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WHAT TO KNOW BEFORE A DATA CENTER COMES TO YOUR COMMUNITY

CALIFORNIA DEPARTMENT OF WATER RESOURCES

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The Growing Thirst for Data: Understanding Water Needs for Future Data Centers

Jason Hick, Sr Director for Data Center Design

ALLIANCE
TECHNOLOGY GROUP

What is a *data center*?

Data centers are essentially warehouses for computing

- They can be massive or look like a normal office building
- On the outside, they generally consist of a building, electrical and/or cooling equipment

Traditionally, they might be half full of computers and half full of electrical and cooling equipment, with a few offices for people

- Racks of servers
- Lots of pipes, wires, and cables
- They might take 30 people or less to operate
- But use as much energy as a small city

The location of the data center is very important

- Climate/environment determines power/cooling choices
- Network access is important to users

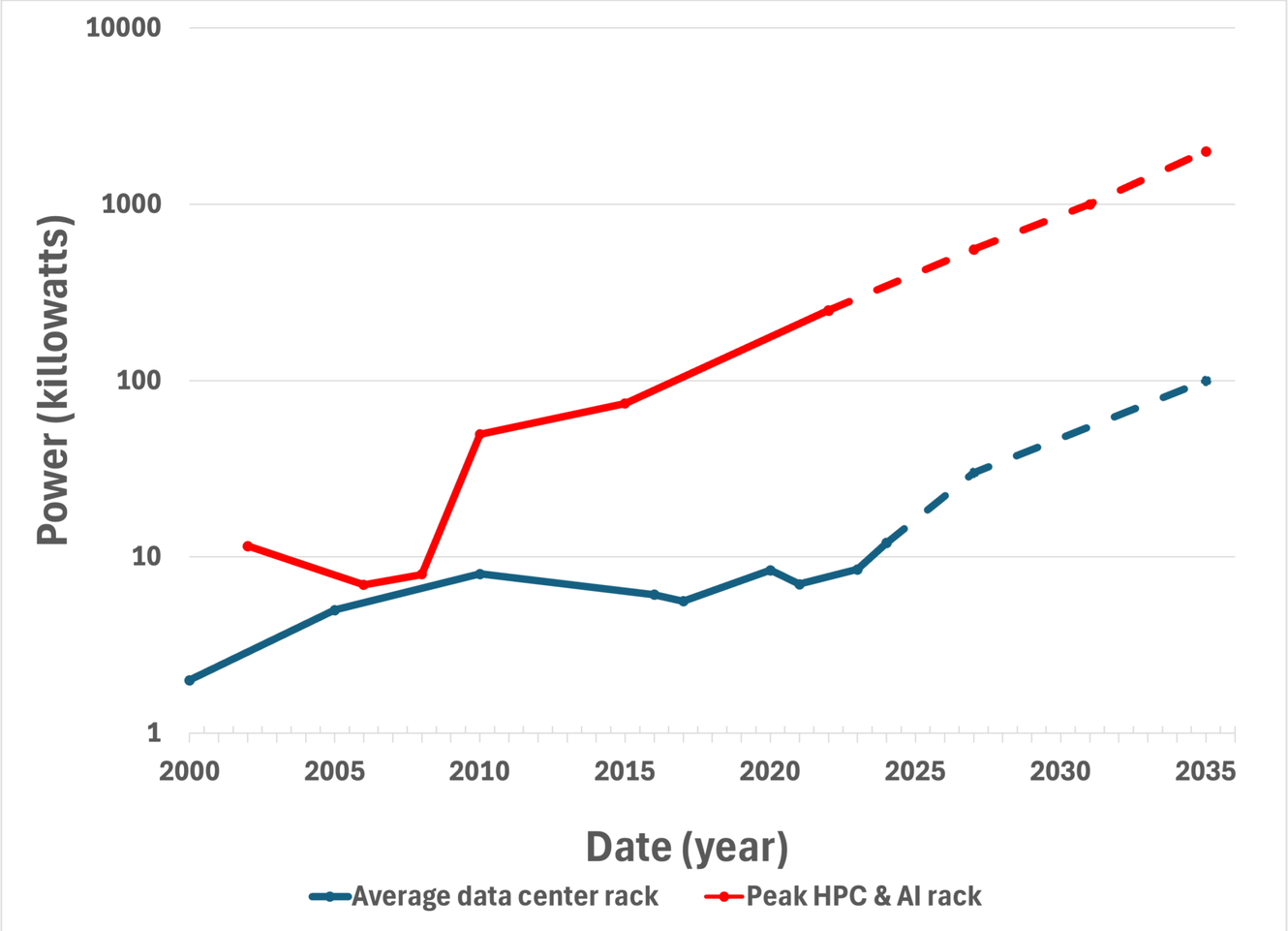
Power and cooling density is a key factor for data center design

Computers are getting more powerful by packing more devices into smaller spaces

- End of Moore's Law and Dennard Scaling (power, resistivity, distance)
- More devices requiring more power, and cooling to remove the heat generated

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

- The Department of Energy National Labs and leading AI companies are making preparations for hosting 1-2 MW racks in 2030's



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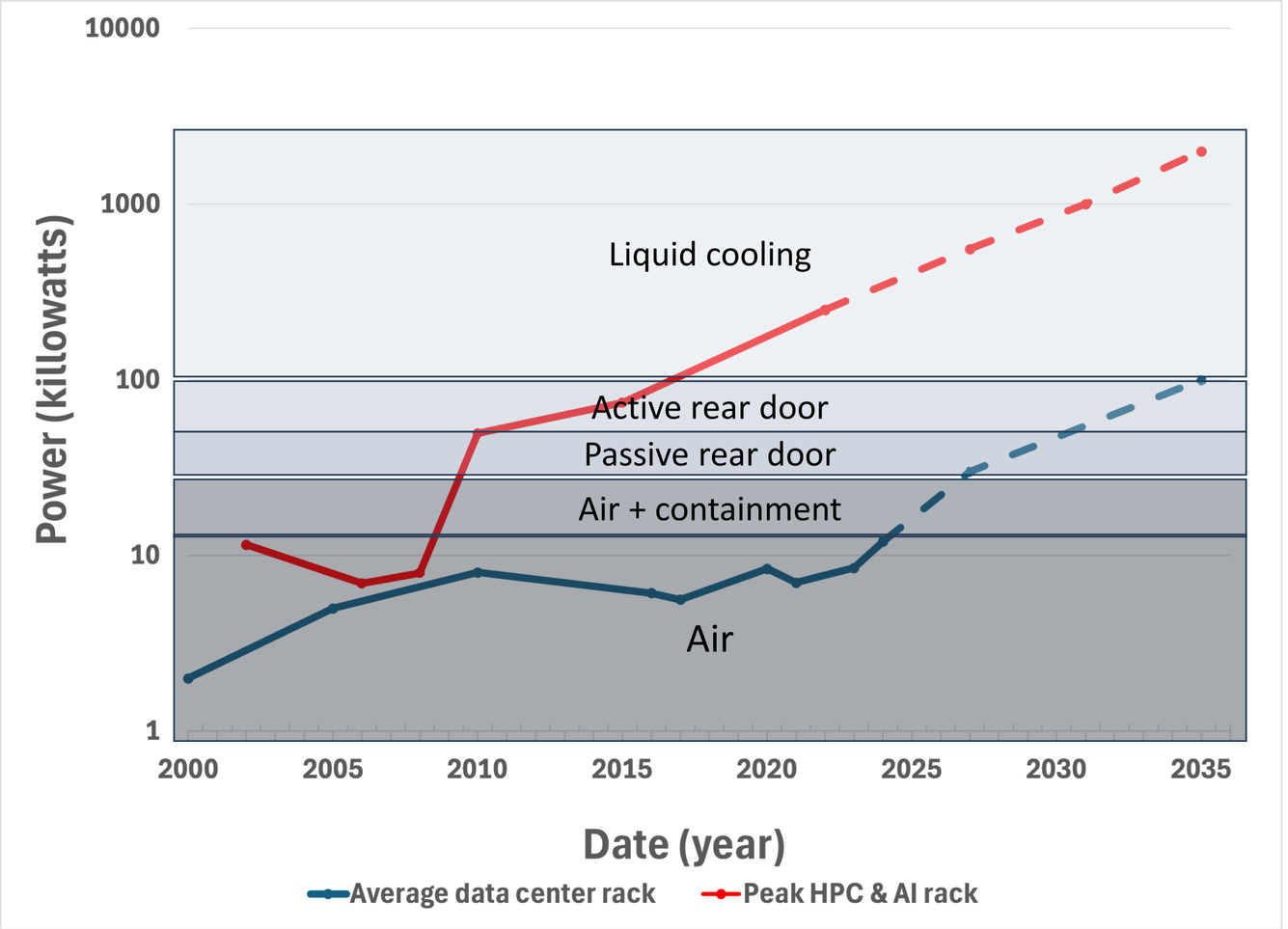


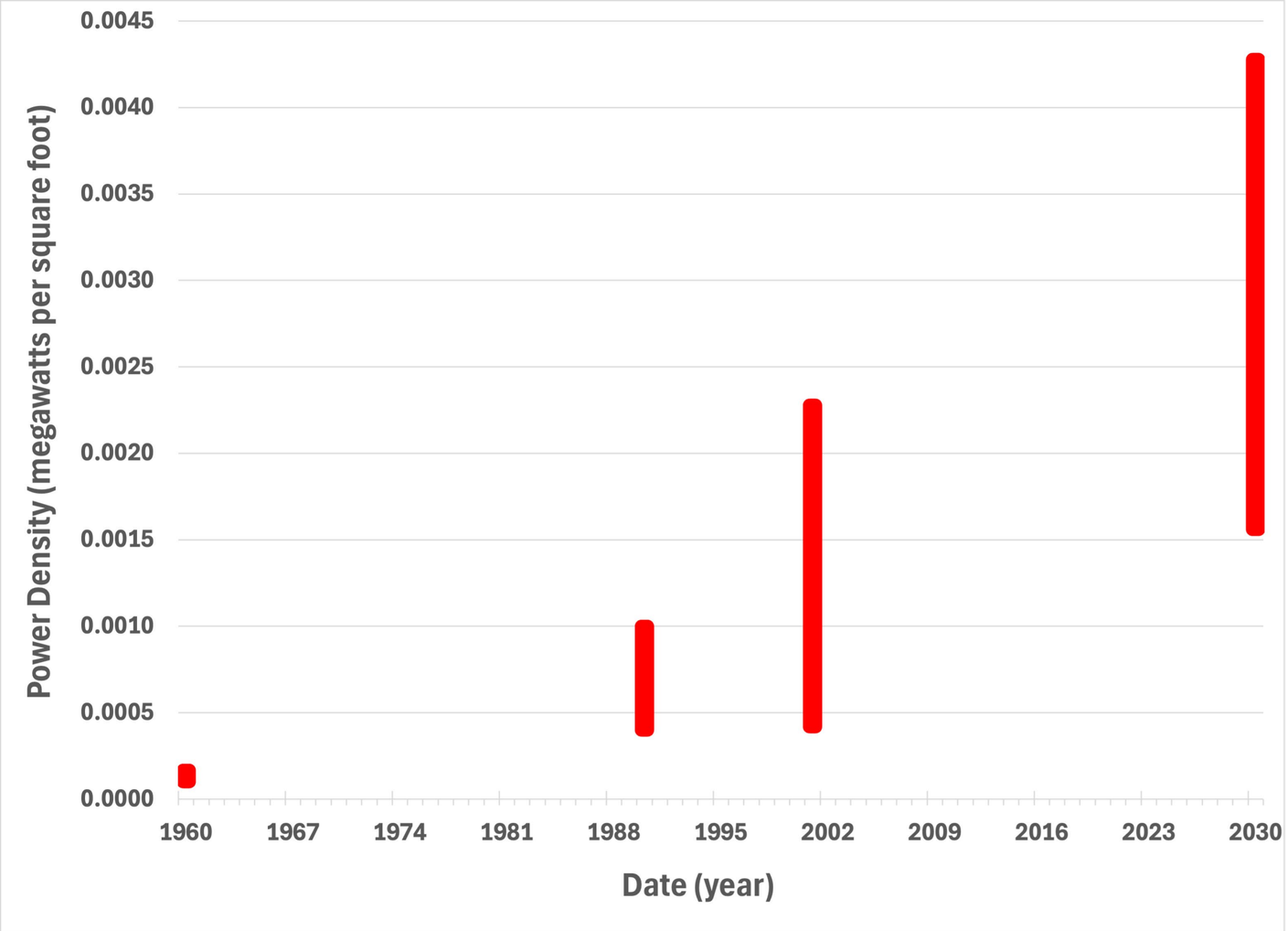
Perhaps by mid-2030's all data centers will require liquid cooling

Data centers need futureproofing for an increasing diverse density landscape

Increasing importance of flexibility in data center design

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

The wider range of power density favors hybrid cooling approaches



* From “Futureproofing through 2035 for the AI and HPC Power Density Trend” [6]

Parting Thoughts

Density is surging: computing technology will continue increasing site requirements for power and cooling

Liquid cooling will become common: data center location determines cooling technology efficiency

Flexibility wins: static design is a dead end; it will be important to have conversations about utilities capabilities to enable growth

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PREPARING FOR THE DIGITAL RUSH: WHAT TO KNOW BEFORE A DATA CENTER COMES TO YOUR COMMUNITY

CalWEP Peer to Peer | May 28, 2026

Johanna DeCotis Smith, P.E. | Senior Manager of Programs

Alliance *for* Water Efficiency

ABOUT ALLIANCE FOR WATER EFFICIENCY

The Alliance for Water Efficiency's mission is to promote the efficient and sustainable use of water across North America.

- AWE supports water efficiency practitioners from 500+ organizations
  - Members include water utility agencies, local and state governments, businesses and industry partners, nonprofits, universities, and more
- AWE develops cutting-edge resources, facilitates peer-to-peer learning and collaboration, and advocates for public policy and funding initiatives to advance the adoption of water efficiency

Visit a4we.org or check us out on social media to learn more!

COMING SOON: DATA CENTER PRIMER

- The **Data Center Primer** provides information on
  - Data center types and functions
  - Data center cooling technologies
  - How much water is used in data centers
  - How to ensure water is appropriately considered in data center development.
- Written for local water providers and water utility professionals.

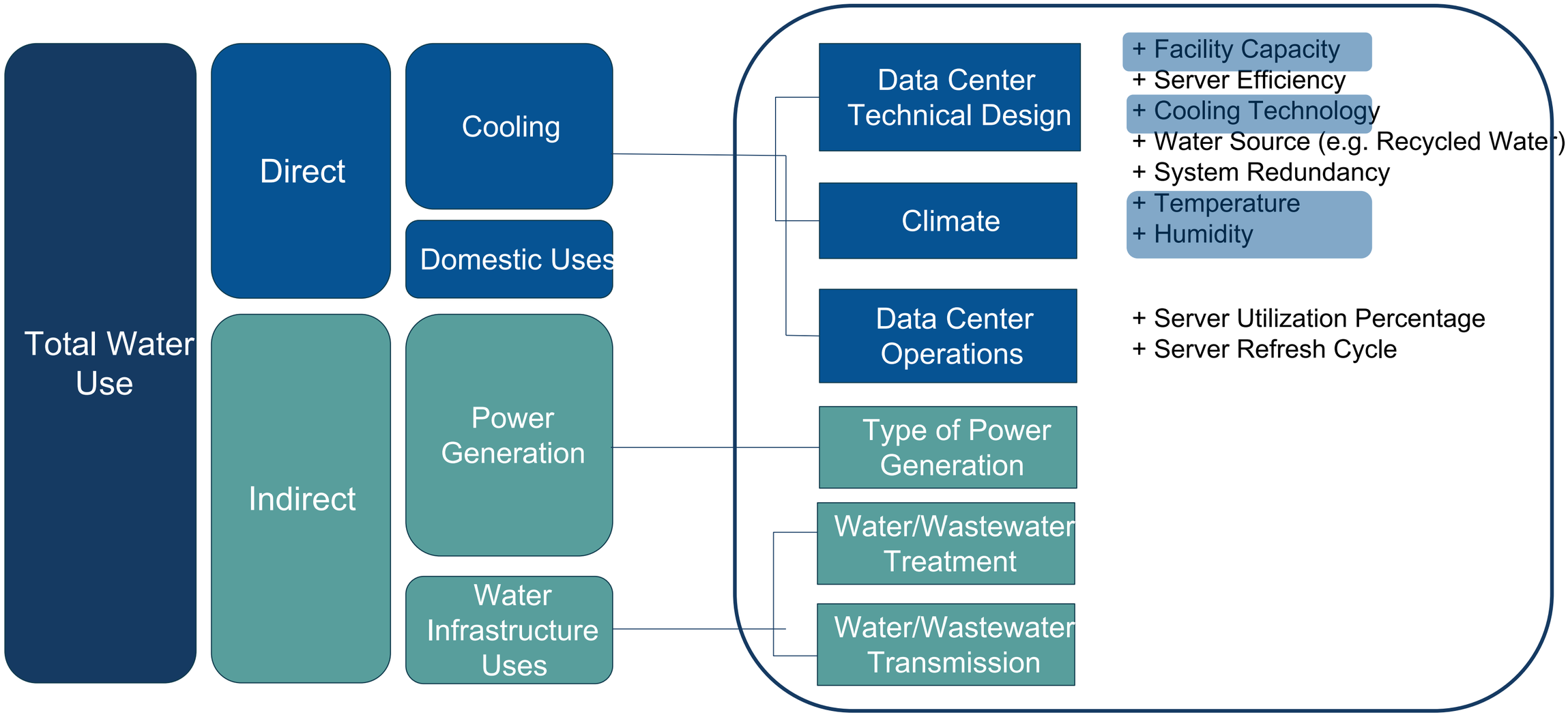
KEY TAKEAWAYS

There is no one-size-fits-all solution for data centers to maximize water efficiency.

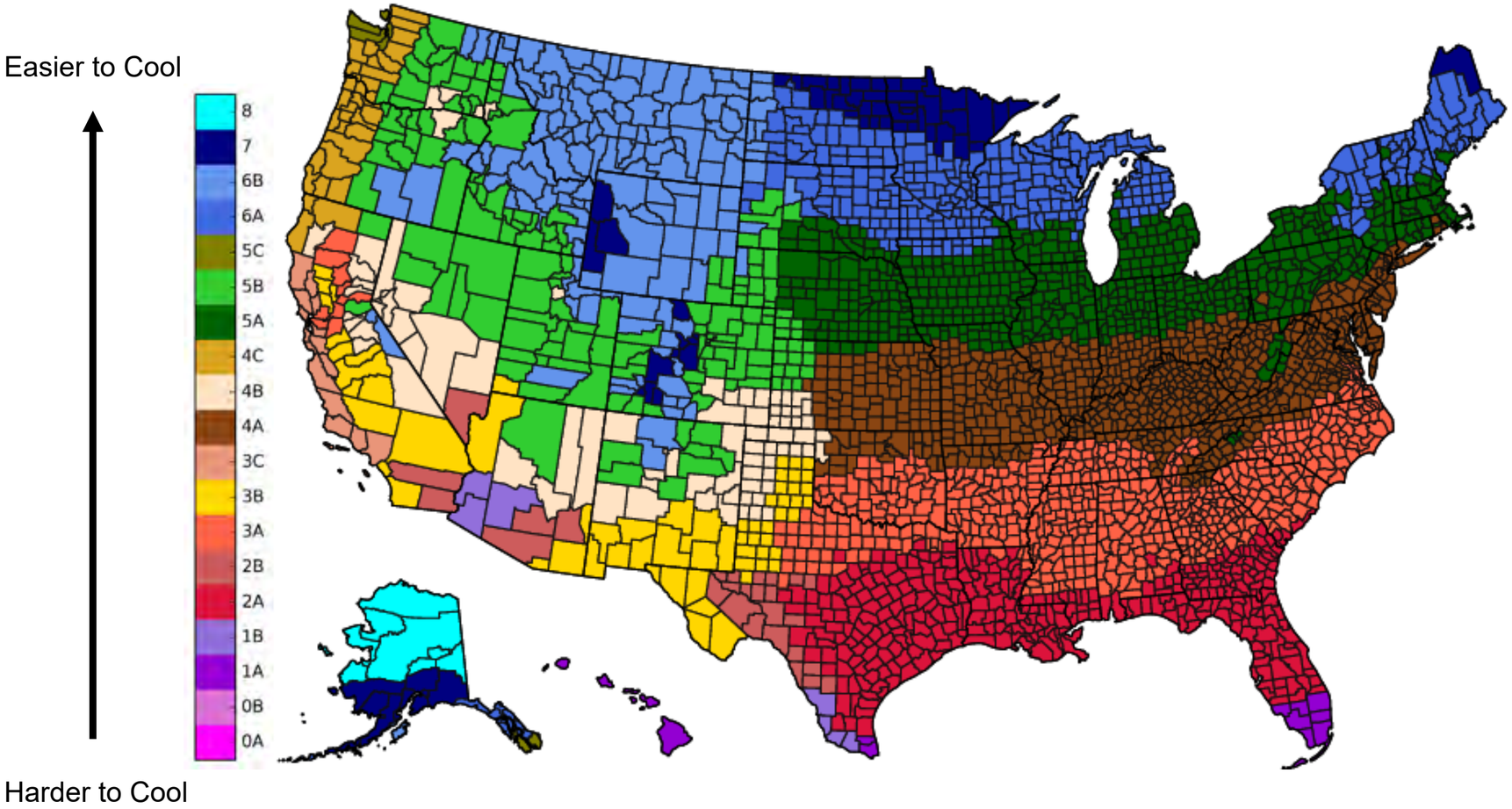
Liquid cooling is a key component of future data center projects.

Early and **regular** involvement of water professionals in data center projects is vital t maximize water efficiency.

DATA CENTER WATER USE



CLIMATE AND COMPUTING CAPACITY: KEY DRIVERS OF COOLING NEEDS



Source: Jim Fukuda et al., *Data Center Resource Effectiveness (DCRE) Metric*, Information Technology Industry Council, 2025, https://www.thegreengrid.org/resources/library-and-tools/wp93-data-center-resource-effectiveness-dcre-metric.

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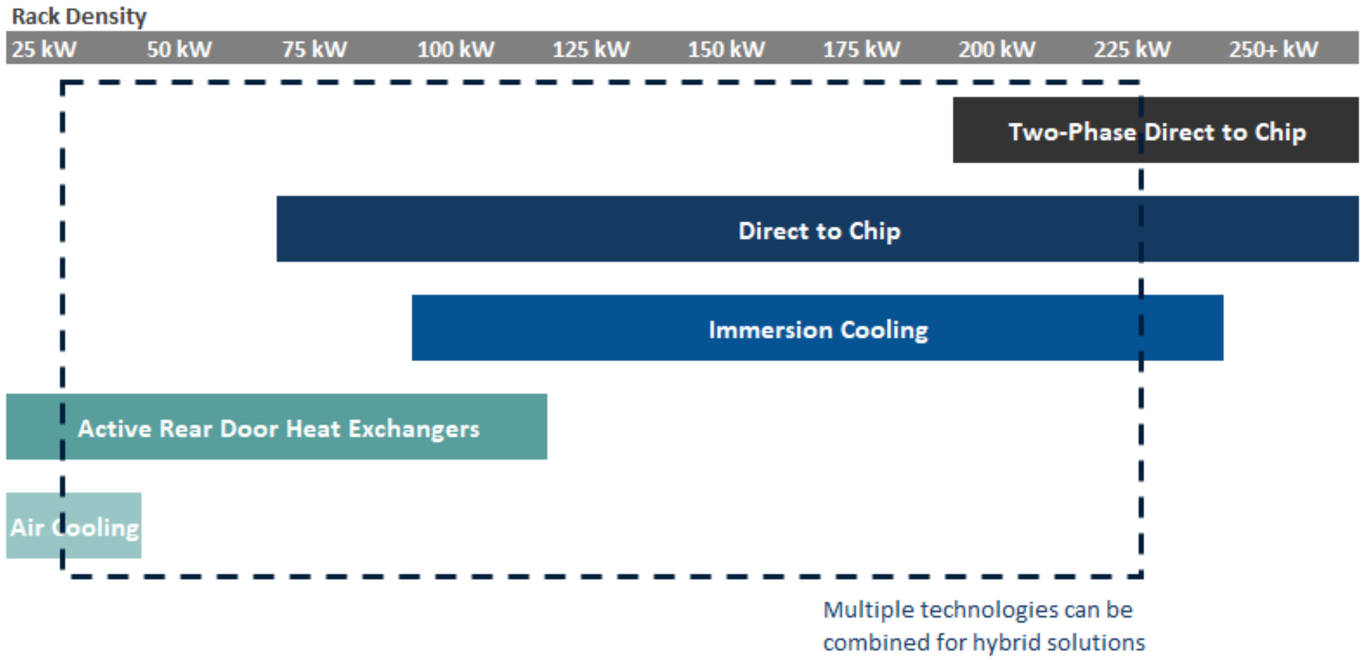

- Higher rack density requires more cooling capacity
- Liquid cooling technologies have higher cooling capacity

Sources: 2025 JLL Data Center Outlook Report, 2025; Kevin Pellicone, "AI Rack Cooling: Applying Directed Energy Thermal Strategies to High-Density Data Centers (50 kW+ MW+)," Advanced Cooling Technologies, 2026, https://www.1act.com/resources/blog/ai-rack-cooling-data-centers/?srsltid=AfmBOoolew1xtc6DS0vM7bL5vsNMc89TW55Y2qxndcxB40xCfhRb.

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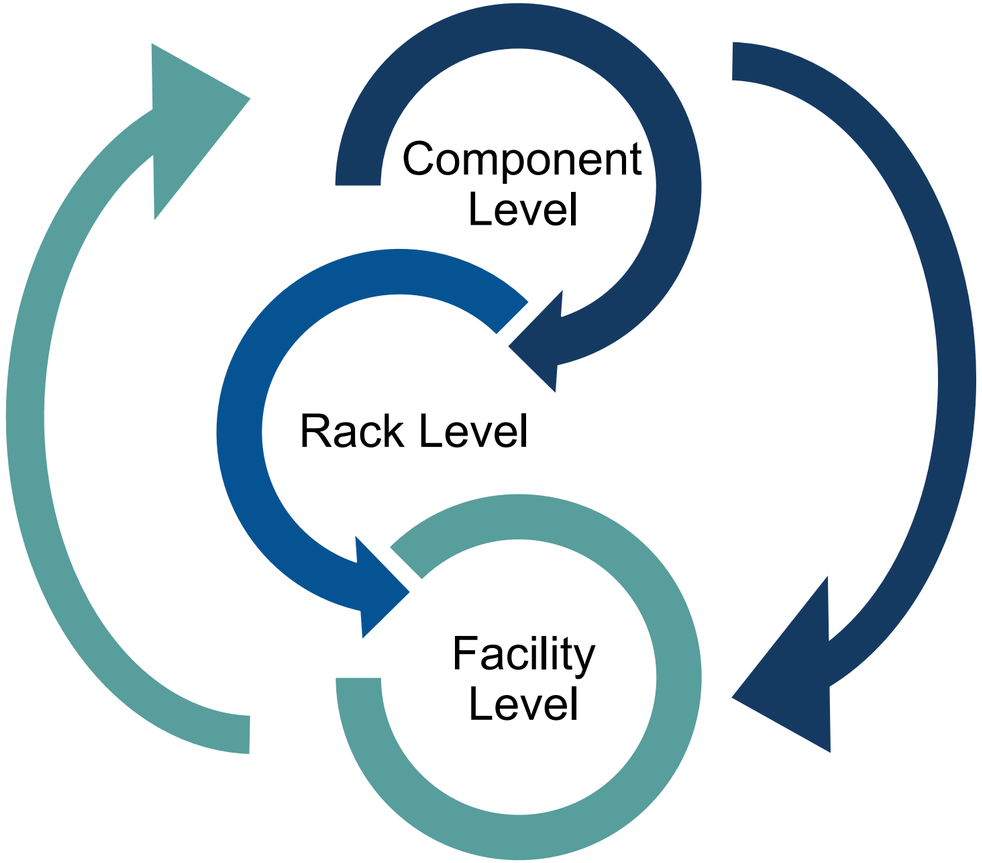
COOLING TECHNOLOGIES WORK TOGETHER



COOLING TECHNOLOGY TRADEOFFS

Note: Higher efficiency doesn't always result in lower usage

Category	System Type	Cooling Capacity	Water Efficiency	Energy Efficiency
Mechanical Refrigeration (Facility-Scale)	Direct Expansion System	Lowest	Highest	Lowest
	Air-Cooled Chiller	Low	Highest	Lowest
Evaporative (Facility-Scale)	Water-Cooled Chiller (Includes Cooling Towers)	Medium	Lowest	Low
	Adiabatic Cooling Assistance	Medium	High	High
	Spray-Assisted Cooling	Medium	Medium	High
Free Cooling / Airside and Waterside Economization (Facility-Scale)	Dry Cooler	Medium	Highest	Medium
	Airside Economizer (Heat Pump)	Medium	Highest	Medium
	Waterside Economizer (Heat Pump)	Medium	Low	High

Facility-Scale Cooling Technologies
- Lower cooling capacities
- Higher water efficiencies
- Lower energy efficiencies

Component-Scale Cooling Technologies
- Higher cooling capacities
- Lower water efficiencies
- Higher energy efficiencies

Category	System Type	Cooling Capacity	Water Efficiency	Energy Efficiency
Liquid (Component-Scale)	Liquid Cooling, Rear-Door Heat Exchangers	High	Medium	Highest
	Liquid Cooling, Immersion	Highest	Medium	Highest
	Liquid Cooling, Direct-to-Chip Cooling	Highest	High	Highest

KEY TAKEAWAYS

There is no one-size-fits-all solution for data centers to maximize water efficiency.

Liquid cooling is a key component of future data center projects.

Early and **regular** involvement of water professionals in data center projects is vital t maximize water efficiency.

BENEFITS OF PROACTIVE PLANNING AND COORDINATION

Retrofitting existing data centers to meet new water efficiency goals is often difficult and costly.

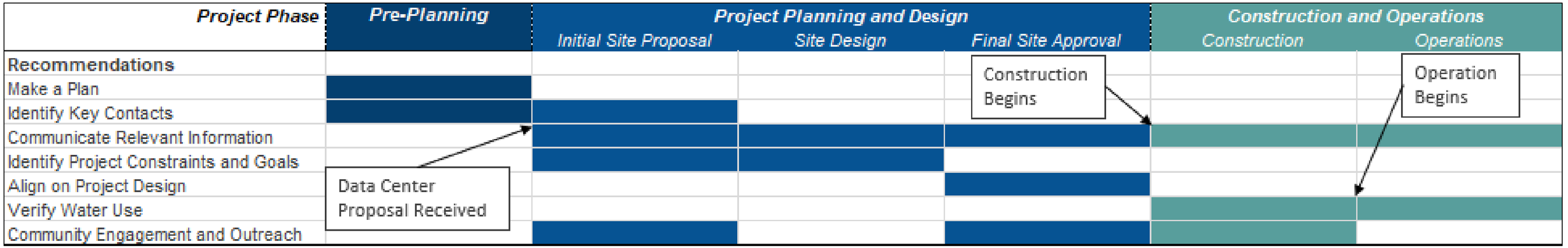
Coordination among all stakeholders identifies key challenges upfront.

Stakeholders can align on a design that meets water efficiency and other project goals.

Transparency fosters public trust.

Data transparency allows you to verify assumptions to improve future planning.

RECOMMENDATIONS OVER TIME



IDENTIFY KEY CONTACTS

Data Center Representatives*

- Data Center Owners/Developers
- Data Center Designers/Engineers
- Data Center Operators

Infrastructure and Regulatory Representatives*

- Local Government Representatives
- Water Utilities / Providers
- Wastewater Utilities
- Energy Utilities
- Regional Planning Bodies
- Regulatory Agencies

External Stakeholders

- Community Organizations
- Community Leaders
- General Public

*Project Team

COMMUNICATE RELEVANT INFORMATION

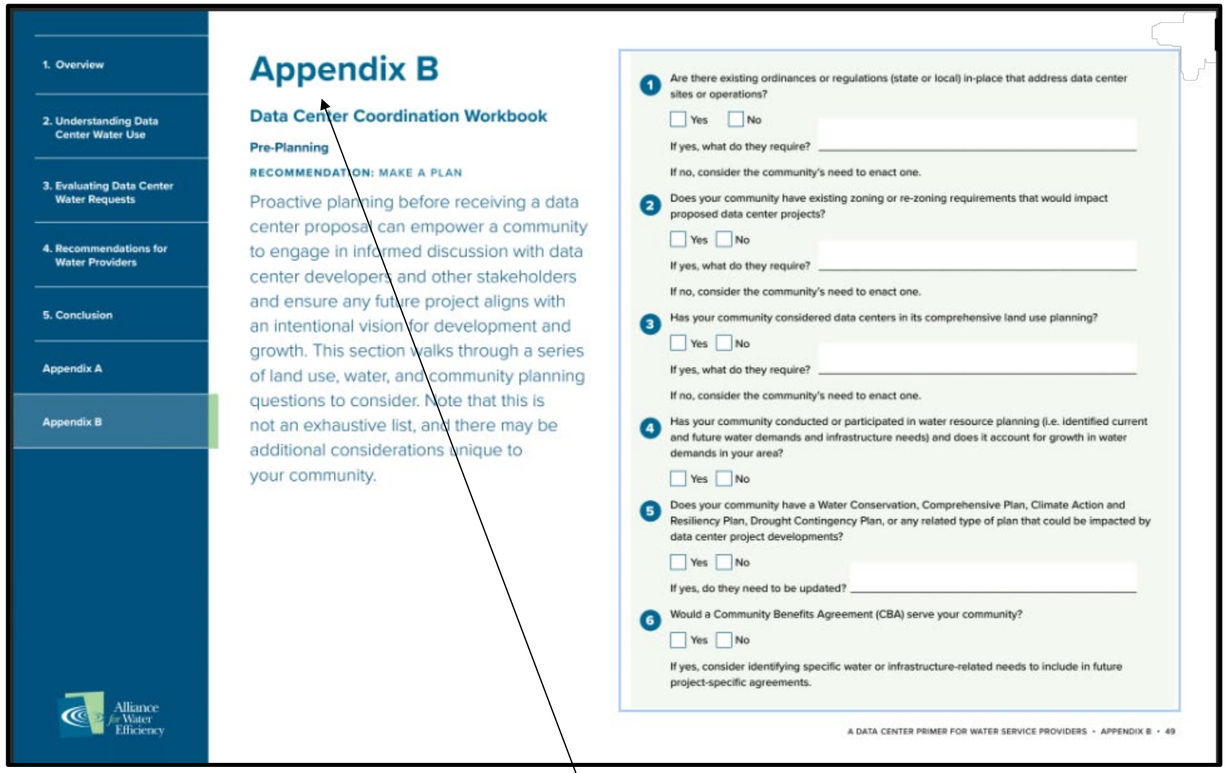
Data Center Representatives

- Type and Number of Facilities
- Project Phases
- Project Address and Ownership
- Project Financing
- Design Uptime / ANSI/TIA Rating
- Design Water Use Efficiency (WUE)
- Design Power Use Efficiency (PUE)
- Rack Density
- Design Assumptions

Infrastructure/Local Representatives

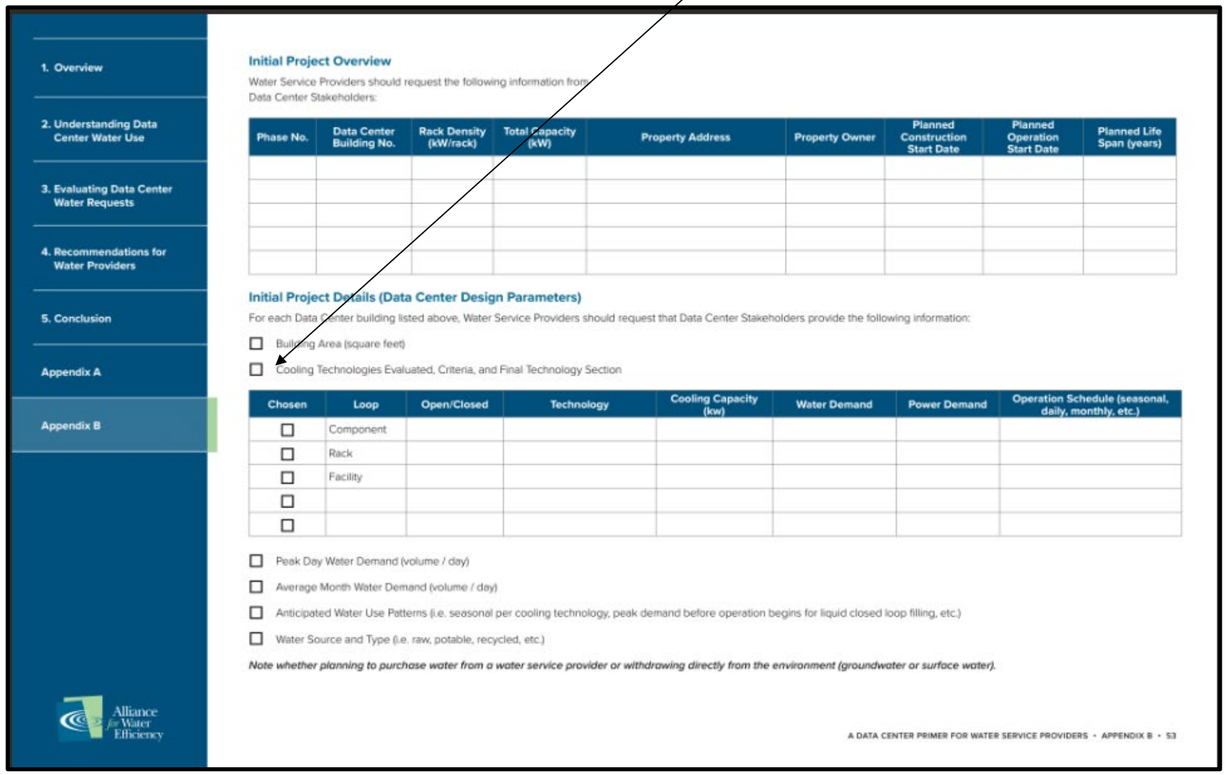
- Property Zoning
- Applicable Local Ordinances
- Applicable Water Regulations
- Available Potable/Raw Water Capacity
- Available Wastewater Capacity
- Water and Wastewater Transmission Capacity
- Available Alternative Water Sources
- Additional Infrastructure Needs
- Compliance Status

RECOMMENDATIONS IN ACTION



Appendix B walks users through recommended project planning and coordination steps

Interactive PDFs streamline data compilation to ensure all relevant information is collected and addressed



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Data Center Siting: Issues for Local Communities

MaryAnn Dickinson

May 28, 2026

Questions to Answer

- What are the impacts of data centers?
- If the negative impacts can’t be completely eliminated, what can communities do to manage them?
- How can Lincoln generate valuable policy insights to aid communities in their decision-making? Can we give them specific guidance based on their local energy and water resource availability?

Currently Active Data Centers

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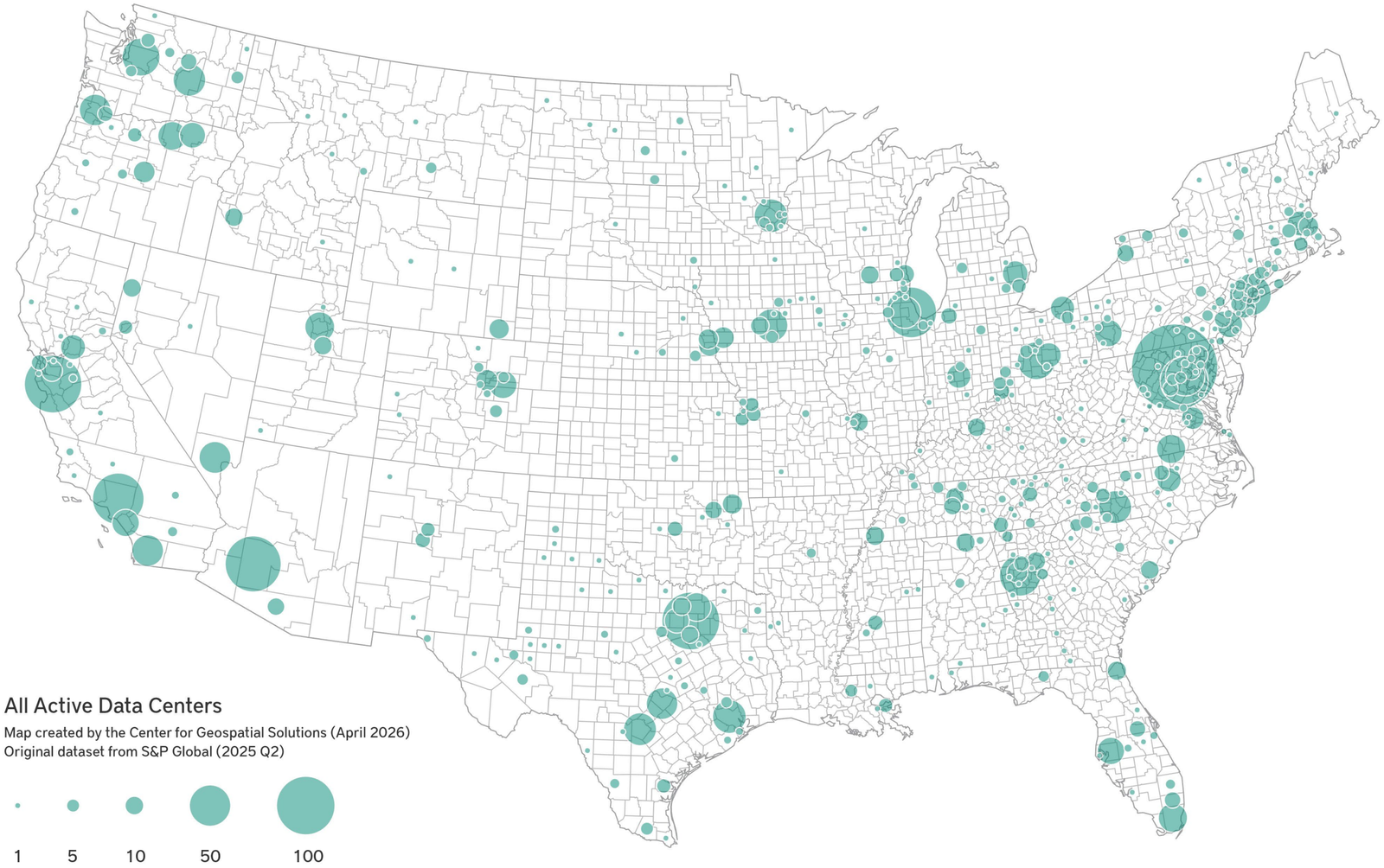

Data Centers Snapshot

- Data Centers aren’t new. It's the AI data centers and their enormous appetite for computing power that’s new and a little frightening
- AI and Digital solutions will be a major tool in the development and management of Smart Cities and many other uses
- This increasing use of AI will require expanded construction of data centers, which are also growing in bulk and size
- Electricity demand for data centers projected to be130 GW by 2030
- Large data centers can consume 5 million gallons/day or more for cooling
- Each 100-word AI prompt uses 519 milliliters of water (1 bottle)
- The data center footprint impact is likely to get much larger

Geography of Potential New Data Centers

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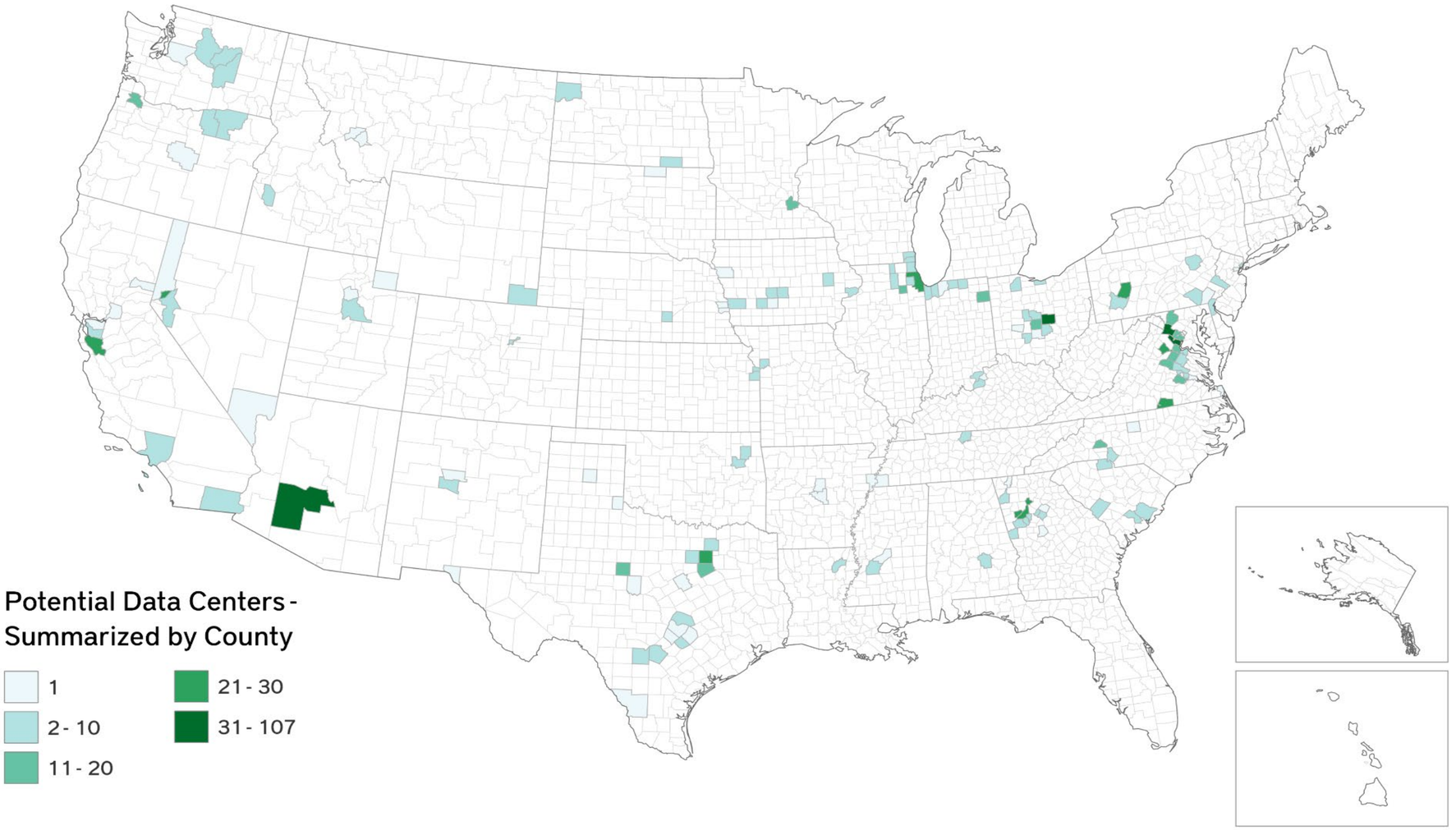
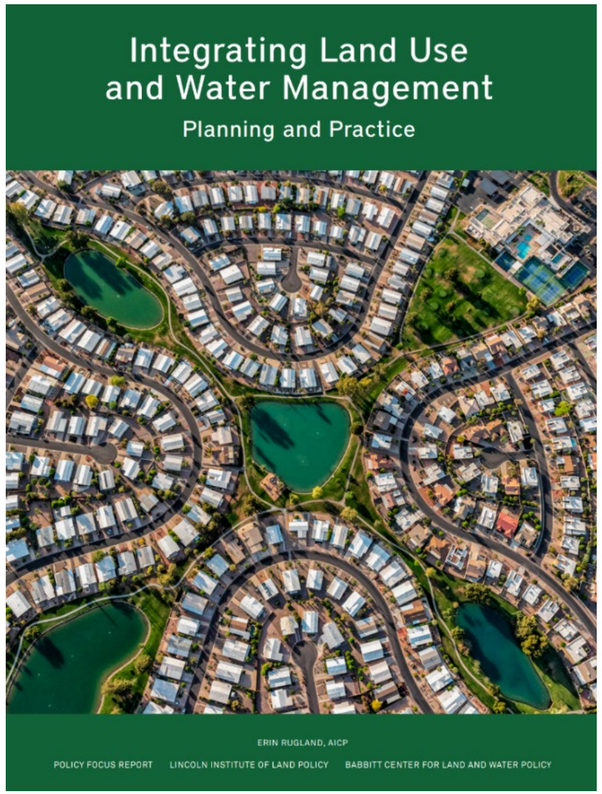


An Integrated Land and Water Policy Problem

- Data centers raise a complex set of interconnected land use and water challenges
- Actual community impacts vary, and depend on a complex set of environmental, technological, and policy factors
- Each data center proposal approved or denied is the product of a decision made by a local government
- Land use planning and water policies are usually not well integrated at the local level. When they are, it can help local governments to better respond the stress of data center applications



Issues Analysis List

- **Water cooling:** What is the source of the water and the amount withdrawn? Is it consumptively used? Where is it discharged? Can the remaining water be recovered and continually reused onsite? Is there an opportunity for close-loop cooling?
- **Energy:** What is the stability of the existing electric grid and the availability of additional generation capacity on site?
- **Water rates:** Is the water acquisition cost for the data center being paid for in the community water system? Or can all costs be assessed directly to the user? What rate structure modifications would be required to do that?
- **Property Taxation:** How to recover the full cost of this facility to the community? (Since there are really no jobs to boost the local economy except construction.) How to calculate the overall community impact that might be recoverable in property taxation?

Issues Analysis List

- **Land value capture:** Once the data center is built, it will lower the value of land around it and will disincentivize other development. Or will it?
- **Impact Fees:** Might this be a strategy that communities can use to offset the local costs to the community? This is a one-time fee at the time of project approval, so how big should this fee be to cover the long-term impact?
- **Municipal approval options:** What might these be? Special Zoning districts? Negotiated MOUs? Specific planning and zoning ordinances? Are there good case examples of communities that have handled this well?
- **Indirect land use impacts**: How are data centers being sited on lands with competing uses (e.g., agriculture, tribal lands, solar farms), and what are the indirect impacts (e.g., are they crowding out other kinds of development?).

Issues Analysis List

- **Governance / oversight issues:** Are these centers being located in fragmented jurisdictions? How transparent is the application process? What are the overall regional cumulative impacts?
- **Offset accounting:** Usually a mismatch between corporate "water-positive" pledges and local scarcity. Nearly all major cloud companies have pledges to be "water positive" by some future date, but their “offsets” are often not within the same watershed. Whether offsetting schemes actually result in reduced aggregate withdrawals in water-stressed basins must be evaluated.
- **Water permitting:** Water permitting and reporting/compliance frameworks are generally lacking and not integrated into tax incentives. Groundwater permitting more specifically is often weak and/or opaque, especially in rural areas. Negative externalities of water table drawdown ("dewatering") on neighboring groundwater users is a serious risk. What kinds of monitoring and regulation are in place?

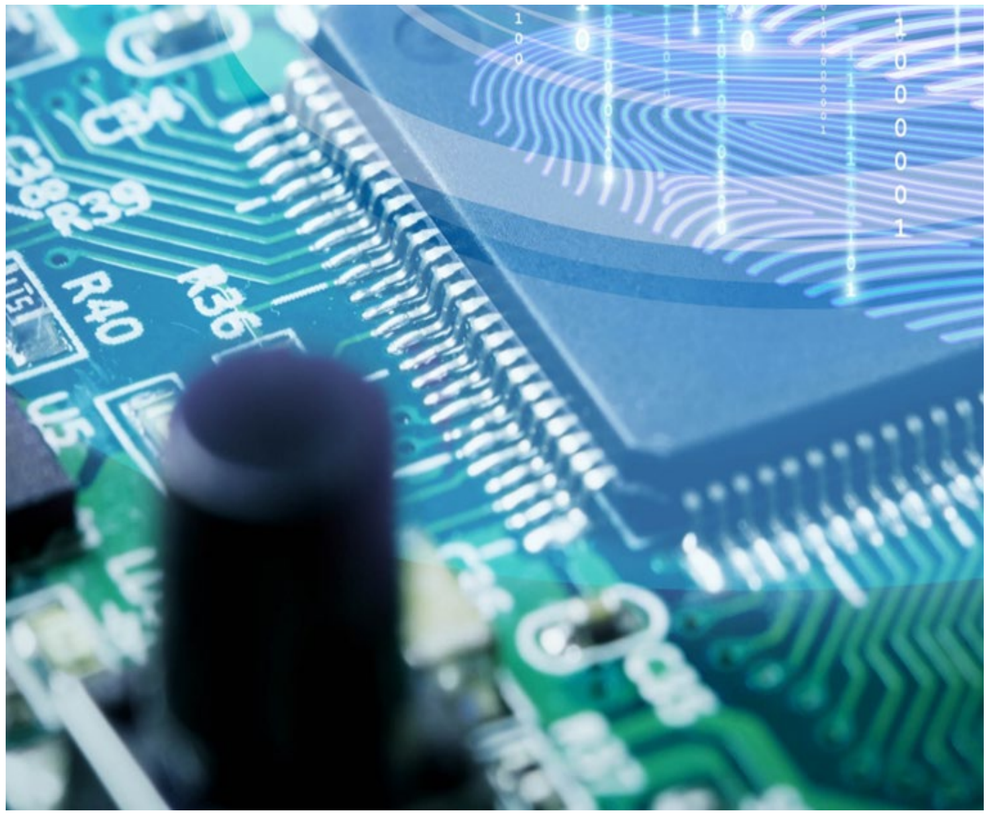
Do Data Centers Affect Surrounding Land Values?

(Photo by Nathan Howard/Getty Images). Virginia *Mercury,* February 10, 2025.

- Do we even know?
- Amazon Web Services Data Center near single family homes
- Stone Ridge, Virginia

Opacity in Data Center Siting and Operations

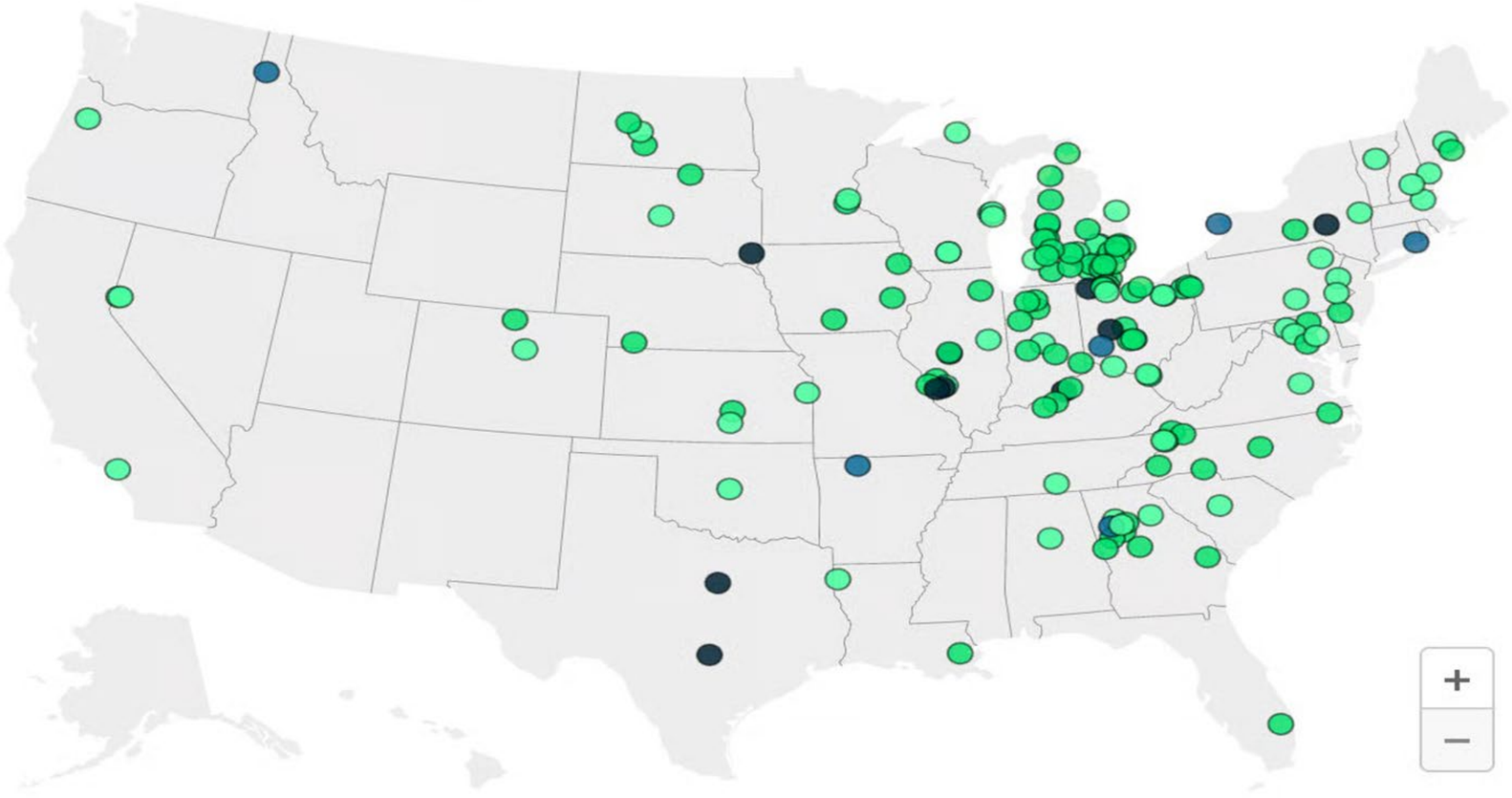
- Limited public disclosure of energy use, water consumption, emissions and supply chains
- Complex corporate structures and nondisclosure agreements obscure operational impacts and accountability
- This opacity limits community awareness, meaningful participation, and informed public decision making



150+ legislative bodies across the US have taken action on data center moratoriums

Of these, most are at the local level. 16 of the efforts are at the state level, marked on the map by their respective state capitals.

In effect | Under consideration | Expired | Rejected



Map: Katie Malone/Technical.ly • Created with Datawrapper

Calling a Time Out on Data Centers

STATES

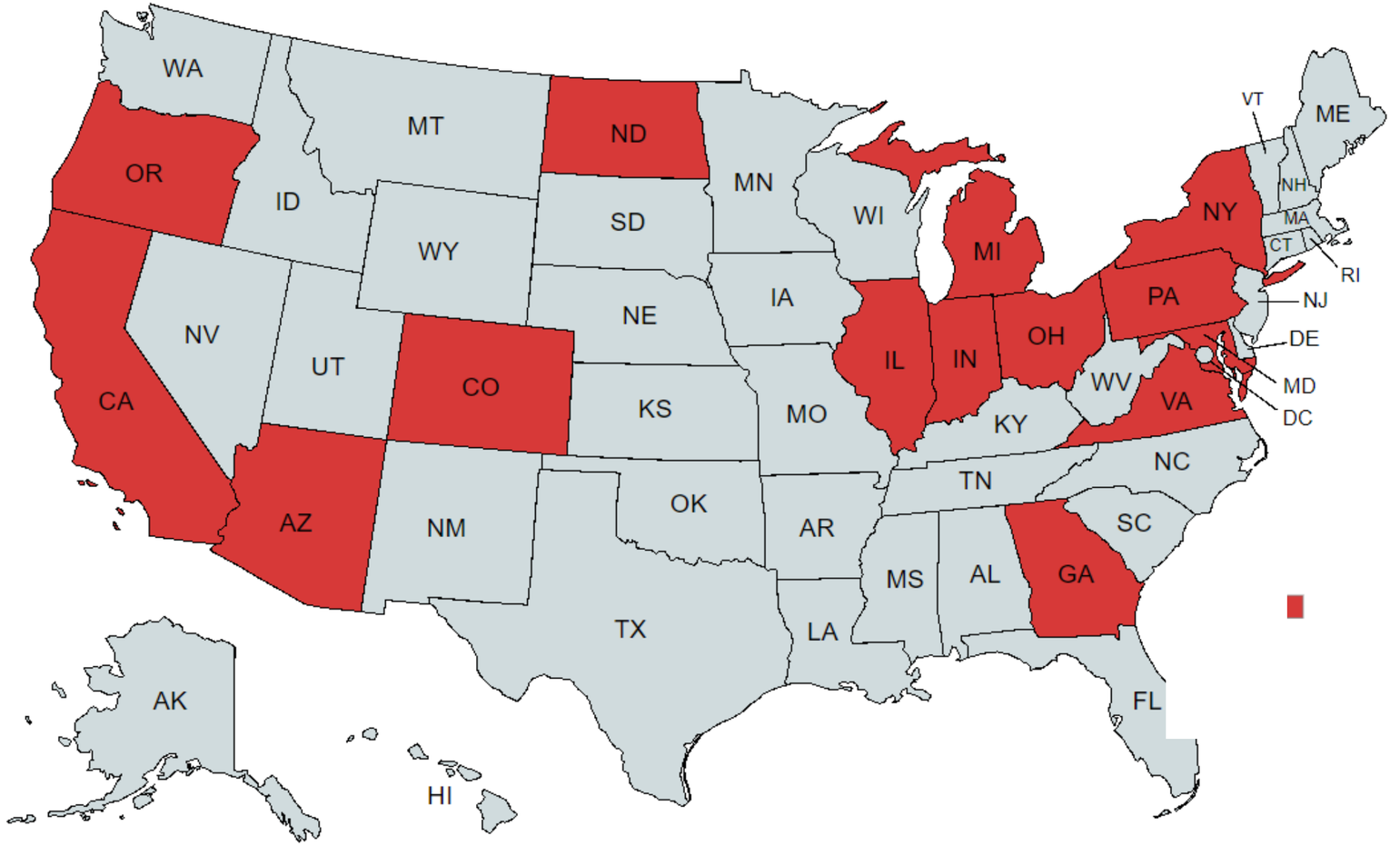
1. Georgia
2. Florida
3. Maine
4. Maryland
5. New York
6. Oklahoma
7. Vermont
8. Virginia

LOCAL JURISDICTIONS

1. Columbus, OH Metro Area
2. Denver, CO
3. Eagan, MN
4. New Orleans, LA
5. St. Louis, MO Metro Area
6. Urbana, IL
7. 4 counties in Maryland
8. 19 communities in Michigan

Data Center Ordinance Trends

From our preliminary research, the shaded states have city or county ordinances that explicitly address "data centers." This analysis is not exhaustive.



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Arizona Activity on Data Centers

STATE ACTION

1. HB 2756 (2026 Session): Electric rates
2. HB 1774 (vetoed): Pre-emption of local authority
3. EO 2025-13: Streamline energy infrastructure development
4. Data Center Tax Incentive Extension
5. ACC Rate Classification Docket
6. Proposition 207 (2006): Requires government compensation when regulations diminish property value

LOCAL ORDINANCES

1. Chandler
2. Phoenix
3. Mesa
4. Marana
5. Tucson
6. Maricopa County
7. Pima County (under review)
8. Goodyear (under review)

NOTE: **Data centers require low internal humidity so are attracted to desert areas**

Data Center Risks

- Many risks with Data Center Siting in local communities
- Lots of media coverage & published reports on energy and water risks
- Lincoln's work is focusing on enabling the local authority necessary for making sustainable siting decisions
- A new issue emerged in our research

A New Financial Risk: Data Center Abandonment

- Completely absent from the general data center discussion
- Why is this a possibility?
  - Chip evolution is rapid: chips can become obsolete within a 5-10 year period
  - Even the racks on which the chips are stored are designed for certain specific types of chips and may become obsolete too
- The cost of chip and rack replacement and reconstruction is higher than the cost of abandonment and new construction elsewhere

What is the Solution?

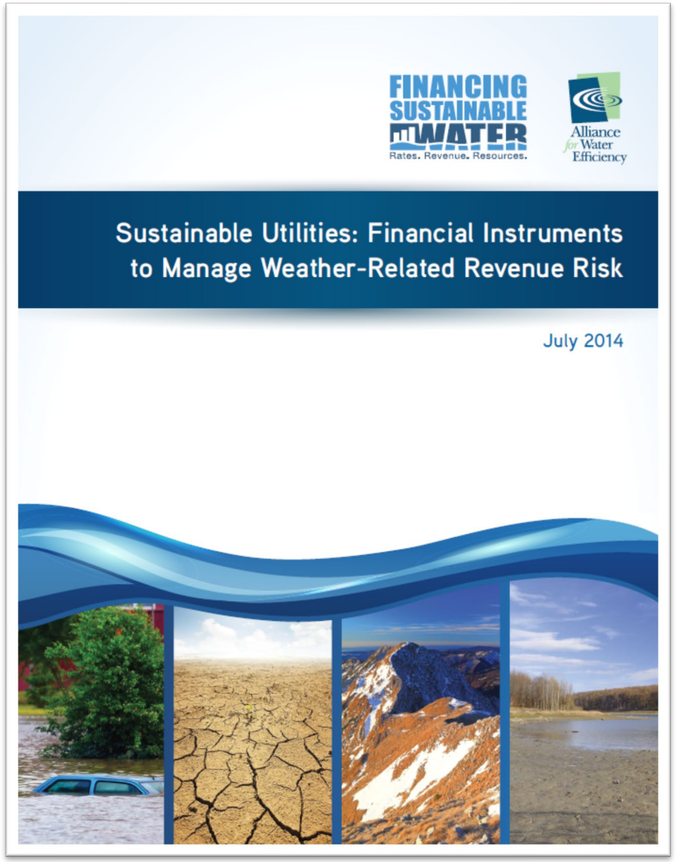
- Financial Risk Instruments are options that could be required of a data center applicant
- Abandonment and decommissioning would automatically trigger payment to the community to deal with the legacy structures

Types of Financial Risk Instruments

- Lincoln is creating tools for data center siting ordinances
- We will assemble the best examples from the large number of ordinances already adopted
- We have retained a risk management expert to create examples of these four instruments tailored to data centers:
  1. Insurance policy
  2. Derivative contract
  3. Hybrid instrument, such as a surety bond
  4. Structured purpose vehicle (a separate legal entity)

Expert Assistance

- John Polasek, President of AIWEX, Inc.
- A highly skilled professional in the finance and risk mitigation arena with over 25 years of experience
- Experience working for multiple top-tier investment banks (Bank of America, Merrill Lynch, Bear Stearns, JP Morgan, and Deutsche Bank)
- Successfully structured and executed numerous financing and risk mitigation structures for renewable power projects around the globe
- The Four Financial Risk Instruments will be completed by June 1, 2026



In Summary: What Do Local Communities Need?

- Adequate local authority to make the right decisions
- Accurate analyses of the LOCAL energy and water availability
- Strategies for avoiding energy and water rate shock
- Advice on taxation revenues and possible fiscal impact
- Ability to negotiate community benefits
- Tools for addressing the financial risk of resource overconsumption and potential abandonment

What Lincoln Will Publish in 2026

- A geospatial sense of the problem
- Recommendations for zoning tools for communities to use and modify as needed
- A strategy for avoiding water rate shock impacts to household ratepayers
- A process for creating community benefit agreements
- Template Examples of financial risk instruments
- Case studies in VA and AZ showing hydrological gap analyses

Thank you

MARY ANN DICKINSON

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OF LAND POLICY

THANK YOU!

Contact:johanna@a4we.org

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COMING UP NEXT:

Closing Plenary Session and Door Prize Winners

2:30 PM - 3:00 PM

Grand Ballroom