

Impacts of Data Center Growth on Virginia and Water Resources



Piedmont
Environmental
Council

Julie Bolthouse, Director of Land Use

PEC's Mission

Protect and restore
the lands and waters
of the Virginia
Piedmont, while
building stronger,
more sustainable
communities.



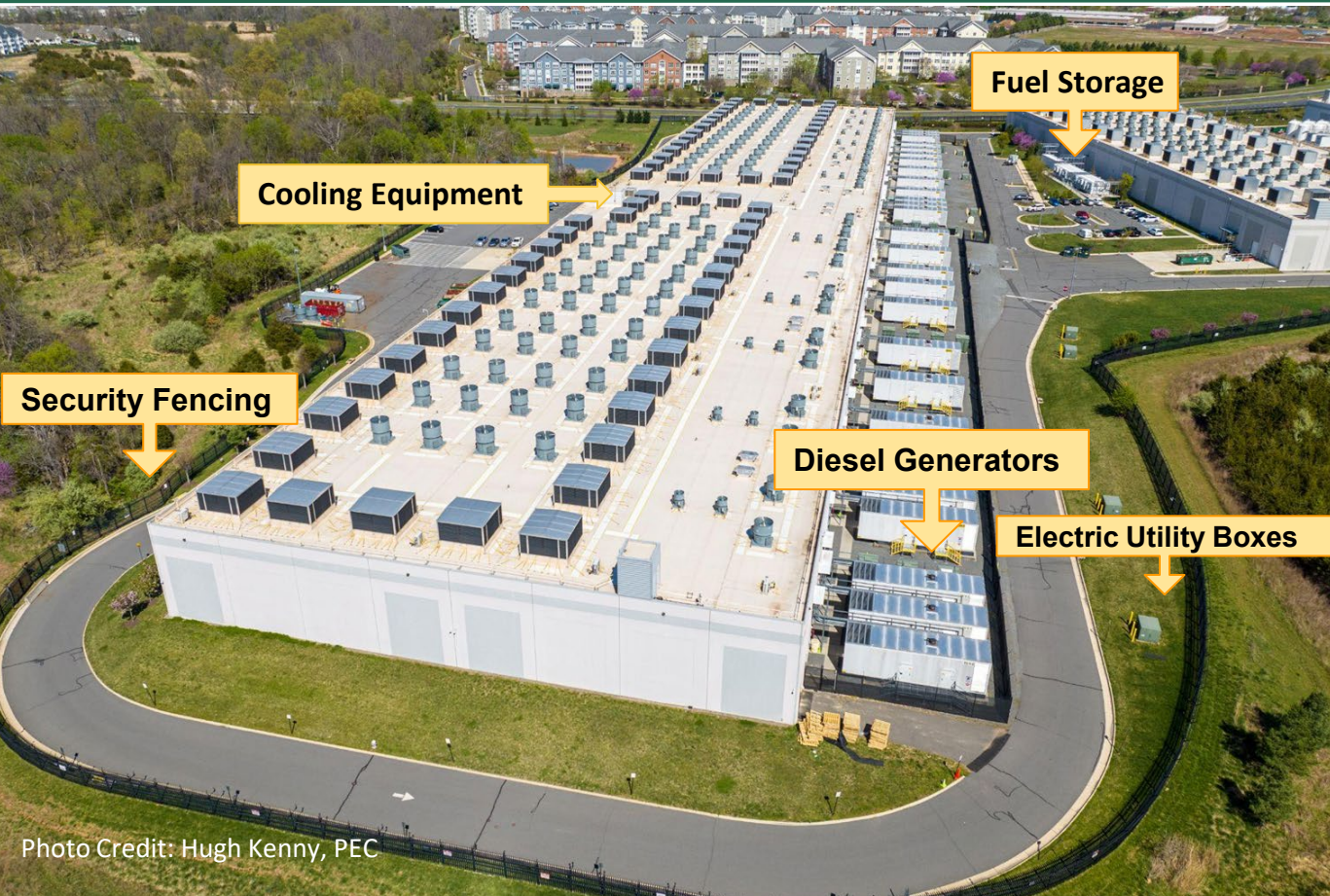
Today's Presentation

- Current Trends and Cumulative Impacts
- The Broken System
- Specific Impacts on Water Resources
- PEC's Data Center Reform Campaign and Associated Advocacy



What is a Data Center?

Top Photo Source: www.globalpwr.com
Bottom Photo: Christopher Bowns, Wikimedia Commons



Back-Up Generator



Inside Data Hall

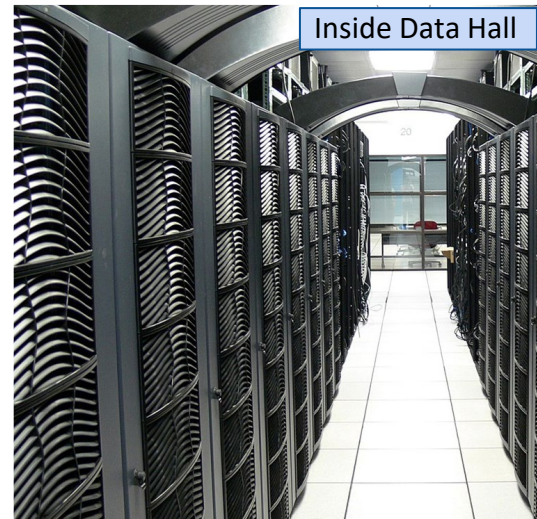


Photo Credit: Hugh Kenny, PEC

Data center development is uniquely impactful

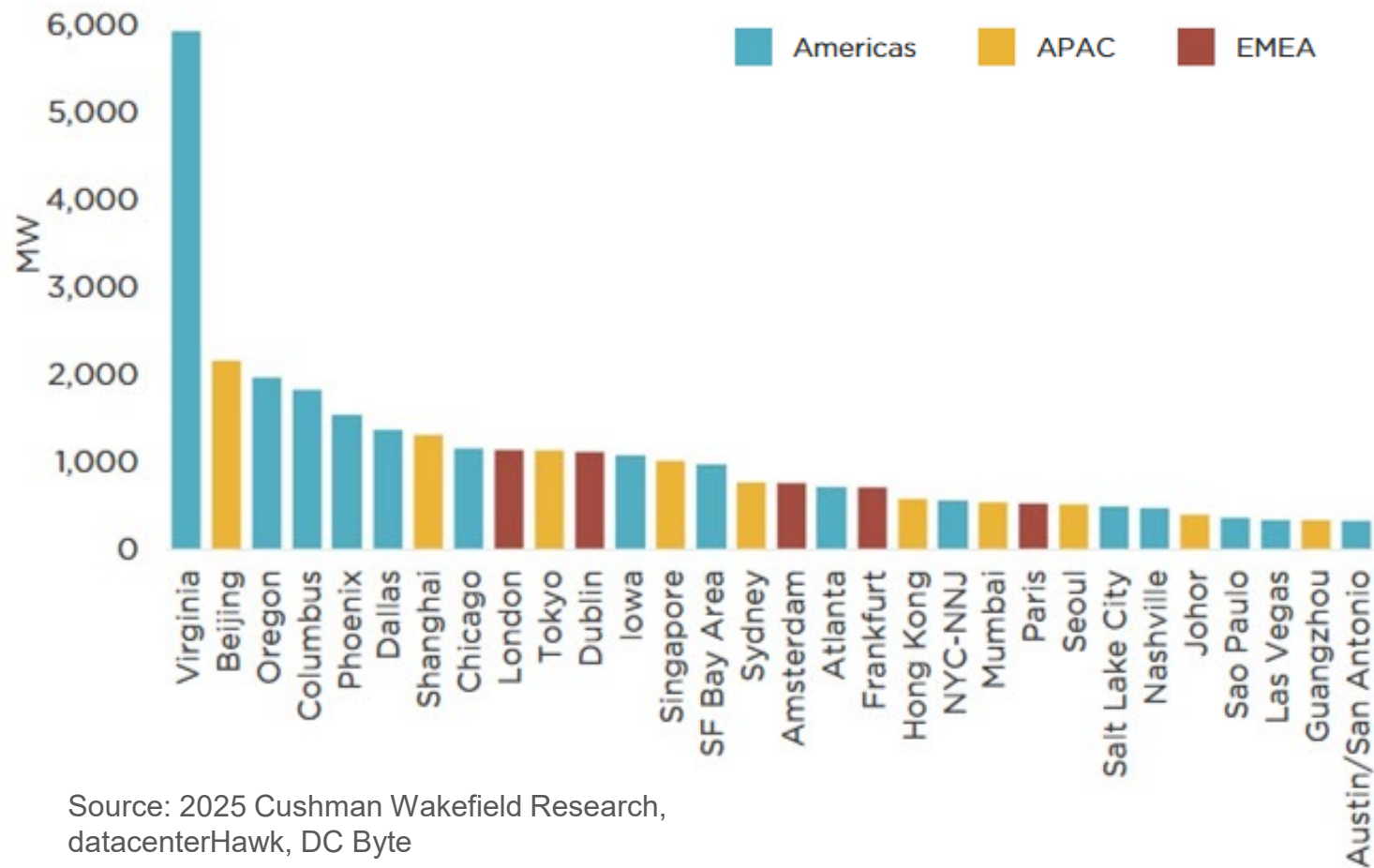
- **Explosive growth** and lots of speculation due to the boom in AI
- **Much more energy**; a campus can use as much as a city
- **More generators** are used for onsite backup power requirements than any other use including hospitals and factories
- **Consumptive water use**; much of the water is lost to evaporative cooling
- Facilities **tend to cluster**, leading to cumulative impacts on air and water quality, water consumption, and energy infrastructure.

Demand Driving Explosive Growth

- Outsourcing of information technology functions
- Advancing smartphone technology and apps (5G)
- Expansion of rural broadband
- Digitization and data storage
- Cloud computing
- GenAI such as large language models, and machine learning



Top Markets by Operational IT Load

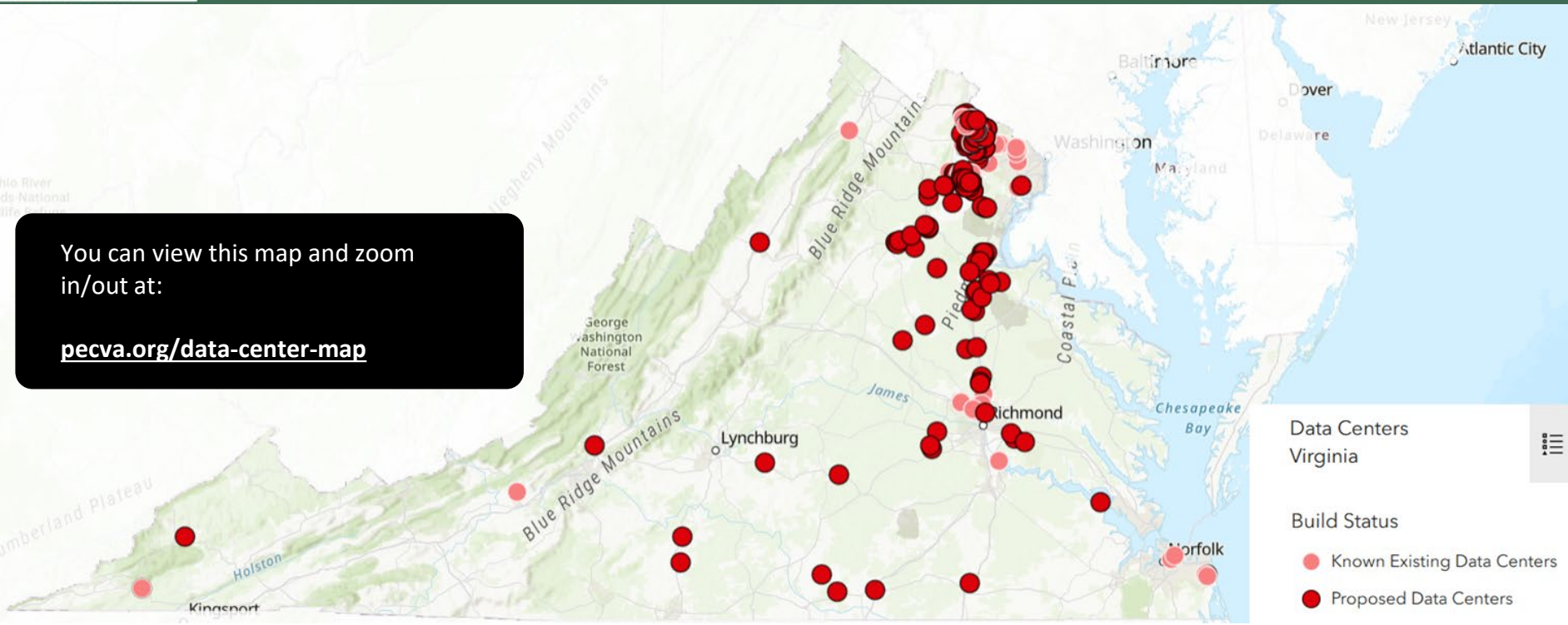


Source: 2025 Cushman Wakefield Research, datacenterHawk, DC Byte

Data Center Projects In Virginia



Existing and Proposed Data Centers - A Web Map



You can view this map and zoom in/out at:

pecva.org/data-center-map

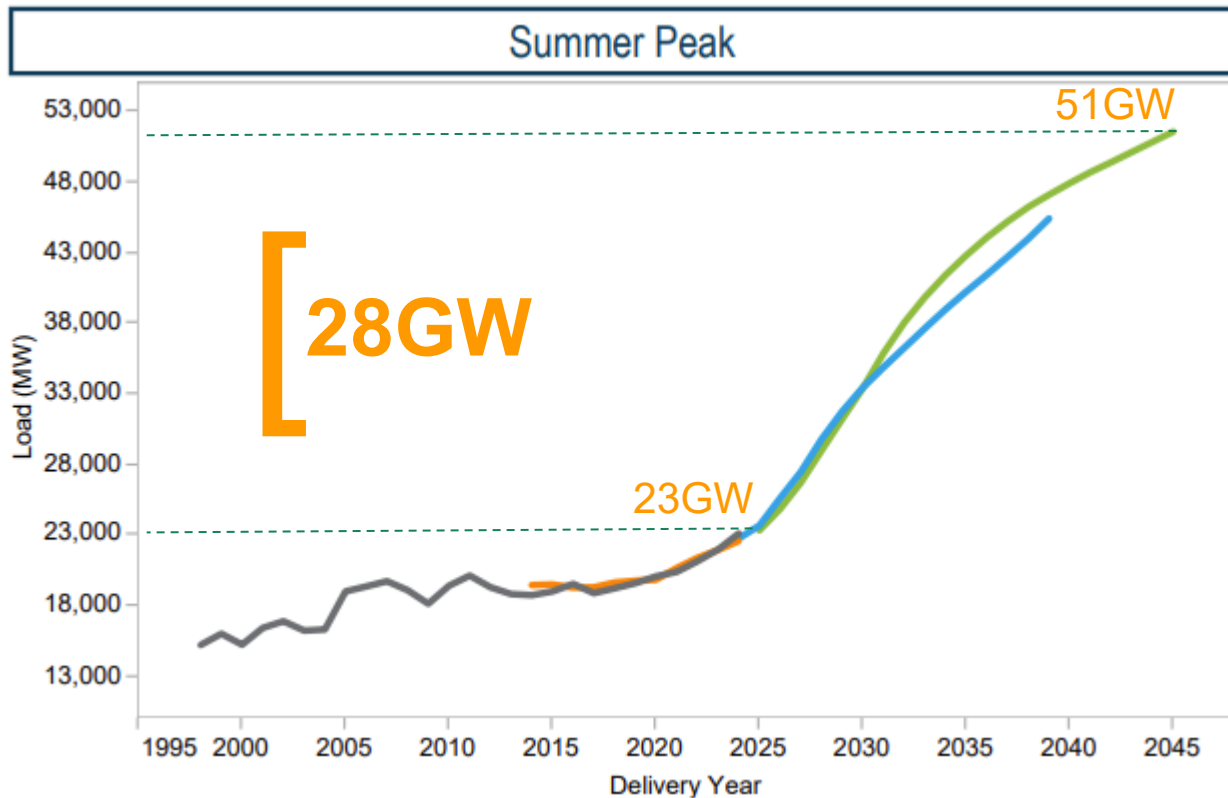
- Data Centers
Virginia
- Build Status
- Known Existing Data Centers
 - Proposed Data Centers

**Currently about 60 million square feet existing
or being constructed in the state**

**There's another 350 million square feet
approved or in the pipeline**

Skyrocketing Load Demand

Dominion Energy's 20 Year Forecast

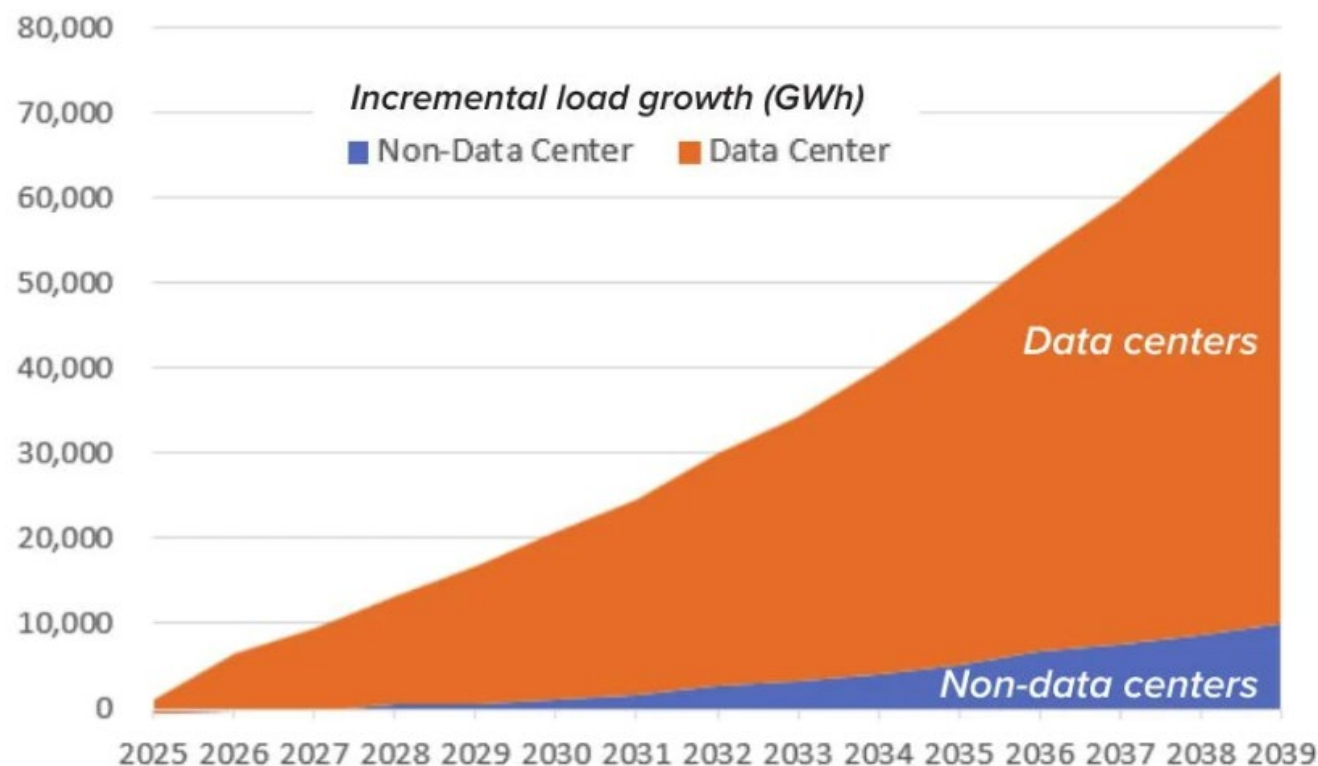


Green = 2025 projection
Blue = 2024 projection

**That's a doubling of Virginia's peak
load!**

Feeding the beast

PEC analysis of regulatory filings shows how data centers are expected to drive steep growth in Virginia's power demands.



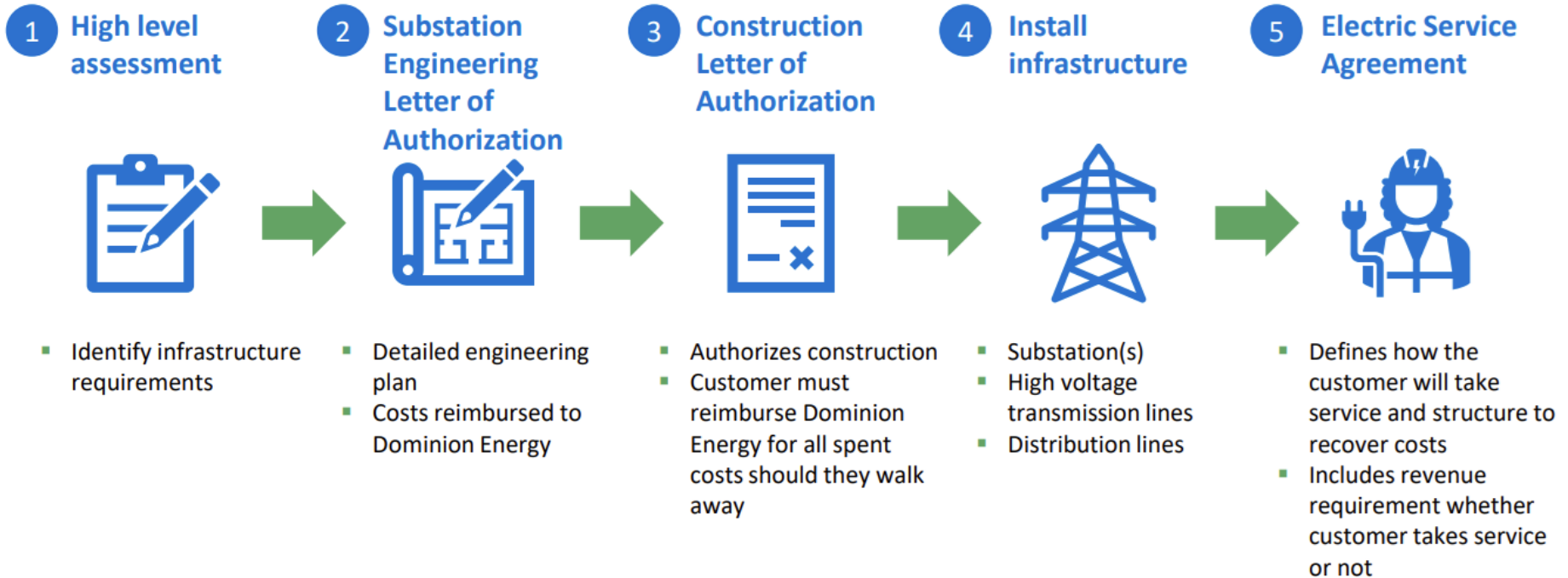
SOURCE: PEC from Dominion Energy data

Crisis by Contract

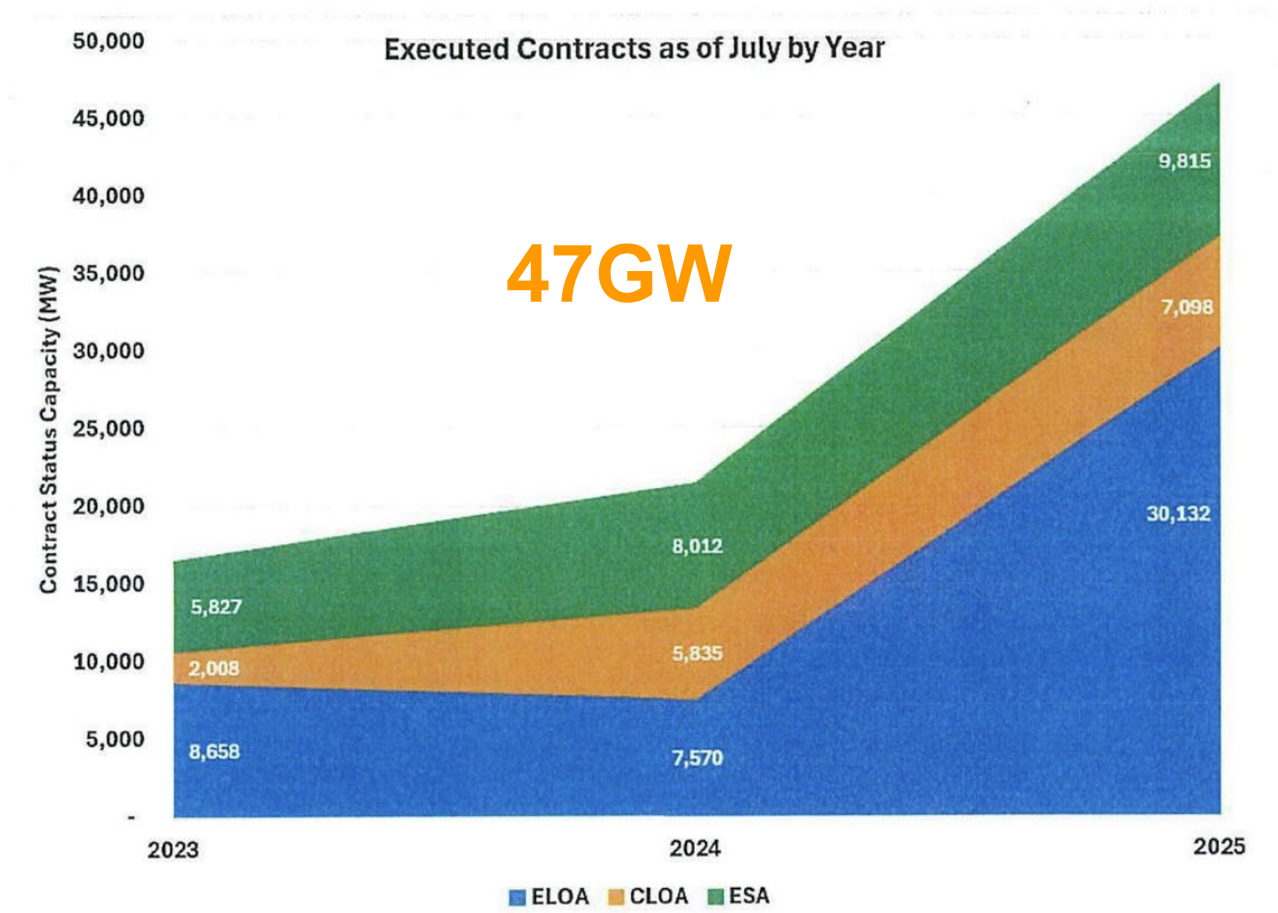
Dominion Energy Virginia

Data center request process

Typical data center request process from contact to connection



Dominion's Contracts with Data Center Customers



What is the “Crisis by Contract”?

An energy “*crisis*” that’s been artificially created through Dominion’s unquestioning acceptance of these contracts and their rushed in-service dates.

PJM fast-tracks 11.8 GW, mainly gas, to bolster power supplies

Natural gas-fired generation accounts for 69% of selected Reliability Resource Initiative capacity, followed by batteries at 19% and nuclear at 12%.

Published May 5, 2025



Ethan Howland
Senior Reporter



PJM selects 11.8 GW in Resource Reliability Initiative

Gas-fired generation accounts for two-thirds of selected capacity.

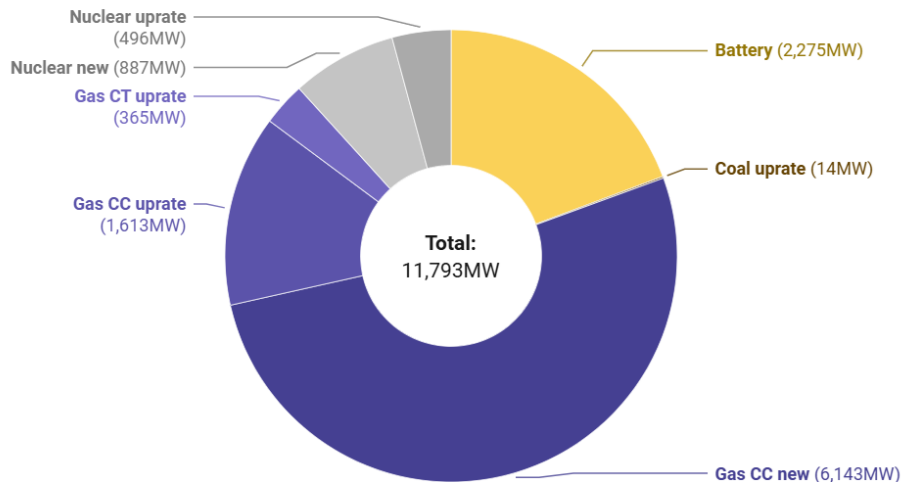
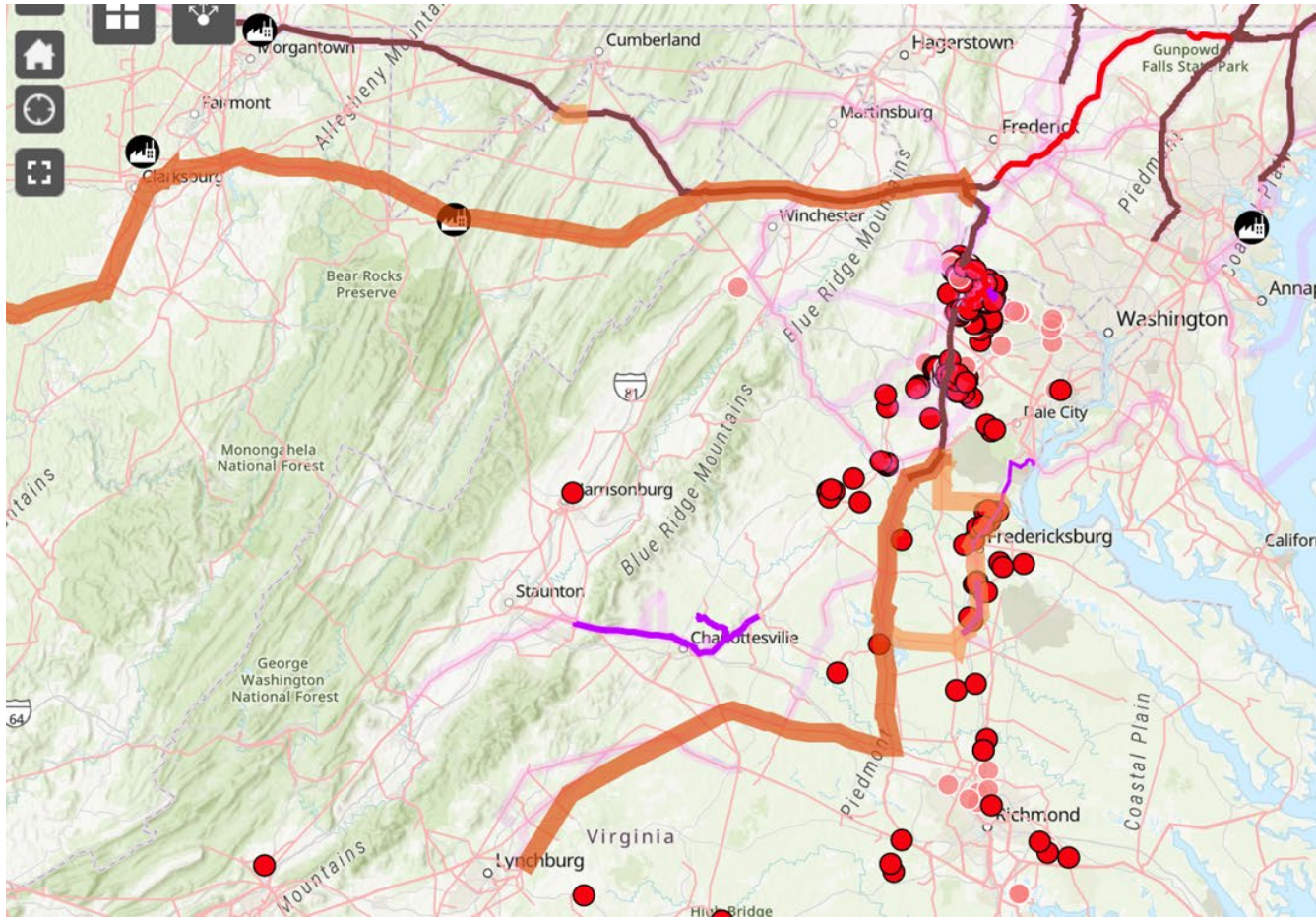


Chart: Ethan Howland/Utility Dive • Source: [PJM Interconnection](#) • [Get the data](#) • Created with [Datawrapper](#)

\$12 Billion in Regional Transmission Lines Being Planned



PJM 2024 Window 1: Selected Transmission Proposals (from 12/2024)

500 kV

765 kV

Coal Power Plants with Maximum Output over 1,000 MW



PJM 2022 Window 3: Selected Transmission Proposals (from 10/31/23)

New Transmission Line (Route to be determined by utility)

Expand Existing Right of Way

Rebuild in Existing Right of Way

PJM 2022 Window 3: Original Transmission Proposals from 9/5/23

Data Centers in Virginia

Existing

Proposed

Who pays and who bears the risk?

Utility Ratepayers (You and Me)

Subsidizing Data Center Power Demand

- **Discounted rates**, private negotiations, and stronger leverage and influence as largest customer class
- **Flawed rate structure** that does not match the new paradigm of 24/7 large load consumers driving increase
- **High demand causing higher capacity costs** and fuel prices that are born by all users
- **Transmission lines** to solely serve a data center are unfairly subsidized by all users
- **Huge risk** borne by the rest of the customers if data centers don't consume as much energy as expected



Community Impacts Experienced in Northern Virginia



Parks and Trails



Noise



Water



Air Quality



Wildlife Habitat



Design



Energy Infrastructure

Community Impacts Experienced in Northern Virginia



Parks and Trails



Noise



Water



Air Quality



Wildlife Habitat



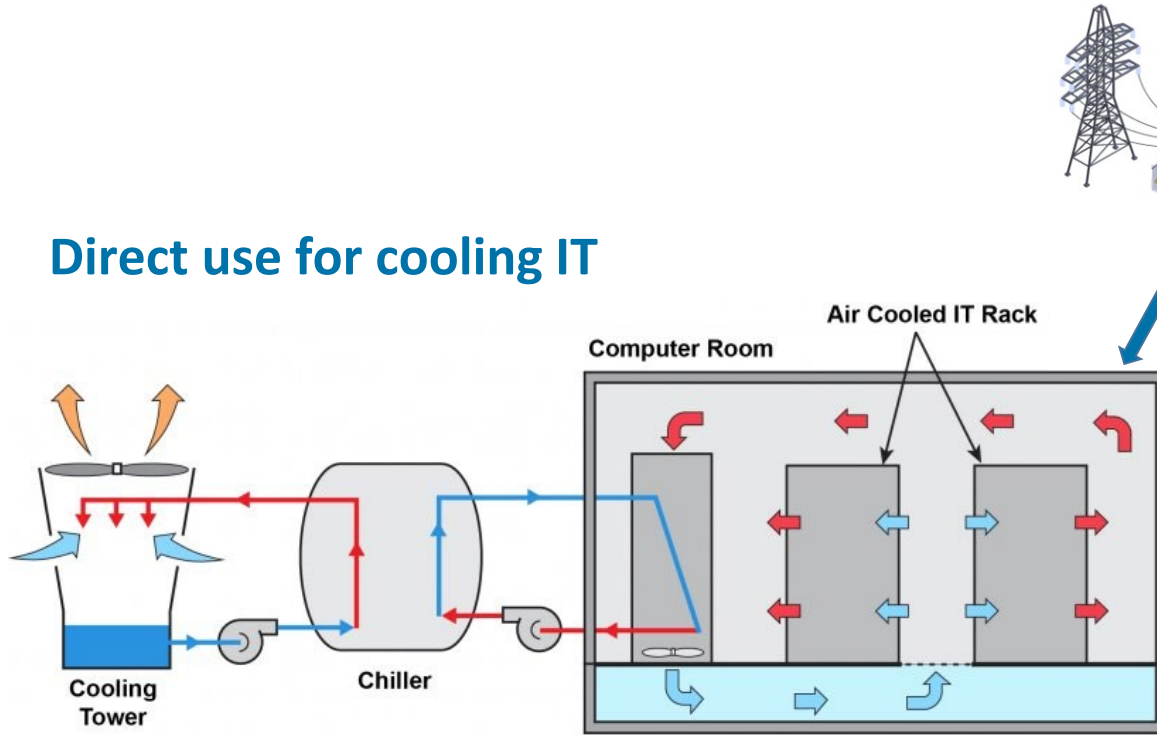
Design



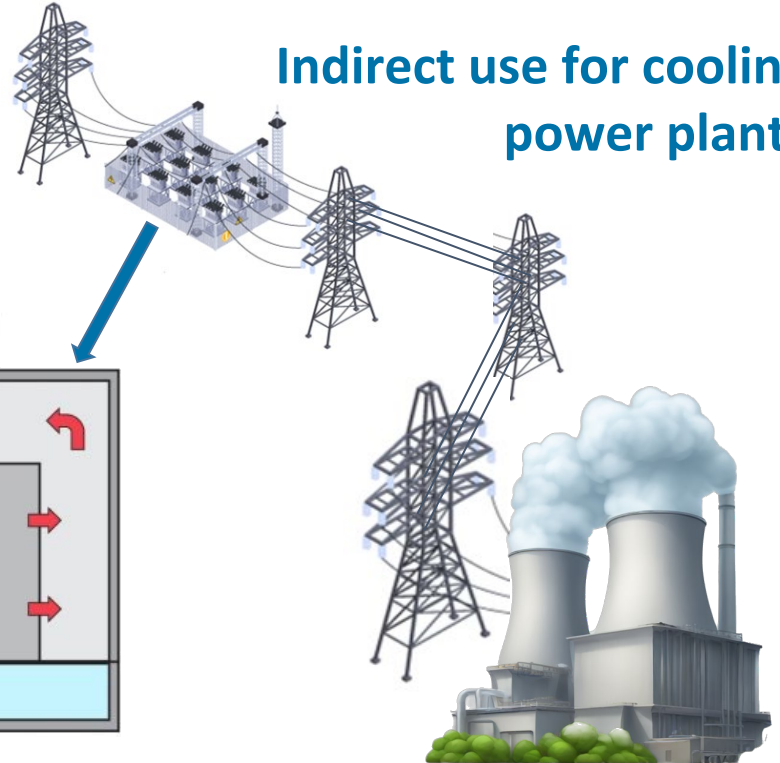
Energy Infrastructure

Water Consumption – Cooling and Power

Direct use for cooling IT



Indirect use for cooling power plants

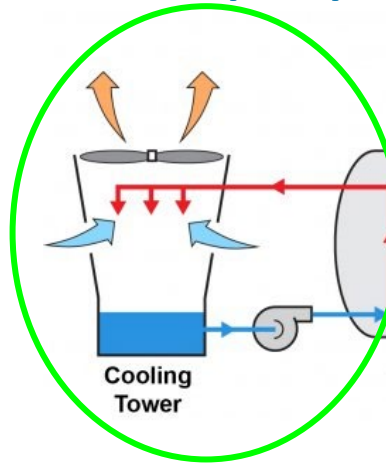


Water Usage Varies Based on Cooling System.

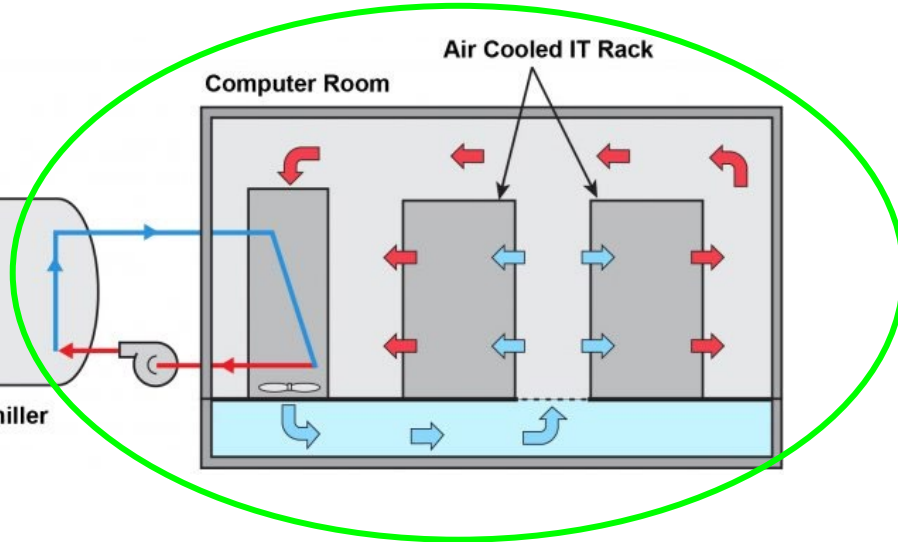
**Descriptors like “closed loop” are confusing.
Regulate the actual usage not the technology.**

Closed Loop systems...

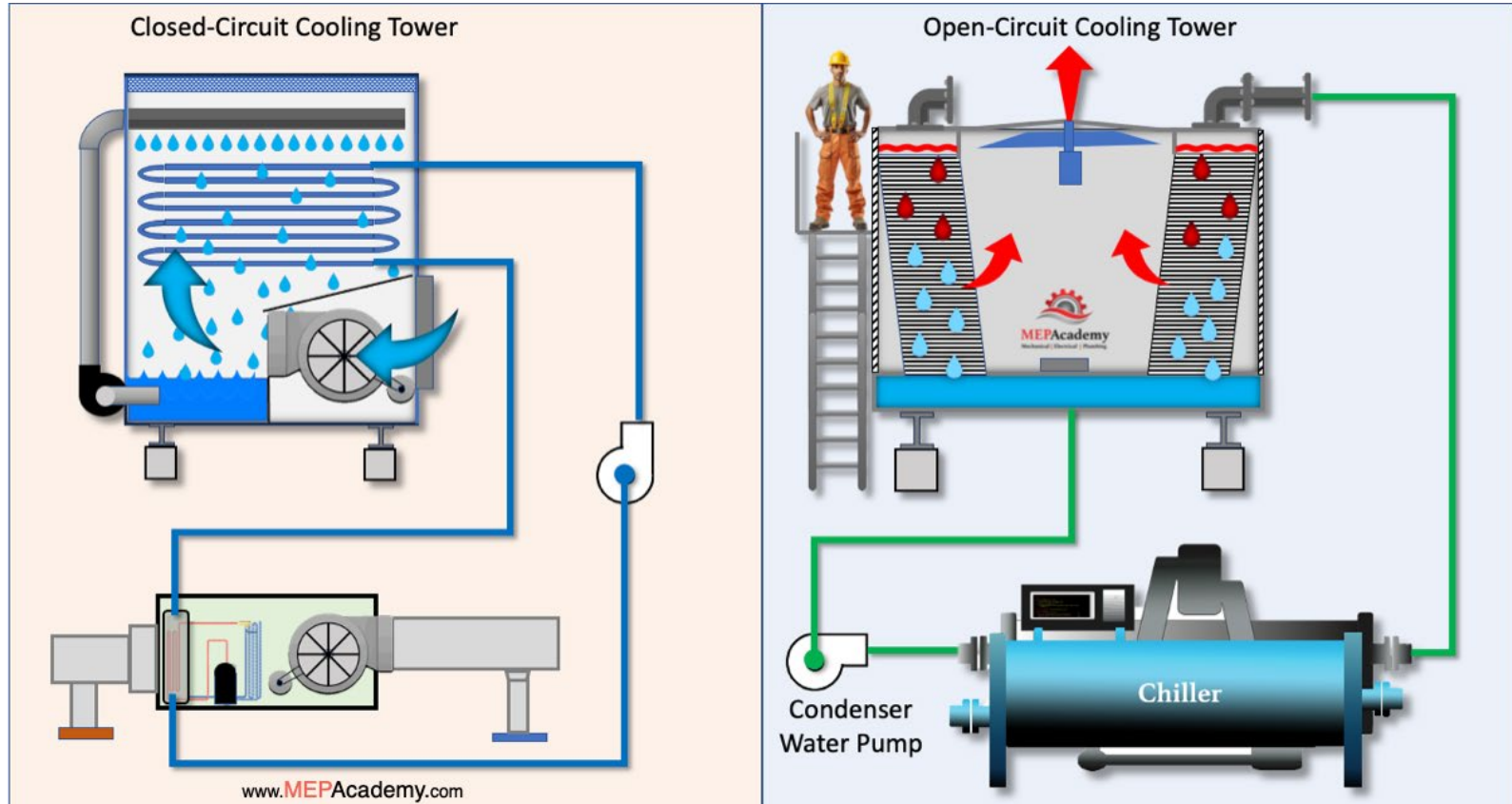
Outer Loop - open



Inner Loop - closed

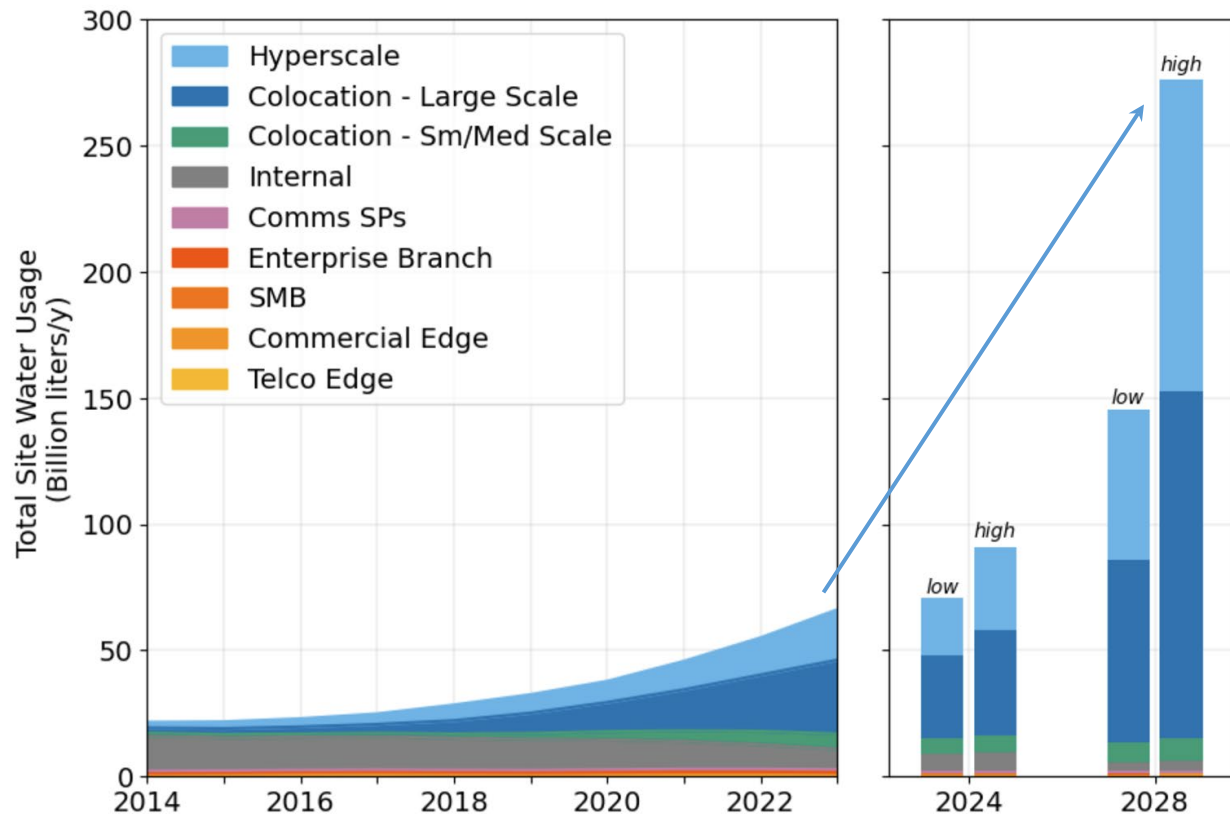


Cooling Tower Can be Closed or Open Too...



Source: <https://mepacademy.com/closed-circuit-vs-open-circuit-cooling-towers/>

Higher Water Consumption Projections with AI



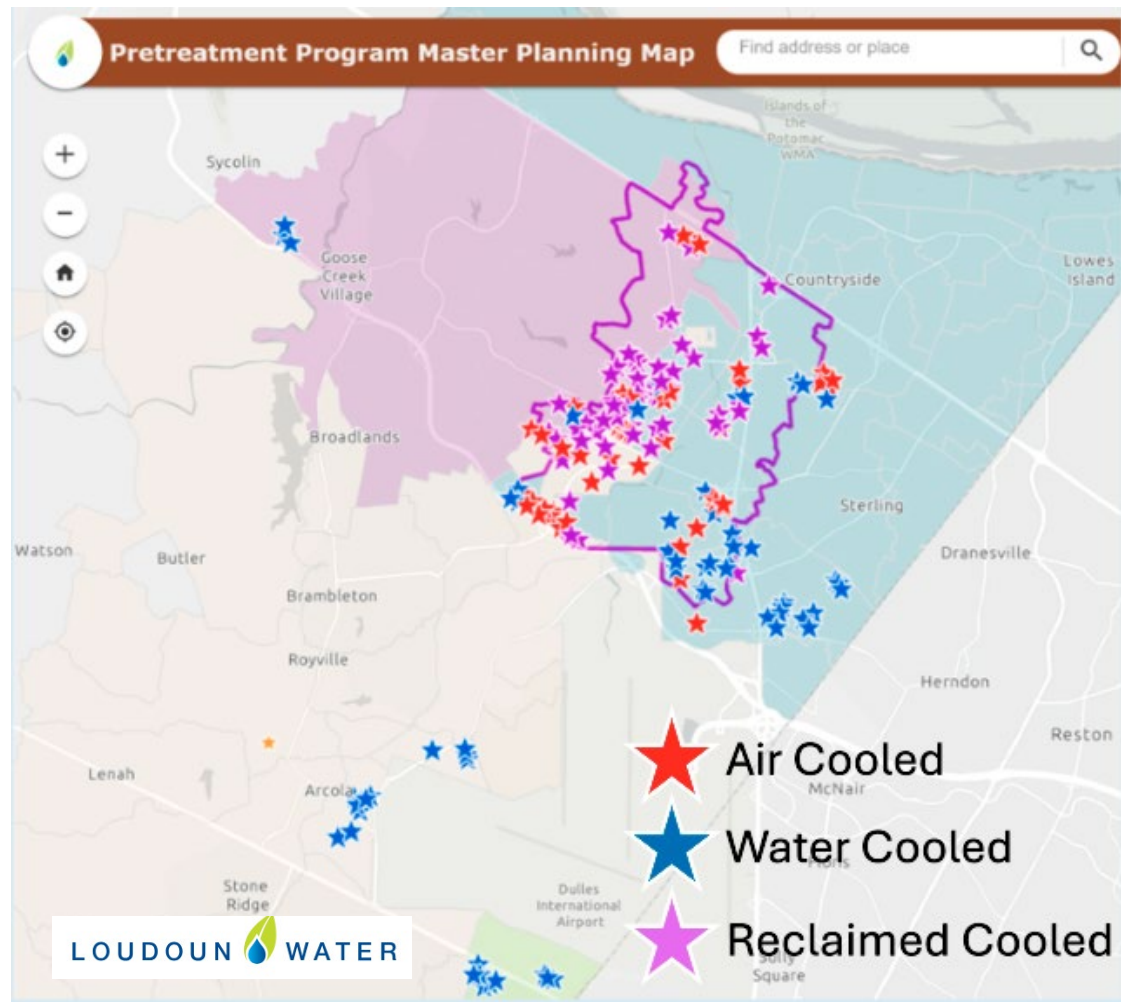
The U.S. data center water consumption in 2028, driven by AI, is expected to exceed **2 – 4x** the 2023 level

Source: 2024 United States Data Center Energy Usage Report and graph from Making AI Less "Thirsty": Uncovering and Addressing the Secret Water Footprint of AI Models
<https://arxiv.org/abs/2304.03271>

Loudoun County's Total Data Center Water Usage has increased dramatically

2024 Total Water Usage

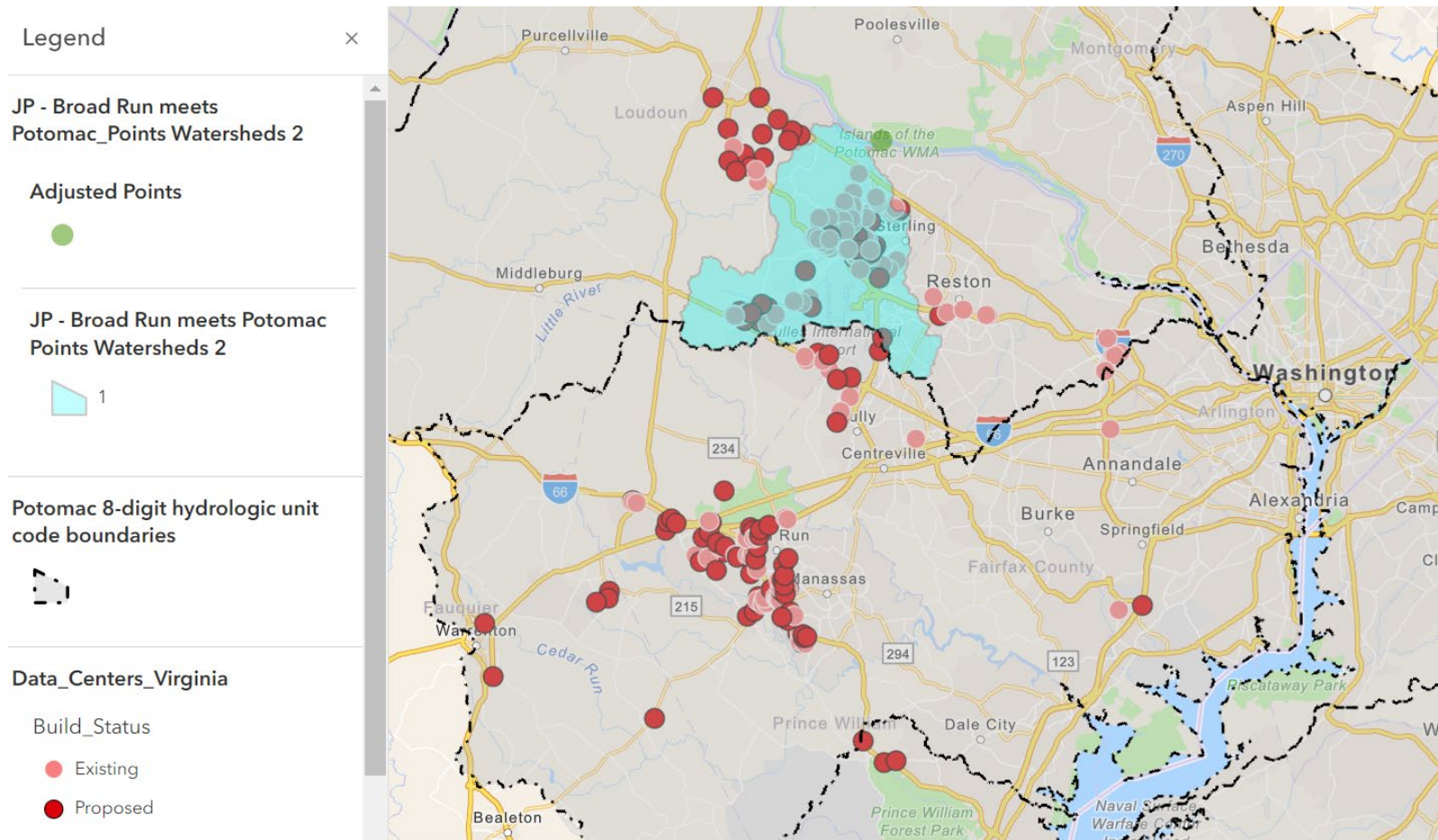
- **Reclaimed** – 704 million gallons
- **Potable** – 937 million gallons
- **9% of total system capacity**
- **242 million gallons in August**



High Amounts of Impervious Surface...



Highly Concentrated In Local Watersheds...



Findings of Potomac River Basin Study by the Interstate Commission

- **Data centers currently consume about 2%-8% of the water used from the river basin.**
- **If the industry continues to grow at an unconstrained pace... that number could surpass 33% by 2050, which is about a third of Washington, DC's, peak water usage in August.**

Source: Initial study findings presented at Choose Clean Water Conference by Alimatou Seck, senior water resources scientist:
www.bayjournal.com/news/growth_conservation/clean-water-advocates-weigh-data-center-growth-in-chesapeake-region/article_8e0de208-442d-450c-877a-2947cdc84a89.html

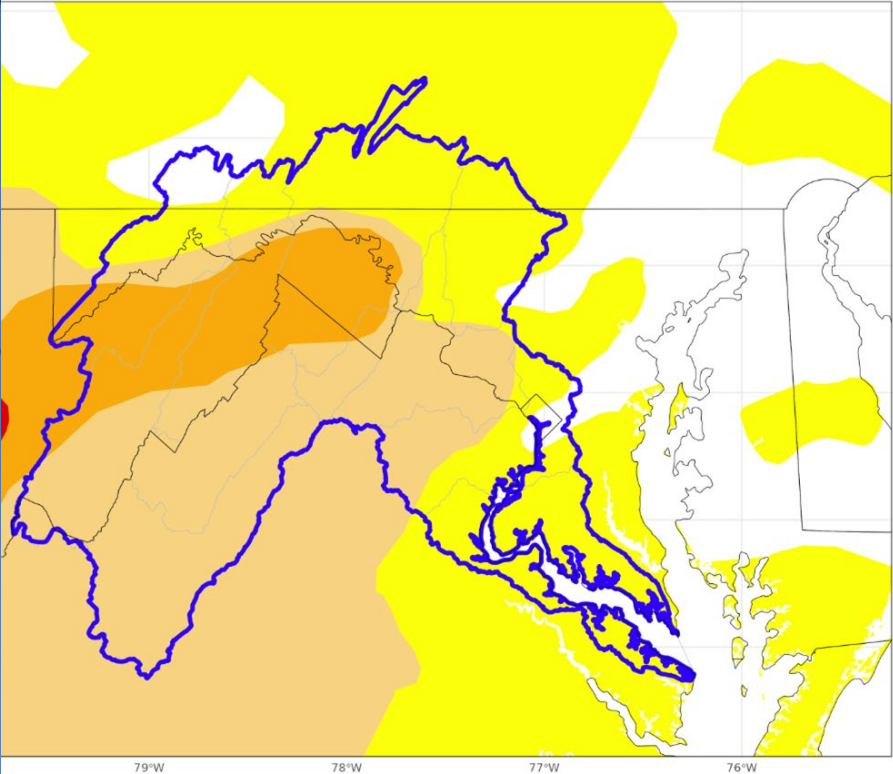
Drought Conditions Return; Middleburg Calls for Conservation

Norman K. Styer Sep 11, 2025 1



U.S. Drought Monitor Map for the Potomac Basin

Map released: Thursday, September 18, 2025
Data valid: September 16, 2025 at 8 a.m. EDT



Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Category	Basin
D0	34%
D1	44.3%
D2	18.8%
D3	0%

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

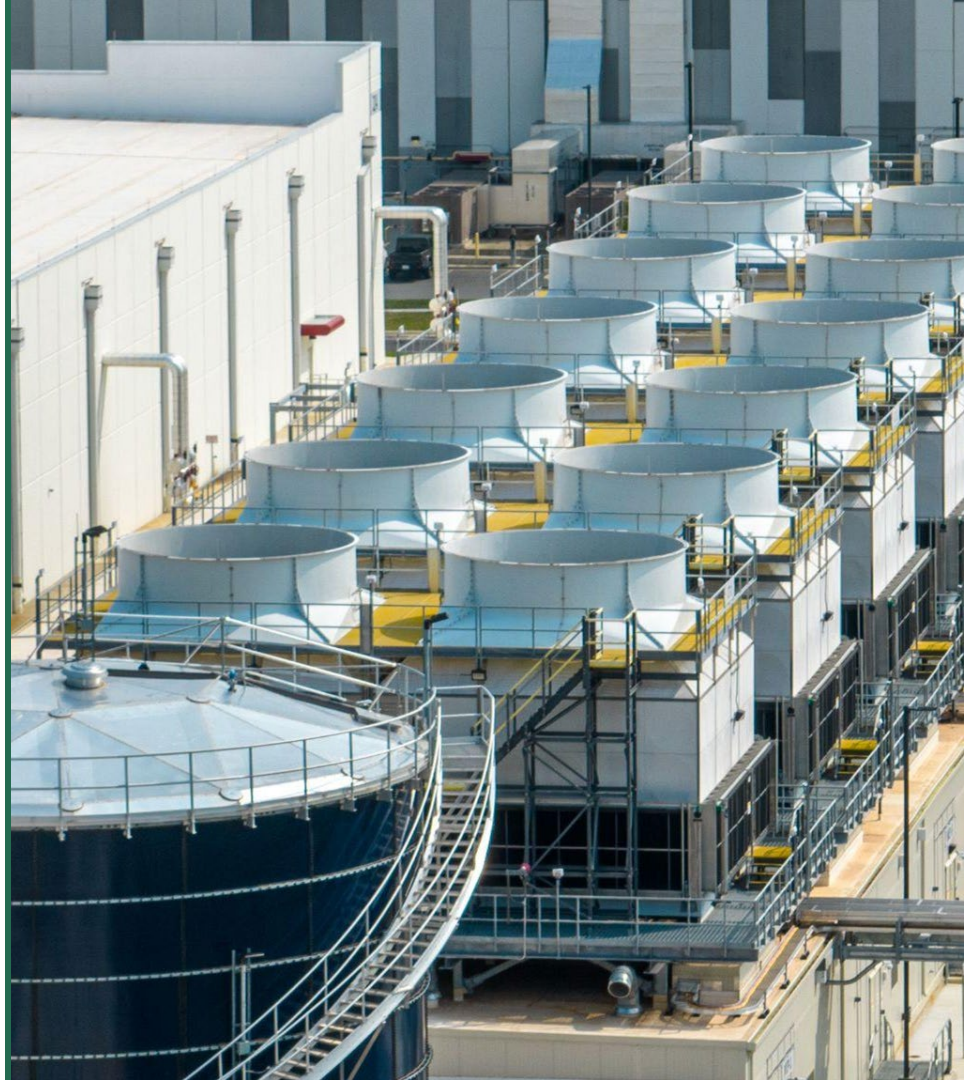


droughtmonitor.unl.edu

Waste Water -

Evaporation through cooling towers concentrates minerals which are discharged from the facility in form of ***blowdown*** that can contain:

- **Higher salinity levels** and Total Dissolved Solids
- **Corrosion inhibitors** such as phosphates and molybdates
- **Biocides** such as chlorine, glutaraldehyde, and isothiazolin
- **Heavy metals** such as zinc, copper, and chromium

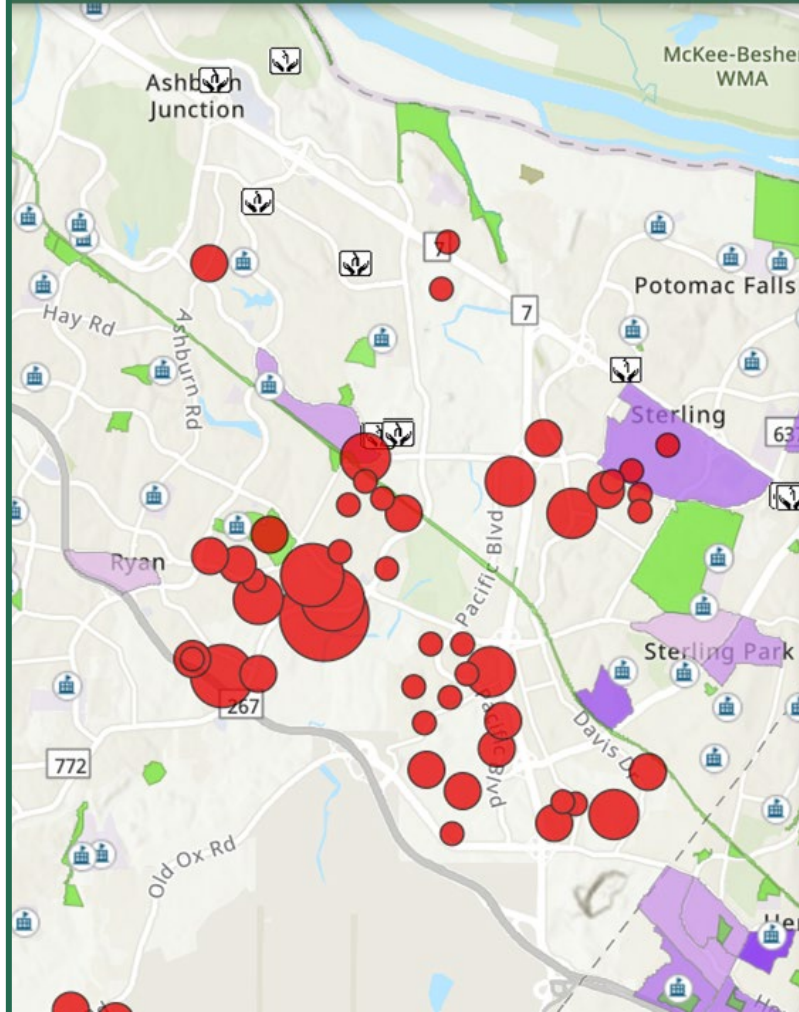


There are nearly 9,000 diesel generators permitted at data centers in Virginia

Diesel fuel storage and exhaust pose risks to urban water quality.

www.pecva.org/work/energy-work/data-centers-diesel-generators-and-air-quality-pec-web-map/

Data Center Diesel Generators



Legend

Data Centers Emissions

Number of Generators



Nursing Homes



Public School Locations



Overall the impacts have been...

- **Higher electric bills** to pay for infrastructure and increasing capacity and fuel costs
- **Public and private right of way taken** for transmission lines
- **Renewable energy transition forfeited** and climate action put on hold
- **Industrialization of community** and pushing out of other land uses
- **Air quality degradation** from onsite power (generators) and power plants
- **Water supply and quality impacts** from cooling, energy production, blowdown, runoff, and increased impervious surfaces
- **Land conversion and habitat loss** for data centers and energy infrastructure

How is this happening?

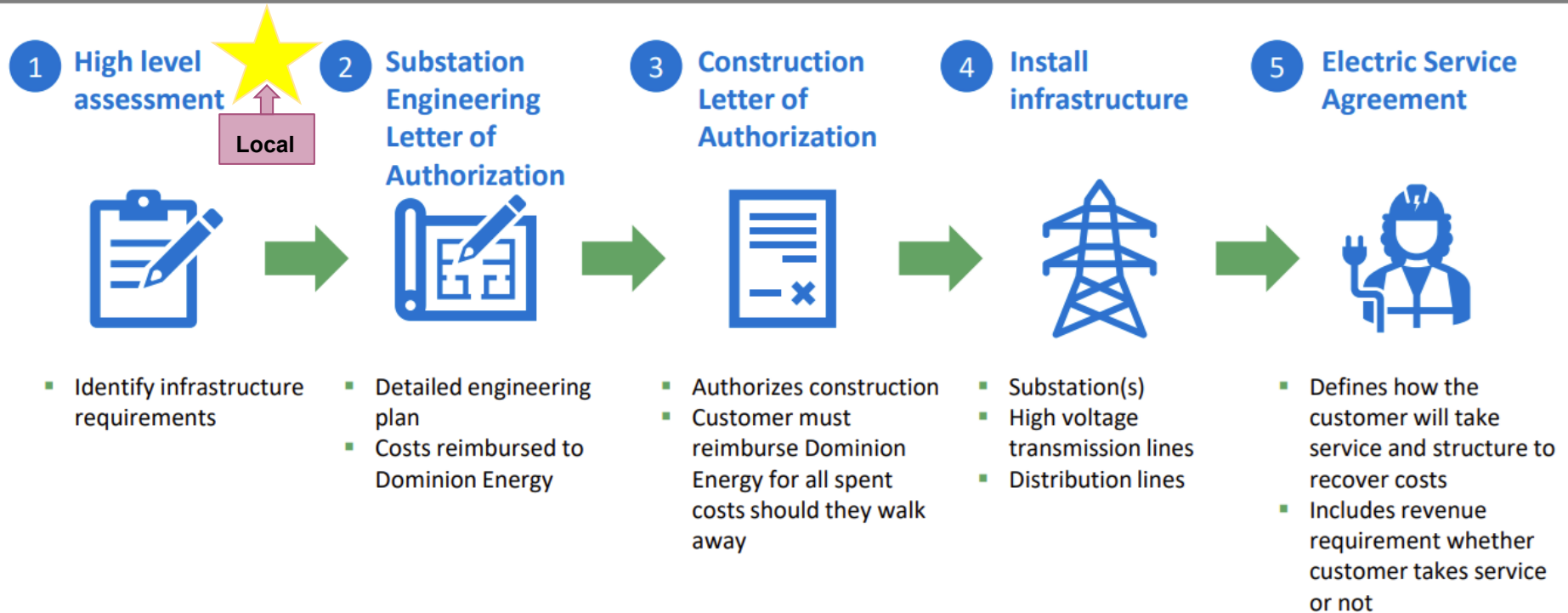
The tail is being allowed to wag the dog.



Dominion Energy Virginia

Data center request process

Typical data center request process from contact to connection

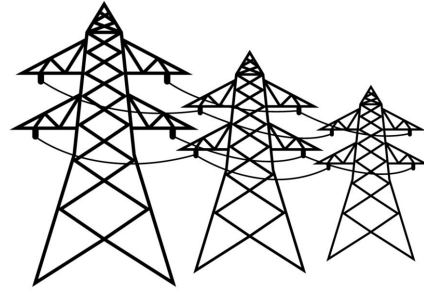


**Review and approval is at the local level and
its review like any other land use.**



It's not like other land uses though.

The impacts demand state oversight that doesn't currently exist.



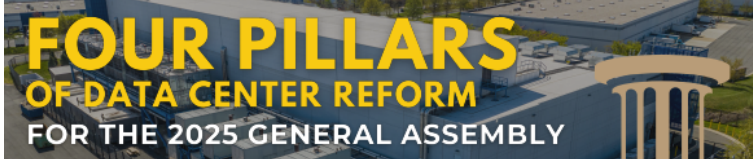
PEC's Data Center Reform Campaign

Virginia Data Center Reform Coalition



State Policy Strategy

- **State review** of data center proposals and oversight of regional and statewide impacts
- **Increased transparency** around energy, water, and emissions
- **Industry pays** for infrastructure through utility tariffs on large load users and fair allocation of costs
- **Incentivize sustainability** through the sales tax exemption or other means and **mitigate impacts**.



If the Virginia General Assembly fails to take action, **unchecked data center expansion will have a disastrous impact on ratepayers, our communities and the environment.**

Four Pillars of Data Center Reform

ENHANCED TRANSPARENCY

**PROTECTIONS FOR FAMILIES
AND BUSINESSES**

STATE OVERSIGHT

INCENTIVES FOR EFFICIENCY

Virginia is already home to the world's largest concentration of data centers, with an IT power load believed to be nearly three times greater than the next largest market in Beijing. Many of these data centers individually draw as much power as small cities.

The rapid growth of data centers is creating an unprecedented demand for energy, land and water, and our communities are paying the costs. Without any public review or oversight by the state, Dominion Energy has already contracted with data centers for a startling 21 gigawatts (GW) of electricity, which nearly doubles its current peak energy capacity and is the equivalent of more than 11 North Anna nuclear power plants.

Without strong regulatory and legislative intervention, the risks and costs of the immense infrastructure supporting data centers is destined to be passed on to all ratepayers, including other businesses and residents.

Our electric companies are using these contracts to justify expensive and polluting energy infrastructure projects, including nuclear and gas power plants, and are delaying the retirement of coal plants. The Virginia Department of Environmental Quality has permitted thousands of diesel generators as back-up power for data centers, and it is now approving onsite gas turbines as primary power. **The continued use of fossil fuels by data centers exacerbates the environmental and climate risks already present throughout the state.**

Water consumption by data centers, particularly in the Potomac and Rappahannock river watersheds, is increasing at an alarming rate — at the same time that much of the state is experiencing increased drought conditions. The cumulative impact of data centers on neighborhood air quality and individual watersheds is yet to be assessed.

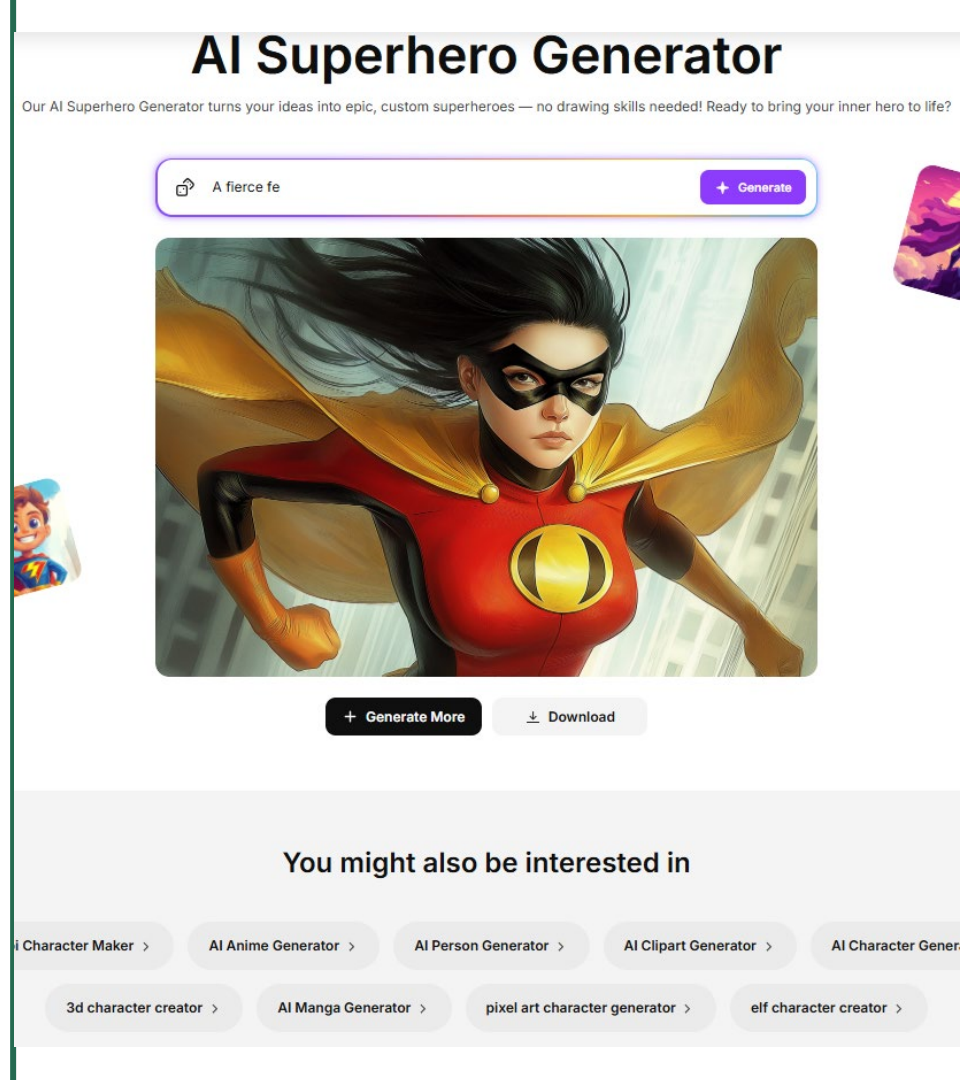
From the **THE PIEDMONT ENVIRONMENTAL COUNCIL**

Learn more and get connected at **PECVA.ORG/DATACENTERS**

Demand and Supply Side Strategies

Demand Side Strategies: Policy that Forces Reduction

- **Full transparency of projected** energy, water, and emissions so the costs vs. benefits are weighed better
- **Transparency during operation** so investors and consumers can make informed decisions
- **Internalization of true cost** (infrastructure costs, sales tax exemptions, mitigation of pollution)
- **Prioritize critical data center uses vs. GenAI** that requires increased scaling



Demand Side Strategies: Sustainability Practices

- *More efficient and smaller software design and AI models*
- Maximize IT and cooling efficiency
- ***Water conservation practices***
- Waste heat utilization
- ***Geothermal heating and cooling***
- Onsite solar, wind, and advanced geothermal power generation
- Onsite battery storage utilized for backup and demand response
- Utilize flexible load shifting



Supply Side Strategies: Clean Energy and Smart Grid

- Well sited and designed utility scale solar
- Innovative grid solutions
 - Advanced conductors/Smart grid technology
 - More battery storage; longer-term storage pilot projects
 - Virtual Power Plants
- Retain Net Metering Rates
- More state incentives: parking lot, brownfield, agrivoltaics, rooftop



PEC's Advocacy is Focused On:

- Local ordinances and applications
- Legislative changes for state reform
- Clean energy & smart grid solutions over fossil fuels
- Engagement in SCC cases
- Outreach and education efforts
- Studies - data collection and research by volunteers, nonprofits, and academic institutions



Questions?