Municipal Ordinance Considerations for Data Centers

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Penn State Center for Energy Law and Policy

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PennState CELP | CENTER FOR ENERGY LAW AND POLICY

Today's Agenda

- Background: Why Here? Why Now?
- Municipal Ordinance Considerations
- County and State Authorities [if there's time]



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Data Centers in Pennsylvania - Why Here? Why Now?

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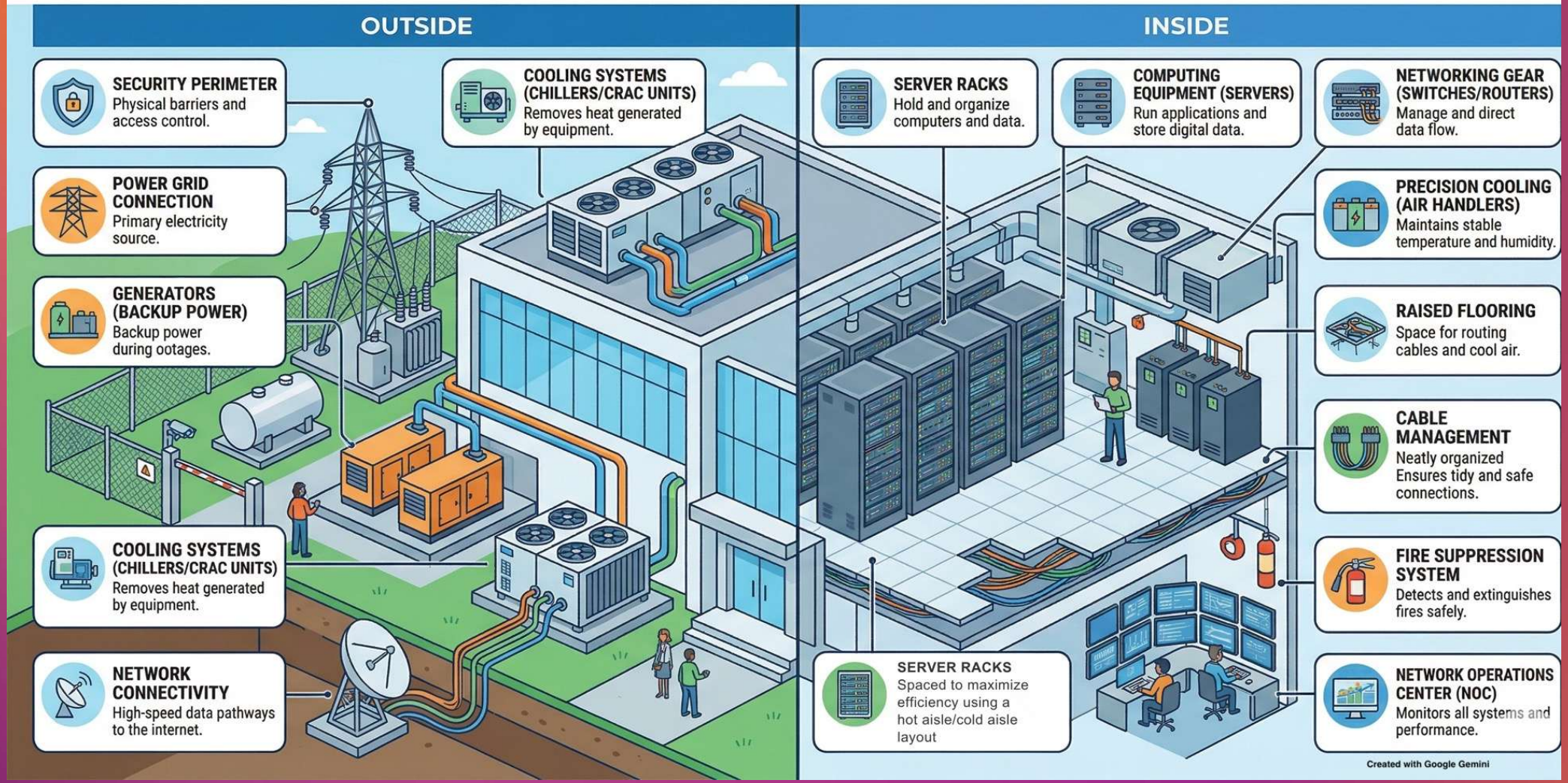
PA's Competitive Advantages Summary

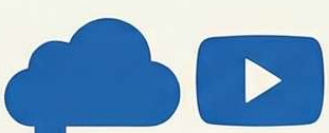
- **Proximity to Internet Infrastructure**
  - Low latency, ecosystem access
- **Natural Gas**
  - Reliable, cheap power
- **Electricity Infrastructure**
  - Existing grid/transmission
- **Water**
  - Cooling sustainability
- **Investments/Policy**
  - $90B+ momentum
- **Work Force and Education**
  - Talent ready now

Data Centers Defined

INSIDE AND OUTSIDE A DATA CENTER: BASIC COMPONENTS



The Invisible Backbone of Your Day



POWERING YOUR ENTERTAINMENT AND MEMORIES

Streaming movies, social media scrolling, and cloud photo storage all happen on physical servers.



ENABLING DAILY FINANCE AND NAVIGATION

Banking transactions and GPS routing are processed in real-time by remote data centers.



SUPPORTING REMOTE WORK AND HEALTHCARE

Video meetings and digital health records require constant access to secure data facilities.



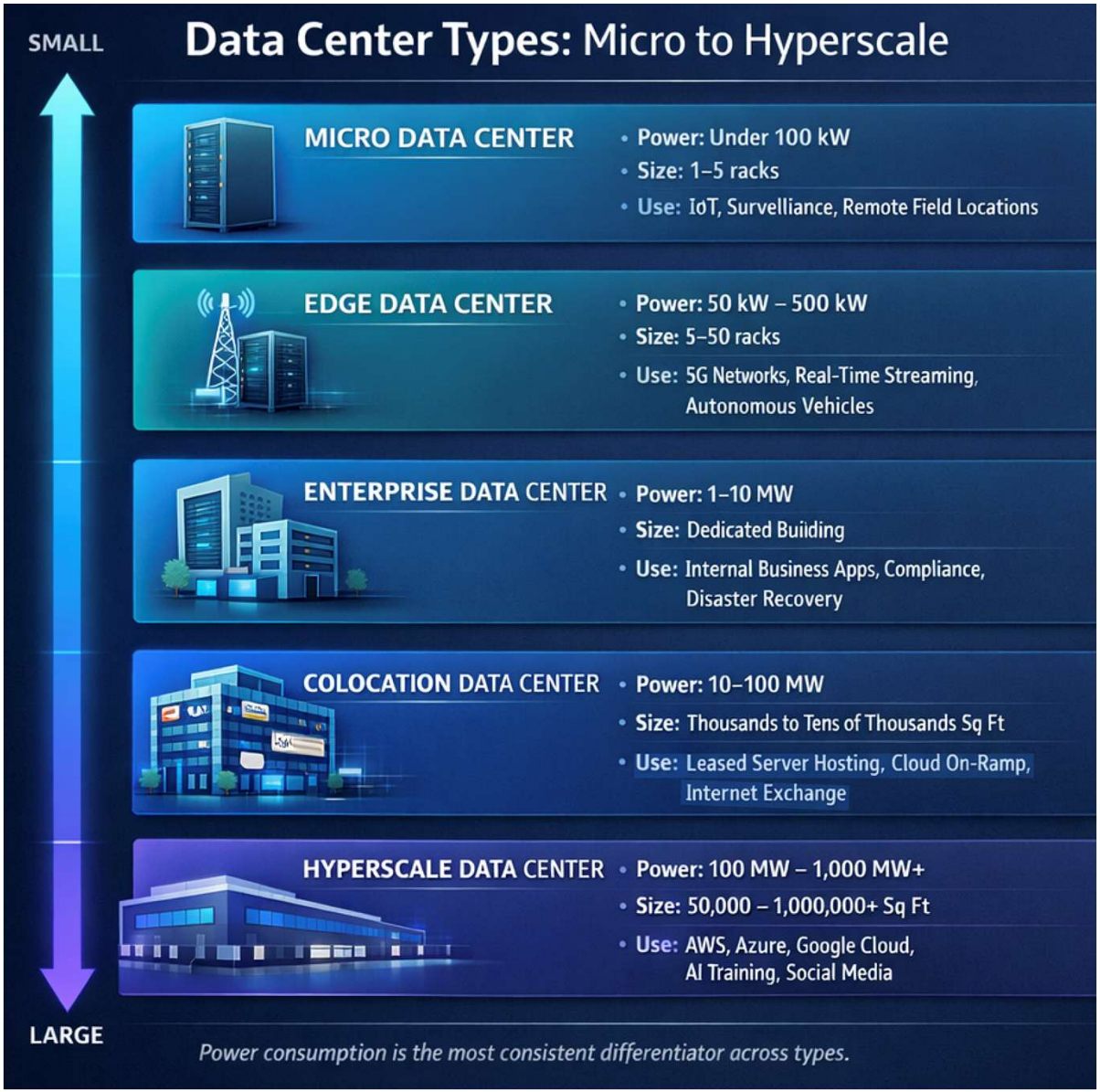
DRIVING THE RAPID GROWTH OF AI

As of 2026, data center demand is accelerating to support generative AI models like ChatGPT.



PHYSICAL DATA CENTERS

NotebookLM



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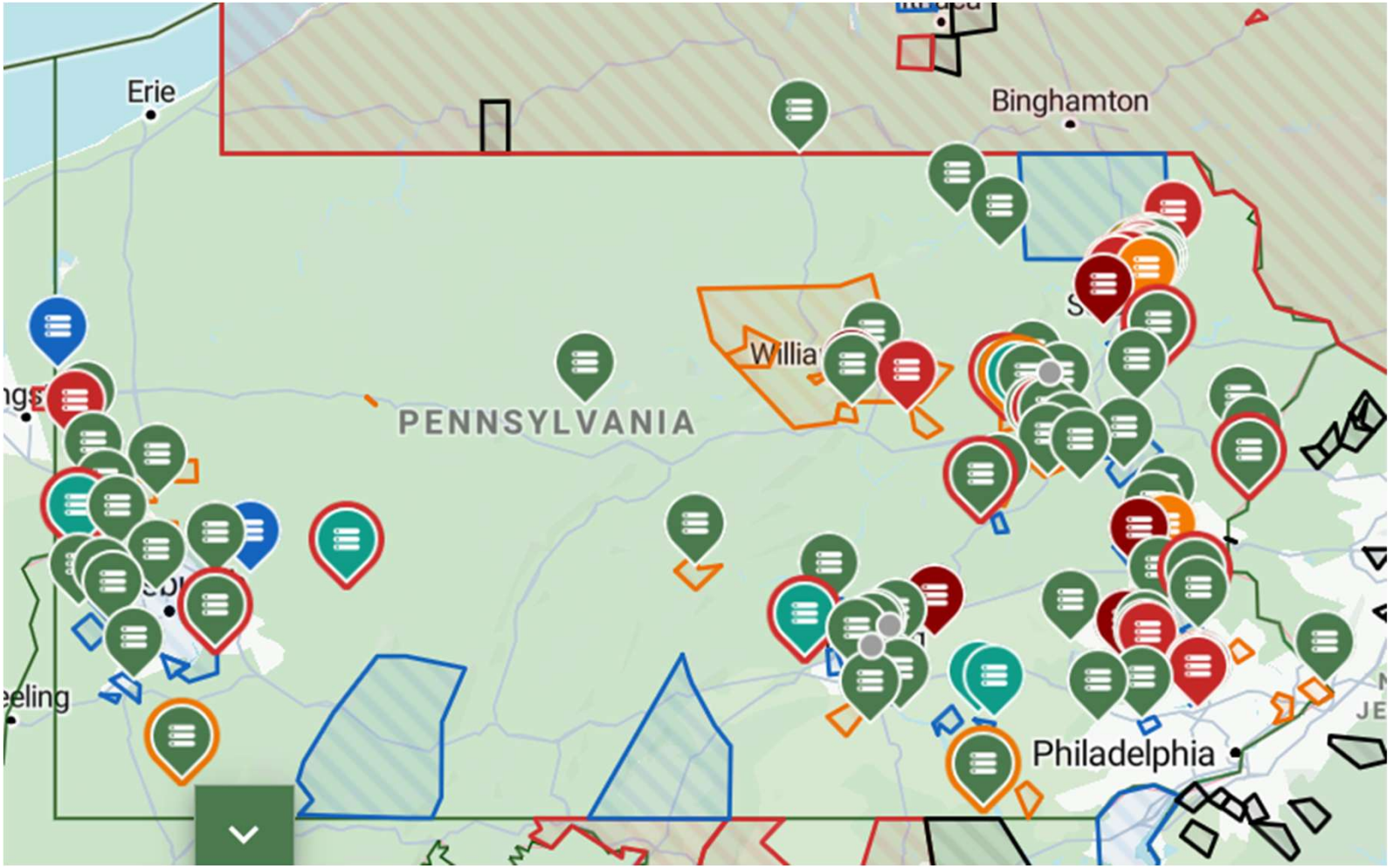


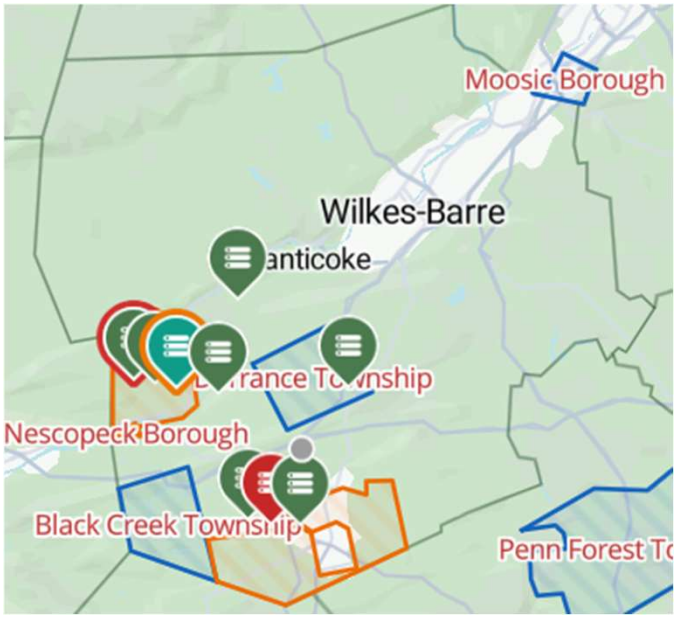






From (11/12/26):
https://trackdatacenters.com/state/pennsylvania

Luzerne County

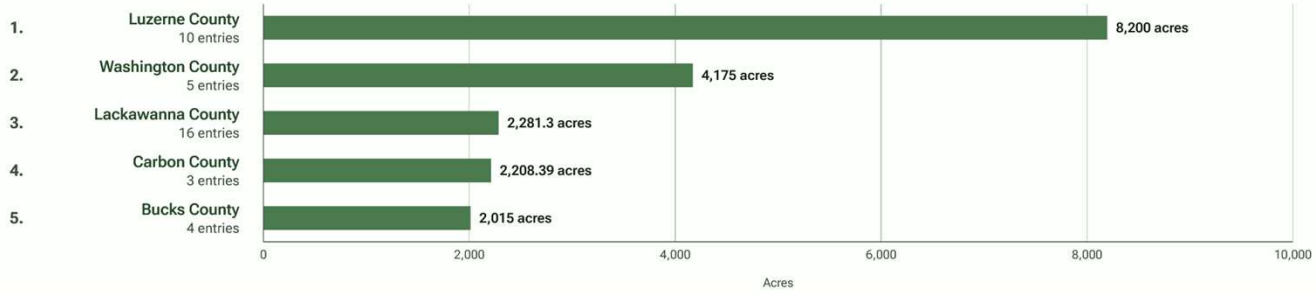


Luzerne County

8 proposals · 1 withdrawn · 1 existing · 4.3 GW · 8,200 acres

ACREAGE

Land reported across each county's sites.



ANNOUNCED CAPACITY

The lighter track extends to the full build-out figure where one is reported.



From (as of 11/12/26): https://trackdatacenters.com/usa/pennsylvania/counties

Power Requirements

Energy Terms and AI Power Needs

Pennsylvania: The Keystone of American Energy

National Production Powerhouse



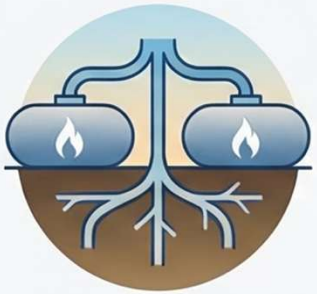
#2 in U.S. Natural Gas Production

Pennsylvania produces **one-fifth** of the nation's total marketed natural gas output.



#3 in National Coal Production

The state is the third-largest producer and the only U.S. source of anthracite coal.



Largest Natural Gas Storage Capacity

Pennsylvania operates **49 underground facilities**, the most of any state in the nation.



National Ranking in Energy Categories

Energy Category	National Rank
Net Energy Supplier	3rd
Electricity Generation	3rd
Nuclear Power Generation	2nd

https://www.eia.gov/states/PA/analysis

Electricity Generation & Export



#1 Net Exporter of Electricity

The state sends more power across its borders than any other state.



90% of Power from Gas & Nuclear

Natural gas provides **59%** of in-state generation, while nuclear power provides **31%**.

Solar Generation Tripled in 2024



Utility-scale solar capacity surged from **361 MW** to **1,095 MW** in a single year.

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EIA forecasts strongest four-year growth in U.S. electricity demand since 2000, fueled by data centers

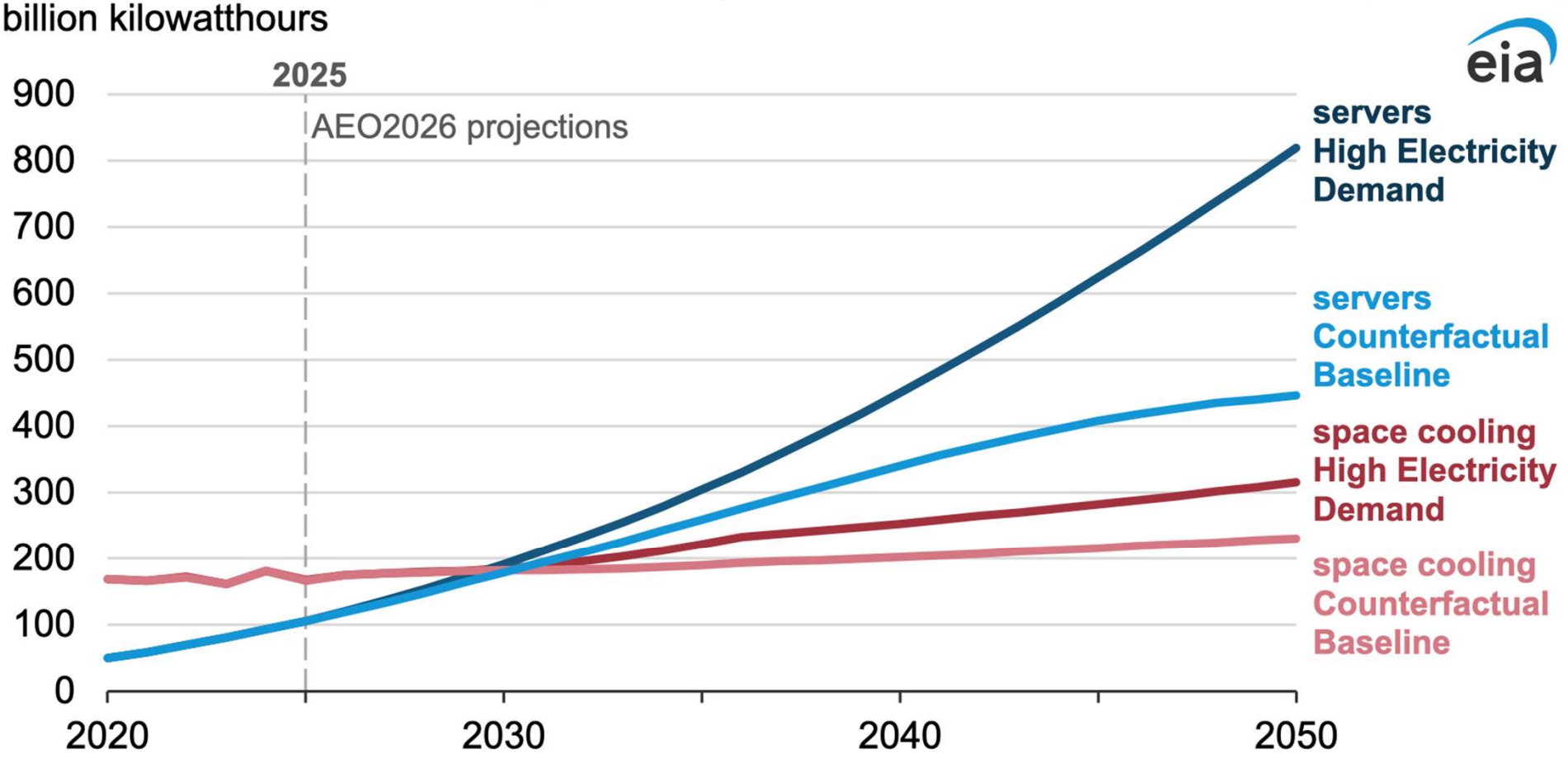
- The U.S. Energy Information Administration (EIA) expects U.S. electricity use to grow by 1% this year and 3% in 2027. Marking the first time since 2007 that power demand has risen for four years in a row and the strongest four-year growth period since 2000. The driving factor - demand from large computing centers.

- "U.S. energy production remains strong, and natural gas output is expected to grow to nearly 109 billion cubic feet per day this year. Natural gas supply is critical as we forecast that U.S. liquefied natural gas exports expand and electricity demand rises through 2027, driven largely by increasing demand from large computing facilities, including data centers."

  - Tristan Abbey, EIA Administrator

https://www.eia.gov/pressroom/releases/press582.php

Data center server and cooling electricity use in the U.S. commercial sector (2020–2050)
billion kilowatthours



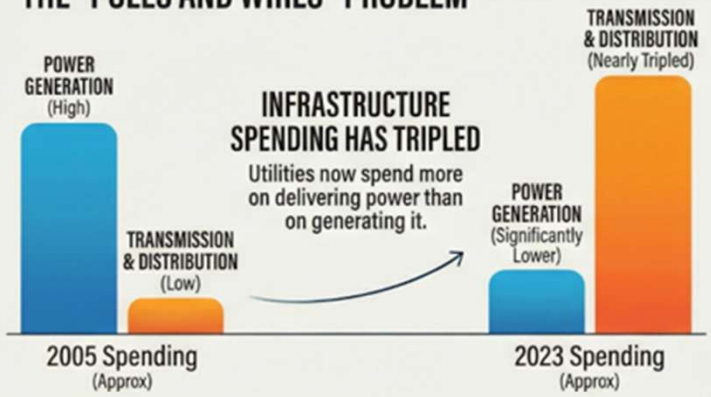
Data source: U.S. Energy Information Administration, Annual Energy Outlook 2026 (AEO2026) Counterfactual Baseline and High Electricity Demand cases

THE SPARK BEHIND THE SPIKE

Why U.S. Electricity Prices are Rising

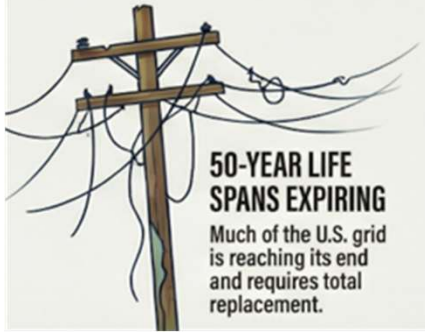
While electricity prices have risen faster then inflation in 28 states since 2019, the primary driver nationwide is no longer the cost of fuel, but the massive investment required to modernize and harden the aging electrical grid.

THE "POLES AND WIRES" PROBLEM



INFRASTRUCTURE SPENDING HAS TRIPLED

Utilities now spend more on delivering power than on generating it.



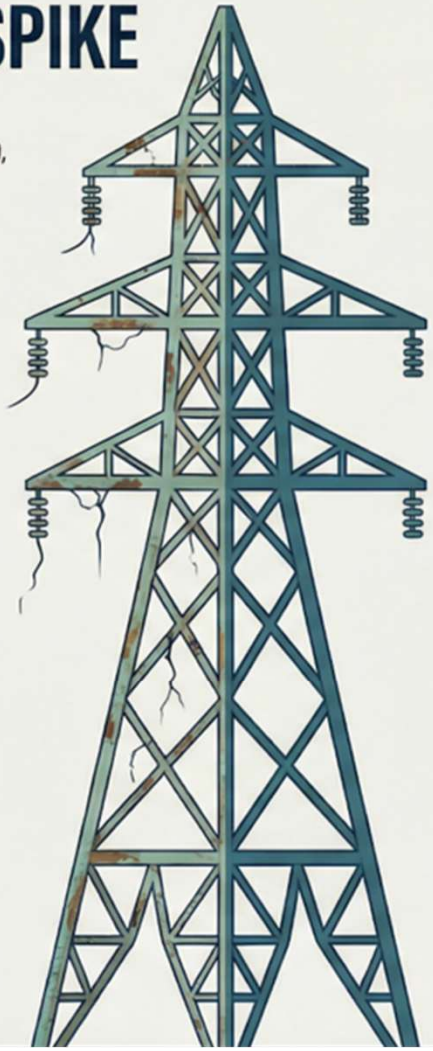
50-YEAR LIFE SPANS EXPIRING

Much of the U.S. grid is reaching its end and requires total replacement.



CLIMATE HARDENING COSTS

Wildfire prevention and hurricane-proofing are driving significant rate increases in Florida and California.



REGIONAL PRICE DRIVERS

THE RENEWABLES IMPACT



LOWER PRICES

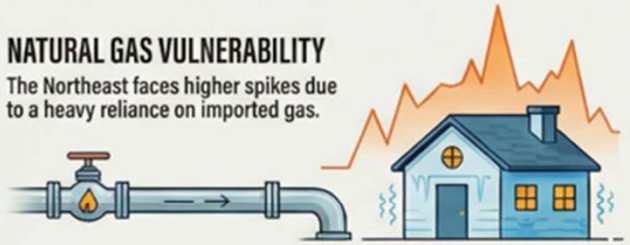
Prices often fall in wind-rich states

HIGHER PRICES (DUE TO UPGRADES)

but may rise where mandates require upgrades.

NATURAL GAS VULNERABILITY

The Northeast faces higher spikes due to a heavy reliance on imported gas.



THE DATA CENTER BOTTLENECK



AI facilities can strain local grids faster than new power plants can be built.

https://www.wsj.com/business/energy-oil/be-prepared-to-keep-paying-more-for-electricity-31462755?

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Water Needs

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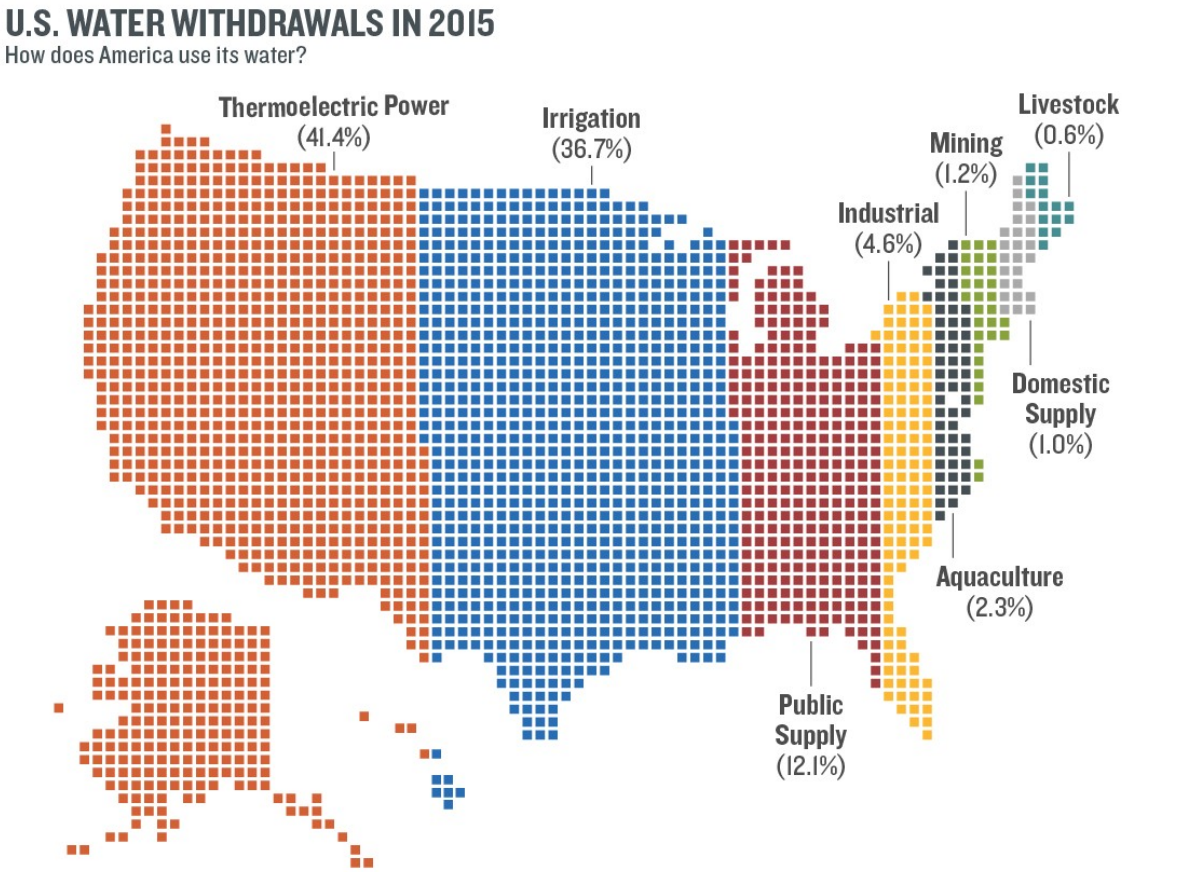
How Water is Used in the US



Source: Dieter et al. (2018) Estimated Use of Water in the United States in 2015. USGS Circular 1441.

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Data Center Cooling: The Big Trade-Off

Choose the right cooling method based on climate and resource availability.

Wet Cooling: Max Efficiency, High Waste



Uses evaporation to achieve the lowest temperatures but consumes millions of gallons of water daily.

Dry Cooling: Zero Water, High Energy



Operates like a car radiator with zero water loss, though energy costs spike during hot weather.

Adiabatic: The Hybrid Choice



Uses **70–90%** less water than wet systems by only using evaporation when outdoor temperatures peak.

https://datacenters.microsoft.com/

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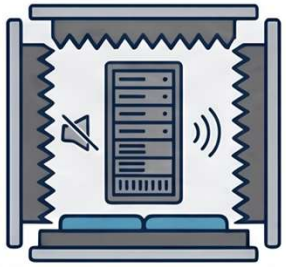
Noise

Quiet Power: Silencing Data Center Noise

The Multi-Layered Approach to Noise Reduction

Soundproof internal equipment and fans.

Use foam mats, fan silencers, and compressor blankets to muffle sound at the source.



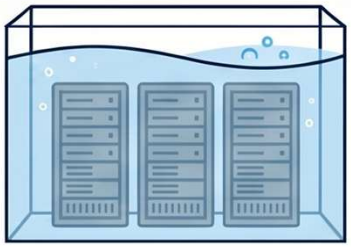
Shield the building with acoustic barriers.

Install modular metal walls, and natural landscaping to block sound waves.



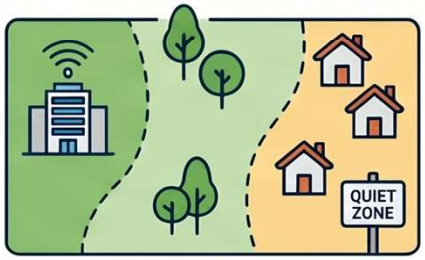
Adopt silent immersion cooling technology.

Bathing servers in liquid-cooling fluid eliminates the need for noisy industrial fans.



Use smarter zoning and site planning.

Position facilities far from residential areas and establish “quiet place” ordinances.



https://www.eesi.org/articles/view/communities-are-raising-noise-pollution-concernsabout-data-centers

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Broadband Infrastructure

DATA CENTERS: URBAN SPEED VS. RURAL SCALE

URBAN HUBS PRIORITIZE INSTANT CONNECTION

- Cluster for low latency (finance, healthcare, IT).



RURAL SITES PRIORITIZE MASSIVE SCALE

- Cloud providers build for cheaper electricity and land.

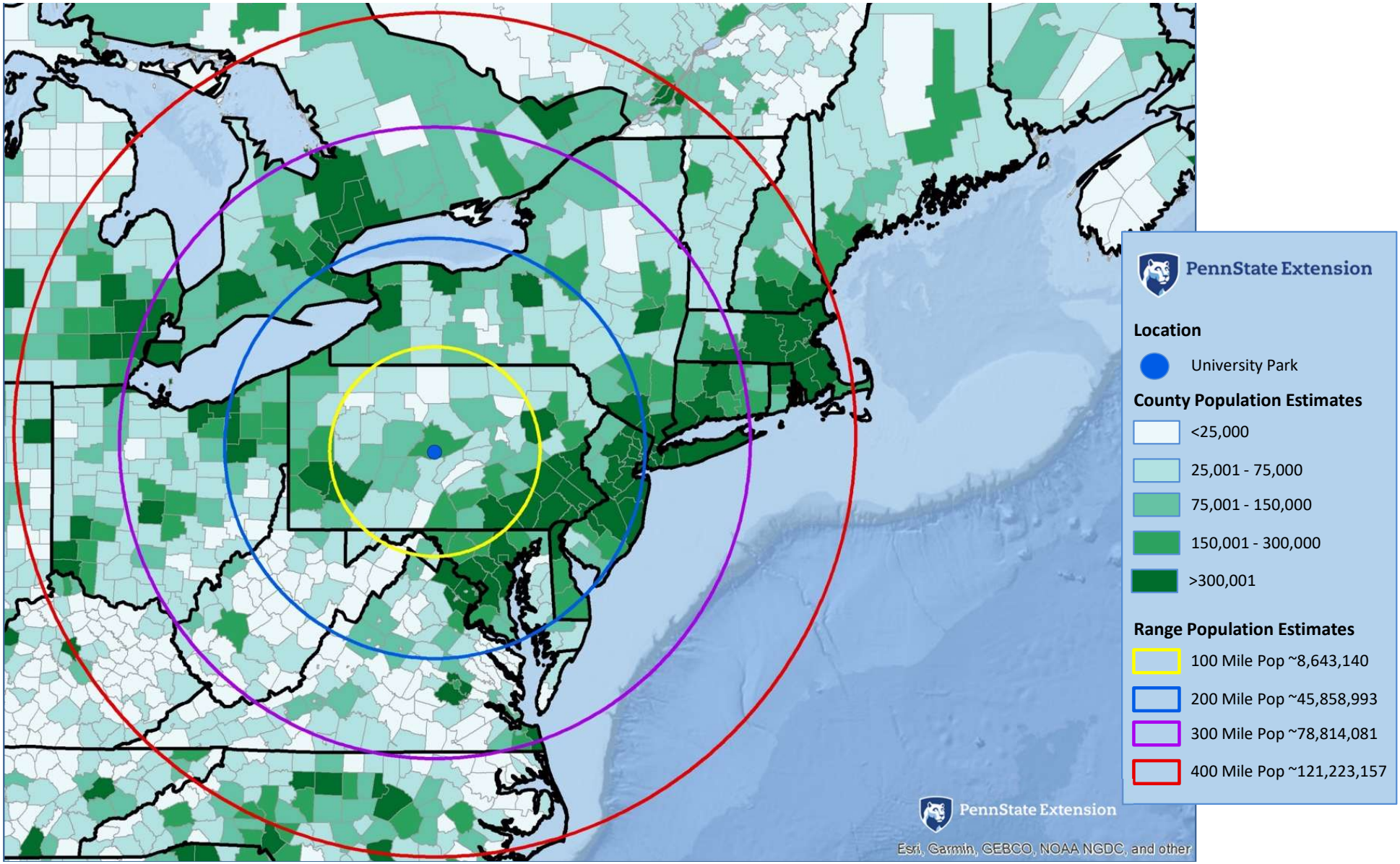


INFRASTRUCTURE AND COST OUTWEIGH JOBS

Decisions driven by power and networks, not local talent pools.

https://news.rice.edu/news/2026/data-center-location-decisions-focus-cost-and-proximity-not-job-centers-study-shows

NotebookLM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Location
University Park
County Population Estimates
<25,000
25,001 - 75,000
75,001 - 150,000
150,001 - 300,000
>300,001
Range Population Estimates
100 Mile Pop ~8,643,140
200 Mile Pop ~45,858,993
300 Mile Pop ~78,814,081
400 Mile Pop ~121,223,157
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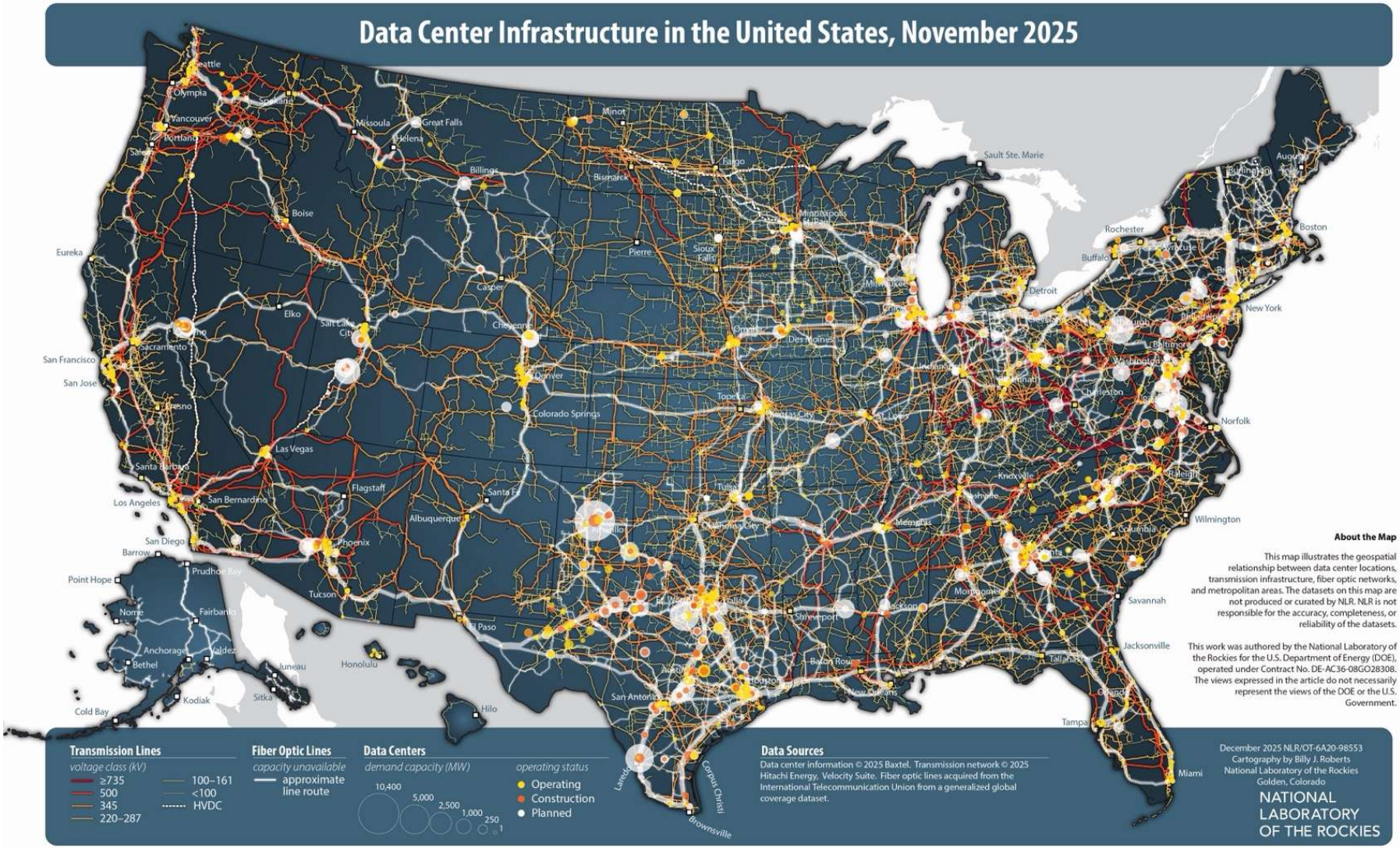
Esri, Garmin, GEBCO, NOAA NGDC, and other

Data Center Infrastructure in the United States, November 2025



About the Map

This map illustrates the geospatial relationship between data center locations, transmission infrastructure, fiber optic networks, and metropolitan areas. The datasets on this map are not produced or curated by NLR. NLR is not responsible for the accuracy, completeness, or reliability of the datasets.

This work was authored by the National Laboratory of the Rockies for the U.S. Department of Energy (DOE), operated under Contract No. DE-AC36-08GO28308. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government.

Transmission Lines

voltage class (kV)

- ≥735
- 500
- 345
- 220–287
- 100–161
- <100
- HVDC

Fiber Optic Lines

capacity unavailable

- approximate line route

Data Centers

demand capacity (MW)

10,400 · 5,000 · 2,500 · 1,000 · 250 · 1

operating status

- Operating
- Construction
- Planned

Data Sources

Data center information © 2025 Baxtel. Transmission network © 2025 Hitachi Energy, Velocity Suite. Fiber optic lines acquired from the International Telecommunication Union from a generalized global coverage dataset.

December 2025 NLR/OT-6A20-98553
Cartography by Billy J. Roberts
National Laboratory of the Rockies
Golden, Colorado

NATIONAL LABORATORY OF THE ROCKIES

Workforce by Project Phase

Jobs

- All Jobs Depend on Data Center Scale
- Construction
  - 100s – 1,000s (total FTE equivalent)
    - Note: may include direct, indirect, and induced jobs
  - ~0.7–2.0 workers per MW (est. peak on-site)
  - Location dependent
  - Move from site to site
  - Likely specialized



Operational Jobs Rule-of-Thumb

- Location-based jobs
  - ~15-35 per 100 MW
  - 0.15–0.35 full-time employees per MW
- Regional-based jobs
  - ~15-35 per 100 MW

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Challenges and Opportunities?

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Challenges & Solutions

Data Centers in Pennsylvania - Why Here? Why Now?

- Concerns:
  - Energy costs
  - Water
  - Noise
  - Environmental concerns
  - Concerns about impacts from AI more generally
- Proposed Solutions:
  - PUC tariffs
  - Bring your own power
  - Community benefits agreements
  - Farmland preservation
  - Local land-use control

Policy Considerations for Data Centers



CELP | CENTER FOR ENERGY LAW AND POLICY

Roadmap

- Municipal action on data centers
  - Common zoning provisions
- County authority to enact zoning
- Proposed policies pending in Pennsylvania
- Enacted or proposed policies in other states
  - General legislation
  - Policies affecting permitting
  - Policies affecting PUC activities
- Q & A



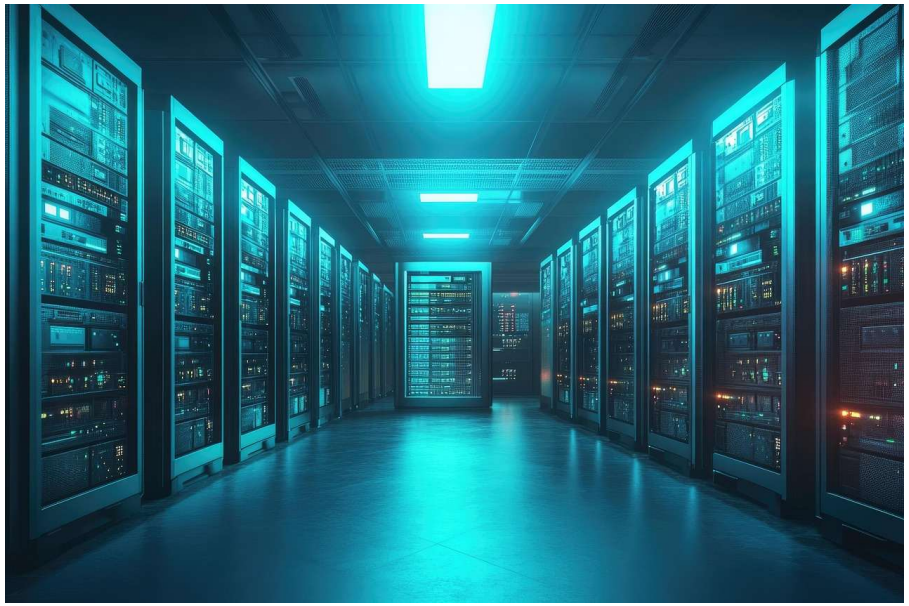
Municipal Actions re: Data Centers

Municipal Action re: Data Centers

- To develop land in zoned municipalities in Pennsylvania, a developer must comply with local zoning regulations.
- In areas where data center proposals are most common, many municipalities are taking action by amending their zoning ordinances.
- We are in the process of gathering municipal ordinances from Pennsylvania.
- A survey of select ordinances that we have gathered so far reveals a wide variety of approaches.
- Many municipalities include construction restrictions like setbacks and building height limits. Other provisions show significant variation.

Examples of Ordinance Provisions

- "[A] zoning ordinance that excludes a use from a municipality, or makes only a token allocation of available land, may be invalid because it is exclusionary in its effect."
  - Ryan on Zoning § 3.5.1 (2026).
- **Municipalities must allow for all lawful activities, but they can restrict where and how they occur.**
- Data center ordinance provisions address topics such as:
  - Siting (zone) of data centers
  - Conditional use/special exception
  - Lot size restrictions
  - Setbacks
  - Building height restrictions
  - Required submission of plans



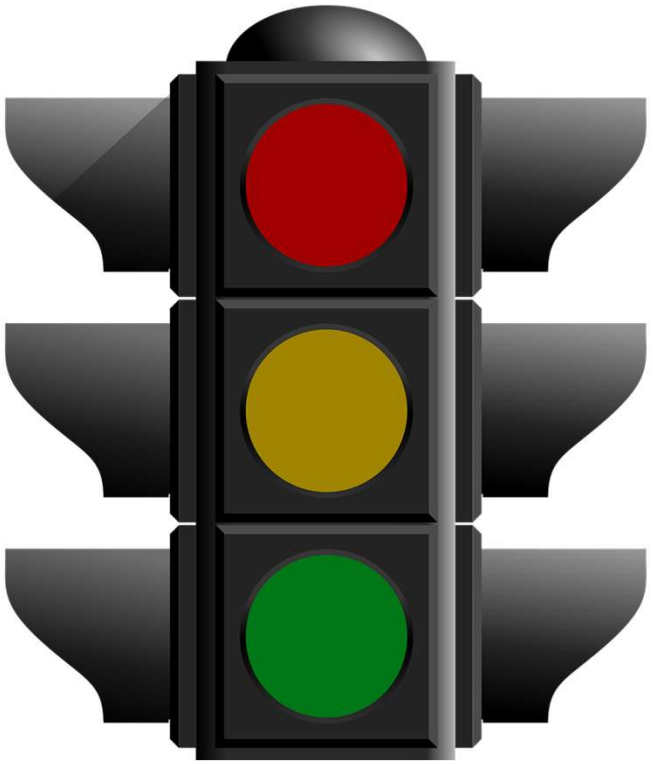
Siting (Zone)



- Municipalities take varying approaches to data center siting
  - Many restrict to manufacturing, commercial, and/or industrial districts
    - E.g., West Pennsboro Twp., PA; Fairview Twp., PA; Fairfax Co., VA
  - Some created a zone expressly for data centers and energy technology
    - E.g., Covington Twp., PA
  - Some created “overlays” specifically for data centers
    - E.g., Jessup, PA; Archbald, PA
  - Most exclude from residential zones

Permission Needed

- In municipal zoning, there are three primary mechanisms for approval of a use:
  - By right- No prior approval needed as long as use complies with ordinance conditions.
  - Special exceptions- Approval required from zoning hearing board after hearing
  - Conditional use- Approval required from municipal governing body after hearing



Permission Needed (cont.)



- We've seen variation in approaches municipalities have taken to data centers.
- Many municipalities consider data centers "conditional uses"
  - E.g., West Pennsboro Twp., PA; Fairview Twp., PA
- Some consider data centers "special exceptions"
  - E.g., Fairfax Co., VA; Loudon Co., VA
- A few examples of "by right" use for small data centers
  - E.g., Fredericksburg, VA

Minimum Lot Size Restrictions

- Wide variations among lot size restrictions
- Ordinances we have reviewed range from **3 acres** (Cumberland Co., PA, Model Ordinance) to **120 acres** (Archbald, PA)
- Other examples:
  - Jessup Boro., PA – 4 acres
  - West Pennsboro Twp., PA – 25 acres
  - Chestnuthill Twp., PA – 10 acres
  - Fairview Twp., PA – 50 acres
  - Covington Twp., PA – 60 acres

Setbacks

- Setbacks are the distance from the property line in which no buildings may be built.
- Setback requirements vary greatly – from 50 ft. (Jessup Boro., PA, distance to non-residential property line) to 400 ft. (Covington Twp., PA, distance to residential property line).
- Many municipalities have different setbacks for different property types.
  - E.g., Archbald Boro., PA (300 ft. from residential; 200 ft. from other uses)



Building Height Restrictions



- Some municipalities set a maximum height for data center buildings.
- Those maximum heights vary between 50 and 120 feet.
- Examples include:
  - Jessup Boro., PA – 50 ft.
  - North Whitehall Twp. – 50 ft.
  - Fairview Twp., PA – 55 ft.
  - West Pennsboro Twp., PA – 75 ft.
  - Covington Twp., PA – 120 ft.

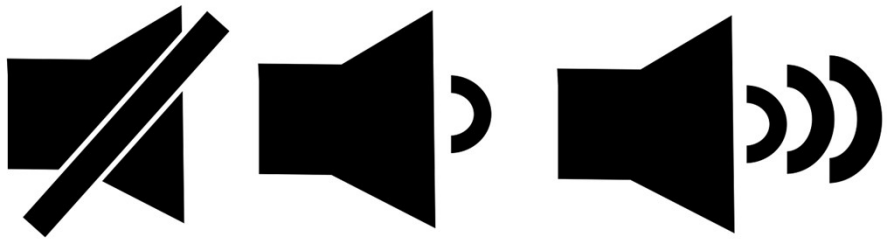
Plan/Study Submissions

- Many municipalities require developers to submit plans or studies related to their development activities. Types of plans required include:
  - Noise mitigation plan/sound study
  - Energy management plan
  - Water service analysis
  - Thermal impact mitigation plan
  - Emergency response plan
  - Electric interconnection agreement
  - Environmental impact assessment
  - Transportation impact study



Noise Limits

- Establish decibel-based noise limits for sound at property lines.
  - Some are general noise ordinances for all uses.
  - Others are specific to data centers.
- Often vary based on time of day and/or neighboring property zoning use
- Often include exceptions (emergency signal, repairs, church bells, etc.)



Noise Limit: Example (General ordinance)

☐ § 550-1005 **Noise.**

A. No principal commercial or industrial uses or their operations on their lot shall generate a re-occurring sound level exceeding the limits established in the table below, when measured at the specified locations:

Sound Level Limits by Receiving Land Use/District			
Land Use Or Zoning District Receiving The Noise		**Hours/Days**	**Maximum Sound Level**
1.	At a lot line of a residential use in a residential district	1) 7:00 a.m. to 10:00 p.m., other than any-time on: Christmas Day, Thanksgiving Day, New Years Day, Easter Sunday, Labor Day, 4th of July, and Memorial Day 2) 10:00 p.m. to 7:00 a.m., plus anytime on any of the following days: Christmas, Thanksgiving, New Years, Easter Sunday, Labor Day, 4th of July and Memorial Day	1) 55 dBA 2) 45 dBA
2.	At a lot line of a commercial or R-C District	All times and days	65 dBA
3.	Any lot line other than "1." or "2."	All times and days	70 dBA

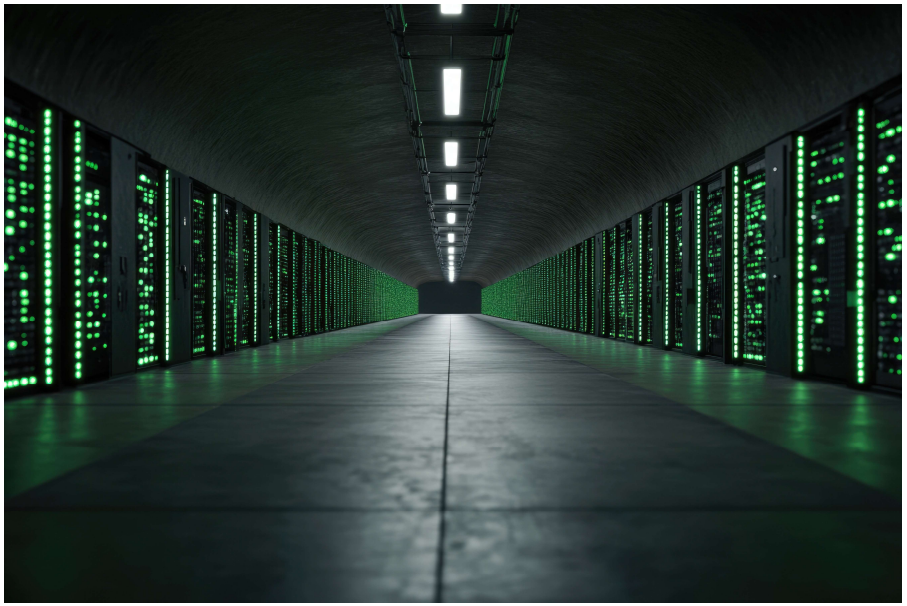
Source: Archbald Borough (Lackawanna Co.) Zoning Ordinance § 550-1005.

Decibel C

2. Sound level.
   a. Sound levels at the property line shall not exceed 40 dB(A) and 50 dB(C) from 7:00pm to 7:00 am, nor shall they exceed 45 dB(A) and 60 dB(C) from 7:00am to 7:00pm.
   b. Where baseline ambient noise measured for the pre-construction noise study exceeds that of the maximum sound level above, sound levels at the property line shall not exceed the baseline ambient noise level (for dB(A) and dB(C)).

Source: Data Center Ordinance Guide | Montgomery County, PA

Additional Provisions



- Requirement that external building color must be low-reflective, subtle, or earth tone.
  - Tioga Co., PA
- Requirement that, to extent practical, utility lines be underground.
  - Palmer Twp., PA
- Security fencing requirements.
  - E.g., Jackson Twp., PA

Municipalities without Zoning

- Zoning provides the broadest municipal authority overseeing land use.
- The Municipalities Planning Code does allow for a municipality to adopt in its SALDO provisions that "apply uniformly throughout the municipality regulating minimum setback lines and minimum lot sizes which are based upon the availability of water and sewage." 53 P.S. § 10503(4.1).
- Case law establishes that municipalities cannot use a SALDO to regulate the location of specified land uses. Ryan at § 11.1.3, *quoting Middle Paxton Township v. Sweitzer*, 97 Dauph. 240 (1975), *reversed on other grounds*, 350 A.2d 184 (Pa. Commw. 1976).

Other things to think about

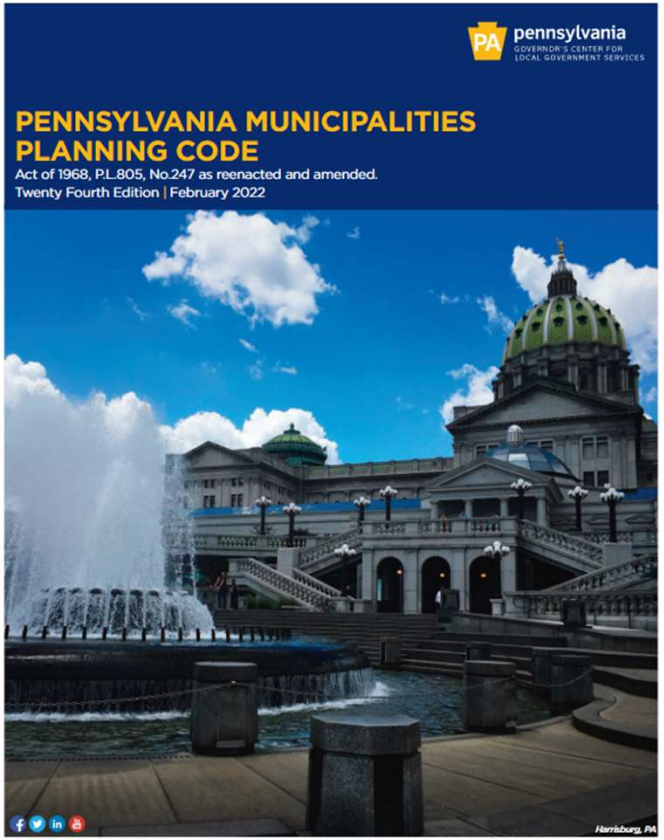
- Ensure that your municipality has zoning provisions addressing related land uses:
  - Electricity generation (gas or coal-fired power plants or utility-scale solar)
  - Storage (BESS = Battery Energy Storage System)
- Consider adding catchall like “use not provided for” to zoning ordinance to reduce likelihood of exclusionary zoning allegations
- If current zoning appears inadequate, consider curative amendment process.
- Expect new transmission lines
  - Generally exempt from local control (PUC/FERC preemption)
  - But it can be a consideration when you develop zoning maps for other uses (Putting energy-intensive land uses closer to existing electricity infrastructure may reduce need for infrastructure.)

Reference: https://mpl-law.com/data-centers-are-coming-to-your-township-is-your-zoning-code-ready/

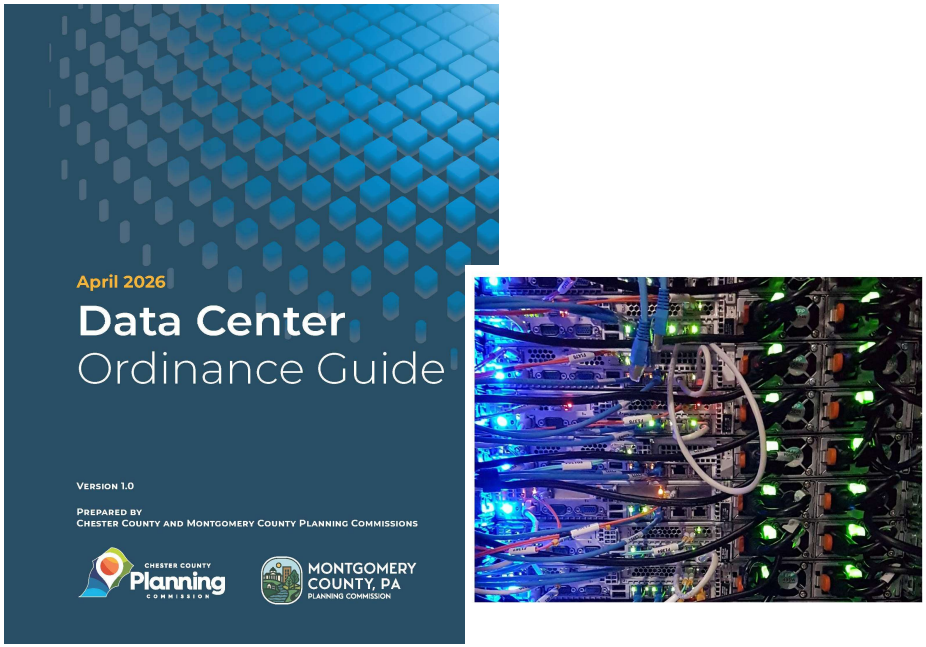
County Authority over Zoning

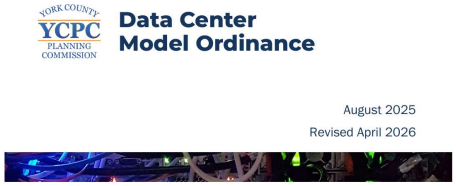
County Authority under the MPC

- A county may choose to adopt a zoning ordinance that would apply ***only to municipalities within the county that do not have their own zoning ordinances***.
  - MPC Section 602



County Action in Pennsylvania





- Some have developed model ordinances
  - Data Centers Model Ordinance (York Co.)
  - Monroe County Model Ordinance.pdf (Monroe Co.)
- Montgomery and Chester Counties' Planning Commissions developed a "Data Center Ordinance Guide" for municipalities.
  - Data Center Ordinance Guide | Montgomery County, PA
- Tioga Co. has developed a Data Center Ordinance under its SALDO authority
  - Tioga County Data Center Ordinance, https://www.tiogacountypa.us/getmedia/8f770a00-d107-488f-8a49-6a15b03a141a/Tioga-County-Data-Centers-Ordinance-Final-12-15-25.pdf

Existing PA State Laws Impacting Data Center Development

PA State Permits That May Be Required

- Chapter 102 NPDES permits for construction stormwater and/or industrial stormwater
- Chapter 105 permit for water obstruction or encroachment
- NPDES (water) permit for cooling water discharge
- Air quality permit (especially if diesel generators are used on site)
- Water withdrawal approval (DRBC, SRBC) if exceeding regulatory thresholds.

Actions(s) Taken on Plan Approval(s) Under the Air Pollution Control Act (35 P.S. §§ 4001—4015) and Regulations in 25 Pa. Code Chapter 127, Subchapter B Relating to Construction, Modification and Reactivation of Air Contamination Sources and Associated Air Cleaning Devices.

Southcentral Region: Air Quality Program, 909 Elmerton Avenue, Harrisburg, PA 17110-8200, 717-705-4700.

Contact: Vincent Pascucci, PE, East Permit Section Chief, 717-705-4862.

36-05169A: Greenfield Road Owner, LLC, 216 Greenfield Road, Lancaster, PA 17601, City of Lancaster, **Lancaster County**. For the installation of a data center and managed hosting service facility in the former LSC Communication East facility. As part of the project, 176 diesel fired emergency generators will be installed to support operations at the facility. The installation of the data center is to
72—3,250 kW R
will be installed.
Royce model 4P9
engines will be or
Each generator
bhP) MTU engi
were manufactur
with a Safety Po
system with an
filter (cDPF). Ap
December 29, 20

Source: 56 Pa. Bull 420 (Jan. 17, 2026)

Altoona Mirror

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Agency OKs data center water permit

Amazon facility will use 129,000 gallons of water per day from Susquehanna River

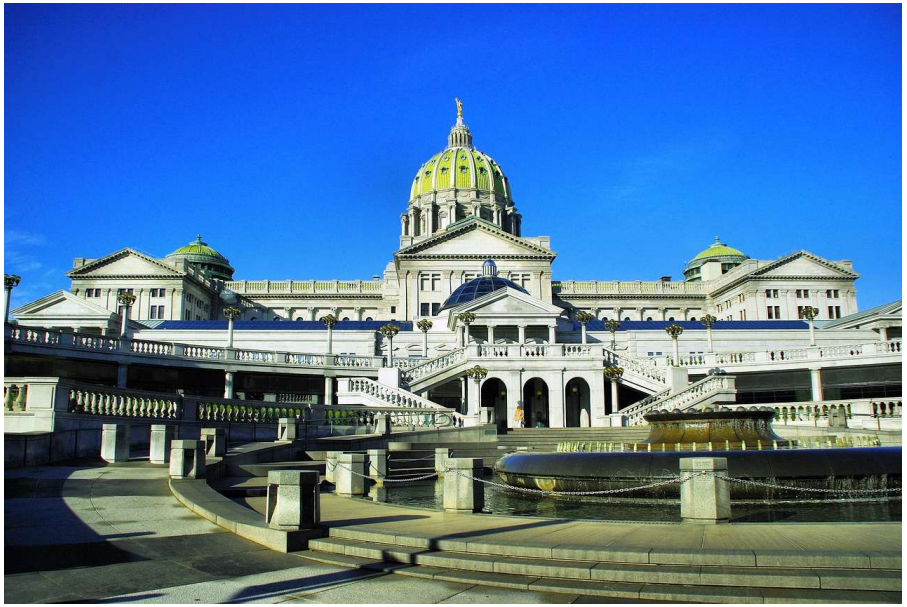
LOCAL NEWS

MAR 30, 2026

The building of a hyperscale data center in northeast Pennsylvania hit a milestone earlier this month with an interstate agency's approval of its request to use more water from the Susquehanna River.

Source: https://www.altoonamirror.com/news/local-news/2026/03/agency-oks-data-center-water-permit/

PA State Sales Tax Exemption



- Under Act 25 of 2021, computer data center equipment is exempt from PA state sales tax when used in a certified data center facility.
- Program guidelines are available here: https://www.pa.gov/content/dam/copapwp-pagov/en/revenue/documents/incentivescreditsprograms/computerdatacenterequipprog/documents/computer_data_center_equip_exemption_program_guidelines.pdf

Pennsylvania's New Data Center Oversight Law



Mandatory Annual Resource Reporting

Data centers must report exact water and power usage, peak loads, and carbon-reduction measures to the state.



$10,000 Daily Fine for Non-Compliance

Companies face heavy financial penalties for every day their required report remains unsubmitted.



28.3 GW Expected Demand by 2034

The state's data center pipeline grew 12% in just three months, necessitating better grid oversight.



New Power to Validate Utility Forecasts

State regulators can now review "opaque" utility data to fix disparities, such as one utility projecting 200% growth.

https://www.utilitydive.com/news/pennsylvania-passes-budget-increasing-data-center-oversight/825177/

NotebookLM

The Governor's Responsible Infrastructure Development (GRID) Standards

- Energy Affordability
  - Bring your own power
  - Clean energy requirements
  - Pay for all interconnection and services from the grid
- Transparency and Community Engagement
  - Requires early community engagement and certain informational disclosures
- Workforce and Economic Development
  - Local hiring, wage and community investment requirements
- Environmental Protection
  - Energy and water efficiency requirements
  - Requires stronger air emissions reduction steps on back up generation

Executive Order 2026-05 (Aug. 18, 2026)

- Delays issuance of state permits until AFTER local approval
- Makes all data center projects ineligible for PA Fast Track Program
- Prohibits state officials from entering non-disclosure agreements
- Requires DEP to create map showing permitting status
- Two-track permitting review:
  - GRID-compliant
  - Non-GRID-compliant



Proposed Policies Pending in PA

Proposed PA House Bills re: Data Centers

- HB 1834 (passed House)
  - Would direct PA PUC to initiate rulemaking applying to large loads (>25 MW or > 50 MW)
- HB 2061
  - Would require data centers to show prevailing wage to qualify for sales tax exemption
- HB 2198 (passed House)
  - Would repeal state sales tax exemption for data center equipment purchases
- HB 2246 (passed House)
  - Would require certain data centers to report water usage to the Commonwealth
- HB 2150 (passed House)
  - Would require annual reporting on energy and water use and conservation measures
- HB 2151 (passed House)
  - Directs state government to develop model municipal ordinance
- HB 2153
  - Would require that any increase in property tax revenue attributable to the construction of a new data center within a school distric be used exclusively to fund additional Homestead/Farmstead property tax relief for district residents
- HB 2650 (passed House)
  - Would retain data center tax incentives but condition them on compliance with the Governor's GRID guidelines
- HB 2496 (passed House)
  - Would allow municipalities to institute a 180-day pause on data center development applications while they re-evaluate their municipal ordinances.
- HB 2359 (passed House)
  - Would prohibit local governments from entering non-disclosure agreements with developers.

Proposed PA Senate Bills re: Data Centers

- **SB 146 (*Enacted* as part of budget – discussed above)**
  - **Requires data centers to annually report energy and water consumption, as well as projections of energy usage for the following year**
- SB 704 (passed Senate)
  - Requires state government to identify priority sites for new generation
- SB 939
  - Accelerated permitting for data centers
  - Includes BYOG provision
- SB 991
  - Would require PA DEP to identify 15 sites for data centers, including 5 at the site of decommissioned power plants. Expedited permitting would be possible for development on those sites.
- SB 1359
  - 3-year moratorium on siting and permitting of hyperscale data centers.
- Planned bills (text not yet available):
  - 6-bill package (Sen. Boscola – co-sponsorship memo 47850)
    - Prohibit cost shifts
    - Impact fee
    - Allows interconnection delay due to resource adequacy
    - Demand response or flexible load participation
    - Siting reform

PA PUC Activities

- PA PUC issued final order with a model tariff for Large Load Customers (single load >50 MW or aggregate load >100 MW).
  - Final order released on May 13th
  - Defines large load customers as customers with demand >50 MW individually or >100 MW in the aggregate
  - Aims to ensure that costs associated with data center construction will be borne by the data center developers
  - Requirements for financial assurances
  - Timelines for planning and interconnection studies
  - Exit provisions

Policies re: Data Centers from Other States

Information in this section is derived from the Steptoe Data Center Regulation Tracker, available at https://www.steptoe.com/en/data-center-regulation-tracker.html.

The Large Load Era

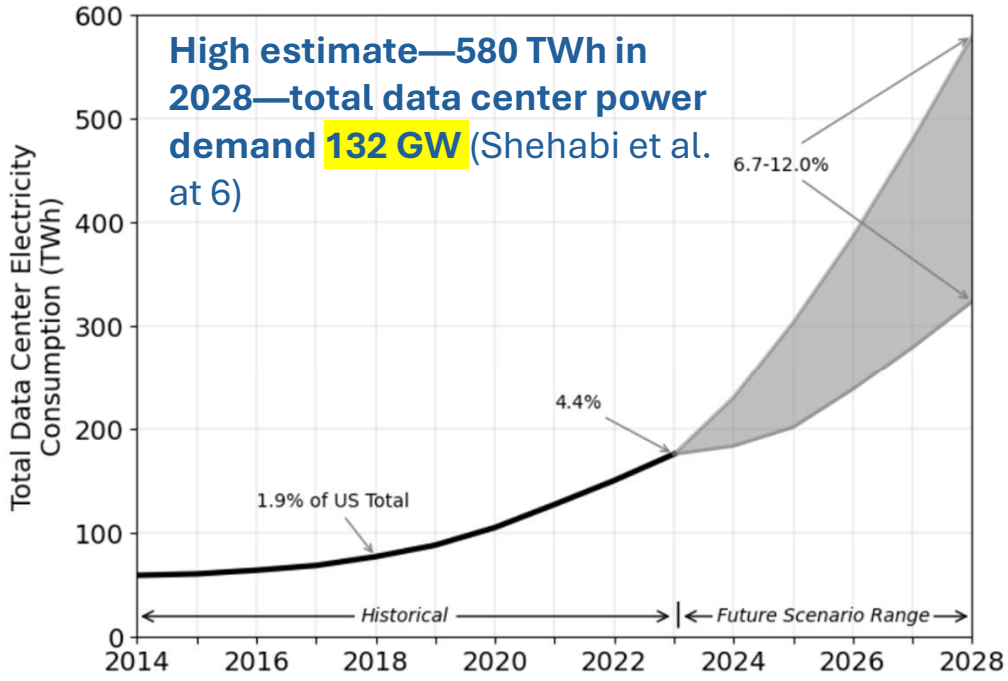


Figure ES-1. Total U.S. data center electricity use from 2014 through 2028.

https://escholarship.org/uc/item/32d6m0d1

PJM 2025 long-term load forecast: 32 GW of new capacity 2024-2030, 30 GW from data centers

https://www.pjm.com//-/media/DotCom/about-pjm/who-we-are/public-disclosures/2025/20250808-pjm-board-letter-re-implementation-of-critical-issue-fast-path-process-for-large-load-additions.pdf



innotap.com

Compare: total PJM generation capacity December 2024: 199 GW

https://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2024/2024-som-pjm-sec12.pdf

Compare: total in-state generation capacity California 2024: 89 GW

https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy

Themes of State Regulation

- Permitting—tax breaks and incentives, siting (location), water use, environmental impacts

- Electricity rates–

  1. Avoid overbuilds: properly project location and likelihood of proposed data center builds, associated generation and transmission needs.

  2. Avoid stranded costs: require proof of financial security, exit fees.

  3. Make data centers pay for data center infrastructure and energy: define large loads and set distinct large load rates.

  4. Require or incentivize demand response.



https://images.wsj.net/im-88142440?width=700&height=475

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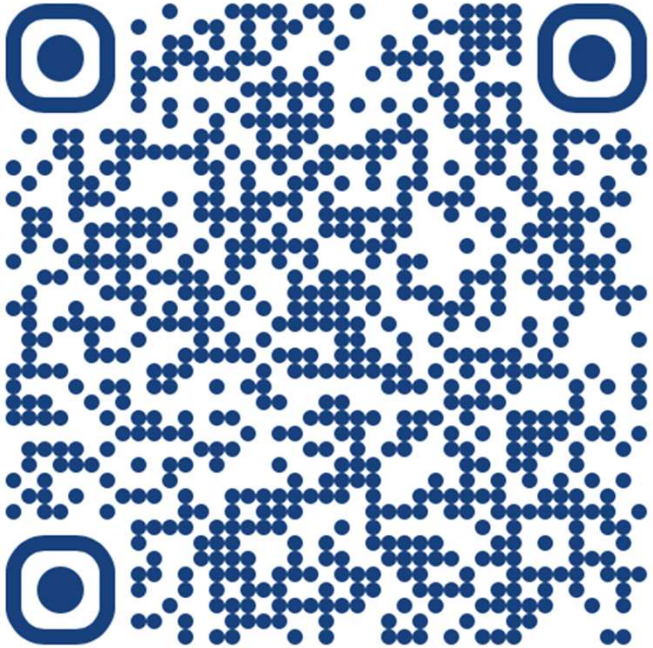
PSU Resources

DELIVERING EDUCATION YOU CAN TRUST

Data Centers: A Guide to Common Questions

- A Guide to Common Questions is designed to help communities engage in informed, transparent, and respectful conversations about proposed data center development. It is not intended to advocate for or oppose any specific project. Instead, it provides a structured set of questions communities may consider when evaluating proposals in the context of local priorities, land-use planning, infrastructure capacity, and long-term resilience.



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Data Centers in PA Research and Extension Network

Data centers are rapidly expanding across the Commonwealth of Pennsylvania to support growth in Artificial Intelligence (AI). To address research and extension needs, we created the Penn State Research and Extension Network for Data Centers in PA.



Questions?



Thank you!

Michael Helbing
Executive Director
Penn State Center for Energy Law
and Policy
mdh224@psu.edu



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PennState CELP CENTER FOR ENERGY LAW AND POLICY

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Additional Slides

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Noise-related Measures in Municipal Ordinances

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Municipal Options for Addressing Noise

- Noise limits
- Noise/sound studies
- Requirement of mitigation measures
- Monitoring and enforcement mechanisms



Photo Credit: By Ajay Suresh from New York, NY, USA - Scranton - Scranton City Hall, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=81076719

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Noise Limit: Data Center-specific

vii. Noise Control

1. For Data Center uses, it shall be demonstrated through a sound study conducted by a professional acoustical expert that the installation of one or more sound reducing materials or systems, approved by the Township, will effectively reduce the sound generated by the Data Center and associated DCE during normal operations and testing and maintenance operations (i.e. all standby emergency equipment, including but not limited to generators) to a maximum daytime (7:00 AM to 8:00 PM Monday-Friday) decibel level of 65 dB(A) and a maximum nighttime (8:00 PM to 7:00 AM Monday-Friday and all day Saturday and all day Sunday) decibel level of 55 dB(A) as measured from all external property lines of the Data Center use. At no point shall the decibel level exceed 55 dB(A) at a property line adjoining a residential structure. Such sound study or studies shall be conducted using Sound Level Meters described in ANSI S1.4-2014 and using generally accepted criteria. A sound study shall be conducted at the following phases:

Source: Covington Twp. (Lackawanna Co.) Ordinance No. 2025-03 at 10.

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Noise Limit: Data Center-specific

c. Future sound levels attributable to Project Operation ("Project Sound") shall not exceed the measured pre-construction ambient sound level by more than 5 dBA, as assessed at any lot line of the property where residential uses exist within 2,500 feet, or at the site of any other residential uses within 2,500 feet.

Source: Archbald Borough Ordinance 04-2025 § IV(2).

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Exceptions for Some Data Center Operations

- Some municipalities include exceptions to noise requirements for certain data center operations. Examples of exceptions include:
  - Power outages.
    - *See*, *e.g.*, Archbald Borough (Lackawanna Co.) Ordinance 04-2025 § IV(2).
  - "Emergency use of data center equipment"
    - *See*, *e.g.*, Palmer Twp. (Northampton Co.) Ordinance No. 2025-493 Article II(C).
  - Routine back-up generator testing that occurs between 7 a.m. and 8 p.m.
    - *See*, *e.g.*, Archbald Borough Ordinance 04-2025 § IV(2).

Sound Studies



- Many municipalities are requiring sound/noise studies as part of a conditional use application for data centers. Here's how they generally work:
  - Require preliminary sound study as part of permit application
    - Sometimes done by developer; sometimes done by municipality and paid by developer
  - Study shall include recommendations for any noise-reducing materials that are necessary to comply with noise requirements
  - Requires as-built noise study a few months after full occupancy (and/or as subsequently required by municipality).
    - If violation of noise limits is observed, developer must remediate.
    - Some ordinances allow muni. to revoke permit until remediation.

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Mitigation Measures

- In addition to sound studies, some municipalities require specific noise mitigation measures in their ordinances.
  - “(b) All ground-mounted equipment that produces sound (e.g., HVAC, cooling towers, generators, and the like) shall not be placed or operated on any side of a building that directly abuts or faces a residential property line. Placement of such equipment shall be limited to non-residential-facing sides of the structure to mitigate noise and visual impacts.”
    - Fairview Twp. (York Co.), Ordinance No. 2025-03

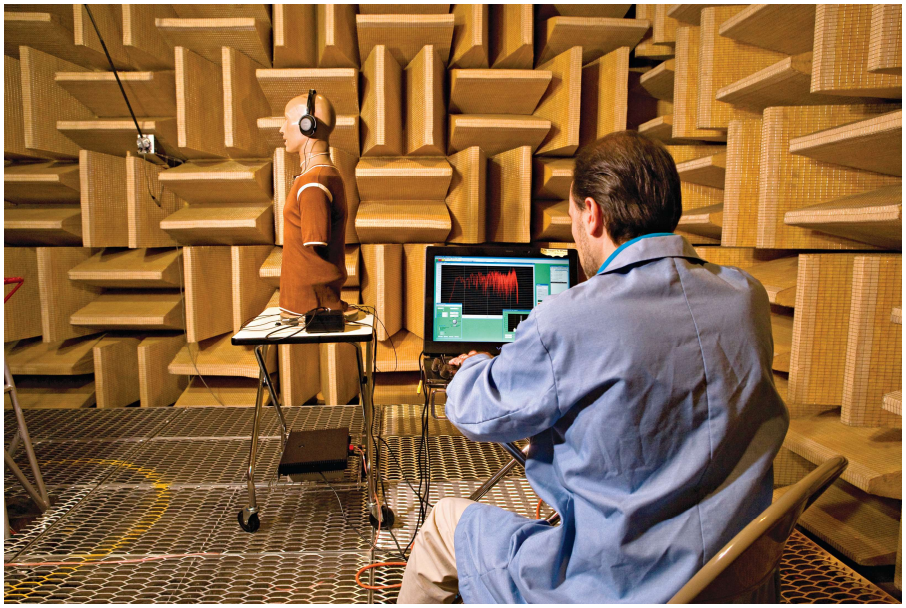

Photo credit: By Consumer Reports, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=48764103

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Mitigation measures– Another example:

- To provide visual screening and reduce noise levels, ground-mounted and roof-mounted equipment used for cooling, ventilating, or otherwise operating the facility, including power generation or other power supply equipment, that is located within three hundred (300) feet of a public roadway, residential zoning district, residential use, or the lot line of any sensitive receptor must be fully enclosed, except where not mechanically feasible based on the manufacturer's specifications. If it is not mechanically feasible to fully enclose the equipment, it must be fully screened from view using one or more of the following means:
  - [a] The landscape buffer required by subsection (d) above.
  - [b] By existing vegetation that will remain on the property.
  - [c] By the principal Data Center building or an accessory building.
  - [d] A berm averaging a minimum of five (5) feet in height above the adjacent average ground level with a maximum side slope of 3:1, provided that the berm shall be covered by a well-maintained all season natural ground cover and any required screening plantings shall be arranged on the outside and top of the berm.
  - [e] A visually solid fence, screen wall or panel, parapet wall, or other visually solid screen that shall be constructed of materials compatible with those used in the exterior construction of the principal building.

Source: Forks Twp. (Northampton Co.) Data Center Ordinance

Monitoring and enforcement



- Many ordinances require as-built noise studies 6-9 months after occupancy.
  - *See*, *e.g.*, Archbald Borough Ordinance No. 04-2025.
- If a violation is observed:
  - Most ordinances require that the violation be remedied. Some include a specific time limit for remediation.
  - Some ordinances allow for permit revocation if remediation is not timely.
    - *See*, *e.g.*, Archbald Borough Ordinance No. 04-2025.
  - Some ordinances allow for the future requirement of noise mitigation equipment in certain situations.
    - See, e.g., Tioga Co. Ordinance No. 2026-3 § 5(F)(2).
- Some ordinances call for the immediate rescission of the permit until the violation is remediated.
  - *See*, *e.g.*, Covington Twp. (Lackawanna Co.) Ordinance No. 2025-03 Item 3 (1)(c)(vii)(1)(c).

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Another Resource: PennFuture Model Ordinance

f. **Log Average Level (LAL_{xx})**: The logarithmic average of the interval measurements of a compliance metric, computed as follows:

$$LAL_{xx} = 10 \log_{10} \left[\frac{1}{nP_o^2} \sum_{k=1}^{n} P_o^2 \quad 10^{L_{xk}/10} \right]$$

$$= 10 \log_{10} \left[\left\{ 10^{\frac{L_{x1}}{10}} + 10^{\frac{L_{x2}}{10}} \ldots 10^{\frac{L_{xn}}{10}} \right\} / n \right]$$

Where:

LAL_{xx} = log average level in dBA or dB where L_{xx} represents either L_{EQ}, L_{MAX}, L_{PK}, or L_{PTL}.
L_{x1} = level of the first interval measurement in dBA or dB
L_{x2} = level of the second interval measurement in dBA or dB
L_{xn} = level of the nth interval measurement in dBA or dB
n = the number of measurement intervals
P_0 = standard reference pressure of 20 micro pascals

A minimum of 20 intervals of one minute each measured over a single period of 24 hours shall be used, however, intervals need not be contiguous. Intervals with louder, and preferably the loudest noise, should be used.

3. **Sound level limits**.

   a. For purposes of compliance with this subsection, sound shall be measured at the point, at any elevation, on the Receiving Property where the Log Average Level of the relevant Compliance Metric is highest.

   b. LAL_{EQ} shall not exceed the following values:

Table 1: Equivalent Continuous Sound Level (L_{EQ}) Limits[11]

Zoning District	Daytime hours	Evening hours	Nighttime hours
Rural Residential, Low-Density Residential Districts, Properties containing Sensitive Receptors	50 dB	45 dB	45 dB
Medium- and High-Density Residential Districts	55 dB	50 dB	45 dB
Mixed Use, Commercial, Industrial Districts	65 dB	60 dB	55 dB

- NGO PennFuture has published a model ordinance for data centers that includes a highly detailed noise provision.
- Attempts to account for background noise levels and different aspects of sound quality that affect human perception.
- It is available here: https://pennfuture.org/files/galleries/Model-Data-Center-Ordinance-v_-2_0-(cmts-as-footnotes).pdf

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