# Large Load Literature Review: Data Sources

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# Large Load Literature Review: Data Sources

- This slide deck is a supplement to the Large Load Literature Review reports (2025 and 2026).
- Here, we summarize data sources from reports we reviewed that include quantitative analysis. Each slide presents an overview of the research methodology and key inputs and data used in report analysis.
- This is a living document and will continue to be updated each month.

# Data Sources (1) - *New*

**Large Load Tariff Whitepaper (Energy and Environmental Economics (E3), May 2026)**

- **Methodology:** The analysis uses bottom-up bill modeling to assess the impact of tariffs on data center customers under realistic conditions.
- **Key Inputs and Data Sources:**
  - *Tariffs and rate sheets:*
    - Halcyon Large Load Tariff Tracker
  - *Wholesale market prices:*
    - PJM capacity auction prices
    - ERCOT day-ahead energy prices

# Data Sources (2)

**Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites (RAND, March 2026)**

- **Methodology:** This research uses Multicriterion Decision-making (MCDM) framework to evaluate the feasibility of siting AI data centers based on various energy-centric parameters.
- **Key Inputs and Data Sources:**
  - *Energy supply:*
    - EIA data on utility-scale facility net generation from geothermal sources
    - Global gas infrastructure tracker
  - *Energy system:*
    - EIA data on average state-level industrial power prices
    - Interconnection process and timeline data from LBNL report
  - *Data center characteristics:*
    - Data center development cost guide
  - *Other inputs and sources are listed in Table 3.1 of the report*

# Data Sources (3)

**Powering Intelligence 2026 (Electric Power Research Institute (EPRI), February 2026)**

- **Methodology:** This analysis uses estimates of data center commercial development to map nominal IT capacity to annual electricity, using assumptions about Power Usage Effectiveness, operational ramp-up, and utilization.
- **Key Inputs and Data Sources:**
  - *Data Center Developments:*
    - Synthesis of nominal capacity estimates from Aterio, Avison Young, Baxtel, BloombergNEF, CBRE, Cushman & Wakefield, JLL, S&P Global, and Wood Mackenzie.
  - *Utility and Planning Forecasts:*
    - FERC Form 714 data
    - ERCOT long-term load forecasts
  - *State-level Energy Data:*
    - U.S. Energy Information Administration's (EIA) State Energy Data System (SEDS) dataset

# Data Sources (4)

**Flexible Data Centers: A Faster, More Affordable Path to Power (Camus, encoord, and Princeton ZERO Lab, December 2025)**

- **Methodology:** Three-tiered modeling framework to evaluate flexibility and capacity needs at the level of system, grid, and site. Princeton's GenX model, NLR's REopt model, and encoord's SAInt platform were used for the modeling.
- **Key Inputs and Data Sources:**
  - PJM load forecasts as of July 15, 2025
  - PJM Interconnection Queue
  - PJM Forecasted Data Center Additions
  - See Appendix A of the report for more details on inputs and assumptions

# Data Sources (5)

**Tailored for Scale: Designing Electric Rates and Tariffs for Large Loads (E3, December 2025)**

- **Methodology:** Cost-benefit analysis comparing the data centers' levelized projected costs to the annual projected revenues to assess the resulting surplus or deficit.
- **Key Inputs and Data Sources:**
  - Data Center Load Size and Typical Load Profiles
  - Dominion Energy Virginia Biennial Review of Base Rates
  - Pacific Gas & Electric Projected Data Center Pipeline

# Data Sources (6)

**Power Demand Forecasts Revised Up for Third Year Running, Led by Data Centers (Grid Strategies, November 2025)**

- **Methodology:** Market analysis based on utility forecasts and proprietary database of data center projects.
- **Key Inputs and Data Sources:**
  - *National and Regional forecasts of peak load and energy use:*
    - FERC Form 714 Filings
    - Plans from RTOs/ISOs: SPP, ERCOT, PJM, MISO, CAISO, NYISO
  - *Data Center Projects and Market Analysis:*
    - Cleanview Tracker
    - TD Cowen

# Data Sources (7)

**Bringing Data Center Flexibility into Resource Adequacy Planning: A Case Study of NV Energy**
**(GridLab, Telos Energy, September 2025)**

- **Methodology:** Analyzes data center flexibility (in terms of percentage up-time and gigawatts of participation) as an accredited supply-side resource by running and to re-running a capacity expansion model and quantify the benefits of data center flexibility.
- **Key Inputs and Data Sources:**
  - *Peak Demand Forecast, Generator Capacities, Forced Outage Rates*: Adapted from NV Energy's 2024 IRP
  - *Load Profiles*: GridPath RA Toolkit study of the Western United States
  - *Energy profiles*: National Laboratory of the Rockies (formerly NREL) Toolkit and DB

# Data Sources (8)

**An Assessment of Large Load Interconnection Risks in the Western Interconnection (Elevate Energy Consulting for Western Electricity Coordinating Council, February 2025)**

- **Methodology:** Quantitative data collection and analysis to estimate the large load interconnection queue size and breakdown by category.
- **Key Inputs and Data Sources:**
  - *Self-administered questionnaire:*
    - Western Electricity Coordinating Council's industry advisory group (IAG), also known as Large Load IAG
  - *Data Center Demand Forecasts:*
    - McKinsey & Co.
  - *Operational Data on Load Loss Events (expressed as Load Loss or Reduction in MW):*
    - ERCOT

# Data Sources (9)

**Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems (Duke University, February 2025)**

- **Methodology:** Leveraging the headroom in seasonal load factors (= average seasonal load/maximum seasonal load) and combining it with varying % of data center load curtailment can allow new loads (in MW) to be added with relatively low rates of curtailment.
- **Key Inputs and Data Sources:**
  - *Hourly load data* - EIA Hourly Load Monitor (EIA-930) which contains data for the 22 balancing authorities
  - *Load curtailment limits* - assumed 0.25%, 0.5%, 1.0%, and 5.0%

# Data Sources (10)

**2024 United States Data Center Energy Usage Report (Lawrence Berkeley National Lab (LBNL), December 2024)**

- **Methodology:** Bottom-up energy use model that uses IT equipment wattage, product shipments, and modeled Power Usage Effectiveness/Water Usage Effectiveness (PUE/WUE).
- **Key Inputs and Data Sources:**
  - *Non-AI Server Wattage* - Green Grid Server Energy Efficiency Database (SEED), SERT, Standard Performance Evaluation Corporation (SPEC)
  - *AI workloads* - empirical data from Brookhaven National Laboratory data, open-source benchmarking data from Sustainable Metal Cloud
  - *Shipments* - IDC's Worldwide Quarterly Server Tracker for servers; IDC's 2024 Q2 Data Center Semiconductor Consumption Report, IDC's 2023 Processors AI Tracker for AI servers; Omdia Research for GPU shipments
  - *PUE/WUE* - Market data for data center space type and cooling system, Typical meteorological year (TMY) climate data

# Data Sources (11)

**Virginia Data Center Study: Electric Infrastructure and Customer Rate Impacts, (Energy+Environmental Economics (E3), December 2024)**

- **Methodology:** Using in-house modeling - capacity expansion model (RESOLVE) and loss-of-load probability model (RECAP) to study the impacts of data center growth on Virginia's electric infrastructure and corresponding costs.
- **Key Inputs and Data Sources:**
  - *Load Forecasts and Projections:*
    - University of Virginia Weldon Cooper Center (WCC)
    - 2024 PJM Forecast
  - *Transmission Constraints:*
    - Energy Exemplar's PJM database
  - *Virginia State Goals*

# Data Sources (12)

**Powering Data Centers: U.S. Energy System and Emissions Impacts of Growing Loads (Electric Power Research Institute (EPRI), October 2024)**

- **Methodology:** State-level data center capacity data is translated to energy use by making assumptions about capacity factors using state-level EIA electricity demand data across different sectors. Future data center electricity load is projected using three scenarios of average annual growth rate. Scenarios represent varying levels of AI tool usage, efficiency improvements in data center hardware or algorithms.
- **Key Inputs and Data Sources:**
  - *State-level data center capacity* - Baxtel
  - *State-level electricity demand data* - Energy Information Administration (EIA), 2024
  - *Nominal capacity factors* - assumed 70-90%
  - *Data center average annual growth rate* - assumed 6%, 12%, and 18% for Low, Medium, and High scenarios, respectively.

# Additional resources?

If you are aware of other reports that would be useful to include in this literature review, please send the resource to nfrick@lbl.gov.

# Thank you

## Contact


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