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Energy Supply Chain Overviews

Sept 11	AI Data Centers: Power & Electrical Infrastructure
Sept. 25	Natural Gas: Upstream
Oct. 2	AI Data Centers: Advanced Cooling
Nov. 6	Geothermal
Nov. 20	AI Data Centers: Steel Infrastructure

www.wemakeithere.org/energy/

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Project Goal

▶ Provide support for small and medium-sized manufacturers interested in providing components for the potential market opportunity presented by AI data centers in the region, nationwide, and globally

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AI Data Center are specialized facilities designed to support the intensive computing and data storage needs of artificial intelligence applications.

AI Data Centers Series

- ▶ Overview
- ▶ Power & Electrical Infrastructure Manufacturing
- ▶ Advanced Cooling & Thermal Management
- ▶ Structural Steel, Racking, and Enclosures

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AI Data Centers and Energy:
In the News

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Pennsylvania Department of Community & Economic Development

Governor Josh Shapiro Announces Amazon Plans to Invest $20 Billion in Pennsylvania for AI Infrastructure in Largest Capital Investment in Commonwealth History

June 9, 2025

Amazon investment in Pennsylvania will bring 1,250 jobs and expand education and training programs

Pennsylvania Business Report

Home » News » Balancing growth & grid: PUC, energy leaders urge caution on data center expansion

Balancing growth & grid: PUC, energy leaders urge caution on data center expansion

TEMBER 5, 2025 | FEATURED

West Virginia Office of the Governor
Patrick Morrisey

GOVERNOR PATRICK MORRISEY SIGNS POWER GENERATION AND CONSUMPTION AND ONE-STOP SHOP PERMITTING BILLS INTO LAW TO MAKE WEST VIRGINIA THE BEST STATE IN THE COUNTRY FOR DATA CENTERS

April 30, 2025

West Virginia Watch

CRIMINAL JUSTICE   EDUCATION   ENVIRONMENT & ENERGY   GOVERNMENT   HEALTH   LABOR

ENVIRONMENT & ENERGY

'Enough devastation:' Mingo, Logan residents worry about proposed power plants, data centers in WV

BY: CAITY COYNE - SEPTEMBER 2, 2025   6:00 AM

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Sources: WV Gov Office; Penn Biz Report; PA DCED; WV Watch

New York plans for 1GW nuclear power plant as AI demand grows

Governor Hochul cited a need to achieve "energy independence" when announcing the plans

June 24, 2025   By: Zachary Skidmore   💬 Have your say

✉ ↥   Gift article 🎁

Rulemakers play catch-up as data centers multiply

State regulators and utilities are writing new rules to ensure data centers don't drive up electricity prices or raise the risks of blackouts.

BY: **JASON PLAUTZ** | 07/18/2025 06:38 AM EDT

Maryland governor signs bill easing restrictions around data center backup generators

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Sources: Politico Pro; Data Center Dynamics (NY); Data Center Dynamics (MD)

Today's Agenda

How Does Power & Electrical Infrastructure Support Data Centers?

Eight Things to Know About Data Centers & Energy

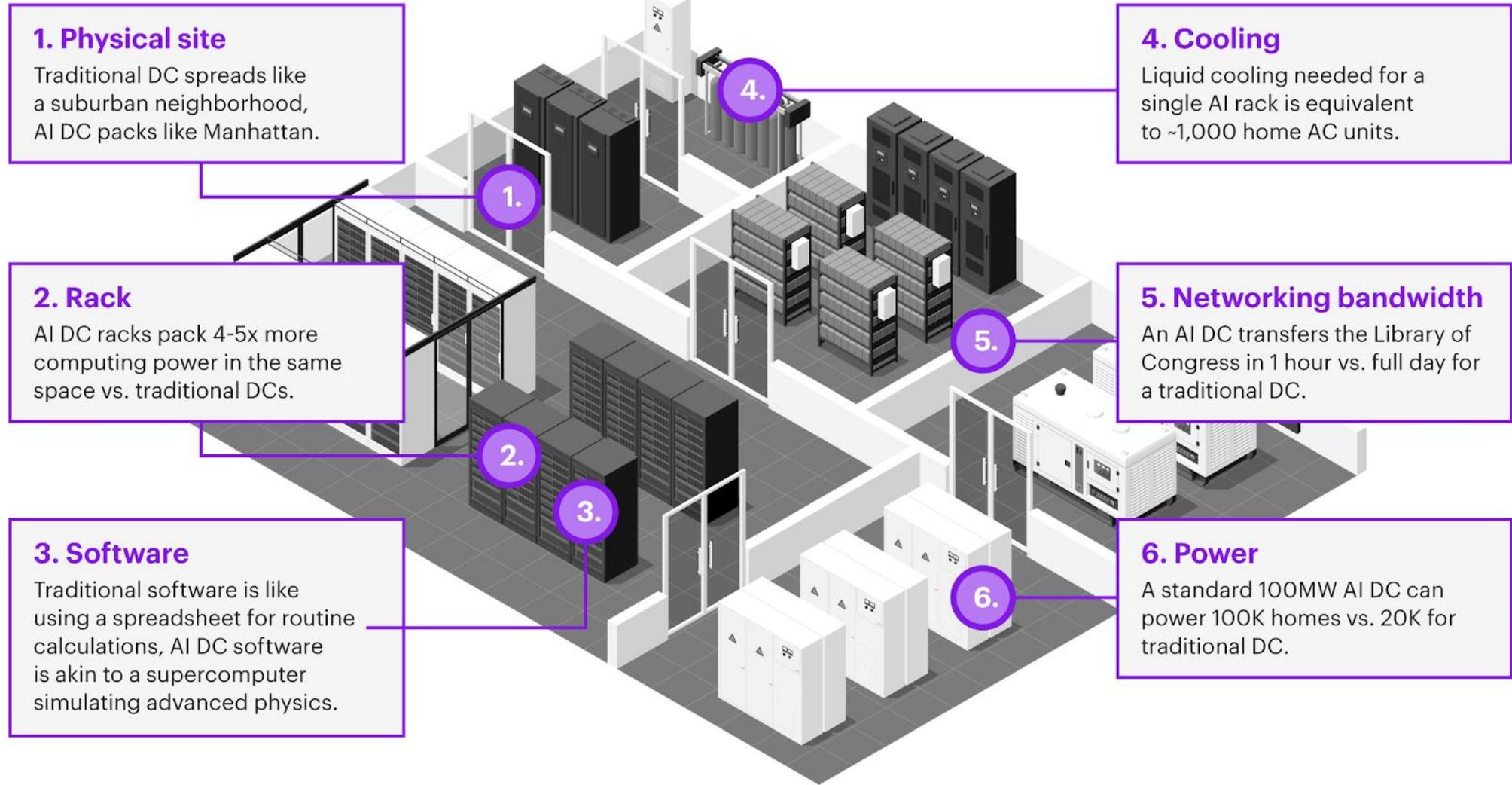AI Data Center Energy-Related Components

Industry Resources

Questions & Answers

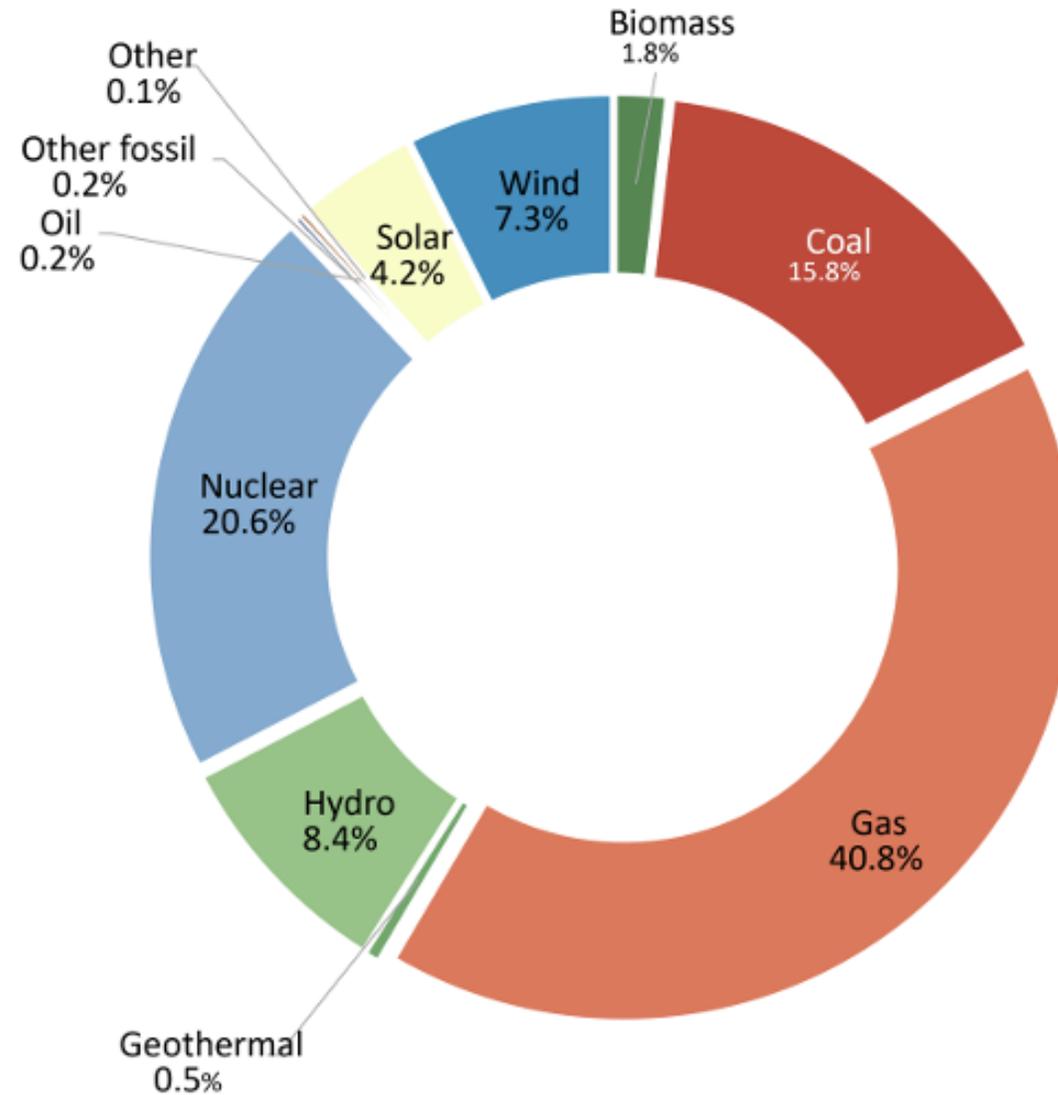# How Does Power & Electrical Infrastructure Support Data Centers?

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MANUFACTURING®
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Source: Google

AI data centers differ significantly from traditional ones

1. Physical site
Traditional DC spreads like a suburban neighborhood, AI DC packs like Manhattan.

2. Rack
AI DC racks pack 4-5x more computing power in the same space vs. traditional DCs.

3. Software
Traditional software is like using a spreadsheet for routine calculations, AI DC software is akin to a supercomputer simulating advanced physics.

4. Cooling
Liquid cooling needed for a single AI rack is equivalent to ~1,000 home AC units.

5. Networking bandwidth
An AI DC transfers the Library of Congress in 1 hour vs. full day for a traditional DC.

6. Power
A standard 100MW AI DC can power 100K homes vs. 20K for traditional DC.

Source: Kearney analysis

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AI Data Center Sources of Energy

Donut chart: AI Data Center Sources of Energy
- Biomass 1.8%
- Coal 15.8%
- Gas 40.8%
- Geothermal 0.5%
- Hydro 8.4%
- Nuclear 20.6%
- Solar 4.2%
- Oil 0.2%
- Other fossil 0.2%
- Other 0.1%
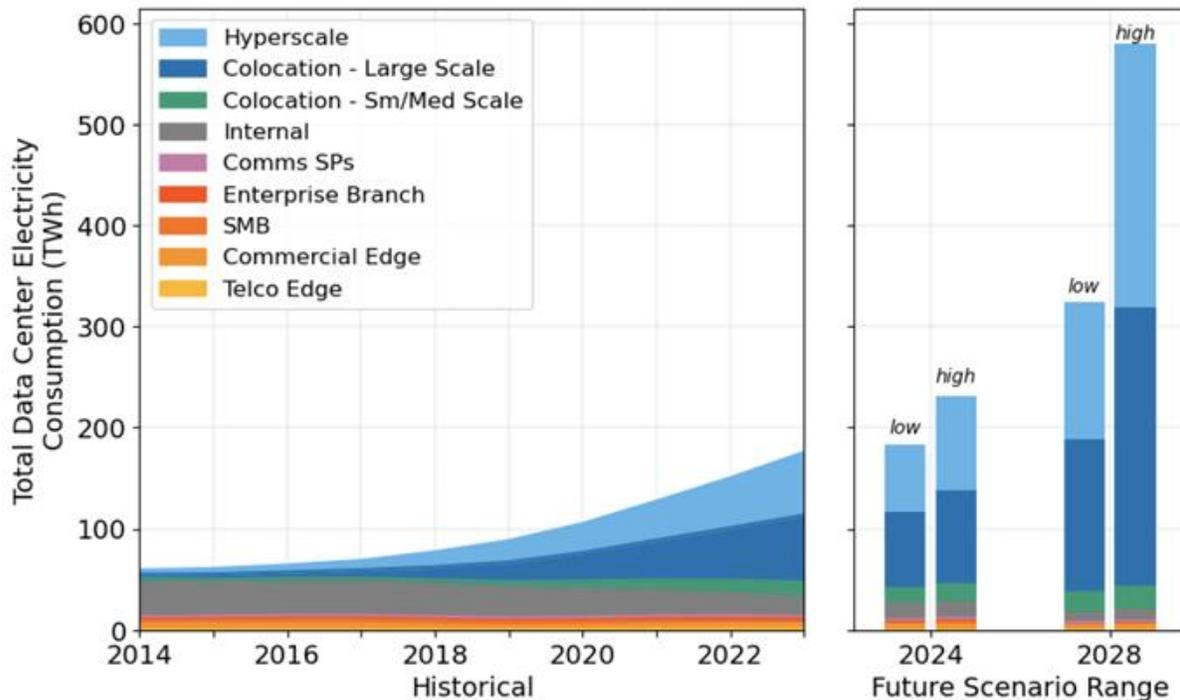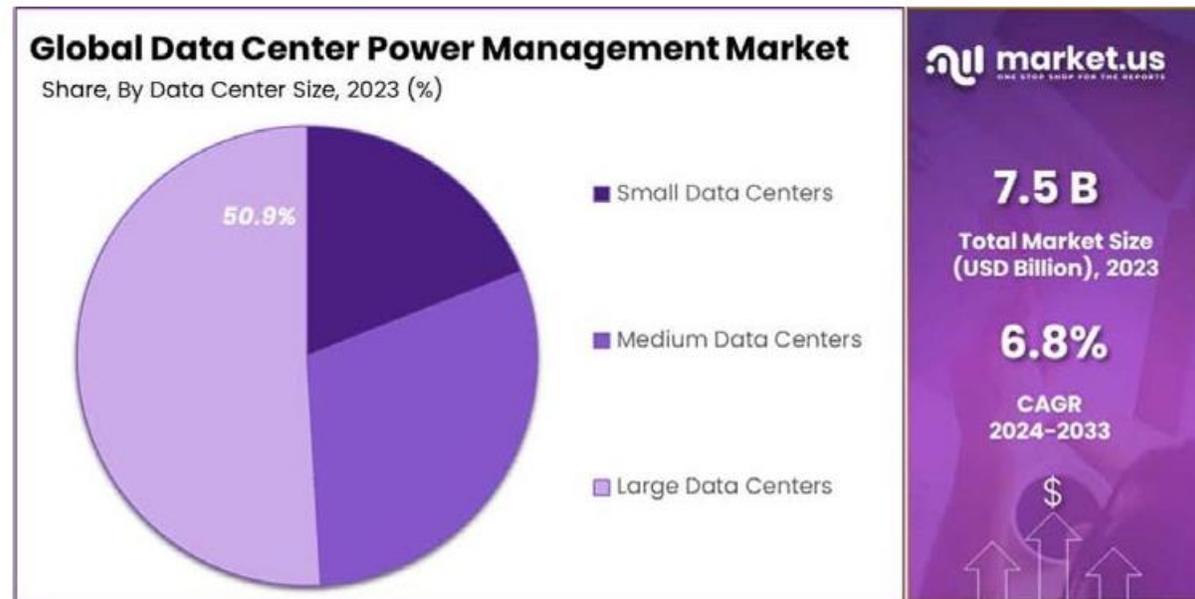- Wind 7.3%

Source: Environmental Burden of United States Data Centers in the Artificial Intelligence Era, 2024

Eight Things to Know About Data Centers & Energy

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1. AI Data Centers Use More Energy Than Traditional Data Centers Impacting Power Management Market

Total data center electricity use from 2014 through 2028 by space type

Global Data Center Power Management Market
Share, By Data Center Size, 2023 (%)

50.9%

- Small Data Centers
- Medium Data Centers
- Large Data Centers

market.us

7.5 B
Total Market Size (USD Billion), 2023

6.8%
CAGR 2024–2033

Source: Market.US, 2024

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2. Markets Include Energy Generation, Management, and Equipment

Renewables
NEXTera ENERGY
First Solar.
GE VERNOVA

Nuclear
Westinghouse
HELION
NUSCALE
RADIANT

Oil & Natural Gas
ExxonMobil
Chevron

Batteries
FOURTH POWER
Form energy
EXOWATT
TESLA

Electrical Equipment
VERTIV.
Schneider Electric
ABB
EATON
SIEMENS
nVent
legrand
GE VERNOVA
DELTA
RITTAL

Energy Management and Backup Power
LG Energy Solution
C&D TECHNOLOGIES
HANLEY ENERGY
GENERAC
skeleton+
ZincFive
SAMSUNG SDI
CATL
CyberPower
saft
BYD
Honeywell
TESLA
Natron Energy
Panasonic ENERGY

Power Providers
Constellation.
aes
VISTRA
solar alliance
TALEN ENERGY
GE VERNOVA

Source: Modified from Eric Flanagan, October 13, 2024

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3. Energy Sources Transitioning from Fossil to Renewable and Nuclear Energy from Industry Perspective

Data Center Energy Consumption Surges Amid AI Boom

Electricity generation to supply data centers, by energy source (in TWh)

Legend: Coal, Natural gas, Nuclear, Renewables*, Other

Global / China / U.S. — 2025 and 2035
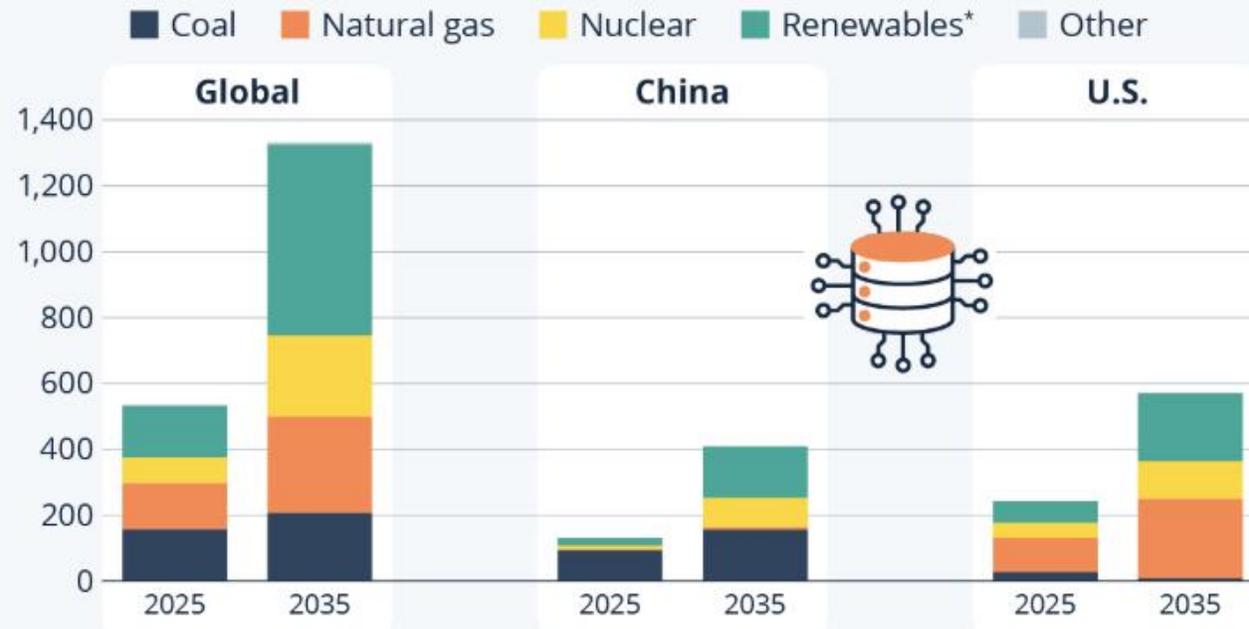
* Solar PV, wind and other renewables
Based on the fuel mix of the electricity physically consumed by data centers rather than contractual mix of different data center operators.
Source: IEA

4. Trump Administration Advocating for Coal vs. Renewables But Supportive of Nuclear

ENERGY

Trump wants coal to power AI data centers. The tech industry may need to make peace with that for now

PUBLISHED SAT, MAY 17 2025·8:47 AM EDT

Spencer Kimball
@SPENCEKIMBALL

SHARE

NBC NEWS   Trump signs executive order to boost U.   SHARE & SAVE —

Trump signs executive order to boost U.S. coal industry, in part to fuel artificial intelligence

It's the latest move by the Trump administration that clashes with global aims to reduce coal power and cut harmful greenhouse gas emissions fueling climate change.

PRESIDENT DONALD J. TRUMP   The WHITE HOUSE

45 | 47

PRESIDENTIAL ACTIONS

REINVIGORATING THE NUCLEAR INDUSTRIAL BASE

Executive Orders | May 23, 2025

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Source: CNBC, 2025; NBC, 2025; White House, 2025

Low-carbon, local generation either prime or standby and carbon-free electricity moving toward grid integrated and stabilizing

Circular economy and integration – embodied carbon, waste heat re-use, water positivity, hardware recycling

Clean

Low-Carbon Energy

Circular Economy

Data Center of the Future

High Efficiency Cooling

Software Optimized and Auto-mated

Efficient

High efficiency air cooling moving to liquid cooling

Software optimized and automated data center systems – AI/ML for maintenance, materials

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Source: Equinix, 2022

6. Delays in Transmission Interconnection Approvals Impacting AI Data Center Geographic Locations

US transmission interconnection delays
Median duration of months from request to operation, 2005-2022
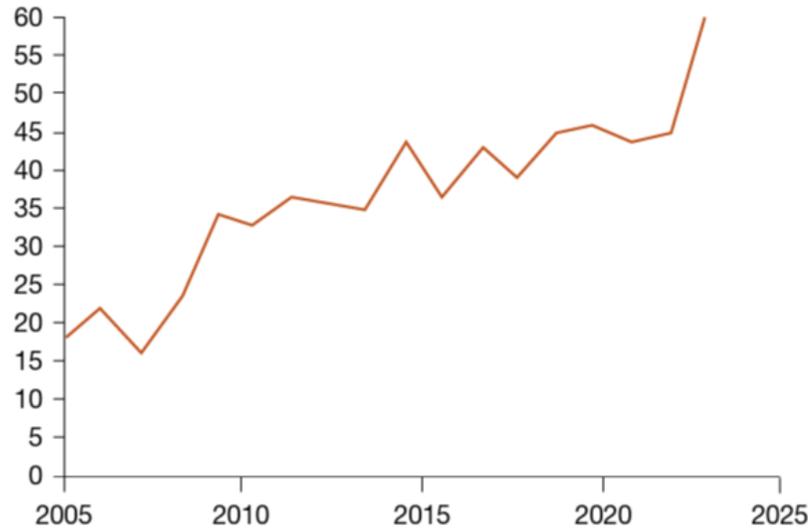
Source: Berkeley Lab, Utility Drive, PwC Strategy& Interviews and Analysis

The Kearney AI Data Center Location Attractiveness framework incorporates 18 distinct parameters organized across six critical factors
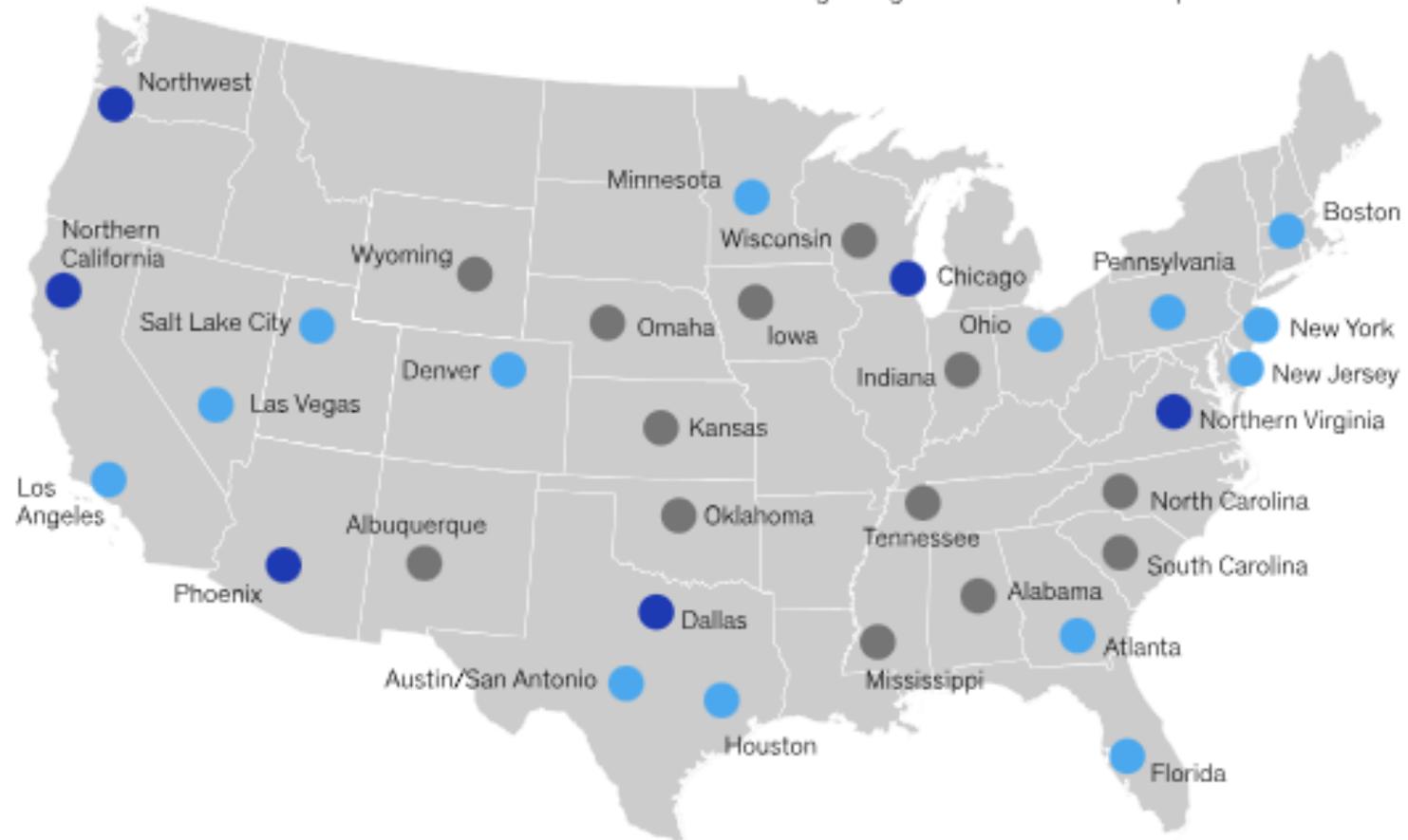
AI Data Center Location Attractiveness framework

Power infrastructure (30%)	Land (20%)	Network connectivity (15%)	Labor market (15%)	Business environment (10%)	Climate and resources (10%)
Grid reliability	Costs	Carrier ecosystem	Technical talent availability	Economic incentives	Temperature profile
Power costs	Availability	Latency	Labor costs	Regulations	Resource availability
Sustainability	Zoning regulations		Education and training	Political stability	Natural disaster risk profile
					Other environmental factors

Note: Sub-factor descriptions are included in the appendix.
Source: Kearney, 2025

Source: PwC, 2025

7. AI Data Centers Emerging in Remote Locations due to Energy Demands

Source: McKinsey, 2025

8. Public is Concerned About Energy Consumption and Electricity Price Impact

Survey: 93% of Americans Support AI Data Center Development—Just Not Near Them

Key Concerns of AI Data Centers for Local Residents

- Environmental impact: 29%
- Energy consumption: 25%
- Increased traffic: 21%
- Land use disruption: 18%
- No concerns: 7%
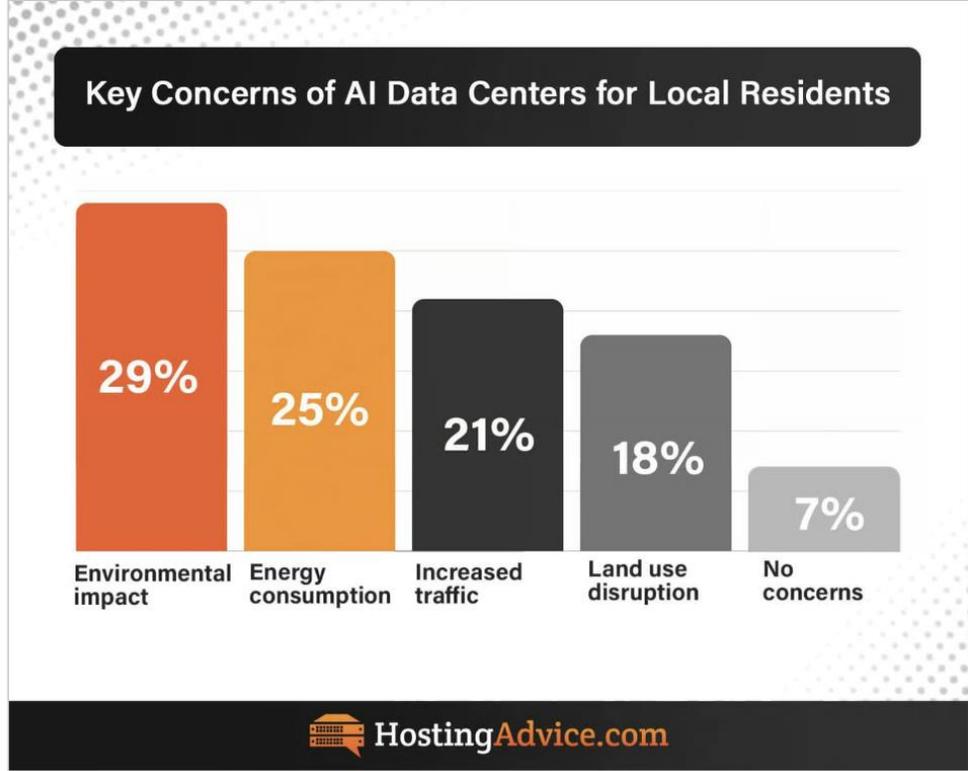
HostingAdvice.com

As more data centers connect to Pennsylvania's electric grid, some worry prices will spike

RACHEL MCDEVITT · JULY 15, 2025

Source: HostingAdvice.com, 2025; Allegheny Front, 2025; Argus, 2025

US states make data centers pay up for power

Market: Electricity | 09/09/25

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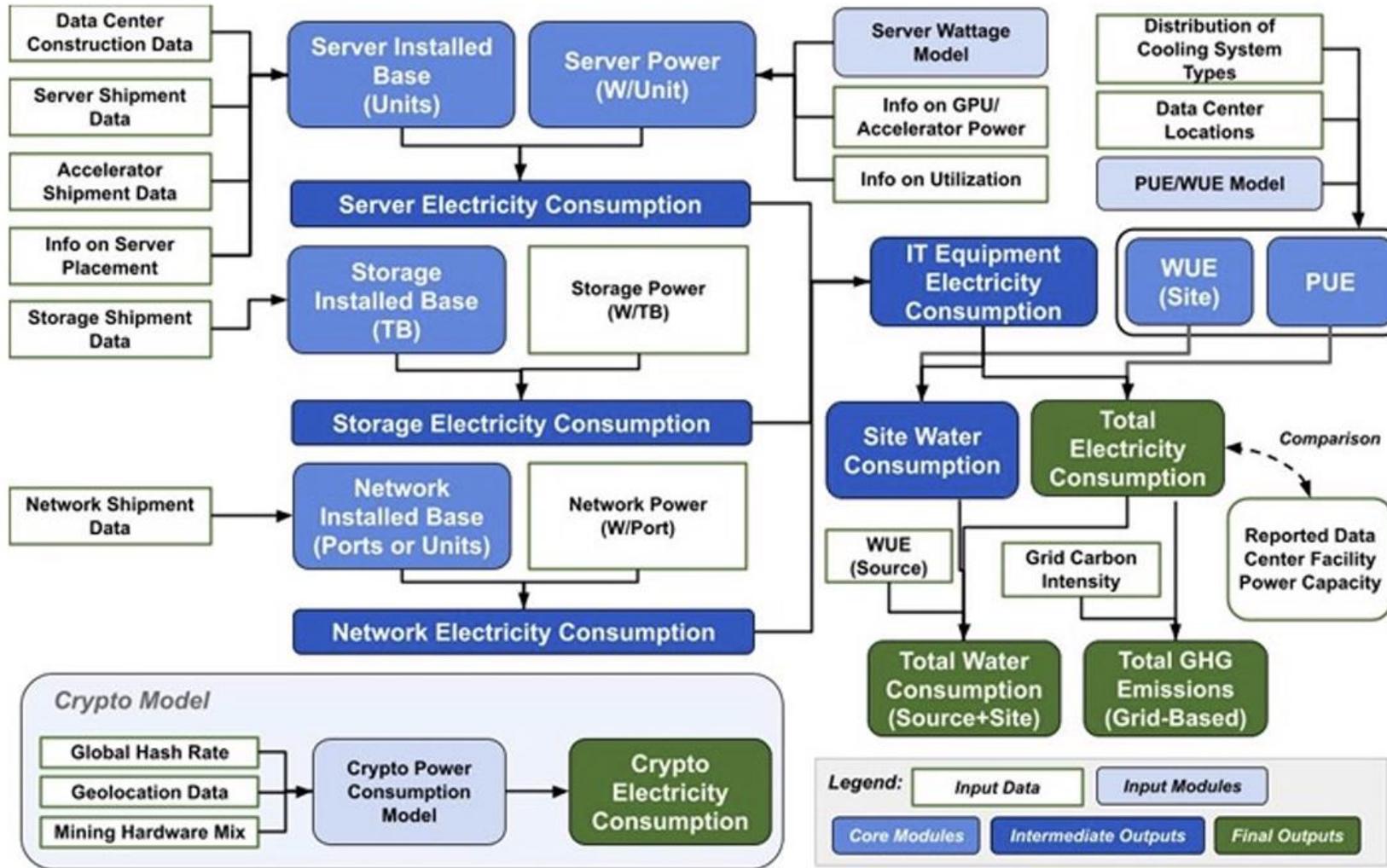# AI Data Center Energy-Related Components

Electrical Equipment is Needed to Power, Cool, and Connect
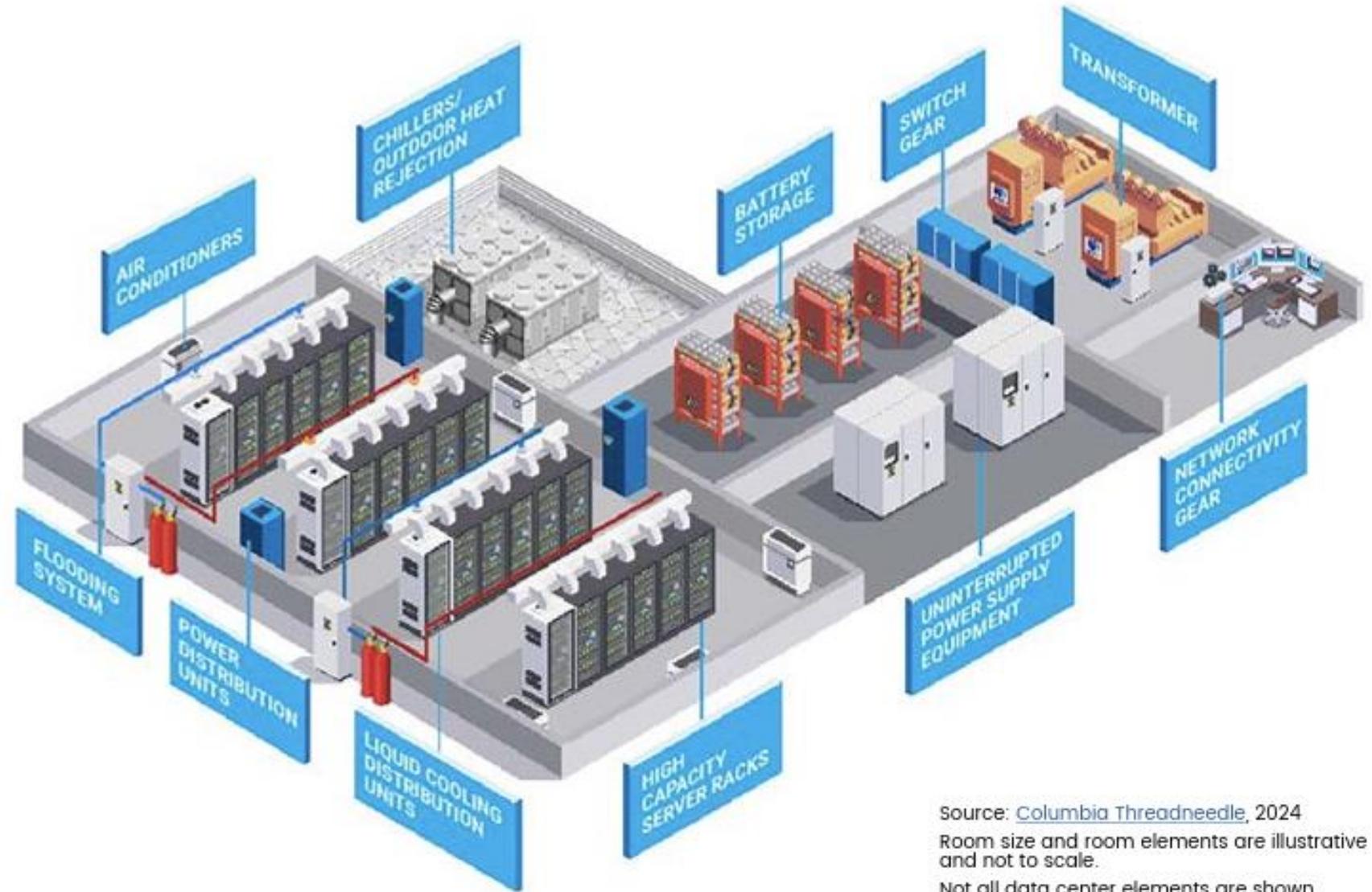
Source: Columbia Threadneedle, 2024
Room size and room elements are illustrative and not to scale.
Not all data center elements are shown.

Energy Components of Typical AI Data Centers

Data Center Electricity Use Model,

Source: Lawrence Berkeley National Laboratory, 2024

Component List of Typical AI Data Centers

COMPONENT	NAICS NUMBERS	NAICS NAME	DESCRIPTION	USE
Automatic transfer switches (ATS)	335313	Switchgear and Switchboard Apparatus Manufacturing	Switches taht automatically transfer power source from the grid to the generator.	Ensures seamless transition to backup power during an outage.
Backup Power	335999	Electrical Equipment Manufacturing	Diesel/gas generators and fuel systems for emergency power.	Provides electricity during grid outages to maintain uptime for critical AI workloads.
Battery Banks (lead-acid or lithium-ion)	335911	Storage Battery Manufacturing	Arrays of batteries store energy for UPS systems.	Supplies immediate power to critical loads during outages.
Building Automation	238220	Heating and Air-Conditioning Contractors	AI-driven software and IoT sensors for monitoring HVAC, lighting, and security.	Optimizes energy efficiency and environmental conditions via predictive analytics.
Busways	335311	Power, Distribution, and Specialty Transformer Mfg.	Modular metal bars for distributing power along a path.	Allows scalable and efficient power delivery to multiple racks.
Cabling & Wiring	335929	Other Communication and Energy Wire Manufacturing	Conductive cables and wires for power and data transmission.	Connect and distribute power and data throughout data centers.
Circuit Breakers	335311	Power, Distribution, and Specialty Transformer Mfg.	Safety devices that interrupt power during overloads or faults.	Protects equipment and wiring from damage due to electrical faults.
Diesel/gas generators	335312	Motor and Generator Manufacturing	Engines that produce electricity during power outages.	Supplies backup power to the entire data center when the grid fails.
Distribution panels	335311	Power, Distribution, and Specialty Transformer Mfg.	Panels that distribute power to various facility sections.	Organizes and manages power delivery to different data center zones.
Electric Generators & Turbines	333611	Turbine and Turbine Generator Set Units Manufacturing	Converts mechanical energy into electrical power.	Provides backup or primary power for data centers.

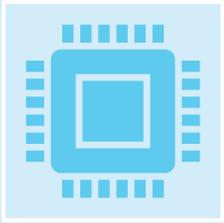ENERGY & MANUFACTURING® in Appalachia

Industry Resources

Policy & Advocacy Organization

▶ Data Center Coalition

▶ Energy Infrastructure Council

▶ Marcellus Shale Coalition

▶ National Assn of Electrical Distributors

▶ National Electrical Manufacturers Assn

▶ The Green Grid

Resources & Funding Opportunities

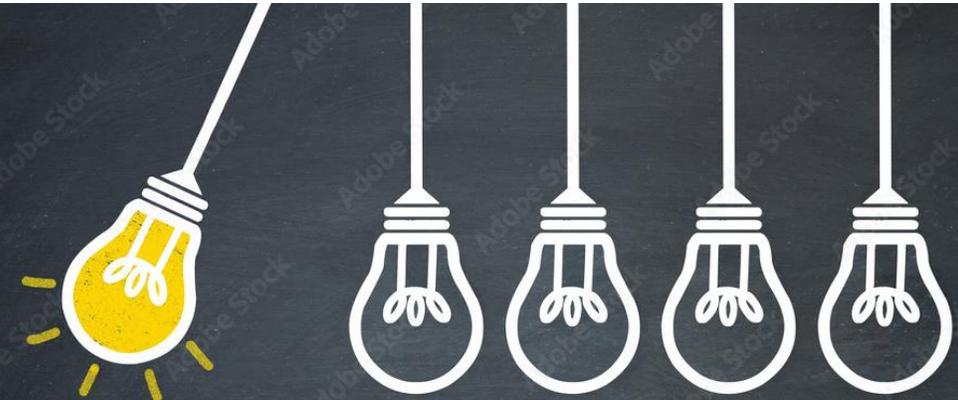▶ U.S. DOE Manufacturing and Energy
Supply Chains (MESC)

AI Data Centers are a potential major emerging market for small and medium-sized energy and electrical equipment manufacturers

AI company sustainability policies will likely drive new equipment purchases, though Trump Administration fossil fuel policies may counteract.

Sprint is needed to capture market opportunity at the regional, national, and global level

FINAL THOUGHTS

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