ALLIANCE FOR WATER EFFICIENCY

WATER EFFICIENCY & CONSERVATION SYMPOSIUM 2025

AUGUST 6-8, 2025 | CHICAGO, IL

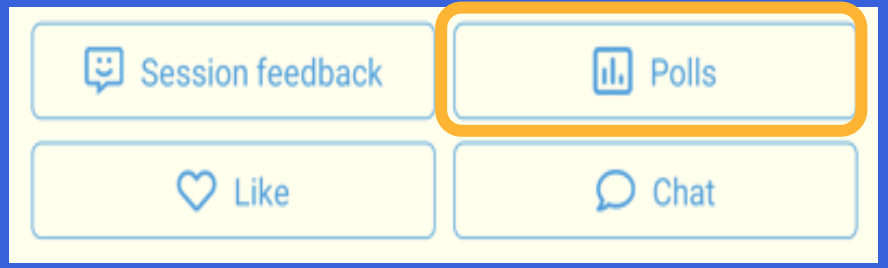
Data Centers + Water: A Conversation at the Crossroads

Room 300 2:00 – 3:30pm

Live Polling

Open your Whova apps to participate in a few session polls!

Navigate to the Whova app → Go to this session → Click on “Polls” → Select and respond to the question you see displayed on the screen



Poll Questions

- Are there data centers in your local community?
- Have you or your organization ever interacted with a data center project (planned or existing) related to water use?

Think about it…

Consider the following questions

- What questions do you have about data centers and water/resource use?
- What are the opportunities and challenges of adding data centers to a community and its watershed?

Data Center Considerations

Eddie Wilcut

Water & Energy Efficiency Services Practice Leader, Plummer Associates Inc.

PLUMMER

DATA CENTER CONSIDERATIONS

What should we know before making a decision?

Eddie Wilcut, Water & Energy Efficiency Practice Leader,
Plummer Associates, Inc.

PLUMMER

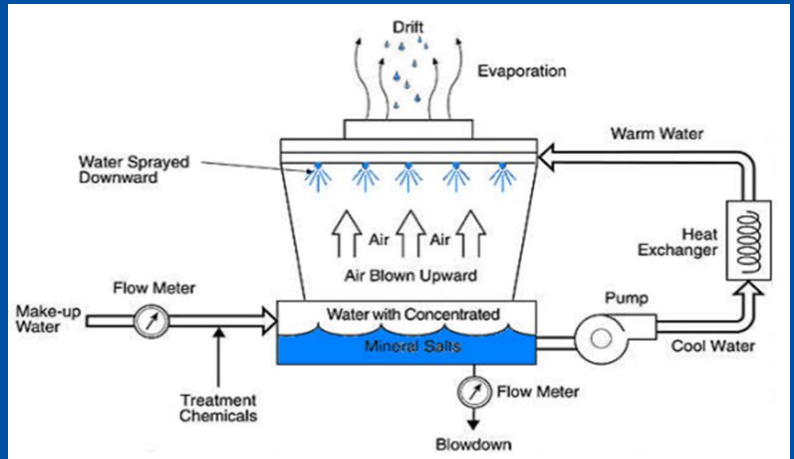
WATER VS ENERGY USE

DETERMING LOCATION

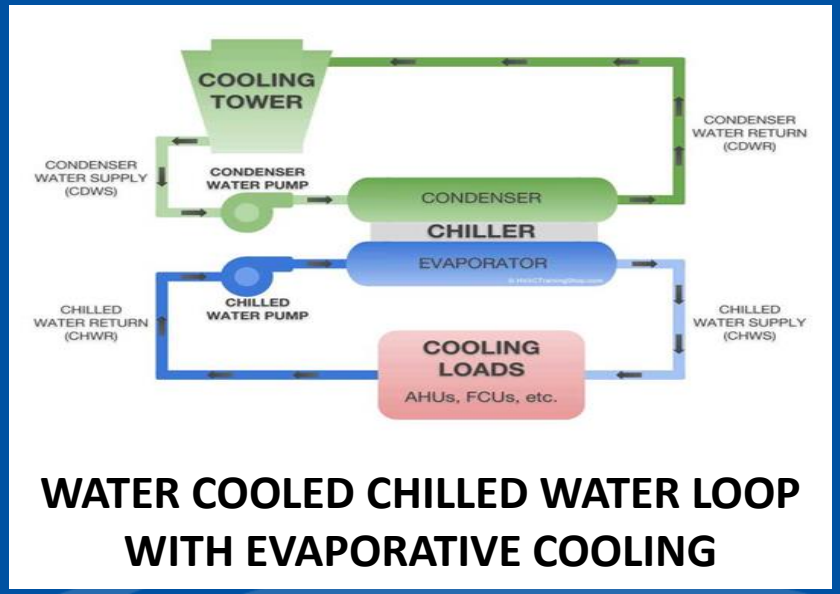
IMPACT ON LOCAL UTILITIES

COOLING TECHNOLOGY OPTIONS

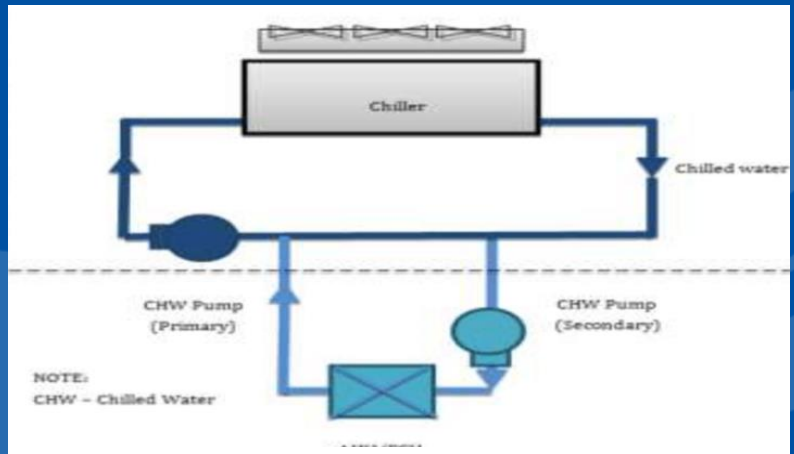
TYPICAL DATA CENTER COOLING OPTIONS



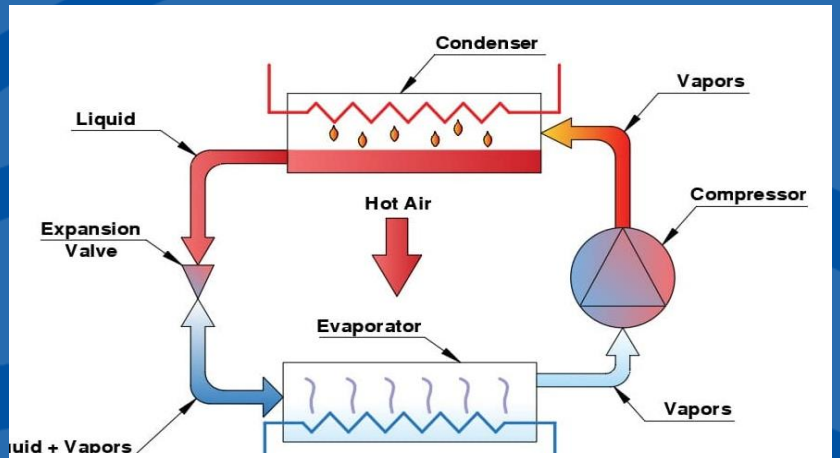
WATER COOLED CHILLER WITH EVAPORATIVE COOLING



WATER COOLED CHILLED WATER LOOP WITH EVAPORATIVE COOLING



AIR COOLED CHILLED WATER LOOP



AIR COOLED CHILLER

DATA CENTER – WATER VS ENERGY USE

- 200 Acre Site
- 22 Buildings
- 3,960,600 Square Feet of Server Rooms
- Approximately 40 FTE
- 0 TO 8.4 Million Gallons/Day
- 90,000 kWh TO 5.9 Million kWh/day

THE WATER/ENERGY NEXUS

Cooling Load Assumption	Total Cooling Load Demand (tons)	Total Water-Cooled Water Use	Air Cooled Energy Use kWh	Annual Air-Cooled Energy Cost	Water Cooled Energy Use kWh	Water Cooled Energy Cost	Evaporative Cooling Water Cost	Evaporative Cooling Wastewater Cost	Total Water-Cooled System Water & Wastewater Cost	Total Air Cooled without Closed Loop	Total Water-Cooled Cost without Closed Loop	Cost Difference
10 sq ft-ton	396,060	3,069,465,000	2,178,330,000	$158,146,758	990,150,000	$71,884,890	$17,822,700	$2,732,814	$21,149,604	$158,146,758	$92,440,404	$65,706,354
50 sq ft-ton	79,212	613,893,000	435,666,000	$31,629,352	198,030,000	$14,376,978	$3,564,540	$546,563	$4,229,921	$31,629,352	$18,488,081	$13,141,271
100 sq ft-ton	39,606	306,946,500	217,833,000	$15,814,676	99,015,000	$7,188,489	$1,782,270	$273,281	$2,114,960	$15,814,676	$9,244,040	$6,570,635
150 sq ft-ton	26,404	204,631,000	145,222,000	$10,543,117	66,010,000	$4,792,326	$1,188,180	$182,188	$1,409,974	$10,543,117	$6,162,694	$4,380,424
200 sq ft-ton	19,803	153,473,250	108,916,500	$7,907,338	49,507,500	$3,594,245	$891,135	$136,641	$1,057,480	$7,907,338	$4,622,020	$3,285,318
250 sq ft-ton	15,842	122,778,600	87,133,200	$6,325,870	39,606,000	$2,875,396	$712,908	$109,313	$845,984	$6,325,870	$3,697,616	$2,628,254
300 sq ft-ton	13,202	102,315,500	72,611,000	$5,271,559	33,005,000	$2,396,163	$594,090	$91,094	$704,987	$5,271,559	$3,081,347	$2,190,212

DETERMINING LOCATION – THE "BIG 7"

1. Power - Cost, Reliability, Sustainability
2. Network – Speed, Reliability, Proximity to Fiber
3. Climate & Cooling – Cooling Efficiency, Natural Disaster Risk, Humidity and Temperature Stability
4. Geography – Land & Construction Costs, Redundancy
5. Security & Compliance – Physical Security, Legal and Regulatory, Political Stability
6. Infrastructure Support – Power Demand, Water, Wastewater
7. Economic Incentives – Tax Breaks, Real Estate Prices

IMPACT ON LOCAL UTILITIES

1. Electrical Demand
2. Water Intensity
3. Utility Planning & Infrastructure
4. Potential Benefits to Utilities
5. Environmental & Social Concerns

COOLING TECHNOLOGY OPTIONS

1. Direct-to Chip Liquid Cooling
2. Immersion Cooling
3. Evaporative/Adiabatic Cooling
4. Rear Door Heat Exchanger
5. Advanced Chilled Water Systems
6. Free Cooling (Economization)
7. Thermal Energy Storage
8. AI/ML-Based Cooling Optimization
9. District Cooling/Central Utility Plants

PLUMMER

DATA CENTER CONSIDERATIONS

What should we know before making a decision?

Eddie Wilcut, Water & Energy Efficiency Practice Leader,
Plummer Associates, Inc.

The Power Density Struggle is Real

Jason Hick

Project Director for Future Supercomputing Infrastructure, Los Alamos National Laboratory

The Power Density Struggle is Real

Jason Hick and Mark Izzo

August 7, 2025

LA-UR-25-28272

Computers are getting more powerful, not by making chips faster, but by packing more into a smaller space

National labs and most data center users seek the highest performance technology

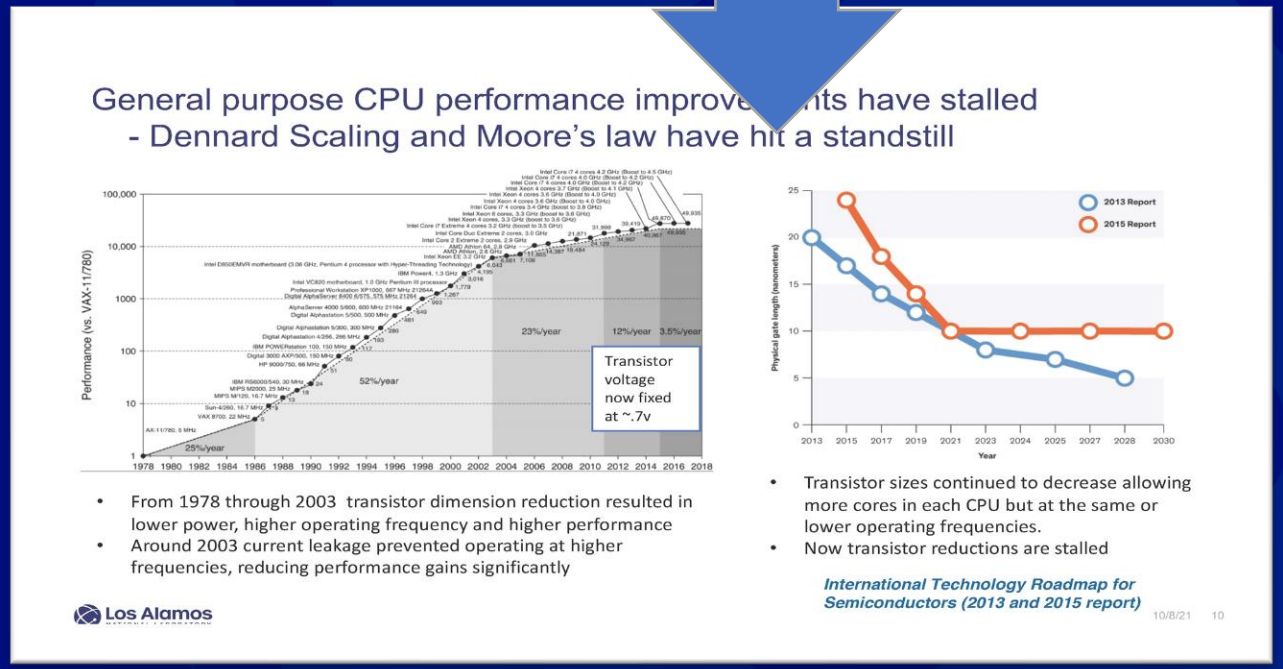
Increasingly pack more into their racks

- Network speed improvements require more energy, generating more heat
- Fixed energy cost per transistor, packing more transistors results in more energy & heat

Today's performance gains demand exponentially more devices per rack

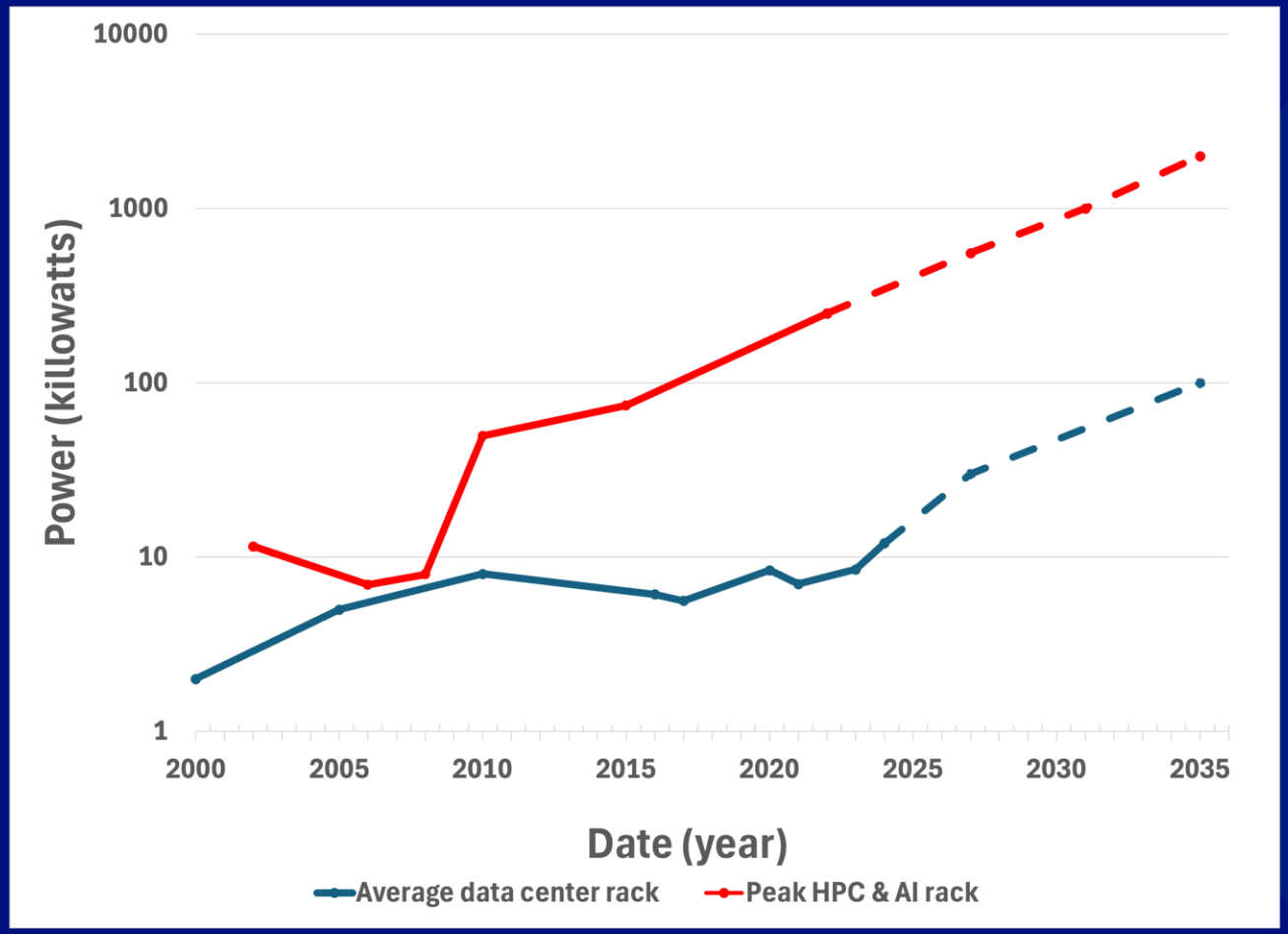
This trend of packing more into a smaller space is expected to continue increasing for the foreseeable future

Fixed energy per transistor and stalling of transistor size reductions drive increased power per platform



[ideas from http://www.cs.columbia.edu/~martha/courses/3827/au14/advanced-topics.pdf]

Technology inside data centers shows exponential growth in power capacity required for peak performance



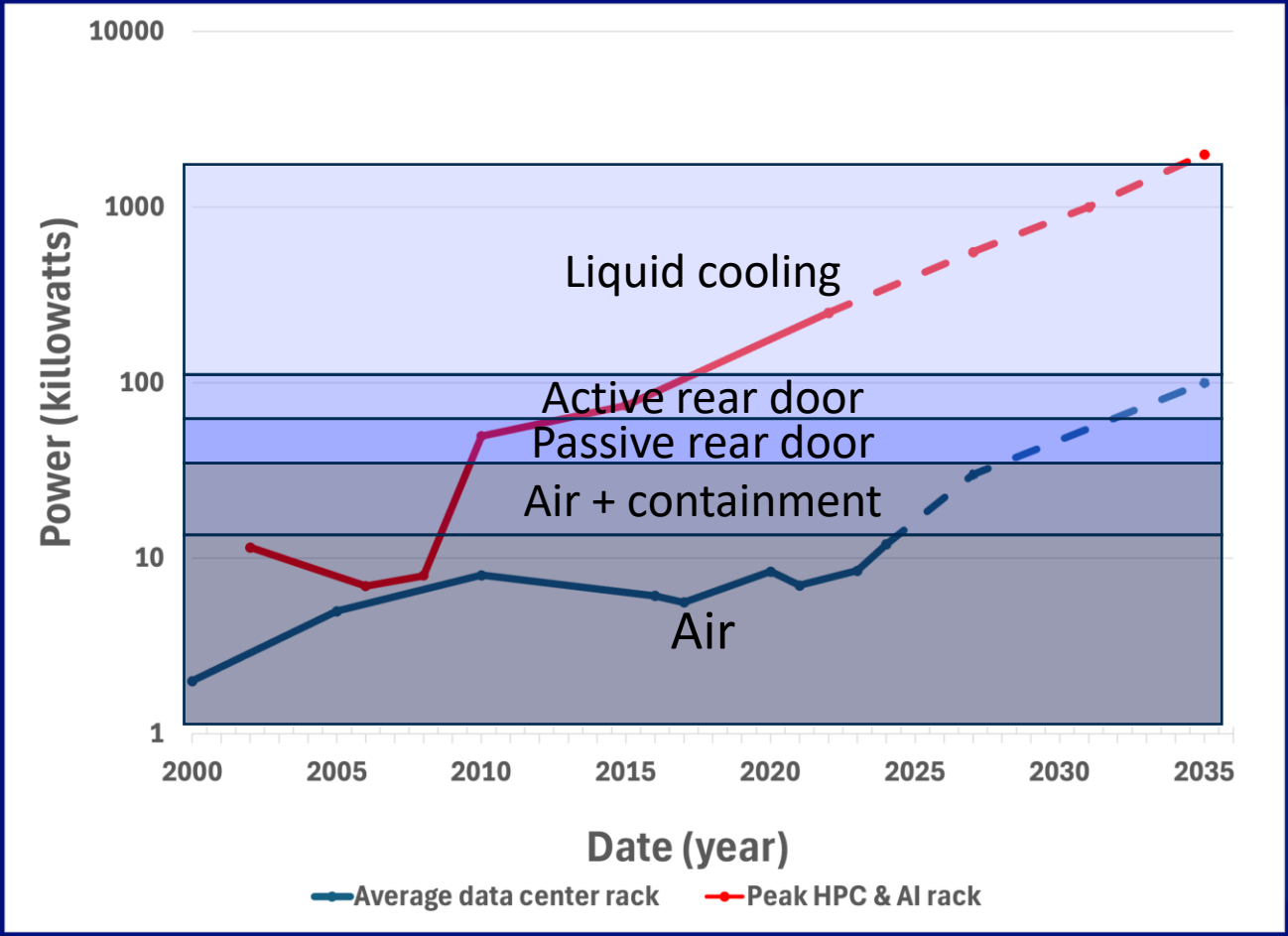
Plot of total power for computers

- Red line are for data center computers at a particular national laboratory site
- Blue line is data taken from public reports for computers in commercial data centers

LANL is making preparations for hosting 1-2 MW racks in 2030's

* Industry data taken from public reports[1][2][3][4]. National lab data available from official power forecasting model[5]

Technology inside data centers shows exponential growth in power capacity required for peak performance



Plot of total power for computers

- Red line are for data center computers at a particular national laboratory site
- Blue line is data taken from public reports for computers in commercial data centers

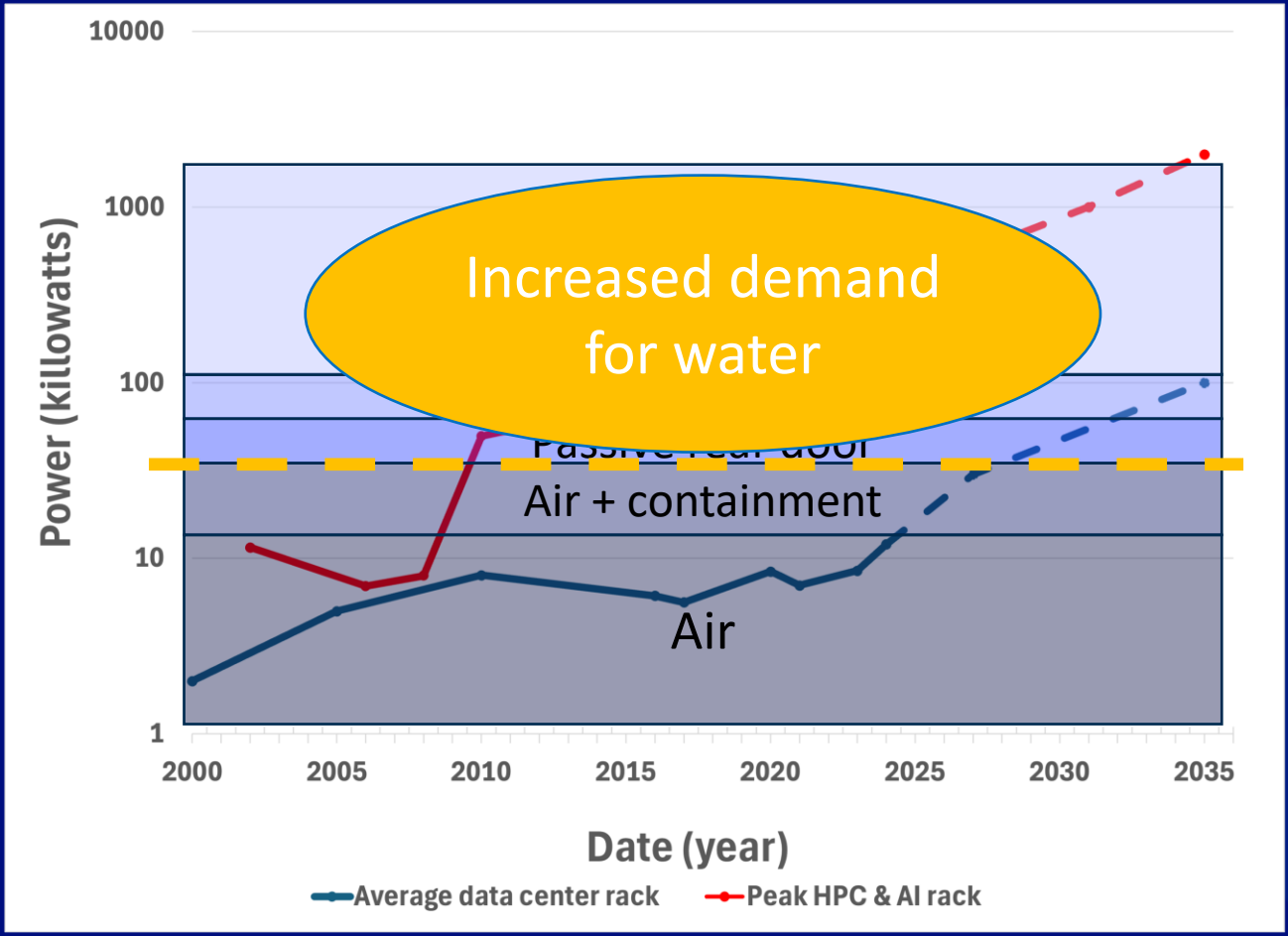
Adding norms for cooling technologies

- Types of cooling are comprehensive

Perhaps by mid-2030's all data centers will require liquid cooling

* Industry data taken from public reports[1][2][3][4]. National lab data available from official power forecasting model[5]

Technology inside data centers shows exponential growth in power capacity required for peak performance



Plot of total power for computers

- Red line are for data center computers at a particular national laboratory site
- Blue line is data taken from public reports for computers in commercial data centers

Adding norms for cooling technologies

- Types of cooling are comprehensive

Data centers will have increased demand for water

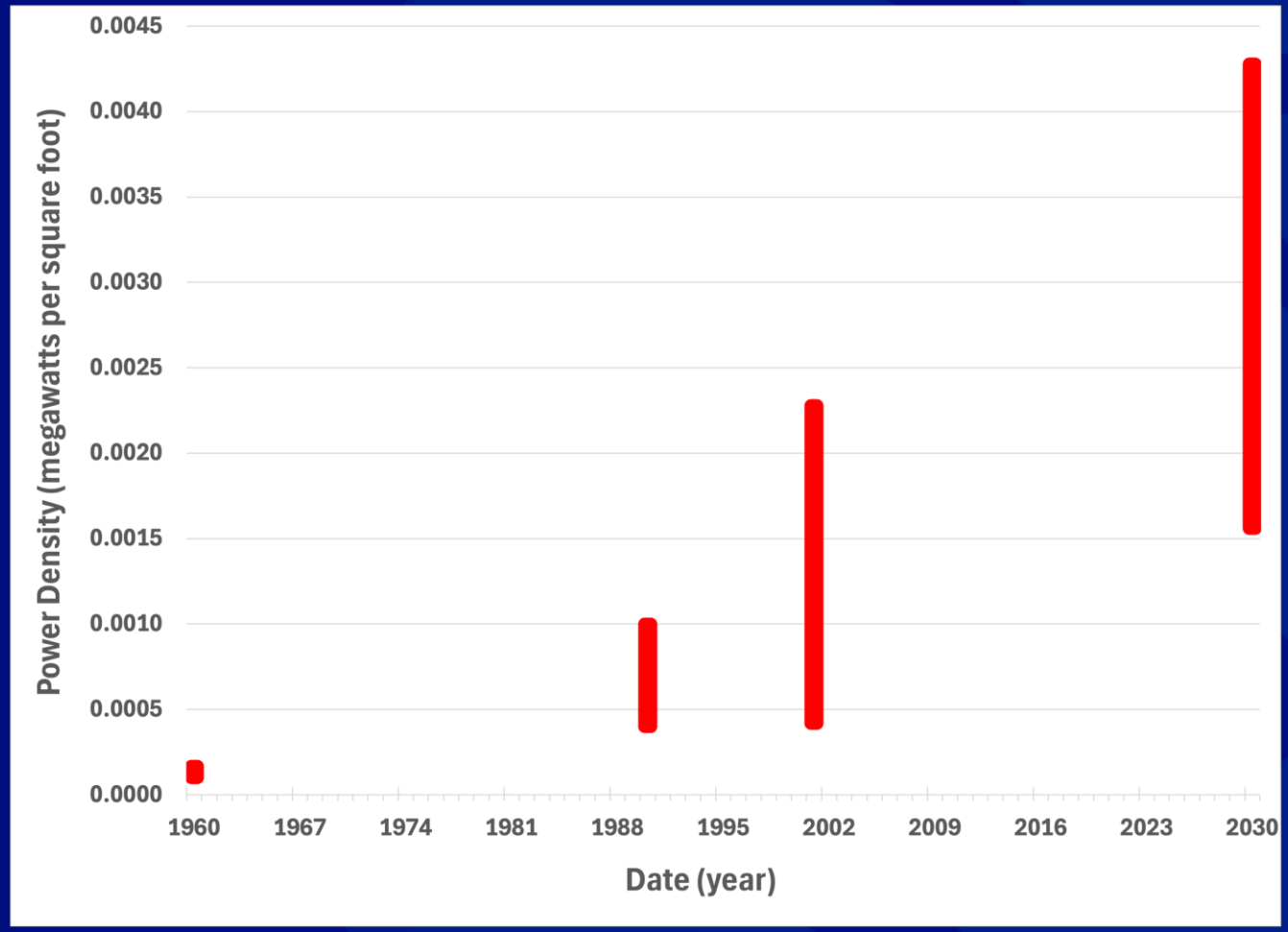
* Industry data taken from public reports[1][2][3][4]. National lab data available from official power forecasting model[5]

Data centers need future-proofing for a diverse density landscape

Increasing importance of flexibility in data center design

Approaching a tipping point for requiring more space for power and cooling than compute

Wider range of power density favors hybrid cooling approaches



Parting thoughts

Density is surging: Our highest density racks will double or triple site requirements for power and cooling

Liquid cooling will become standard: every data center will need water

Flexibility wins: static design is a dead end

Backup Slides

Discussion ideas

- The AI industry is already making plans for gigawatt-scale campuses of multiple data centers
  - Coupling to nuclear power options

- Water quality is an important consideration
  - For data center cooling, non-potable water can work better than potable (high treatment)

- What role can regional planning play in site selection for future data campuses?

References

[1] B. Kleyman, “2024 state of the data center report,” AFCOM, Tech. Rep., January 2024.

[2] D. Donnellan, D. Bizo, J. Davis, A. Lawrence, O. Rogers, L. Simon, and M. Smolaks, “Uptime institute’s global data center survey results 2023,”Uptime Institute, Tech. Rep., July 18, 2023. [Online]. Available: https://uptimeinstitute.com/about-ui/press-releases/uptimes-13th-annual-global-data-center-survey-shows-widening-range-of-challenges/

[3] B. Srivathsan, M. Sorel, P. Sachdeva, A. Bhan, H. Batra, R. Sharma, R. Gupta, and S. Choudhary, “Ai power: Expanding data center capacity to meet growing demand,”McKinsey & Company, Tech. Rep., October 29, 2024. [Online]. Available: https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/ai-power-expanding-data-center-capacity-to-meet-growing-demand/

[4] J. Ciesla, “Data center trends: Rack densities and outages on the rise,” Raritan, Tech. Rep., March 30, 2021. [Online]. Available: https://www.raritan.com/blog/detail/data-center-trends-rack-densities-and-outages-on-therise/

[5] J. Hick and P. Weber, “Los Alamos National Laboratory High Performance Computing Division Power Forecast Model,” December, 2024.

Joel Brammeier

President & Chief Executive Officer

Alliance for the Great Lakes

Carol Kauffman

Chief Executive Officer

Ohio Environmental Council

Melissa Pierce

Technical Program Director

Current

Gabby Plotkin

Senior Policy Manager

Illinois Environmental Council

ALLIANCE *for the*
GREAT LAKES

Joel Brammeier, President & CEO
www.Greatlakes.org

To protect, conserve and restore the Great Lakes, ensuring healthy water in the lakes and in our communities for all generations of people and wildlife

Abundance

Scarcity

Transparency

Ohio Environmental Council

Working together for a healthy Ohio.

For more than 55 years, the Ohio Environmental Council has advocated for a healthier environment for all who call Ohio home.

Water

Democracy

Energy

Public Lands

Law Center

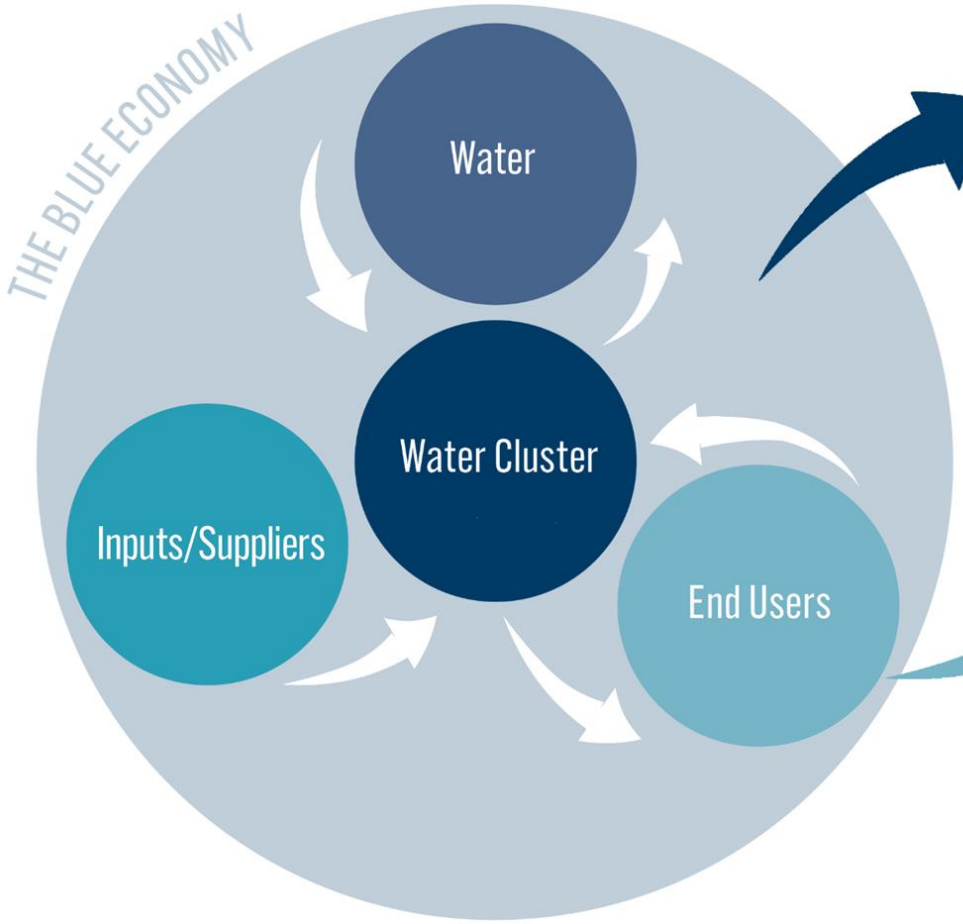
Climate

Learn more: TheOEC.org

Current

SINCE 2016

RAISED $58M+	LAUNCHED 11 PILOTS	SUPPORTED 40+ STARTUPS	40K PEOPLE CONVENED



Water Cluster:

- Treatment
- Monitoring/sensing
- Infrastructure
- Water-saving products
- Resource recovery
- Water-energy nexus
- Data in water systems

End Users:

- Food & Beverage
- Agriculture
- Manufacturing
- Energy
- Health & Life Sciences

MISSION:

To accelerate the transition to a circular blue economy, turning waste into wealth for the communities of the Great Lakes region and beyond.

NSF

GREAT LAKES ReNEW

Current

Illinois Environmental Council

BUILDING POWER FOR PEOPLE AND THE ENVIRONMENT

Six Issue Areas

- Sustainable Agriculture

- Conservation

- Clean Energy

- Equitable Transportation

- Clean Water

- Zero Waste

Our Approach

- Coalition Building

- Legislator Education

- Policy Advocacy

Joel Brammeier

President & Chief Executive Officer

Alliance for the Great Lakes

Carol Kauffman

Chief Executive Officer

Ohio Environmental Council

Melissa Pierce

Technical Program Director

Current

Gabby Plotkin

Senior Policy Manager

Illinois Environmental Council

Reminders & What's Next

Thank you all for participating in this session!

- **CEUs:** AWWA CA-NV Water Use Efficiency Practitioner

American Water Works Association
California-Nevada Section

- **Next:** Plenary Session (3:35 – 4:45 pm)
  - Rising to the Challenge: When Extremes Become the New Normal **(Room 621)**

Thank You to Our Sponsors

WATER EFFICIENCY & CONSERVATION SYMPOSIUM

Additional Resources

The next three slides include additional resources from the Alliance for the Great Lakes, Ohio Environmental Council, and Illinois Environmental Council.

ALLIANCE for the GREAT LAKES

Resources

https://greatlakes.org/2025/03/data-centers-are-increasing-in-the-great-lakes-at-what-cost/

https://www.axios.com/2025/04/16/midwest-data-center-growth-energy-usage

https://www.circleofblue.org/2025/technology/are-data-centers-a-threat-to-the-great-lakes/

https://www.greatlakesnow.org/2025/06/as-data-centers-proliferate-across-illinois-communities-grapple-with-how-to-supply-the-necessary-water/

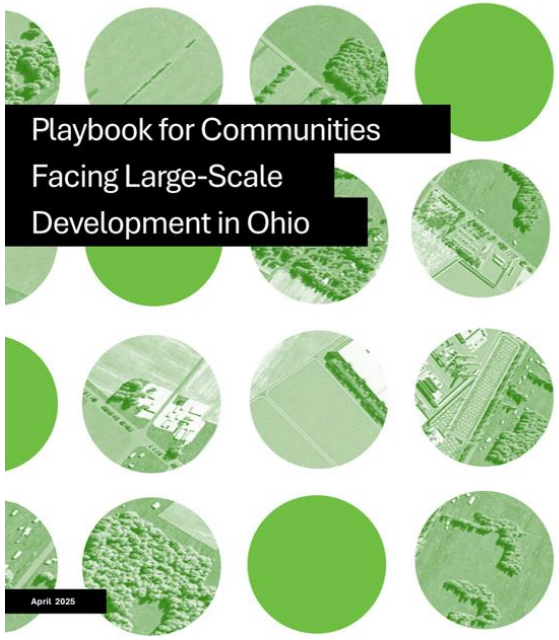
https://www.dispatch.com/story/opinion/columns/guest/2025/07/15/ohios-growing-data-centers-threaten-water-we-all-need-opinion/84631057007/

https://www.joycefdn.org/groundwater-governance-report

Watch for new Great Lakes water use report from the Alliance in August.

Contact Helena Volzer, Senior Source Water Policy Manager, at hvolzer@greatlakes.org, 614-706-5344

Large-Scale Development Trends and Environmental Implications in Central Ohio examines how **rapid economic expansion** is impacting our air, land, and water. This in-depth analysis is now paired with a *Playbook for Communities Facing Large-Scale Development in Ohio*—a step-by-step guide that **doesn't require us to choose between progress and preservation**.



IEC 50
GOLDEN ANNIVERSARY, EVERGREEN MISSION

Illinois Environmental Council

Building Power for People and the Environment

In 1975, organizations and environmentalists formed IEC to strengthen our community's voice in the Illinois General Assembly. 50 years later, we continue to proudly lead an environmental movement more powerful than ever in our state's history.

Facts

- Over 600 individual members from every corner of the state.
- Over 130 affiliate members in our movement.
- 30+ pro-environment bills passed in 2024.

Resources

- IEC helped pass a **water conservation bill** in the Illinois General Assembly this past session.
- IEC contributed to an **article** about water use by data centers.

Contact IEC

www.ilenviro.org

Phone: 217-544-5954
Fax: 217-544-5958
Email: iec@ilenviro.org

@ilenviro
@ilenviro
/Illinois Environmental Council
@ilenviro