.[109]

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[104] "Maps of Projects by Region, State, and County," LBNL, available at https://emp.lbl.gov/maps-projects-region-state-and-county, cumulative MW in regional queues as of July 28, 2025.
[105] Rand, J., et al., "Queued Up: 2024 Edition, Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2023," LBNL, April 2024, available at https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_R2.pdf, at p. 35.
[106] "The Future of Resource Adequacy," DOE, April 2024, available at https://www.energy.gov/sites/default/files/2024-04/2024%20The%20Future%20of%20Resource%20Adequacy%20Report.pdf, at p. 28.
[107] Improvements to Generator Interconnection Procedures and Agreements, FERC Order No. 2023, FERC Docket No. RM22-14-000, July 28, 2023, available at https://www.ferc.gov/media/order-no-2023, at pp. 5-6.
[108] "About the Interconnection Innovation e-Xchange," DOE, available at https://www.energy.gov/eere/i2x/about-interconnection-innovation-e-xchange-i2x; "About the Grid Deployment Office," DOE, available at https://www.energy.gov/gdo/about-grid-deployment-office.
[109] "Unlocking America's Energy: How to Efficiently Connect New Generation to the Grid," Grid Strategies and The Brattle Group, August 2024, available at https://www.brattle.com/wp-content/uploads/2024/08/Unlocking-Americas-Energy-How-to-Efficiently-Connect-New-Generation-to-the-Grid.pdf, at p. 16.

Consequently, the interconnection study process reveals the high degree of interest in investing in and developing new resources to meet growing demand and replace capacity that is reaching the end of its economic life, and retiring. And while the high degree of interest introduces delays in the approval of new capacity projects from an interconnection standpoint, significant efforts are underway to address delays and increase the pace at which new power plant proposals are integrated into bulk power system operations. It is worth noting that while the timing of interconnection studies and other factors (e.g. supply chain issues, permitting challenges) have always affected the amount of time between power plant development interest and commercial operation, the sheer magnitude of resources added to the grid annually – particularly in recent years for solar, wind and storage resources – demonstrates the ability of investors and developers to successfully navigate these steps in the development process and bring resources to commercial operation.

5. Transmission Development

The development or upgrading of inter- and intra-regional transmission capability can alleviate localized and regional reliability concerns and increase the energy and capacity contributions of operating resources as supply resources are more efficiently interconnected with demand sources over longer distances. NERC notes there are 28,275 miles of transmission of greater than 100 kV in construction or in stages of development that will achieve operational status over the next 10 years, which is substantially higher than planning estimates from the past 5 years (18,900 miles on average).[110] Thus, as with generating capacity resources in active development, there is significant ongoing investment and development interest in new transmission capacity to both interconnect new, distant resources to load and to more efficiently manage the transfers of power between states and regions.

In addition, regulators and state governments are collaborating more consistently on interregional transmission planning to share priorities and discuss solutions – e.g., governors across the Midwest encouraged MISO to enhance long-term transmission planning processes to support state policies, and the New England states have established coordinated transmission study and planning procedures in the ISO-NE transmission tariff to allow transmission projects identified through coordinated state regional planning to proceed to procurement and development.[111] Finally, in May of 2024, FERC released Order No. 1920 to acknowledge the role that transmission

[110] NERC 2024 LTRA, at p. 34.
[111] "Support for MISO's Long-Range Transmission Planning Effort to Cost-Effectively Maintain System Reliability in the Face of a Changing Climate," MISO, July 7, 2021, available at https://sustainableferc.org/wp-content/uploads/2021/06/MISO-LRTP-letter_June-2021_Final.pdf; "Regional System Plan and Related Analyses," ISO New England, available at https://www.iso-ne.com/system-planning/system-plans-studies/rsp.

will play as part of the solution to increasing demand and require transmission providers to conduct and periodically update transmission plans to ensure a long-term focus, and take into account various factors (such as demand growth and state policies) that affect transmission need.[112]

6. Co-Located New Generation

Some of the incremental new load (particularly large loads like data centers) is likely to be met through co-location models that will limit the impact on (and potentially help with) system-wide supply and demand circumstances. Co-location involves connecting a customer load directly to a generator that provides all or most of that customer's electricity supply. Recent discussions in PJM about co-locating load with existing generation have explored the potential impact of large load growth on the supply-demand balance, consumer costs, and opportunities to mitigate large load impacts through policies or strategies such as co-location.[113] Recent studies have also explored the potential beneficial impacts of large loads through co-locating new load with new generation in a large micro grid, which "can address both resource adequacy and transmission adequacy concerns by quickly connecting loads to power without requiring extensive transmission or generation investments and without raising concerns over unfair cost allocation."[114] Co-location is one of a range of solutions to cost-effectively facilitate grid connection of new loads.

There are many reasons to expect that co-location and other strategies and policies will emerge to manage large load growth. Technology companies and other new large load users have a strong incentive to co-locate or help develop incremental generation to control the cost and/or emission profile of their energy use, and potentially avoid transmission and/or distribution system upgrades that would increase the costs and lead times of their projects.

Demand for co-location from large loads is not systematically reported across the country at this stage, but specific RTOs/ISOs with growing demand are beginning to provide related data. For example, as of April 2023, PJM had received requests to add 4,615 MW of generation co-located with load, 3,906 MW (85%) of which were for fully isolated co-located loads without supply from the

[112] "FERC Takes on Long-Term Planning with Historic Transmission Rule," FERC, May 13, 2024, available at https://www.ferc.gov/news-events/news/ferc-takes-long-term-planning-historic-transmission-rule.
[113] PJM, "Answer of PJM Interconnection L.L.C.," FERC Docket No. EL25-49-000, March 24, 2025, Exhibit B, and New Option 6, at p. 16; "Large Load Additions Workshop," PJM, May 9, 2025, available at https://www.pjm.com/-/media/DotCom/committees-groups/workshops/llaw/2025/20250509/20250509-item-02---large-load-additions-workshop---presentation.pdf.
[114] "Optimizing Grid Infrastructure and Proactive Planning to Support Load Growth and Public Policy Goals," Clean Air Task Force, July 2025, available at https://www.catf.us/wp-content/uploads/2025/07/grid-utilization-planning.pdf, at p. 35.

system.[115] By comparison, PJM projects a systemwide summer peak load increase of 25,575 MW by 2035.[116] This suggests that that, while only a minority of large-load projects include co-location of generation, the overall magnitude of new generation (i.e., supply that may not otherwise be developed but for co-location) being developed according to load requests is substantial relative to total anticipated load growth. Similarly, as of September 2024, ERCOT had tracked that 9,885 MW of large loads co-located with dedicated generation sources were in the interconnection queue, accounting for approximately 17% of total large load growth in ERCOT.[117] The regulatory review process for co-location is discussed further in Section IV.

D. Planning for and Managing Changing Conditions of Supply and Demand

The recent attention to the potential reliability and cost impacts of growth in electricity demand are an appropriate response to changing conditions in the electric industry. As with any other period of significant change in industry conditions (e.g., deregulation), timely consideration of these potential impacts by federal and state policymakers, RTOs, electric companies, and industry stakeholders allows for the promulgation of any regulations, policies, and practices needed to ensure reliability. Yet there is little evidence at this time of any need for extraordinary actions based on the current and expected future of electricity supply and demand, as the processes in place in both wholesale market and regulated utility contexts are robust enough to plan for and manage the changes underway in the industry.

The foundation for both utility regulation/ratemaking and the operation of competitive wholesale electricity markets is the achievement of reliable system operations at the lowest possible cost to consumers. This principle drives federal and state regulation and policy around utility resource planning and procurement; it drives electric company actions to plan for and develop resources well in advance of need and based on least cost principles; it drives federal regulations and policies governing the design and administration of RTO transmission planning and wholesale market activities; and it governs individual RTO efforts to identify system infrastructure needs well in advance of when they materialize, and to adjust market designs to address changes in the underlying electric industry technology and policy.

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[115] Caven, A., “Co-Located Load Requests,” PJM, April 12, 2023, available at https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2023/20230412/20230412-item-09---informational-only---current-co-located-load-requests.ashx.

[116] “PJM Load Forecast Report,” PJM Resource Adequacy Planning Department, January 2024, available at https://www.pjm.com/-/media/DotCom/library/reports-notices/load-forecast/2024-load-report.ashx, at p. 2.

[117] Of the 56,954 large loads queued between September 2023 and September 2024, 9,885 were co-located and 47,069 were standalone. “Large Load Interconnection Status Update,” ERCOT, September 6, 2024, available at https://www.ercot.com/files/docs/2024/09/05/LLI%20Queue%20Status%20Update%20-%202024-9-6.pdf.

1. Wholesale Markets

Wholesale markets are specifically designed to ensure that in times of scarcity prices increase to provide a strong financial signal to the development community. History has shown robust responses to price signals in growth in supply and demand response in competitive market regions, and a tempering of prices and development interest when ample supply materializes. Transmission planning processes in each RTO region efficiently plan for and solicit proposals to develop and construct bulk power system transmission projects when needed to meet reliability, economic, and (increasingly) state policy needs. And as discussed previously, changes are underway to address delays in completing interconnection studies to allow more rapid realization of generation and transmission development interests.

As with every prior period of change to the electric system, regulatory reviews are already underway to determine least-cost opportunities and appropriate incentive structures for growth in demand from data centers and other large loads. FERC is actively reviewing issues related to the co-location of large loads, such as whether ISO and RTO tariffs need to establish specific rules for AI-enabled data centers to ensure grid reliability and equitable cost impacts.[118] Because FERC has jurisdiction over interstate transmission while state regulators have jurisdiction over retail sales of electricity, successful regulatory oversight will "require the involvement of both federal and state actors, including [FERC], state public utility commissions, and other state and local entities."[119] State regulators, reliability councils, and national labs are also actively engaged in finding effective solutions that balance competing priorities.[120]

For example, PJM, a region with a disproportionate burden of demand growth from AI-enabled data centers, has actively taken steps to address electricity demand growth. The Reliability Resource Initiative is an effort to streamline construction and operation of shovel-ready resources

[118] "FERC Orders Action on Co-Location Issues Related to Data Centers Running AI," FERC, February 20, 2025, available at https://ferc.gov/news-events/news/ferc-orders-action-co-location-issues-related-data-centers-running-ai.
[119] PJM Interconnection, et al., 190 FERC ¶ 61,115, Docket Nos. EL25-49-000, February 20, 2025, available at https://www.ferc.gov/media/e-1-el25-49-000, at p. 34.
[120] *See*, for example, "Characteristics and Risks of Emerging Large Loads," NERC, July 2025, available at https://www.nerc.com/comm/RSTCReviewItems/3_Doc_White%20Paper%20Characteristics%20and%20Risks%20of%20Emerging%20Large%20Loads.pdf, at p. 1; "An Assessment of Large Load Interconnection Risks in the Western Interconnection," Elevate Energy Consulting prepared for WECC, February 2025, available at https://www.wecc.org/wecc-document/19111, at p. 2; Silverman, A. et al. "A State Playbook for Managing Data Center-Driven Load Growth," Johns Hopkins University, June 20, 2025, available at https://energyinstitute.jhu.edu/a-state-playbook-for-managing-data-center-driven-load-growth/, at p. 15; Clean Energy States Alliance (2025), "Load Growth: What States Are Doing to Accommodate Increasing Electric Demand," Clean Energy States Alliance, July 2, 2025, available at https://www.cesa.org/resource-library/resource/load-growth-what-states-are-doing/, at p. 28; Frick, N.M. et al., "Electricity Rate Designs for Large Loads: Evolving Practices and Opportunities," Berkeley Lab presentation to NASUCA, January 2025, available at https://eta-publications.lbl.gov/sites/default/files/2025-01/electricity_rate_designs_for_large_loads_evolving_practices_and_opportunities_final.pdf, at pp. 1-2.

with short lead times to allow them to improve reliability.[121] In addition, PJM has taken steps to improve automation of the interconnection process to reduce delays, obtained FERC approval to streamline the use of surplus interconnection services (e.g., battery storage), and is currently engaging with FERC to ease the ability of replacement resources to use the capacity interconnection rights of a retiring resource.[122] Finally, utilities in the region are reacting to potential growth in demand related to data centers by ensuring in advance that sufficient supply resource capability is developed to meet demand.[123]

2. Regulated, Vertically-Integrated Utilities

In states and regions primarily or exclusively characterized by vertically integrated electric companies, utilities carry out robust planning and development processes well in advance to ensure that sufficient supply, transmission, distribution, and energy efficiency/demand response resources are timely developed to meet reliability needs.[124] This includes investor-owned utilities whose obligations and activities are guided and overseen by state and federal regulators, and municipal and cooperative utilities whose activities are analogously overseen by boards of directors. The reliability, planning, and operational obligations on utilities have always been met, even during periods of high demand growth. In addition, regulators and utilities continuously adapt planning processes and development/investment strategies to ensure that changes to the system (e.g., administration of energy efficiency, integration of DERs, etc.) can be adequately addressed in long-term planning processes that have at their foundation goals of reliability, energy efficiency, and fairness.[125]

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[121] "PJM Chooses 51 Generation Resource Projects to Address Near-Term Electricity Demand Growth," PJM Inside Lines, May 2, 2025, available at https://insidelines.pjm.com/pjm-chooses-51-generation-resource-projects-to-address-near-term-electricity-demand-growth/.

[122] "PJM Chooses 51 Generation Resource Projects to Address Near-Term Electricity Demand Growth," PJM Inside Lines, May 2, 2025, available at https://insidelines.pjm.com/pjm-chooses-51-generation-resource-projects-to-address-near-term-electricity-demand-growth/.

[123] For example, PPL reports 14.4 GW of cumulative signed data center interconnections agreements in Pennsylvania through 2034, with 4.8 GW in advance stages already publicly announced. The utility has stated its intent to develop new generation to meet this demand to address expected load growth. "PPL Briefs Analysts on Efforts to Serve Data Centers in Pa., Ky.," RTO Insider, July 31, 2025, available at https://www.rtoinsider.com/111475-ppl-briefs-analysts-efforts-serve-data-centers-pa-ky/. Similarly, Dominion Energy's Integrated Resource Plan (IRP) includes resource procurement to meet its forecast of sustained load growth. Dominion Energy 2024 IRP, Case No. PUR-2024-00184, available at https://www.dominionenergy.com/-/media/content/about/our-company/irp/pdfs/2024-irp-w_o-appendices.pdf, at pp. 1, 3, 19.

[124] Schwartz, L., "Integrated Distribution Planning Overview," DOE, March 3, 2022, available at https://eta-publications.lbl.gov/sites/default/files/schwartz-integrated-distribution-planning-overview-20220303-fin.pptx.pdf.

[125] "Integrated Distribution Planning for Electric Utilities: Guidance for Public Utility Commissions," Mid-Atlantic Distributed Resources Initiative, October 2019, available at https://www.madrionline.org/wp-content/uploads/2019/10/MADRI_IDP_Final.pdf, at p. 2.

In practice, utilities are actively planning to ensure sufficient supply and demand resources and solutions are prepared to meet rising demand in the current context, just as they have historically. For example, Xcel Energy has taken concrete steps in the Upper Midwest to address rising demand driven in part by data centers. In its 2024-2040 Integrated Resource Plan (IRP), Xcel identified large new data centers as a primary driver behind its forecasted load growth and is considering solutions.[126] The company further explains that the entities will be seeking renewable or carbon-free options, aligned with Minnesota's 100% clean electricity by 2040 standard. In a June 2024 press release on the approval of the IRP, the Minnesota Public Utilities Commission announced an order that will require Xcel to propose a new rate class tailored to data centers and other super-large customers, recognizing the need for new approaches to rate design and infrastructure planning in response to these load additions.[127] Similar long-term planning efforts are underway among regulators and utilities across the country.[128]

E. Observations on Electricity Demand and Supply

The electricity sector is changing, and some have suggested that changes in supply and demand threaten to compromise the reliability and affordability of electricity. Yet a careful review of the underlying drivers of demand and supply suggest these anxieties are unwarranted, for at least the following reasons:

- Forecasts of growth in demand reflect current expectations around growth in large loads (data centers) and growth in electrification of the vehicle and building sectors. Yet there remains a significant degree of uncertainty around the pace of growth in these areas, the

[126] Xcel stated that it is "actively engaged with several hyperscale and colocation data centers, with transmission interconnection studies underway for several requests." *See* 2024-2040 Upper Midwest Integrated Resource Plan, Xcel, February 1,2024, available at https://xcelnew.my.salesforce.com/sfc/p/#1U0000011ttV/a/8b000002YCQL/2EQNYnEG7hBohut31h0nHs5yppYhY.lwg_GbUZK8t6w, at Chapter 5.42.

[127] Xcel Energy's 2024-2040 Upper Midwest Integrated Resource Plan," Minnesota Public Utilities Commission, available at https://mn.gov/puc/activities/economic-analysis/planning/xcel-energy-irp/.

[128] In the West, PacifiCorp recently updated its 2025 IRP load forecasts to account for large load customers and is planning for all data center requests and assumes demand will materialize as projected. PG&E has published multiple press releases detailing their efforts to meet increased demands from electrification and other drivers, while protecting customers from rate increases. *See* 2025 Integrated Resource Plan, PacifiCorp, March 31, 2025, available at https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2025-irp/2025_IRP_Vol_2.pdf; "PG&E Accelerating Connection of New Data Centers Throughout Northern and Central California," PG&E Corporation, February 13, 2025 available at https://investor.pgecorp.com/news-events/press-releases/press-release-details/2025/PGE-Accelerating-Connection-of-New-Data-Centers-throughout-Northern-and-Central-California/default.aspx; "Surging Data Center Growth to Help Lower Energy Costs for PG&E Customers," PG&E, May 27, 2025, available at https://www.pge.com/en/newsroom/press-release-details.fd841459-b124-4cde-94ef-95db4dfbdf23.html; Doherty, P., "Revolutionizing Data Centers: The Ultimate Power Play for Today and Tomorrow," PG&E, June 18, 2025, available at https://www.pge.com/en/newsroom/currents/future-of-energy/revolutionizing-data-centers--the-ultimate-power-play-for-today-.html.

ultimate magnitude of demand that will materialize, and the impact of price-responsive demand at wholesale and retail levels. And the history of electricity demand forecasts demonstrates that forecasting is significantly conservative – that is, electricity demand forecasts typically significantly overstate expected future demand growth.

- The actual level of expected growth in demand – inclusive of large load and electrification expectations – is high relative to the past decade, which was characterized by significant demand modification from increasing efficiency, demand response, and economic factors. Although higher than in the immediate past, this expected growth in demand is well within the pace of actual demand growth that the industry has reliably met for many decades. **Figure 10** and **Figure 11** illustrate that the expected growth in total energy consumption and winter and summer peak demand remains lower than that experienced on multiple occasions over the past several decades.

- The actual level of demand growth that materializes will be mitigated by several factors, including at least the following:

  - Tightening reserve margins and increasing costs will not only spur investment in supply (see below), it will necessarily result in an increase in price-responsive demand, through (a) consumer response to increasing prices, (b) an increase in demand response activated in wholesale electricity markets, and (c) an increase in demand response programs administered by regulated utilities, municipal light companies, and electric cooperatives.

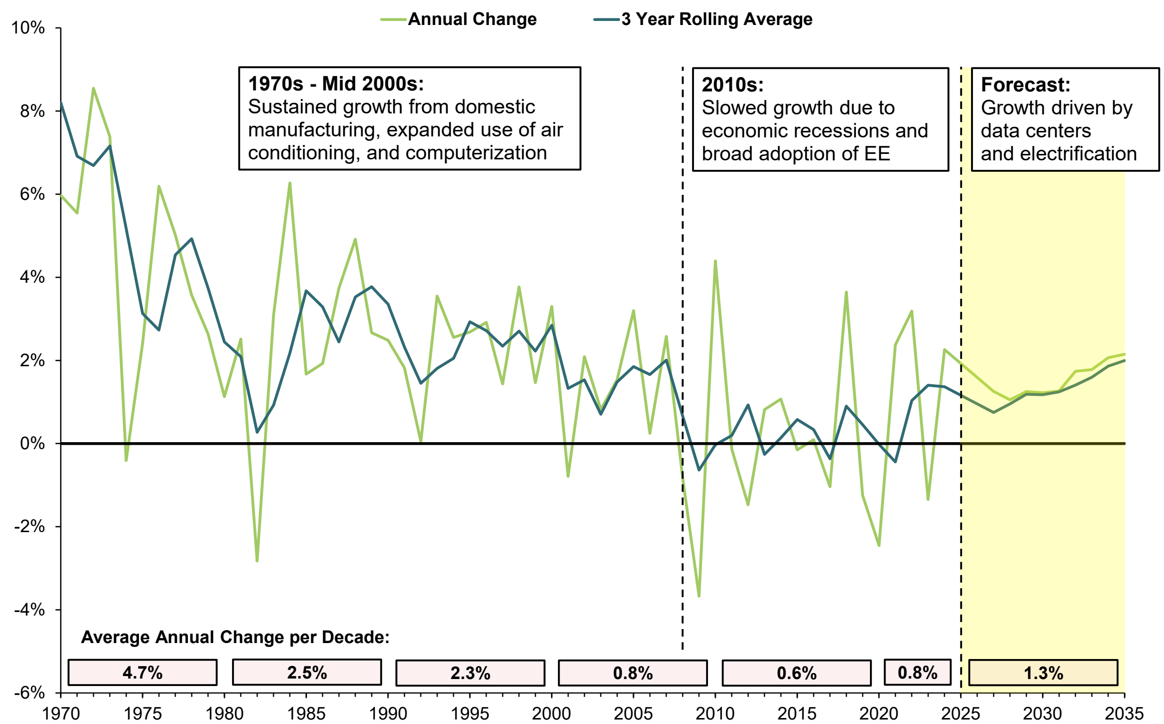
  - Active, ongoing efforts at the state level are focused on fundamental changes to rate designs to empower consumers to actively manage energy budgets through, e.g., timing their vehicle charging and other electric end use activities to increase use in low cost, low load hours and decrease consumption during peak periods.

  - Continued declines in the cost of distributed generation and other "virtual power plant" technologies and strategies will moderate the net load on the bulk power system.

  - Increases in efficiency of operations at large load facilities and a plateauing of demand in the industry will likely flatten demand relative to levels assumed in the more aggressive forecasts of demand from these sources. Similarly, electrification of the vehicle and building sectors has been, and is likely to continue to be, coming at a pace slower than anticipated.

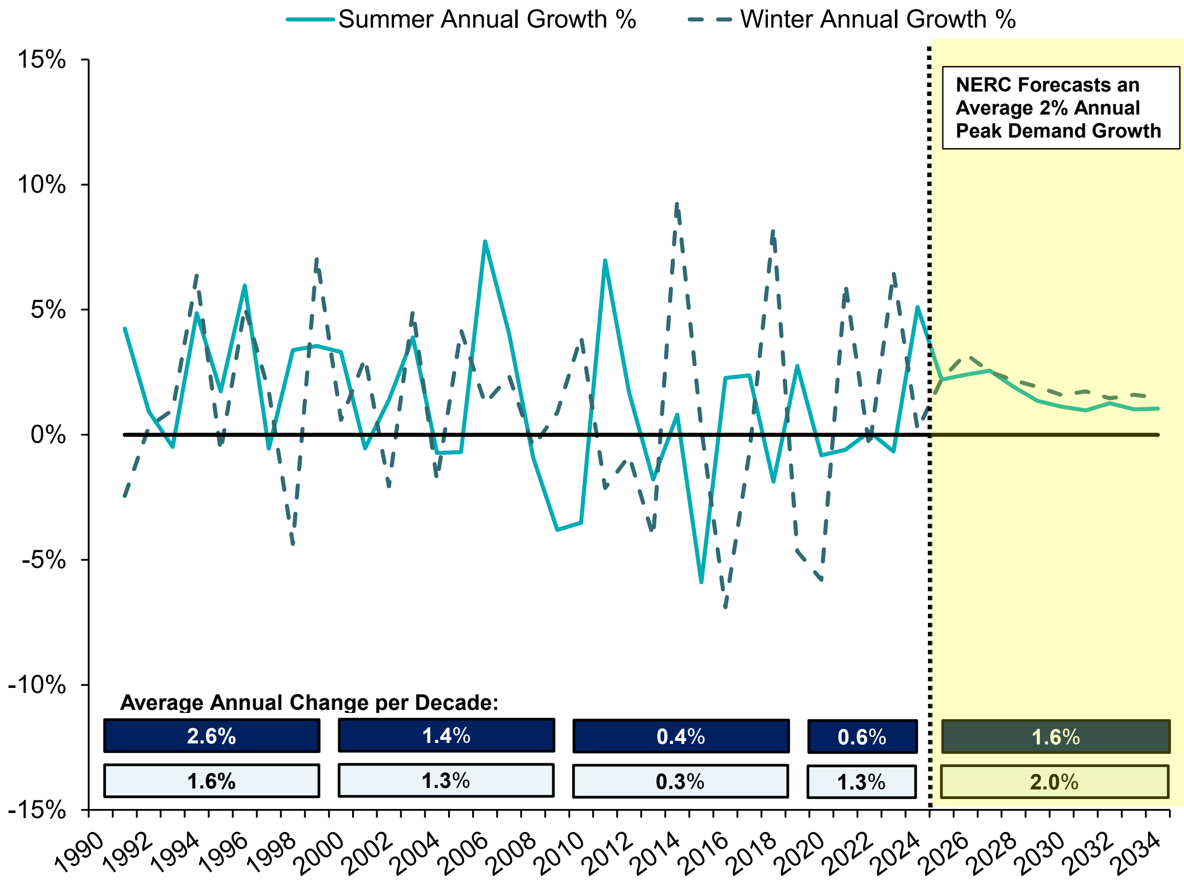
- Demand response, energy efficiency, wholesale markets, and rate designs – all provide mechanisms for shifting the time of energy use. These tools can significantly rationalize total energy consumption and reduce peak demand.

Figure 10: Historic and Forecasted Annual Change in U.S. Electricity Sales[129]



[129] Electricity Sales data are sourced from the U.S. Energy Information Administration (EIA). Historical data through 2024 are sourced from EIA's Monthly Energy Review and are originally reported in trillion BTUs, converted to TWh for consistency. Annual Energy Review - Table 2.1a Energy Consumption: Residential, Commercial, and Industrial Sectors," EIA, available at https://www.eia.gov/totalenergy/data/browser/index.php?tbl=T02.01A#/?f=M; "Annual Energy Review – Table 2.1b Energy Consumption: Transportation Sector, Total End-Use Sectors, and Electric Power Sector," EIA, available at https://www.eia.gov/totalenergy/data/browser/index.php?tbl=T02.01B#/?f=M; "Per Capita Residential Electricity Sales in the U.S. Have Fallen Since 2010," EIA, 2017, available at https://www.eia.gov/todayinenergy/detail.php?id=32212. Forecast data from 2025 onward are sourced from EIA's Annual Energy Outlook 2025 Reference Case and are originally reported in quadrillion BTUs, converted to TWh for consistency. "Annual Energy Outlook 2025 – Table 2. Energy Consumption by Sector and Source," EIA, available at https://www.eia.gov/outlooks/aeo/data/browser/#/?id=2-AEO2025&region=1; U.S. Energy Information Administration, "Per Capita Residential Electricity Sales in the U.S. Have Fallen Since 2010," 2017, available at https://www.eia.gov/todayinenergy/detail.php?id=32212; "Clean Energy Resources to Meet Data Center Electricity Demand," DOE, available at https://www.energy.gov/gdo/clean-energy-resources-meet-data-center-electricity-demand.

Figure 11: Historic and Forecasted Annual Change in U.S. Peak Demand[130]



- Regardless of the actual level of demand growth that materializes, there is evidence that the supply response will be sufficient, for at least the following reasons:
    - Levels of growth in capacity – net of retirements – has occurred in the past at rates more than adequate to meet the rates built into current forecasts of electricity demand growth.
    - Continued rapid declines in the cost of major grid connected solar, wind, and storage resources are prompting strong investment and development interest in these resources in all regions; increasingly, the reliability contribution value of

[130] **Figure 11** displays seasonal peak-hour demand summed across all U.S. NERC regions. In some years, U.S. NERC regions overlap with Mexican and Canadian regions. NERC 2024 LTRA Backup.

variable renewable resources will be supported through the significant amount of battery storage capacity planned for development and/or supported through state policies.

  - The amount of development interest expressed through projects included in interconnection queues is vast relative to expected demand, and FERC, other policymakers, RTOs, and industry stakeholders are all actively pursuing improvements in interconnection processes to reduce barriers to entry.
  - A significant and potentially growing portion of data center/large load projects in planning or under development incorporate co-location of new, incremental generation capacity, and policymakers are actively considering how to allow for data center growth while ensuring continued reliable system operations and fair allocation of costs to the developing entities.
  - There is a healthy pipeline for major transmission investment to access more distant generation resources, increase the output and capacity value of such resources, and improve the reliability of the bulk power system on an interstate and interregional basis. Policymakers are increasingly planning for and pursuing transmission investment for reliability, economic, and resource/policy reasons.

- Technological change, rapid growth in demand, changing sources of supply, and adaptation to new policies that affect power sector investment and operation are nothing new in the electric industry. A century of planning and procedures by federal and state policies, and electric company and RTO development has ensured reliable system operations on a continuous basis throughout periods of rapid changes in supply and demand and major overhauls of industry structure and regulation.

IV. Consequences of Departing from Regulatory Principles

A. Introduction

The Executive Branch, Department of Energy (DOE), and Environmental Protection Agency (EPA) have issued executive orders, reports, and proposed regulations stating or implying that current factors driving an increase in the demand for electricity require emergency actions to ensure power system reliability. As described in Section II, these actions include reversing energy and environmental policies established over time, including (a) efforts to directly force the continued operation of fossil resources, (b) efforts to remove support for renewables and/or create barriers to renewable deployment, and (c) efforts to provide further support for fossil resources by rolling back health/environmental protections for fossil generation. In this Report we critically review the alleged basis for these actions, finding little reason in the context for supply and demand, market operations, or regulated planning processes to declare emergency actions. Yet it is also worth considering the question of "at what cost?" The answer to this reveals potentially major drawbacks to the administration's actions from market efficiency, consumer cost, public health, and climate perspectives.

B. The Proposed Actions Will Negatively Impact Affordability and Reliability

Many of the proposed actions involve a violation of the fundamental principles that underly competitive wholesale market and least-cost utility regulatory practices. Namely, where the actions involve interventions to reverse or prevent retirement of resources that are uneconomic, they unnecessarily raise consumer costs and chill the forces of competition that drive the industry to lower prices and foster technological change.

Uneconomic interventions to dictate the mix of power sources in a region can drive up the cost of financing, chill the overall investment environment, and lead to inefficient and suboptimal resource selection outcomes. Suppressing competition, in turn, will reduce investor and developer interest in a way that can directly slow and delay necessary resource development, thereby introducing reliability risks and raising consumer costs. The current administration's actions will have this effect. DOE's issuance of 202(c) Emergency Orders have forced electricity consumers to bear the cost of sustaining coal-fired generating resources that are clearly uneconomic, and higher-cost than the generating units that otherwise would be used to serve demand.[131] Actions to delay or

[131] Dabbs, B., "Coal Plant Ordered to Stay Open Cost $29M to Run in 5 Weeks," Energy Wire, August 1, 2025, available at https://subscriber.politicopro.com/article/eenews/2025/08/01/coal-plant-ordered-to-stay-open-cost-29m-to-run-in-5-weeks-00487542.

prevent the economic entry of solar and wind generation will deter the development of some of the lowest cost, most competitive resources being added to the market today. In combination, these actions violate the premise of wholesale competition in the electric industry and the long-standing foundation for utility, state and regional least cost planning, and will lead to higher consumer costs with little or no reliability benefit.

Similarly, the current administration's efforts to undo environmental regulations will not improve power system reliability and will exacerbate efforts to address the affordability of electricity. In promulgating the 2024 final rules on Carbon Pollution Standards and amendments to MATS, the Biden EPA comprehensively evaluated the climate and health benefits alongside the projected economic and industry impacts of the proposed regulations, finding negligible impacts on consumer and industry costs.

Compliance costs are modeled based on expected costs associated with pollution mitigation measures and the associated changes in generation dispatch. Monitoring and reporting costs are also included.[132] While compliance costs increase for the highest polluters, the majority of generating capacity is unaffected by these rules.[133]

Compliance costs for the Carbon Standards rule are estimated at $18.8 billion from 2024 through 2045, with an annualized cost of $860 million per year.[134] This annualized figure represents less than 0.2% of total U.S. electricity sector revenue from 2023 – a marginal impact relative to the scale of the industry.[135] The resulting impacts on retail electricity prices are projected to be minimal, with national average change of -0.5%, 1%, 0.2%, and 0.7% in 2030, 2035, 2040, and 2045 respectively.[136] Regional variations exist but remain modest as well.

Similarly, the MATS rule is projected to have zero national impact on retail electricity prices.[137] Compliance costs are estimated at just $790 million between 2028 and 2037, or approximately $92

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132 "Regulatory Impact Analysis for the New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, EPA, April 2024 ('GHG RIA (2024)"), available at https://www.regulations.gov/document/EPA-HQ-OAR-2023-0072-8913, at p. 3-14.

133 "Power Sector Evolution," EPA, June 3, 2025, available at https://www.epa.gov/power-sector/power-sector-evolution.

134 GHG RIA (2024), at pp. 3-18 – 3-19. This is in $2019 and using a 3.76% discount rate.

135 Calculated as 860 / 491,370 * 100 = 0.18%. *See* "Electric Power Annual," EIA, available at https://www.eia.gov/electricity/annual/table.php?t=epa_02_06.html.

136 GHG RIA (2024), at pp. 3-34 – 3-37.

137 Regulatory Impact Analysis for the Final National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review," EPA, April 2024 ("MATS RIA (2024)"), available at https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-6966, at pp. 3-25;In

million annually.[138] EPA found that the small compliance costs of these rules are outweighed by substantial health and environmental benefits, with no impact on reliability.

In contrast, with the newly enacted Public Law No. 119-21, higher financing costs and corresponding suboptimal resource selection outcomes flow into higher rates paid by consumers for electricity. Many studies have estimated significant increases in electricity costs for households and businesses based on the administration's policies to shift away from further development of clean energy resources. For example, the Rhodium Group estimates the law will increase average household energy bills by $78-192 and total industrial expenditure by $7-11 billion by 2035.[139] Another study, developed by Energy Innovation, projects that the quick phasing out of clean technology credits will hamper the development of generation capacity, decreasing new electricity capacity by 120 GW by 2030 and 330 GW by 2035.[140] They provide even higher estimates of the impact on household electricity costs, projecting an increase of almost $150 per year in 2030 to $260 per year in 2035.[141] This projected decline in new capacity would seemingly exacerbate the "energy emergency" the Trump administration cites, undermining efforts to bolster energy supply and grid reliability.

By proposing these rules, the administration is attempting to force inefficient resource outcomes that directly contradict long-standing industry and competitive-market principles that will result in suboptimal resource allocation, incremental costs to consumers, a chilling of investment interest, and higher risk that insufficient resources will be developed to meet future demand.

C. Forcing Operation of Coal (or Other Fossil Resources) Imposes Significant Health and Climate Impacts

The Clean Air Act (CAA), first enacted in 1970 and subsequently amended, established a foundational regulatory framework for reducing air pollution and safeguarding public health. It has enabled the United States to make substantial progress in improving air quality, with measurable

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the RIA for the repeal of this rule, EPA finds "changes to retail electricity prices …to be approximately zero percent in all run years under the 2024 MATS RTR." "Regulatory Impact Analysis for the Proposed Repeal of Amendments to National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Steam Generating Units," EPA, June 2025, available at https://www.epa.gov/system/files/documents/2025-06/ria-for-mats-rtr-repeal-proposal.pdf, at pp. 2-7

[138] MATS RIA (2024), at p. 3-15. This is in $2019 and using a 3% discount rate.

[139] King, B., et al., "What passage of the 'One Big Beautiful Bill Means for US Energy and the Economy," available at https://rhg.com/research/assessing-the-impacts-of-the-final-one-big-beautiful-bill/.

[140] Orvis, R., et al., "Assessing Impacts of the 'One Big Beautiful Bill Act' on U.S. Energy Costs, Jobs, and Health, Emissions," Energy Innovation, June 2025, available at https://energyinnovation.org/report/one-big-beautiful-bill-act/, at p. 3.

[141] Orvis, R., et al., "Assessing Impacts of the 'One Big Beautiful Bill Act' on U.S. Energy Costs, Jobs, and Health, Emissions," Energy Innovation, June 2025, available at https://energyinnovation.org/report/one-big-beautiful-bill-act/, at p. 5.

benefits. A cost-benefit analysis of the CAA's implementation between 1970 and 1990 found that the "benefits of the Clean Air Act and associated control programs substantially exceeded costs."[142] A repeated study covering the period of 1990 to 2020 reached similar conclusions, underscoring the long-term effectiveness of the act.[143] While the CAA has served as a crucial launching point in the effort to address air pollution, it is not an end point. The continued evolution of regulations under this act has allowed standards to reflect advancements in technology and a deeper understanding of health risks. Rolling back or weaking these protections could undermine decades of progress and needlessly expose communities to well-documented and preventable harm.

The results of these analyses and corresponding health and climate impacts are outlined below.

1. Health Impacts

Studies have underscored the health consequences of air pollution. Communities near coal-fired power plants suffer from hazardous fine particle emissions. A 2023 Science study found that coal-derived $PM_{2.5}$ is over twice as lethal as $PM_{2.5}$ from other sources, causing approximately 460,000 attributable deaths between 1999 and 2020.[144] The study points out that "large decreases in annual deaths across the study period highlight the success of emissions reductions brought about by regulations under the 1990 Clean Air Act Amendments."[145] Taken together, the body of evidence strengthens the case for regulations that maintain limits on emissions.

In the Regulatory Impact Analyses (RIA) for proposed regulations, health benefits are often calculated by estimating how pollution reductions from the rule improve public health outcomes and then assign a dollar value to these improvements. Specifically, EPA uses air quality models to estimate how the rule reduces pollutants such as fine particulate matter ($PM_{2.5}$), ozone, and hazardous air pollutants (HAPs) like mercury and heavy metals. These pollution reductions are linked to health improvements – such as fewer premature deaths, asthma attacks and hospital visits – based on epidemiological studies. EPA then uses established economic methods

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[142] "The Benefits and Costs of the Clean Air Act, 1970 to 1990," EPA, October 1997, available at https://www.epa.gov/sites/default/files/2015-06/documents/contsetc.pdf, at p. ES-9.
[143] "The Benefits and Costs of the Clean Air Act from 1990 to 2020," EPA, March 2011, available at https://www.epa.gov/sites/default/files/2015-07/documents/summaryreport.pdf.
[144] Henneman, L. et al., "Mortality Risk from United States Coal Electricity Generation," *Science* (382), November 24, 2023, available at https://www.science.org/doi/10.1126/science.adf4915, at p.1.
[145] Henneman, L. et al., "Mortality Risk from United States Coal Electricity Generation," *Science* (382), November 24, 2023, available at https://www.science.org/doi/10.1126/science.adf4915, at p. 5.

to assign monetary value to each avoided health impact.[146] Some benefits that are not readily quantifiable are discussed but not incorporated into the dollar value benefits.[147] As a result, the monetized benefits can underestimate the overall benefits.

The RIA for the 2024 Carbon Standards projected substantial health gains. **Table 1** below summarizes selected estimated avoided health impacts for the year 2035. The monetized value of these health benefits, along with other benefits not listed, totals $100 billion from 2028 through 2047.[148]

Table 1: 2035 Estimated Health Benefits of Carbon Standards[149]

	Estimated Premature Mortalities and Illnesses	
	Ozone-Related	**$PM_{2.5}$-Related**
Avoided premature mortality from long-term exposure	120	-
Avoided adult premature mortality, ages 18-99	-	1,100
Hospital admissions-respiratory	15	40
ED visits-respiratory	250	310
Asthma symptoms	130,000	230,000
Lost work days	-	57,000
School absence days	48,000	-
Minor restricted activity days	61,000	340,000

By contrast, the MATS RIA reports more modest monetized benefits, not because the health gains are insignificant but because EPA is unable to monetize the majority of benefits associated with reductions of mercury and other HAPs. As a result, the monetized estimates understate the true public health value of the rule.[150]

[146] GHG RIA (2024), Section 4.3, available at https://www.regulations.gov/document/EPA-HQ-OAR-2023-0072-8913.
[147] MATS RIA (2024), Section 4.4, available at https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-6966.
[148] This value reflects a 3% discount rate and is measured in $2019. GHG RIA (2024), at p. 4-66.
[149] Central estimates are presented. The upper and lower bounds can be found in the source. GHG RIA (2024), at pp. 4-51, 4-56.
[150] MATS RIA (2024), at pp. 4-1 – 4-12.

The MATS RIA projected an 18.3% reduction in mercury in 2035 alone, with cumulative reductions of approximately 9,500 pounds from 2028 to 2037.[151] These reductions are particularly important for populations who rely on subsistence fishing, as mercury – especially in its methylated form – bioaccumulates in fish and poses elevated risks to fetal and child neurodevelopment.[152] Beyond neurodevelopmental effects, mercury and co-emitted HAP metals (e.g., arsenic, cadmium, chromium) are linked to a wide range of chronic health effects, including cardiovascular disease, kidney damage, immune suppression, and increased cancer risk.[153] Thus, even though these benefits were not fully monetized in the RIA, the emissions reductions achieved under MATS were expected to yield meaningful, long-term health improvements – particularly for vulnerable and overburdened communities.

To estimate the impacts of repealing these existing air quality standards, the administration did not conduct any new analysis. Instead, EPA simply stated that the costs to repeal the rules are equal to the benefits of adopting them – essentially, the costs are what were found to be benefits calculated in the 2024 RIAs, thereby treating the rollback as eliminating the associated health protections.[154]

2. Climate Impacts

Climate impacts in the 2024 RIAs are estimated by applying a monetary value to the social cost of carbon emissions (SC-CO_2), the estimated net harm to society from emitting one additional ton of carbon dioxide. Conversely, avoided emissions are treated as a benefit. These impacts encompass a wide range of consequences associated with climate change, including – but not limited to – declines in agricultural productivity, adverse health outcomes, increased property damage from flooding and extreme weather events, disruptions from climate-induced migration, heightened risk of conflict, and losses of ecosystem services.[155] As explained in the Carbon Standards RIA, "the well-documented atmospheric changes due to anthropogenic GHG emissions

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[151] MATS RIA (2024), at pp. ES-8, 3-10.
[152] MATS RIA (2024), at pp. 6-4 – 6-6.
[153] MATS RIA (2024), at p. 4-1.
[154] "The health impacts are derived from estimates originally provided in the 2024 CPS RIA that were calculated using a benefits transfer approach that adapts studies relating changes in PM2.5 and ground-level ozone concentrations to incidences of premature death, illness, and related adverse effects that are then monetized using a valuation function." *See* "Regulatory Impact Analysis for the Proposed Repeal of Greenhouse Gas Emissions Standards for Fossil Fuel Fired Electric Generating Units," EPA, June 2025, available at https://www.epa.gov/system/files/documents/2025-06/utilities_ria_proposal_111_repeal_2025-06.pdf, at p. 4-2. "This section relies on the emissions changes produced for the 2024 MATS RTR RIA analysis to assess the health impacts of the proposed repeal." *See also* "Regulatory Impact Analysis for the Proposed Repeal of Amendments to National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Steam Generating Units," EPA, June 2025, available at https://www.epa.gov/system/files/documents/2025-06/ria-for-mats-rtr-repeal-proposal.pdf, at p. 3-1.
[155] GHG RIA (2024), at p. 4-3.

are changing the climate at a pace and in a way that threatens human health, society, and the natural environment."[156] Accordingly, avoided CO_2 emissions are treated as direct social and economic benefits in EPA analyses.

The greenhouse gas intensity of electricity generation varies substantially across fuel types. Among all utility-scale generation technologies, coal-fired power has the highest lifecycle GHG emissions. It emits more than twice as much GHG per kilowatt-hour as natural gas units, and over 20 times more than solar, wind, or nuclear technologies.[157] These differences are crucial in regulatory assessment, where the choice of fuel mix directly affects emissions trajectories and the associated climate damage. Delaying coal retirements or halting the deployment of low-carbon or zero-carbon resources in the face of growing electricity demand would sharply increase emissions and exacerbate the long-term impacts of climate change.

In the 2024 Carbon Standards, EPA estimated that coal use in the U.S. power sector would fall by 89% relative to the baseline by 2045.[158] Importantly, the reduction would not be immediate. The most significant reductions were expected to accelerate after 2035, allowing time for planned capacity additions, grid investments, and resource diversification to take place. This trajectory reflected the prediction that some power companies would choose natural gas and renewables over coal in 2030 rather than invest in available pollution controls for aging units.[159] Notably, by 2040, approximately 56 GW of coal capacity will be at least 53 years old, the average retirement age for coal plants from 2015-2022.[160] In terms of generation, losses from unabated coal were projected to be offset by growth in gas and renewable output, ensuring energy reliability while reducing emissions.[161]

In total, the 2024 Carbon Standards were expected to reduce 1,382 million metric tons of CO_2 from 2028 through 2047, with associated climate benefits valued at $270 billion using SC-$CO_2$ estimates.[162] Although the current EPA excluded climate impact analyses from its regulatory process, it does not eliminate the fact that repealing this rule – especially in conjunction with weakening or delaying complementary policies like the IRA – will eliminate the emission reductions

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[156] GHG RIA (2024), at p. ES-8.
[157] Life Cycle of Greenhouse Gas Emissions from Electricity Generation: Update," NREL, November 2021, available at https://docs.nrel.gov/docs/fy21osti/80580.pdf.
[158] GHG RIA (2024), at p. 3-22.
[159] GHG RIA (2024), at p. 3-20.
[160] GHG RIA (2024), at p. 3-20.
[161] GHG RIA (2024), at p. 3-20.
[162] GHG RIA (2024), at pp. 4-16 – 4-17. The 2024 RIA incorporate the impacts of the IRA. GHG RIA (2024), at p. 3-20. "Consistent with E.O. 14154'Unleashing American Energy' (90 FR 8353, January 20, 2025) and the memorandum titled 'Guidance Implementing Section 6 of Executive Order 14154, Entitled 'Unleashing American Energy'', EPA did not monetize benefits associated with CO2 emissions changes." *See* MATS RIA (2024), at p. 3-1.

that were established in the rule, eliminating the estimated benefits. In combination with the other actions taken by the administration, climate risks will inevitably increase.

V. Observations and Conclusions

The White House, DOE, and EPA have issued executive orders, reports, and proposed regulations stating or implying that emergency action is needed for power system reliability as a result of current factors driving an increase in the demand for electricity and a changing supply mix. These actions involve reversing energy and environmental policies established over time, including steps taken recently by the Biden Administration, as well as issuing orders under emergency authorities. In this report, we review the key factors driving current and forecasted electricity demand (e.g., data centers, electrification, industrial growth, etc.), and technologies and practices used to mitigate and manage demand growth and shifts in electric generation. We also review existing market and regulatory structures designed and administered to meet the needs of a changing energy system over time. We summarize these factors of supply and demand and industry regulatory structures, and use them to test the current administration's premise that emergency actions are needed to maintain power system reliability. We also evaluate the potential drawbacks of taking the proposed actions from consumer cost, economic efficiency, climate, and environmental perspectives.

We find that there is no "energy emergency." Forecasted conditions of supply and demand in the electric industry are not out of line with historical experience. Existing wholesale markets and resource planning processes are well suited to ensure that demand growth is met through a strong supply (and demand) response. While the industry is changing, a careful review of the underlying drivers of demand and supply suggests the administration's declarations and regulatory actions are unwarranted, since (a) the expected growth in demand is within rates of growth that the industry has reliably met for decades, (b) the actual level of growth that will materialize will be mitigated by several factors related to price-responsive demand and technological and regulatory factors, and (c) there is no reason to believe the investment and development interest in supply will not keep pace with demand.

Technological change, rapid growth in demand, changing sources of supply, and adaptation to new policies that affect power sector investment and operation are nothing new in the electric industry. A century of developed federal and state policies, and electric company and RTO planning and operational practices and procedures has ensured reliable system operations on a continuous basis throughout periods of rapid changes in supply and demand, major overhauls of industry structure and regulation, and constantly-changing drivers of demand and sources of supply.

Finally, the executive and agency actions all have one thing in common: a deep blind spot to the very real consumer, economic efficiency, public health, and climate impacts of the "command and control" actions they propose to address the alleged energy emergency. The actions proposed by the administration are neither appropriate nor necessary.