Promises and Perils of AI:
Data Centers, Energy, and Water

Photo credit: Hugh Kenny, Piedmont Environmental Council, from article by Sam Gordon, Smart Growth America [website]

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Live Webcast
Friday, August 7
1:00-2:30 PM EDT

Agenda

Introduction

David Rouse, FAICP, Moderator

Data Center Growth: Our Changing Paradigm

Mike Turner, Vice Chair, Loudon County, VA Board of Supervisors

Data Center Infrastructure Considerations

Chris Dietz, AICP, Critical Infrastructure Analyst, Idaho National Laboratory

Data Center FOMO: Balancing Our Present and Future

Manny Patole, Assistant Professor, NYU’s Center for Urban Science + Progress

Q&A

Smart Cities Interest Group

Mission

…to address advances in technology and innovation for smarter, more resilient, and sustainable cities; provide APA members with the latest smart cities' information and best practices; and position planners as leaders in these changes by connecting with experts in technology.

Everyone is welcome!

To join email robertkernsjr@gmail.com

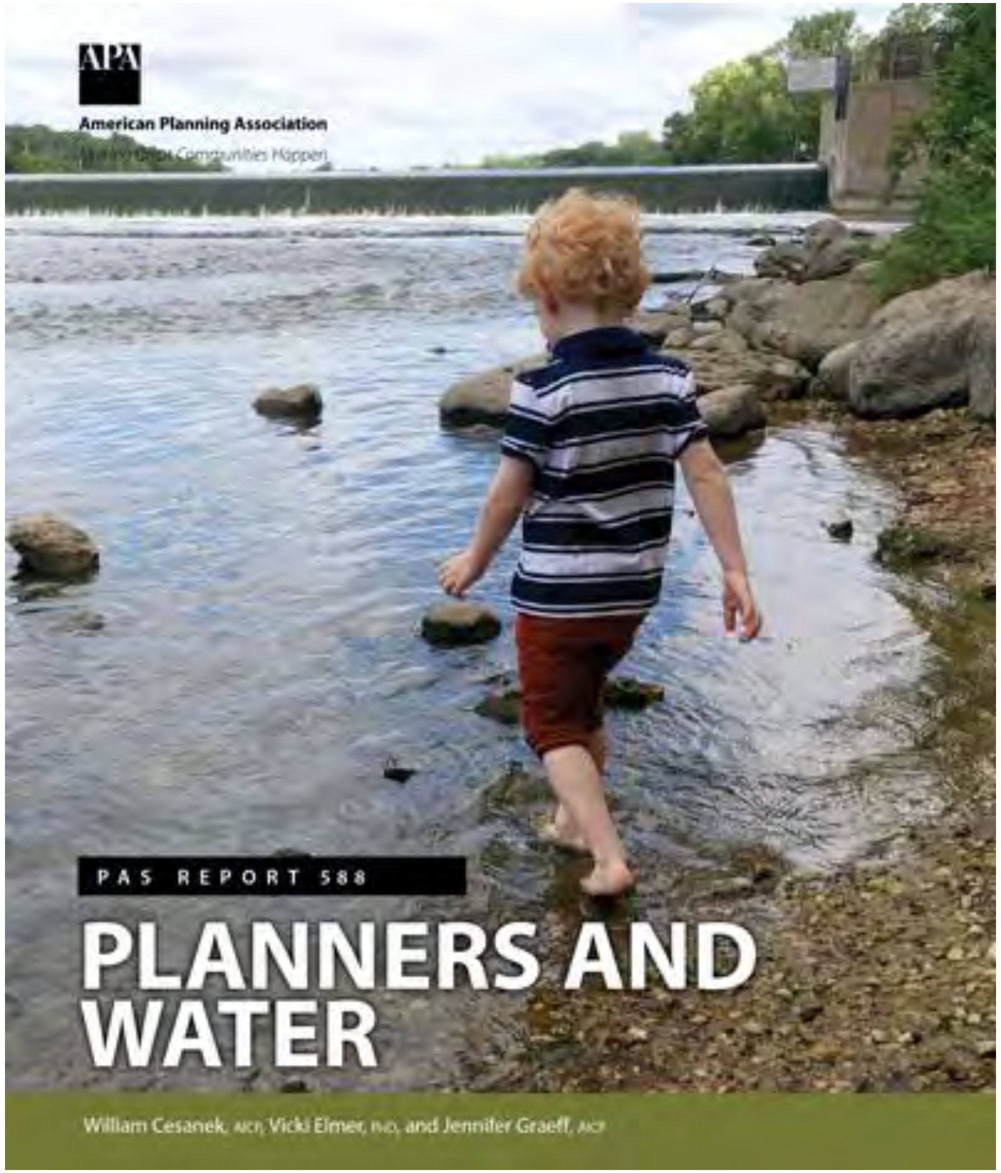
Water & Planning Network

Mission

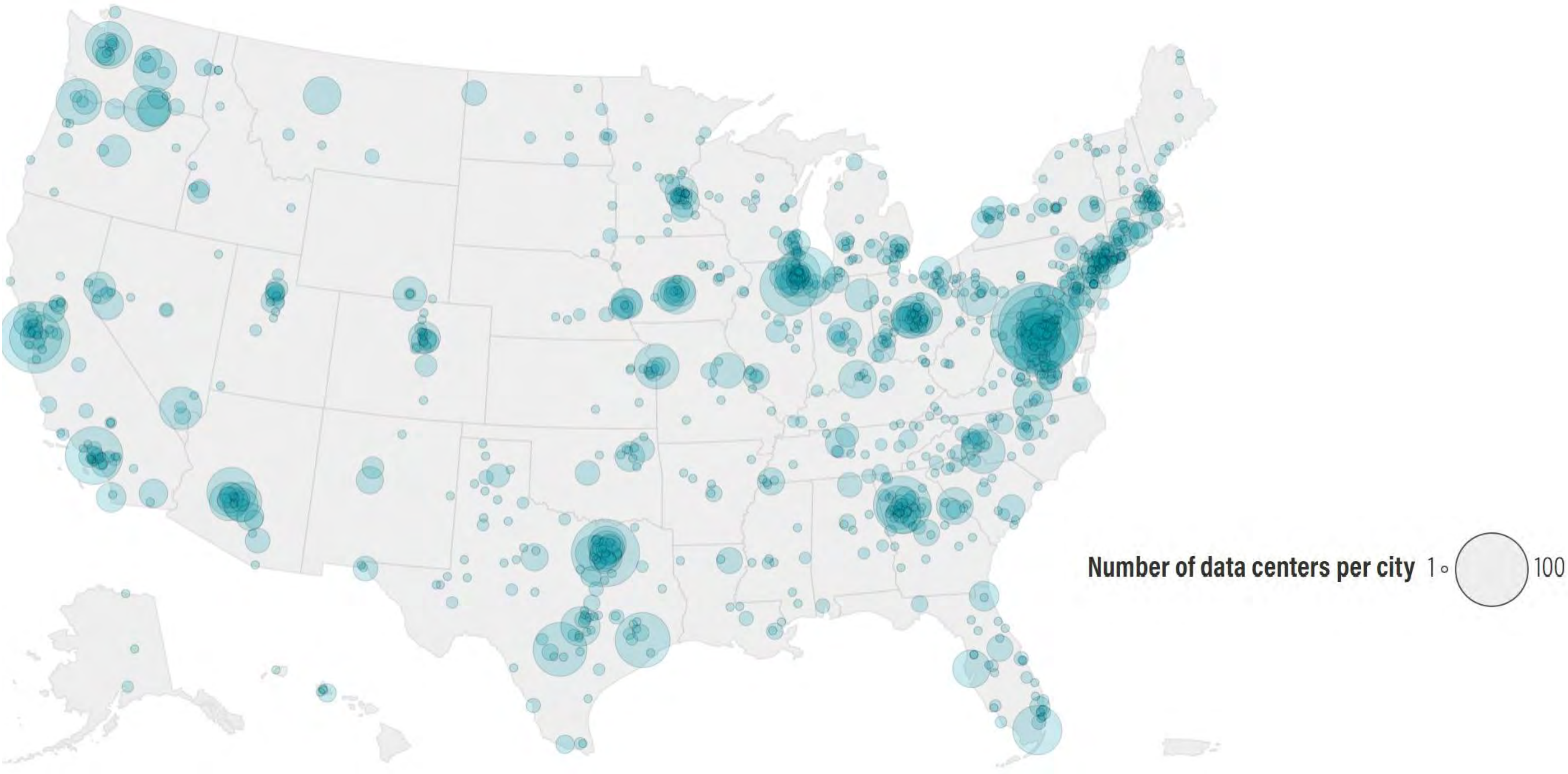
…to provide a professional forum for the interdisciplinary exchange of ideas and planning methods and connect members to best planning practices reflecting current research, science, policy, and technology for the protection, management, and use of water resources and utilities.

Everyone is welcome!

To join email water@planning.org



Data Center Locations Across the U.S.



Source: article by Carla D. Walker and Ian Goldsmith, World Resources Institute [website]

Resource Page

Loudoun County

VIRGINIA

WHERE TRADITION MEETS INNOVATION

Ashburn, Loudoun County, VA
Data Center Growth: Our Changing Paradigm

Vice Chair and Ashburn Supervisor, Mike Turner

August 7, 2026

Loudoun County, VA Key Facts

- Overview: Loudoun County, VA
  - Highest concentration of data centers in the world
  - Home to "Data Center Alley"; construction every single day for 16 years
  - 250+ data centers built; NOVA has 600+; TX 440; CA: 290
  - 53 million sq. ft. built; 60 million in the pipeline

Data Centers: Key Milestones

- 2000: Zoning Administrator determination: Data Centers are considered "office buildings" in the 1993 Zoning Ordinance; **(6) parcels allow "by right" data centers w/o BOS approval**
- 2003: Zoning Ordinance aligned with 2001 Comprehensive Plan; first Mention of Data Centers in Zoning Ordinance
- 2008: Loudoun Economic Development initiates marketing strategy to recruit data centers on land designated for data centers due to underground fiber
- 2014: Zoning Ordinance Amendment (ZOAM) addressing data center sight, setback, sound
- 2019*: General Plan (Comprehensive Plan) Updated (*4-yr. plan/ordinance mismatch)
- 2022: Pivotal year! 1) PJM informs Dominion its infrastructure plan is insufficient; 2) Chat GPT launches; 3) Post COVID demand for data explodes
- 2023*: Zoning ordinance updated to match Comprehensive Plan; Dominion announces plan to build (6) new Loudoun transmission lines
- 2024: JLARC study states it will be "very difficult" for Dominion to meet unconstrained demand
- 2025: On March 18th, Loudoun BOS ends all "by right" data center development in Loudoun

Data Centers: Benefits

- Revenue: FY2027 Projected $2.9 billion in Local Tax Funding; $1.3 billion is data center tax revenue (1/3 real; 2/3 personal)
  - Lowest Real Property Tax Rate in DC Metro area; About 25% Lower Than Neighbors[7]
- Expense: A Data Center Costs the County $0.04 per $1 of Tax Revenue[8]
  - Most Businesses Cost About $0.25 per $1; Homes About Even[8]
- Infrastructure:
  - Put Few Cars on the Road
  - Very Few Kids in Schools

Exponential Growth in Data Demand

- Growth of Permitted data center floor space:[10]
  - 2016: 8.8 mil. sq. ft.
  - 2017: 10.1 mil. sq. ft. (14.7% increase)
  - 2018: 13.1 mil. sq. ft. (29.7% increase)
  - 2019: 18.3 mil. sq. ft. (39.7% increase)
  - 2020: 21.5 mil. sq. ft. (17.5% increase)
  - 2021: 26.4 mil. sq. ft. (22.8% increase)
  - 2022: 28.1 mil. sq. ft. (6.4% increase)
  - 2023: 31.9 mil. sq. ft. (13.5% increase)
  - 2024: 41.2 mil. sq. ft. (29.2% increase)
  - 2025: 53.0 mil. sq. ft. (14.0% increase)

2016-2020 =144% Increase

2021-2025 =100% Increase

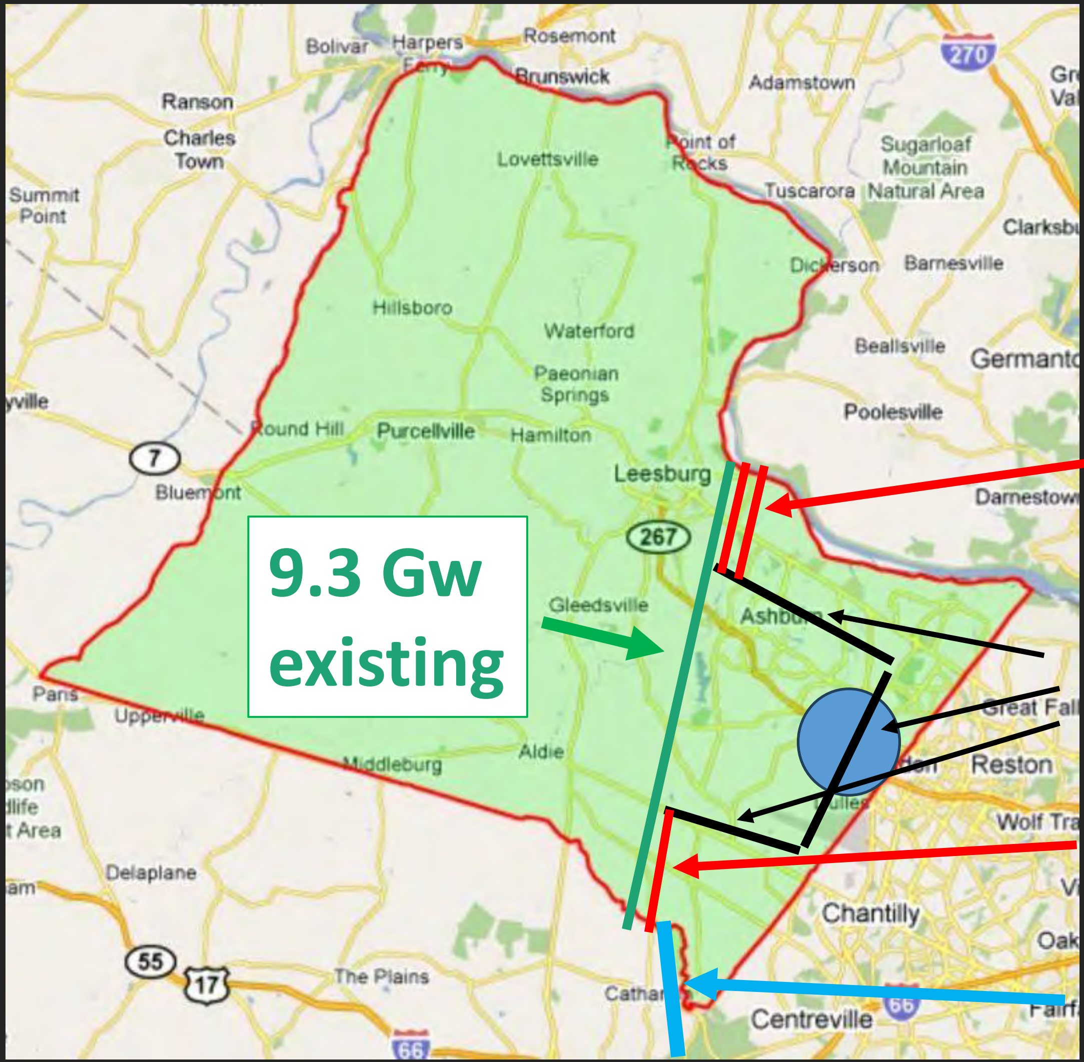
Exponential Growth in Power Demand:

- Power Consumption in Loudoun County:[11]
  - 2018: 1 Gw (chart interpolation)
  - 2019: 1.5 Gw (chart interpolation)
  - 2020: 1.6 Gw (chart interpolation)
  - 2021: 2.0 Gw (chart interpolation)
  - 2022: 2.8 Gw (chart interpolation)
  - 2023: 3.4 Gw (chart interpolation)
  - 2024: 4.14 Gw (actual)
  - 2025: 5.33 Gw (actual)

2020-2025 = 233%

- Same Linear Progression Over the Next 5 Years = 14.2 Gw by 2030
- BUT...Artificial Intelligence (AI) Will Increase Existing Data Rack Power Consumption from 10-14 Kw/rack to 100+ Kw/rack = 20+ Gw by 2030

Based on 5 yr. trend, total needed by 2030 is 14.2 Gw, but that does not count AI growth.



8.6 Gw new planned = 17.9 Gw total available by 2030

4.2 Gw new

2.85 Gw connection (5.7 new to "DC Alley")

2.1 Gw new

2.3 Gw HVDC new

Bottom Line: These Won't Be Enough!

Loudoun County: Current Assessment

Our Realities (author's opinion)

1. Loudoun power grid is oversubscribed and will likely worsen; PJM/Dominion's planned infrastructure buildout will not keep up with demand; confirmed by JLARC study[32]

2. With AI, halting new data center construction will slow but not solve our problem

3. Decommissioning/closing of fossil fuel plants throughout PJM service area will be slowed or reversed[20]

4. Community resistance to power infrastructure expansion will grow rapidly

5. Solar and wind not viable (capacity factor)

6. The 135-yr. old paradigm of power generated by large remote power plants and transmitted across hundreds of miles of transmission lines will not work for Loudoun County

National Assessment: Five, Community-Specific Developing Trends

Exponential increase in demand for data…

Means more data centers; denser racks within existing data centers;

Leads to…

Exponential increase in demand for power

Reduced periodically by increased efficiency…

Means more transmission lines/generation plants; higher bills;

Leads to…

Much higher water use as data centers try to lower power usage by switching to more efficient water cooling…

And Leads to…

Delay or cancellation of plans to decommission fossil fuel plants; new fossil fuel plants built…

Leads to…

Rapid increase in community resistance to data centers due to noise/power/water Leads to…

…more pressure on local elected officials to curtail growth, impose stricter performance standards, stop power lines

The Most Likely Near Term Way Ahead

Three Possible Scenarios:

1. Scenario #1: Utilities or Government Artificially Constrain Demand
   A. Utilities delay or deny applications based on generation/transmission capacity limits (currently happening de facto)
2. Scenario #2: Technological Breakthrough
   A. New Nvidia chip uses 1000x less energy to process AI; 2,300% savings
   B. Jevon's paradox; more efficient use of a resource leads to more resource used
3. Scenario #3: Onsite Power Microgrids <u>with Strict Performance Standards</u>
   A. Onsite power is developing NOW!
   B. Local communities MUST enforce performance standards!
   C. Immediate, transitional solutions: Fuel Cells or Gas Turbines
   D. Long-term solutions: SMRs and HVDC underground regional network

Capacity Factor: Choosing an Onsite Baseload Power Source

- Capacity Factor Definition[30]
  - o Annual hours operated at max. capacity / (8,670 annual hours)
  - o Examples:
    - 1 MW max. capacity averaging .5 MW every hour for a year / 8,670 hrs. = 50%
    - 1 MW max. capacity averaging 1 MW over 4,380 hours for a year / 8,670 hrs. = 50%
- Actual Capacity Factors in 2024 of Various Power Sources[31]

2024	Geothermal	Hydroelectric	Nuclear	Biomass	Gas	Solar	Wind
Capacity Factor	65%	34.5%	92.3%	59.0%	59.7% (90+%)	23.4%	34.3%

Choosing a Microgrid Power Source

Power Source Type	Baseload Capacity	Carbon Net Zero	NOX, CO, PM2.5, CO_2
Tier IV Diesel Backup Generators or Tier II with SCR and DPF			No (CO_2)
Energy Storage Systems (BESS; LDES)		✓	✓
Natural Gas Turbines w/SCR	✓		No (PM 2.5, CO_2)
Green Hydrogen Fuel Cells		✓	✓
Blue Hydrogen Fuel Cells	✓		No (CO_2)
Small Modular Reactor (*Future)	✓ *	✓	✓

15 Best Practices for Communities

Six Factors Communities Must Address When Considering Data Centers:

1. Noise 2. Power 3. Water 4. Emissions 5. Setback 6. Appearance

Basic Rules:

- Make sure your Comprehensive Plan lists performance standards and your Zoning Ordinance aligns with the plan; make sure both are current.
- Never allow “by right” data center development; require local jurisdiction approval.
- Never sign a Non-Disclosure Agreement.

Noise

1. Conduct a pre- and post-construction noise study (dBA and dBC). dBA is audible noise; dBC is Tonal/Narrow band low-frequency humming. dBC has the worst health effects and usually occurs in a single, narrow band.

15 Best Practices for Communities (cont.)

Noise (cont.)

2. Pass a noise ordinance/zoning ordinance that limits noise to a maximum of 50 dBA (audible sound) perceived noise at the sending property line and reduces dBC to background noise levels. (Option: Limit post-construction to a % of pre-constr.)

Power

3. Require utilities to specify, in writing, the maximum power requested by the data center; how the utility plans to deliver power (routing, overhead, substations, etc.); require Board approval to exceed.
4. Build data centers near existing power lines but no closer than 2x the ROW
5. Require substations to be onsite or adjacent and included in the application; never allow "by right" separate substation development or to call them "accessory use."
6. For energy storage, use long duration storage systems (10 hours of storage minimum), not lithium-ion batteries which are not long duration systems.

15 Best Practices for Communities (cont.)

Water

7. Require the data center and water utility to specify in writing how much water the data center will use annually.

8. Determine whether the data center will use air cooling, open loop water cooling or closed loop water cooling.

9. Determine whether the data center will use potable water or reclaimed water

10. Determine how the data center will purify its wastewater and whether the local water treatment facility can adequately process the wastewater.

Emissions

11. Require Tier IV backup generators or Tier II generators with Selective Catalytic Conversion (SCR) attached. If using natural gas turbines, require SCR using ammonia as the catalyst. Require strict noise limits; require no PM2.5

15 Best Practices for Communities (cont.)

Setback

12. 500′ minimum setback from residential; 1,000′ preferred.

Appearance

13. Require natural screening, berms, fenestration (windows) on principal facades.
14. Limit building height, Floor Area Ratio (FAR) to ensure compatibility with surrounding structures.
15. Encourage microgrid design within the data center campus for future use (Microgrid: large power consumer, baseload power source, backup power source, long-duration storage, grid connection).

August 7, 2026

Data Center Infrastructure Considerations:

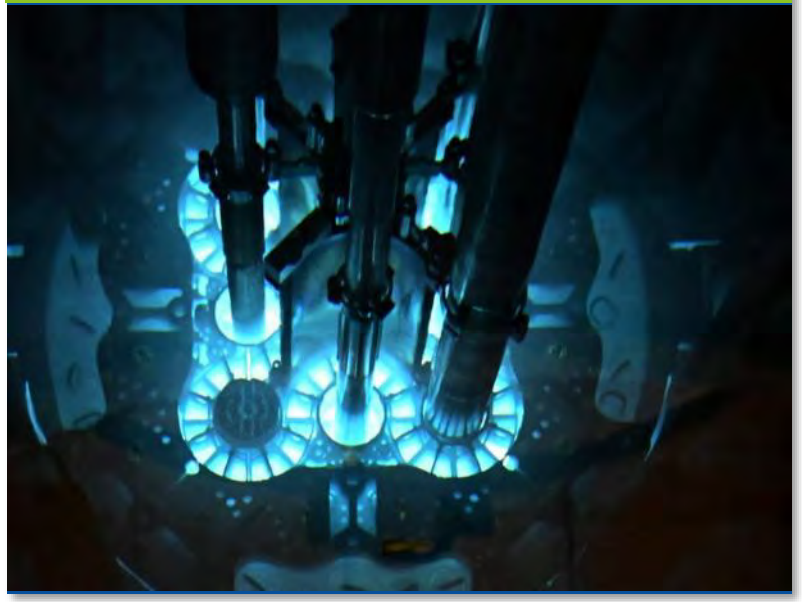
Trade-Offs and Emerging Technologies

Chris Dietz, AICP

Idaho National Laboratory

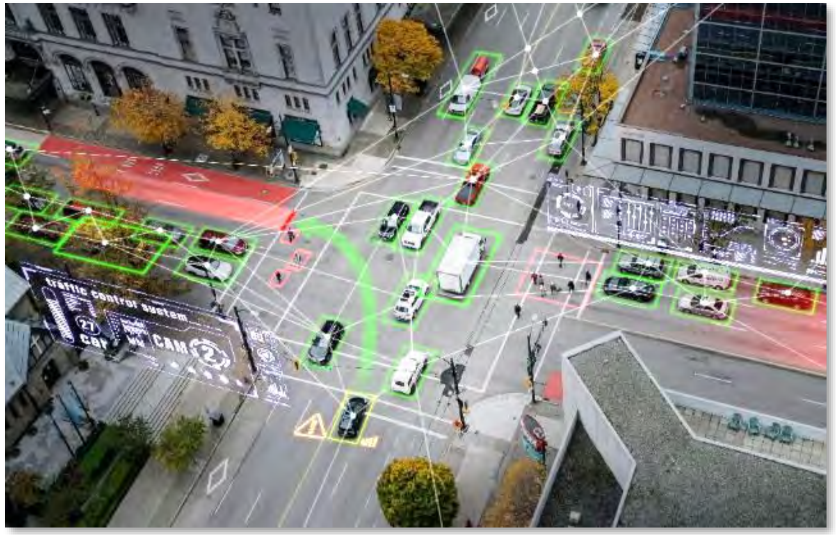
What is Idaho National Laboratory (INL)?

- One of 17 U.S. Department of Energy (DOE) Laboratories.
- Focuses on **advancing energy security** and **protecting our nation's critical infrastructure** through scientific discovery, innovation, and demonstration of new technologies and solutions.
- Network of testing facilities, researchers, and staff supporting three (3) key areas:

Nuclear Energy	National Security	Integrated Energy
		

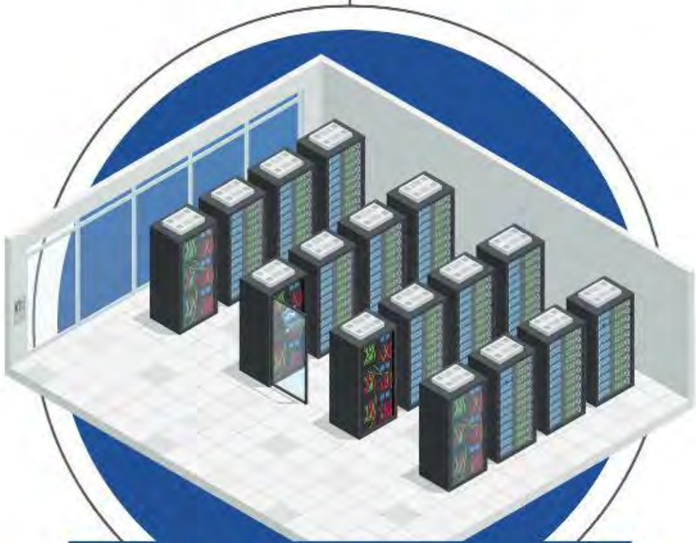
Enabling AI for Smart Cities

- National Priority - State Variation - Local Impacts.
- A **“double-edged sword”** at the local level:
  - Inform infrastructure investment decision making.
  - Physical footprint and resource allocation for datacenters.
  - Geography matters (inference for Smart City applications).
  - Interdependencies come with cybersecurity risk and potential for cascading impacts.



In 2025, all 50 states and most U.S. territories introduced legislation on AI, with 38 states adopting over 100 measures.

Load Requirements



Data Center

- N2+1 Configuration
- Need 99.995% Availability
  (25 minutes annually)
- Outage protection > 96 hours

Common Characteristics and Challenges:

- Energy cost drivers affect deployment plans
- Generation must be available to support high energy consumption
- Backup power on site
- Variability in criticality of sites
- Load forecasting and planning must be in partnership with utility

Conventional Large Loads

Specific Characteristics and Challenges:

- Maximum size ~500 MW
- Less flexible operational schedules
- Aging infrastructure and equipment
- Less visibility into real-time energy use at the facility level

Source: INL

Data Center Resource Dependencies (Primary Drivers)

<u>Grid</u>

Provides access to power but also to other risks and supply chain challenges

<u>Supply Chains</u>

Provide the hardware, software, materials and workforce to enable AI development

<u>Fuel</u>

Serves as backup generation for data centers as well as power generation plants and other industrial uses

<u>Water</u>

Used for cooling in many cases as well as power generation

<u>Geography and Seasonality</u>

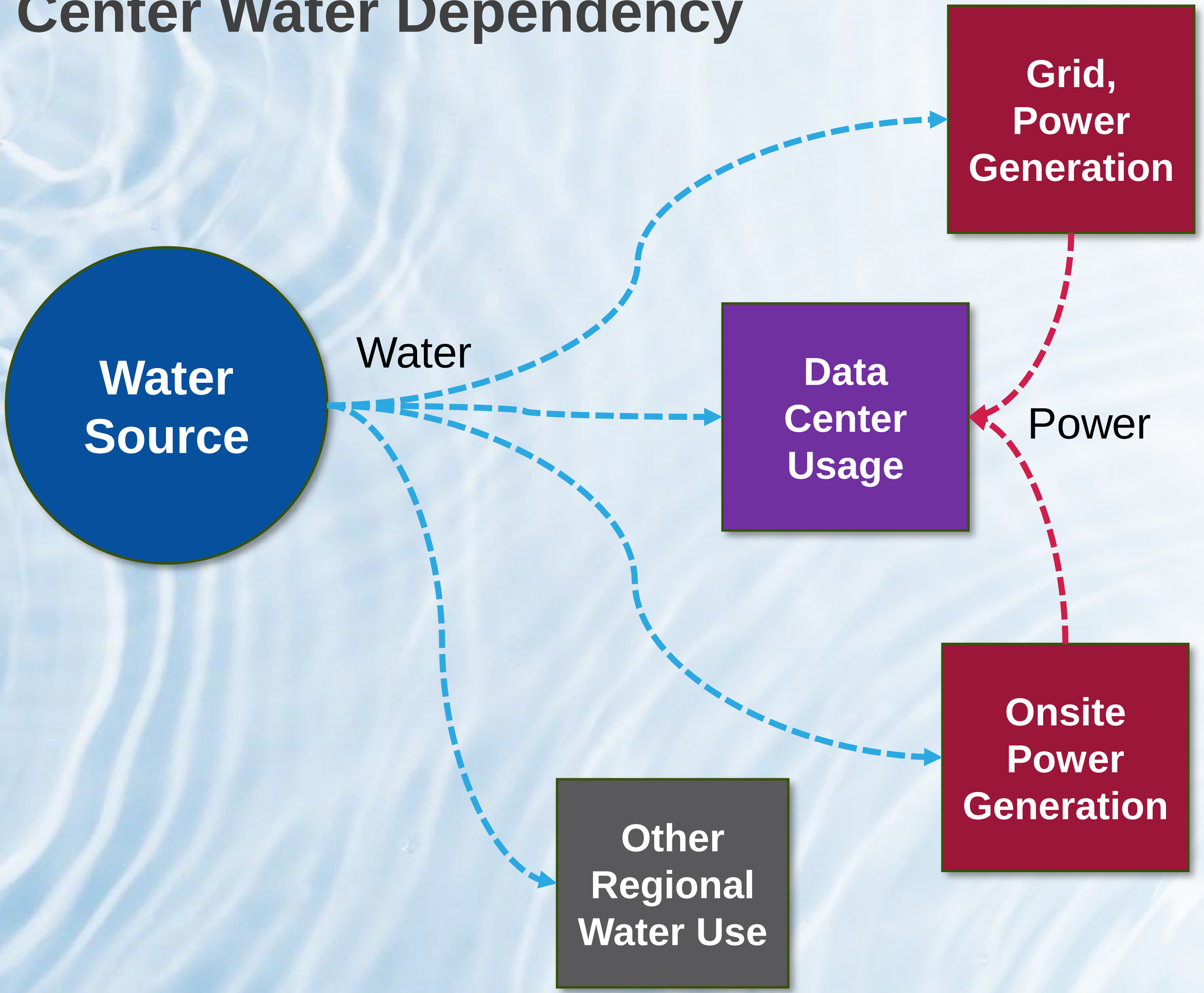
Influence energy

(and water) demand

How can these factors be leveraged to optimize trade-offs for Smart City and water conservation initiatives?

Trade-Offs—Energy-Water Nexus

Data Center Water Dependency



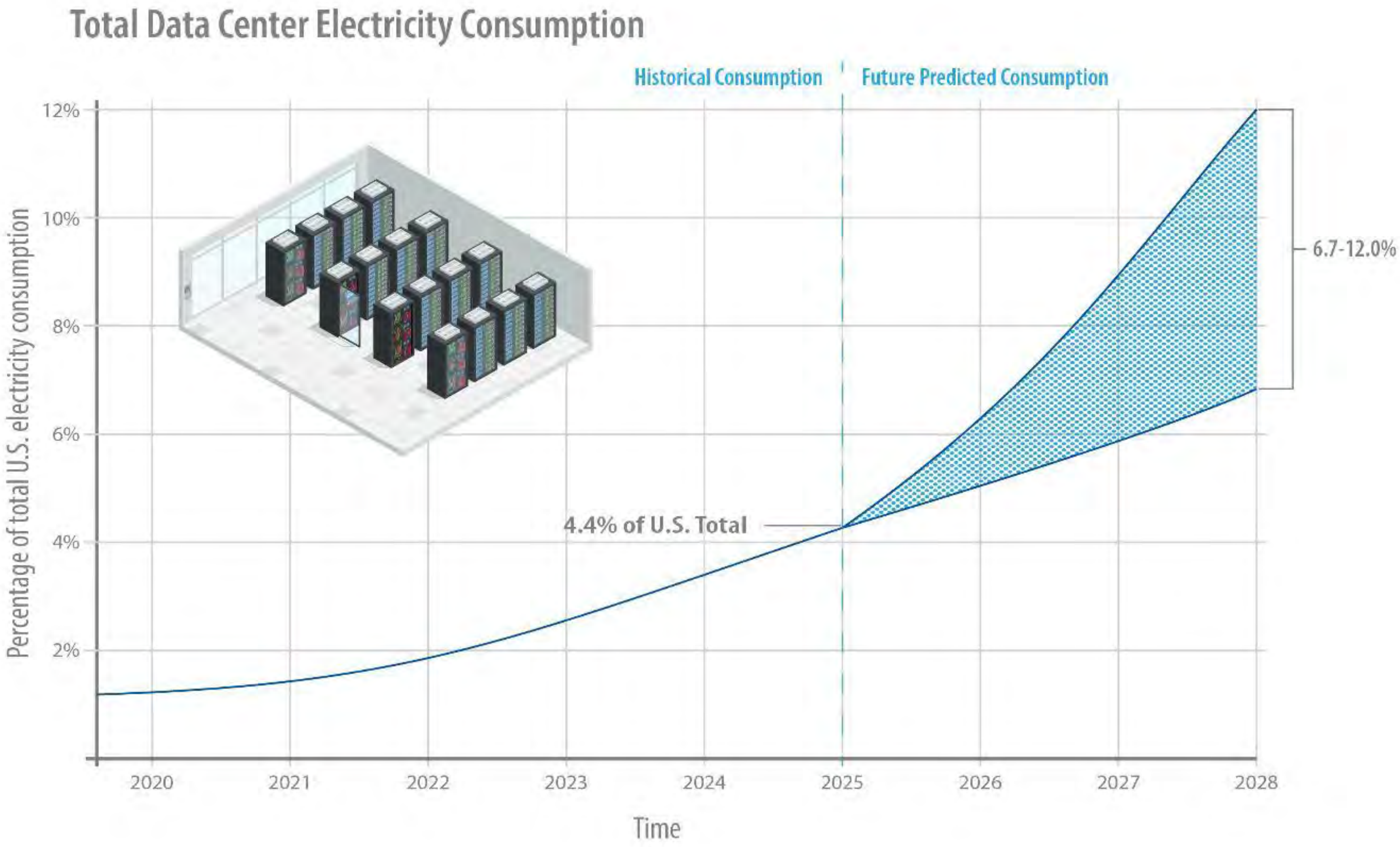
- Demand varies by configuration.
- Required for most power generation sources (offsite/onsite).
- Power supply / cooling configuration is key.
- Even in closed-loop systems, 20% of water is consumed
- closed loop systems can reduce freshwater use by up to 70%.

Water Use for Datacenters

- 100-word prompt uses about 1 bottle of water (~500 mL).
- Water absorbs heat 30x faster than air; processors run more efficiently and with less noise.
- Up to 5 million gallons a day (~30,000 people)
- Up to 80% of water is consumed (evaporated).
- Water reuse volume can be larger than entire water treatment plant capacity.

**Water Usage Effectiveness (WUE) is reported in liters per kilowatt-hour (kWh): While "0" is the ideal WUE score, this can only be achieved in air-cooled data centers, and most data centers cannot meet this target due to their location's climate conditions.*

Electricity's Capacity Gap

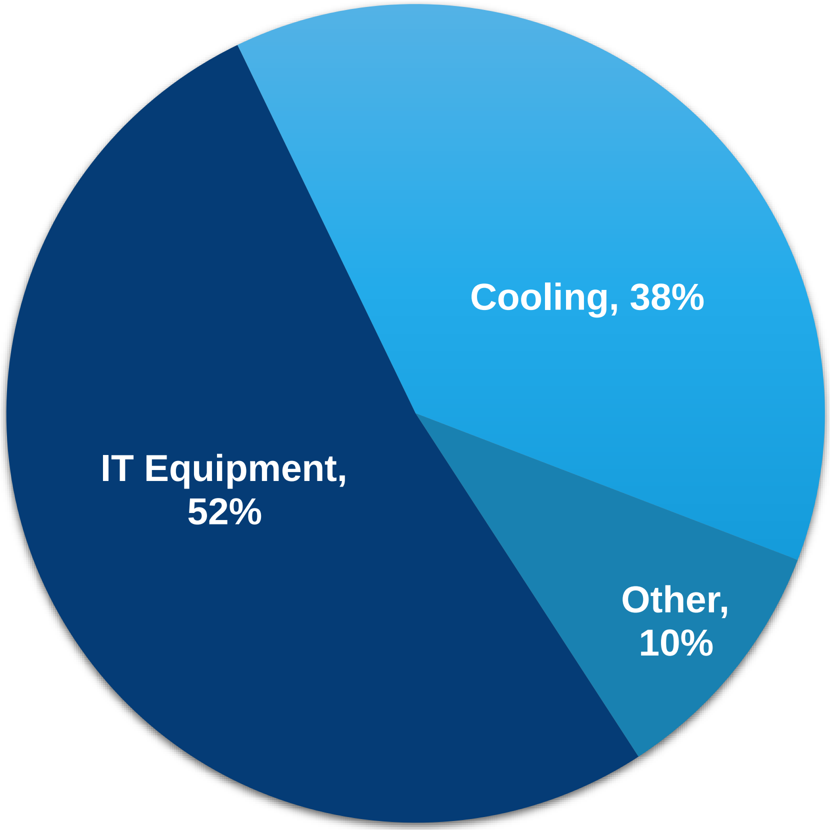


Data Centers are building faster than power plants, underscoring the need for flexible interconnection planning.

Source: INL

Electricity Use for Datacenters

Data Center Electricity Usage

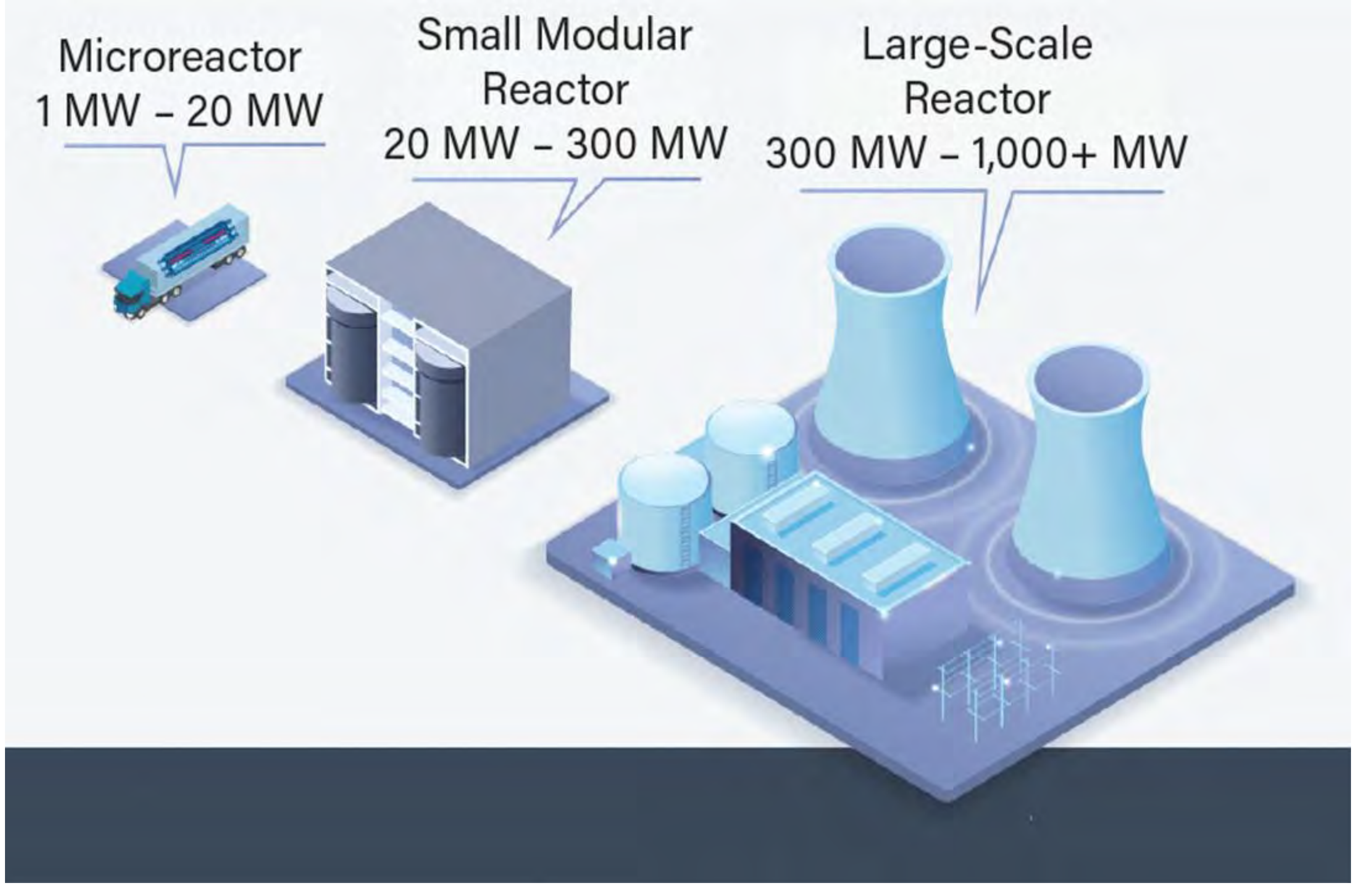


- IT Equipment account for just over half of electricity use.
- AI Training can be especially energy-intensive (99.99% up-time) and less predictable in fluctuation than inference.
- Cooling can fluctuate on a variety of factors (Climate, Design, Configuration, etc)
- Current hyperscale data centers can use around 100 MW of power (~50,000 residents) while planned projects are 10x that amount.
- While efficiencies will increase, time and scale are real limitations.

In general, every 18 acres of data center size requires roughly 100 MW of electricity.

Powering Smart Cities With Advanced Nuclear

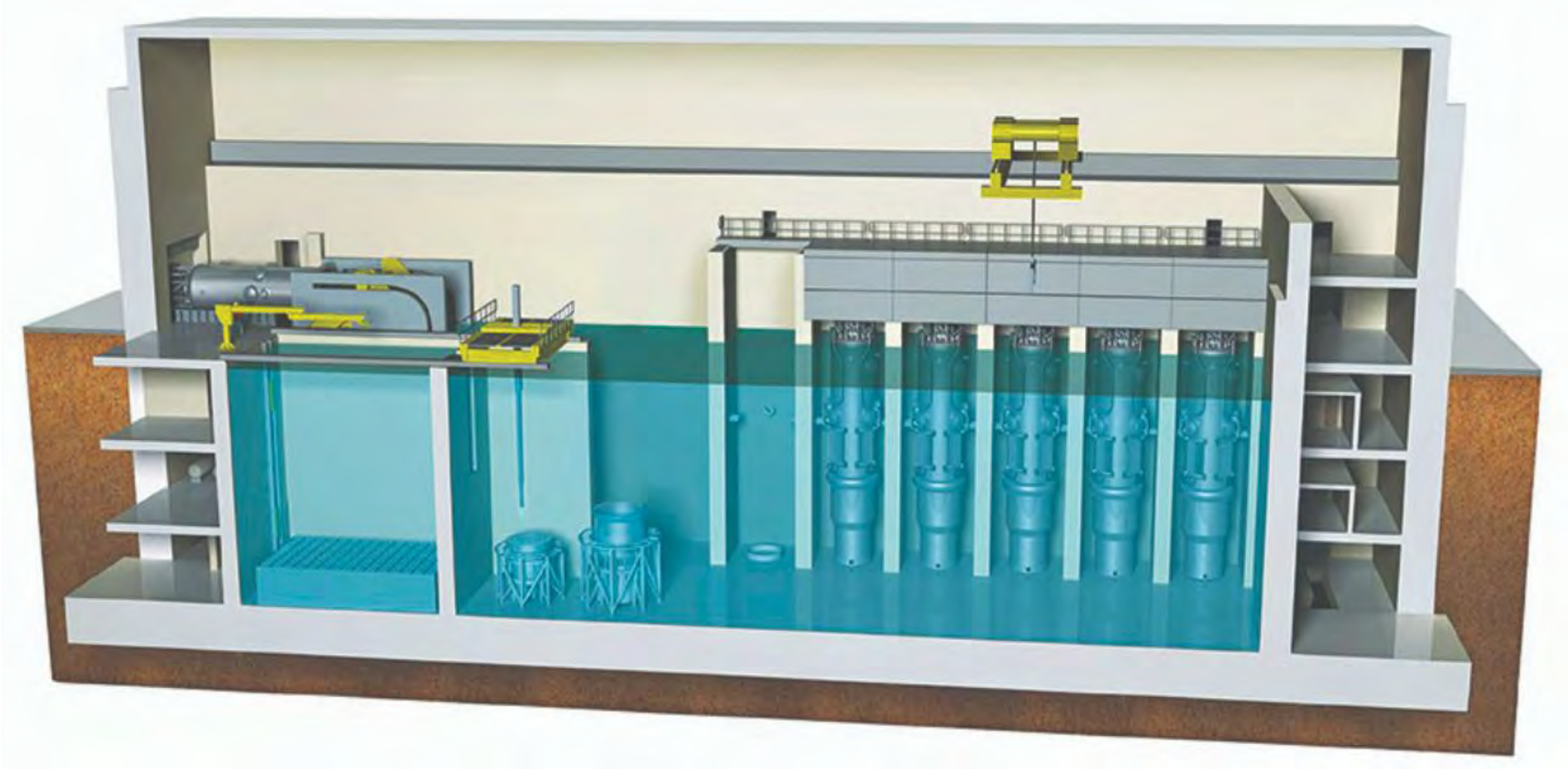
- Ancillary use for datacenters.
- Data centers trending toward Behind-the-Meter (BTM) power configurations.
- Passive safety systems that prevent meltdowns.
- Availability ~2030; Planning window is now.



Source: Datacenterknowledge.com

Small Modular Reactors (SMR)

- 25-300 MW, can be built and delivered in modules, unlike traditional nuclear plants.
- Full-time jobs: more numerous than data centers, but talent pipeline issues may persist.
- Potential for returning power to the grid under emergency circumstances.

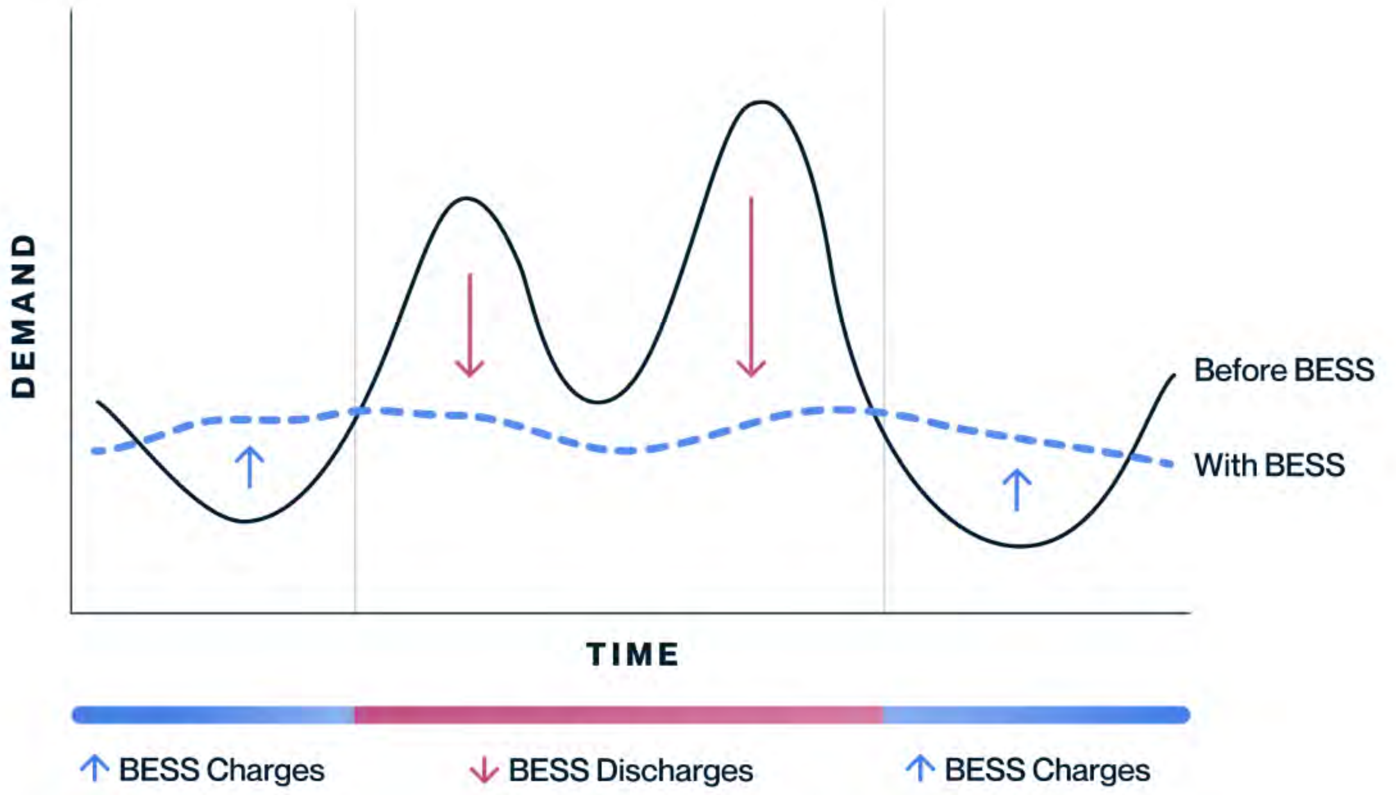


Source: INL

How does this impact the current development code requirements?

Site Planning and Configuration

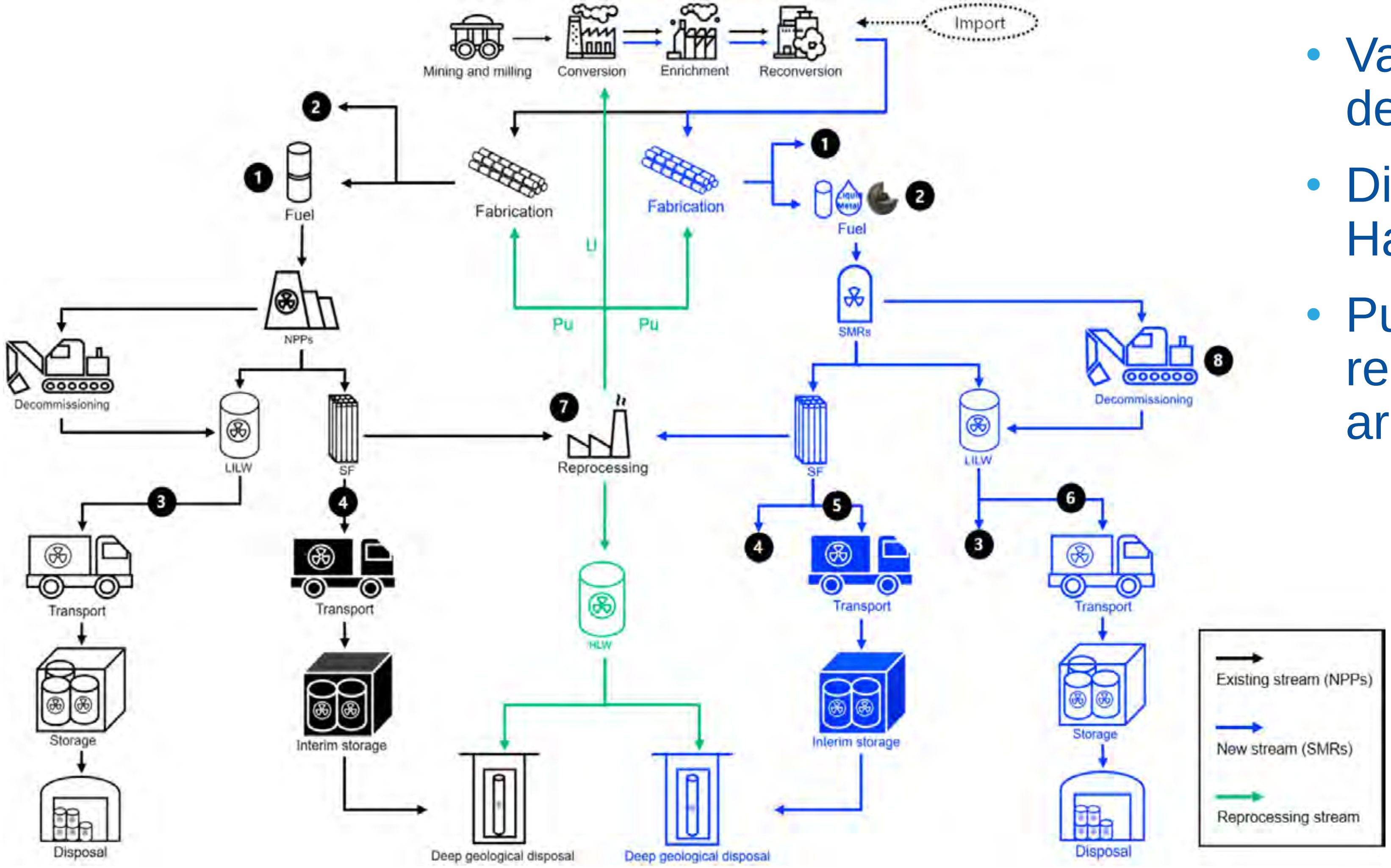
- Modularity has site plan implications—how will this impact initial data center plan review?
- Incorporation of Energy Storage and alternative energy—peak shaving
- SMR configuration (#) and refueling for staggered availability (reduced fluctuation)



Source: Moment Energy

Technology	Acres / MW
Wind	2.47
Solar	7.9
Large Nuclear	0.543
SMR	0.038
Microreactor	0.06

Supply Chain considerations for SMRs--

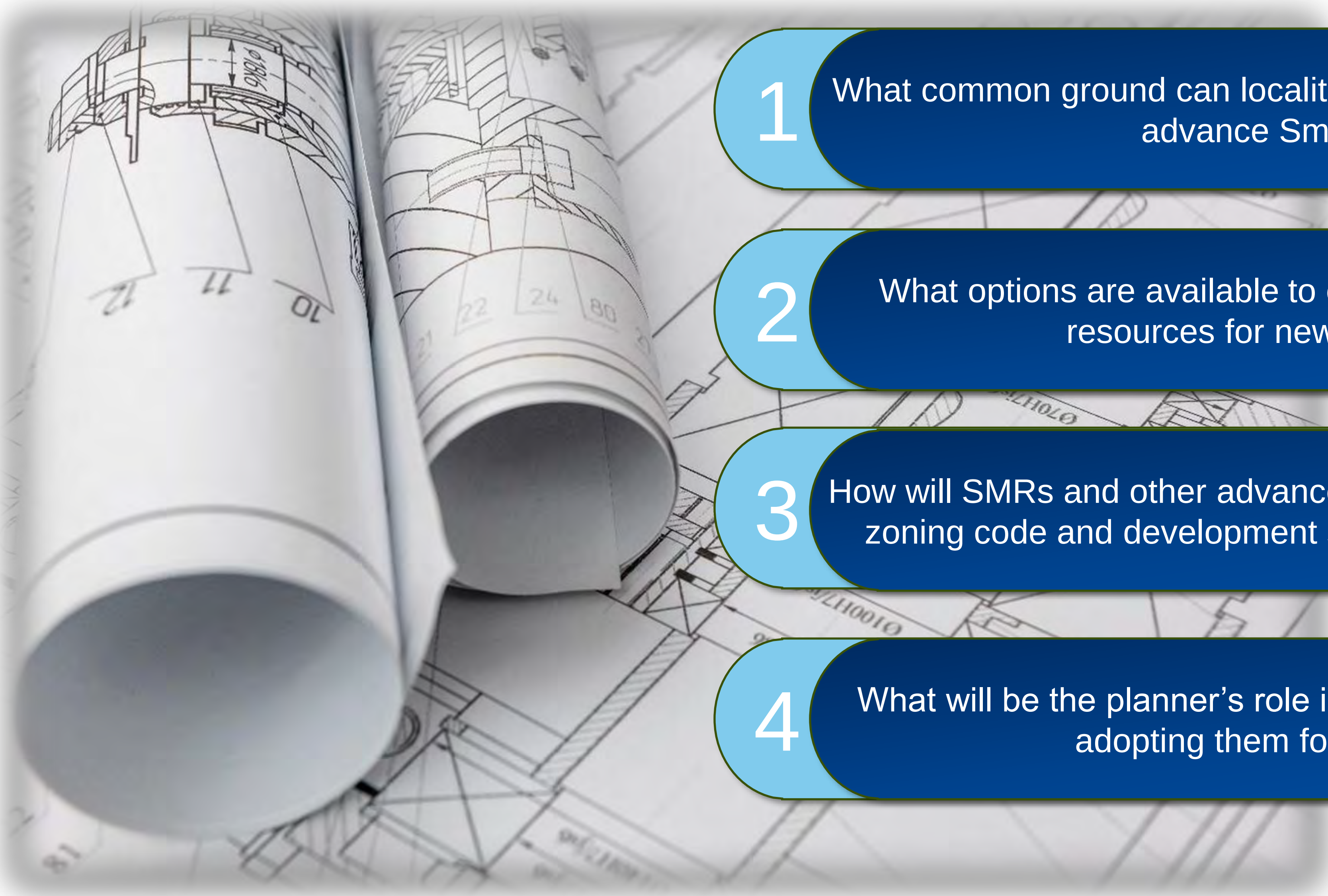


- Variation among SMR designs.
- Different Fuels=Different Handling Requirements
- Public perspective vs. regulatory requirements (both are changing)

How will this affect site planning and transportation planning requirements?

Source: Kyung Hee University

Key Planning Questions: Emerging Technologies



1. What common ground can localities and data center developers establish to advance Smart City infrastructure?
2. What options are available to optimize trade-offs for water and energy resources for new data center development?
3. How will SMRs and other advanced nuclear technologies change the current zoning code and development standards, and what can be done today?
4. What will be the planner’s role in navigating emerging technologies while adopting them for Smart City development?

Data Center FOMO: Balancing Our Present & Future

Manny Patole
Industry Assistant Professor
NYU Tandon School of Engineering
[Center for Urban Science + Progress (CUSP)]

Caveat Emptor

- Not a pro- or anti-data center discussion
- Data centers are critical infrastructure
- AI will continue to expand
- Planning decisions made today will shape communities for decades
- Better questions lead to better planning decisions

How do cities invest in their community's digital infrastructure that supports today's economy without compromising tomorrow's environmental, social, and economic resilience?

What is AI?

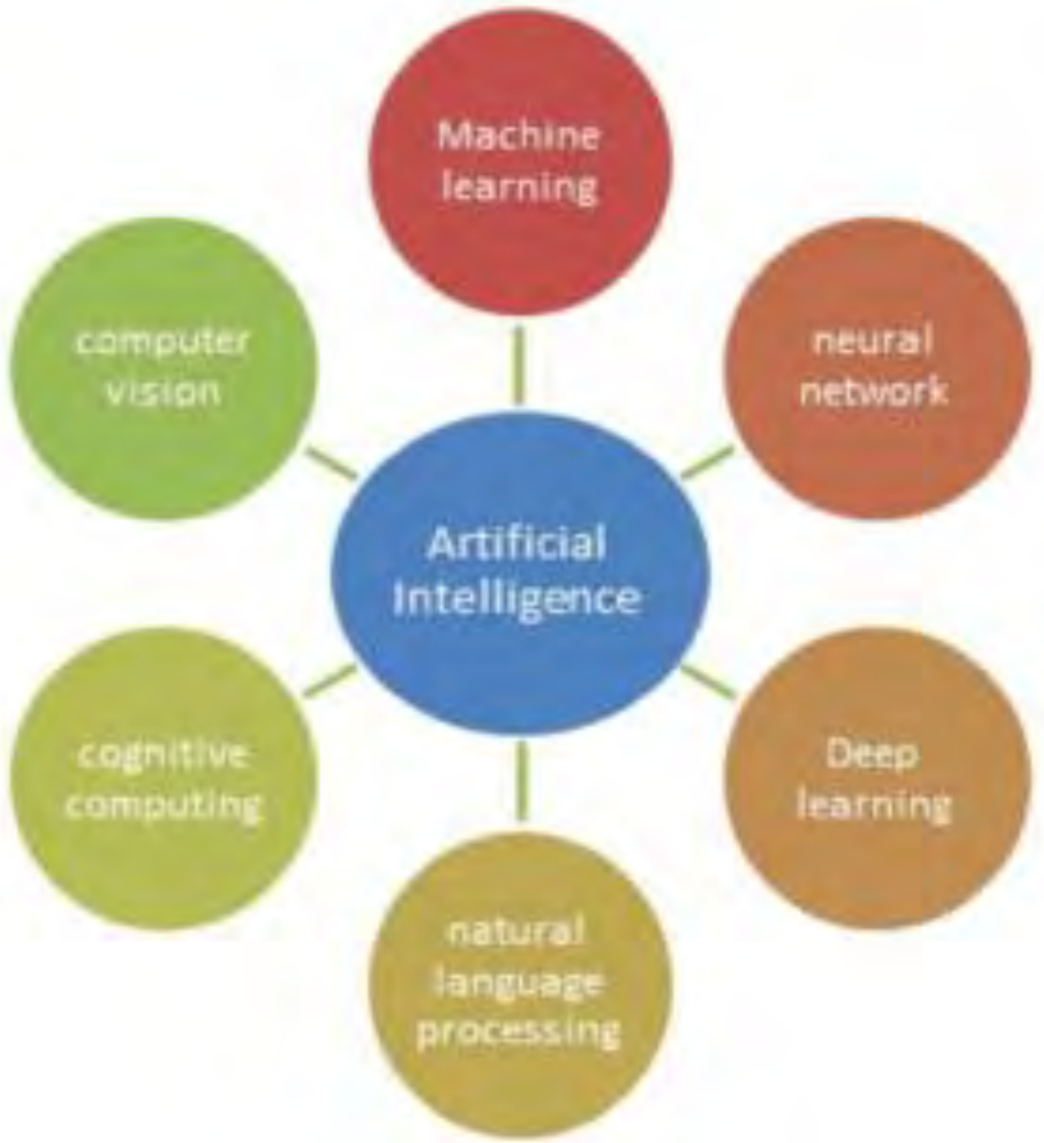
Artificial Intelligence refers to computational systems capable of performing tasks traditionally requiring human intelligence through prediction, pattern recognition, language processing, optimization, and decision support.

Planning Applications

- Infrastructure asset management
- Climate modeling
- Emergency management
- Permit review
- Transportation optimization
- Environmental monitoring
- Land-use scenario planning

AI itself does not "live in the cloud."

It depends upon **Data Centers**.

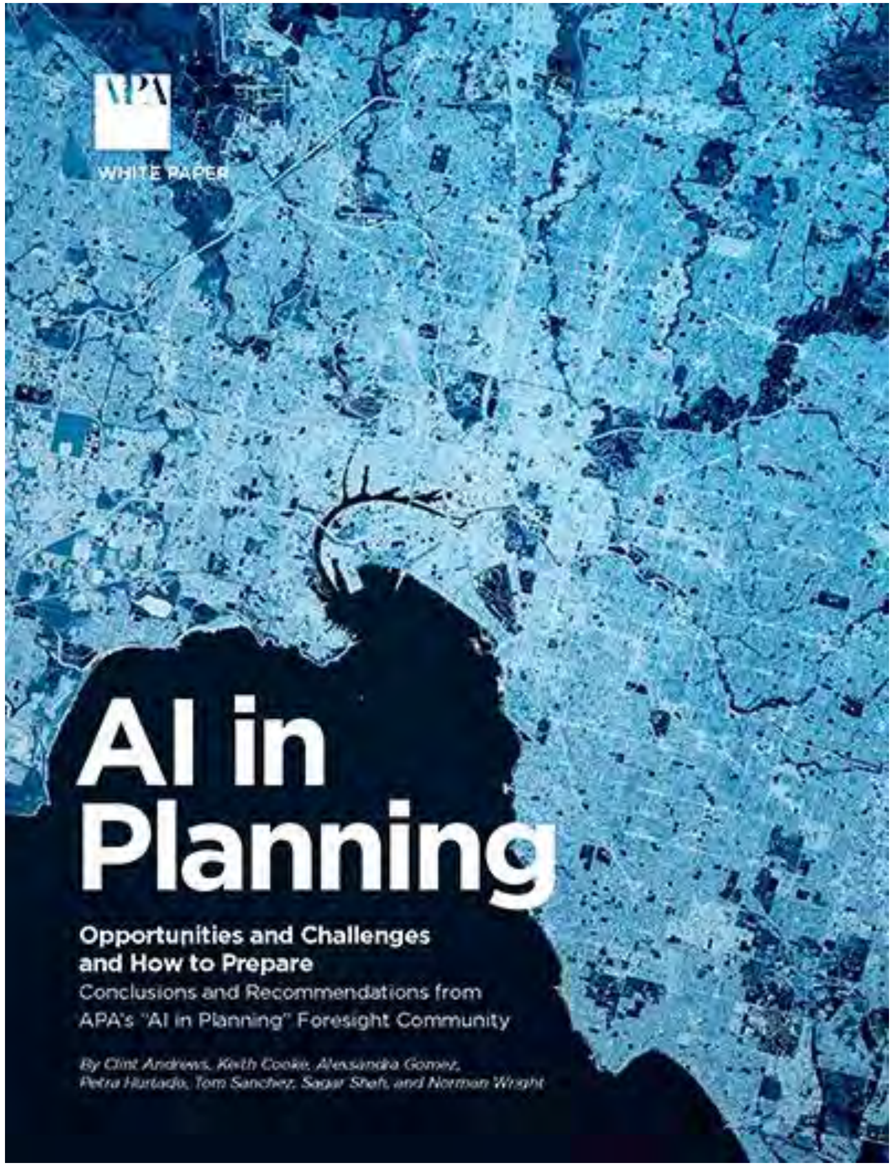


AI Changing How We Work

Planning Considerations

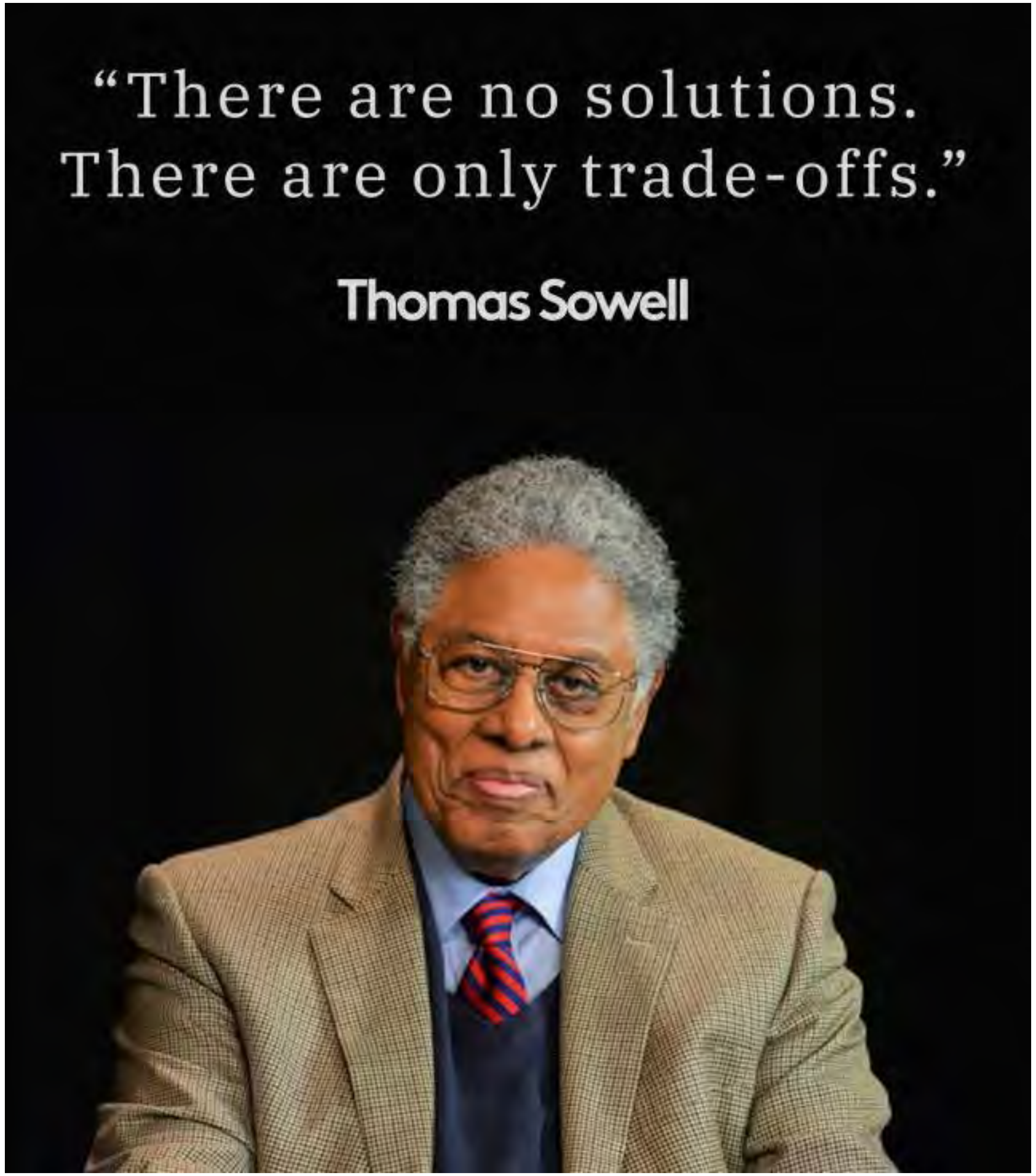
- Growing critical infrastructure supporting nearly every digital service across sectors
- Extremely reliable electrical and water systems required.
- Long operational lifespan with significant land-use implications.
- Impacts experienced locally despite serving global users.
- Increasingly treated as strategic infrastructure alongside transportation, energy, and communications.

Every AI model depends upon: Land. Water, Electricity, Cooling, Transportation , Labor, Governance.
Digital infrastructure is now planning infrastructure.
Data centers are changing how and where cities invest in their communities.



Guiding Questions

- Who benefits?
- Who bears the costs?
- Who participates in decisions?
- Who remains accountable over time?
- How do we evaluate long-term community benefit?



Who Reaps the Benefits?

Communities are often presented with economic projections before broader public benefits are evaluated. Planners must distinguish between private returns and lasting public value.

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Questions to Consider:

- Who receives economic returns?
- Who gains permanent employment?
- Who benefits from infrastructure improvements?
- Who benefits after incentives expire?
- How is community benefit defined and measured?

Community Benefits Should Extend Beyond Norms

Social

- Workforce development
- Education
- Digital inclusion
- Public infrastructure
- Community partnerships

Economic

- Long-term tax base
- Local procurement
- Small business participation
- Innovation ecosystem
- Fiscal resilience

Environmental

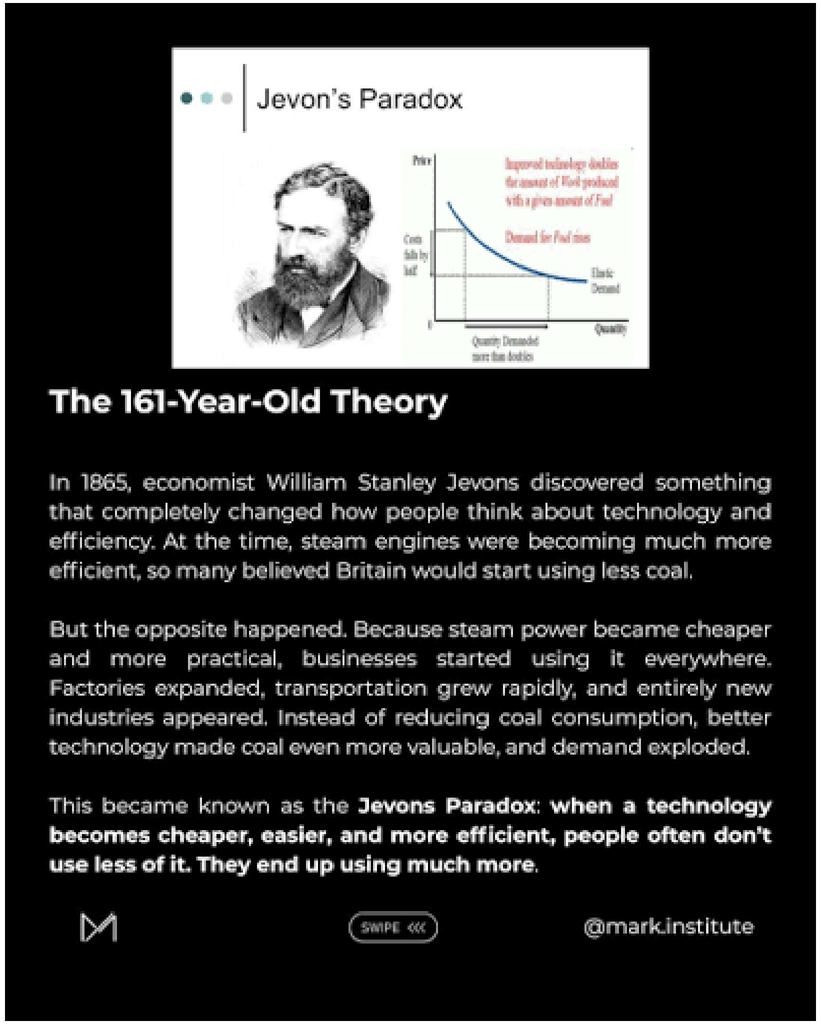
- Improved infrastructure efficiency
- Water stewardship
- Renewable energy
- Heat recovery
- Ecological restoration

Benefits and Paradox

Jevons Paradox suggests that as artificial intelligence becomes more efficient and less expensive to develop and use, overall demand for AI often increases, leading to **greater—not lower—consumption of computing power, electricity, water, and digital infrastructure.**

Efficiency Increases Use: More efficient technologies often reduce costs, encouraging greater overall consumption rather than less.
Lower Costs Drive Demand: As AI becomes cheaper and faster, demand for computing services continues to grow.
More AI, More Infrastructure: Efficiency gains can accelerate investment in additional data centers instead of reducing resource needs.
Resource Consumption Can Rise: Total electricity, water, and material use may increase despite improvements in hardware efficiency.
Planning Implication: Communities should evaluate total system demand, not just per-unit efficiency, when assessing AI infrastructure impacts.

Planning takeaway: *Efficiency does not automatically mean lower environmental impact. If demand grows faster than efficiency improves, AI's overall environmental footprint can continue to expand.*



Who Bears the Cost?

Every infrastructure investment creates costs. Some appear immediately; others emerge slowly over decades. Many are not reflected in project budgets. The total cost of ownership often extends well beyond construction.

Questions to Consider:

Environmental
- Water demand
- Energy demand
- Air quality
- Habitat impacts
- Waste generation

Climate
- Carbon emissions
- Grid reliability
- Climate resilience
- Future adaptation costs
- Extreme weather exposure

Community
- Noise
- Traffic
- Opportunity costs
- Infrastructure strain
- Public expenditures

Hidden Costs - The total cost of ownership often extends well beyond construction.

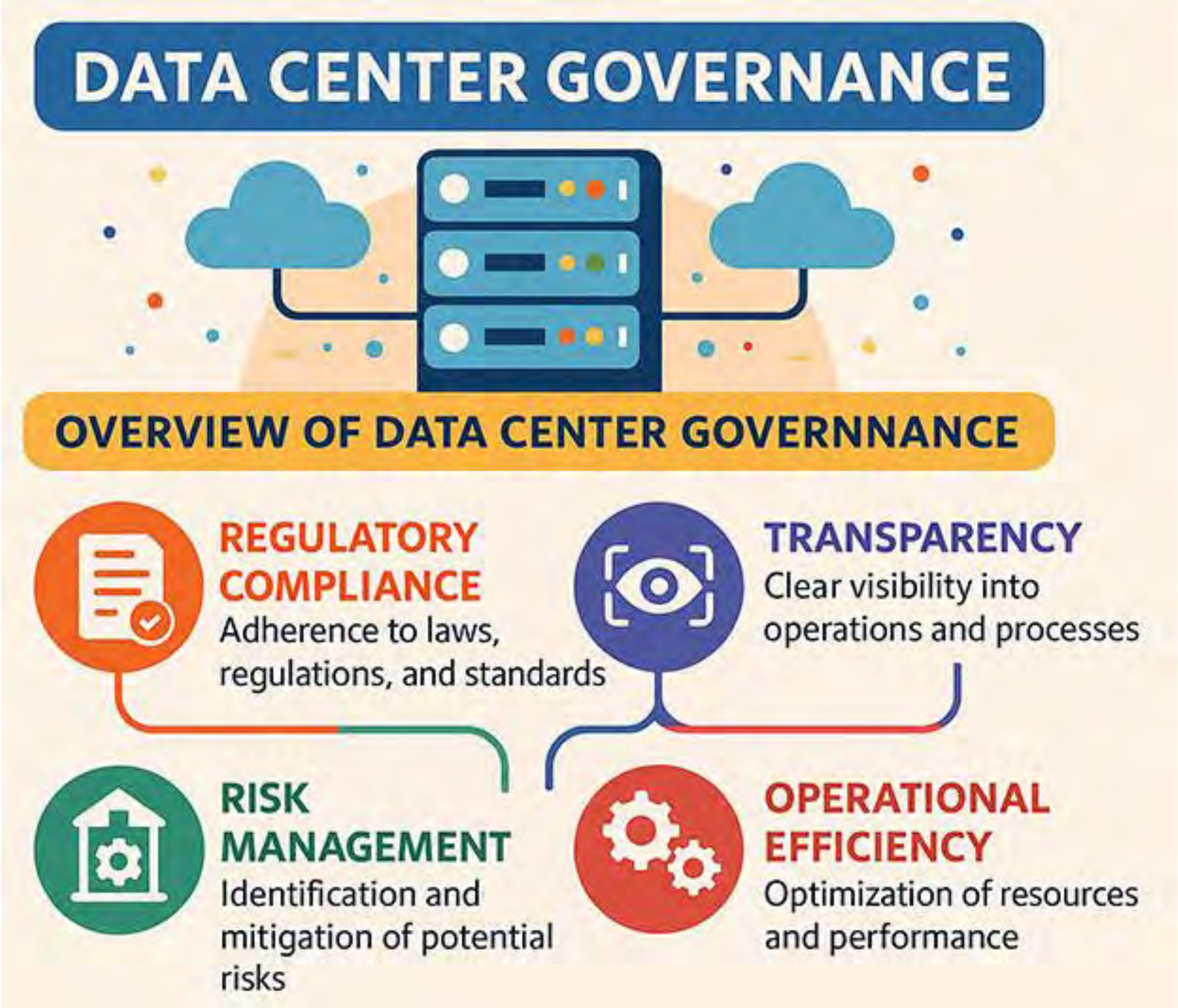
Communities should consider:
- Utility upgrades
- Water system expansion
- Road improvements
- Emergency response capacity
- Environmental monitoring
- Future infrastructure replacement
- Decommissioning

Who Participates?

Good planning depends upon meaningful participation—not simply public notification. Communities possess local knowledge that technical studies often overlook.

Participation Through a Justice Lens
Social: Are frontline communities represented?
Economic: Who negotiates community benefits?
Environmental: Who identifies cumulative impacts?
Governance: Who has decision-making authority?
Knowledge: What community knowledge is valued equally with technical expertise?

Questions to Consider:
Who is invited into planning?
Who is missing?
How early are communities engaged?
How transparent is decision-making?
How are concerns incorporated?



Participation Challenges

Communities should help shape AI infrastructure decisions because they experience the environmental, economic, and social consequences long after construction ends.

(Some) Current Challenges

- **Technical complexity** limits meaningful public understanding of infrastructure proposals and long-term impacts.
- **Limited transparency** around agreements, incentives, and resource demands reduces public trust significantly.
- **Compressed timelines** constrain thoughtful community engagement before key planning decisions are finalized.
- **Unequal participation** leaves historically marginalized communities underrepresented in planning and policymaking processes.
- **Balancing competing priorities** requires weighing economic development against environmental and community resilience.

(Some) Possible Responses

- **Translate technical information** into accessible language using clear visuals and practical examples.
- **Increase transparency** through open data, public reporting, and accessible planning documents.
- **Engage communities early** before decisions, permits, and development agreements become finalized.
- **Center diverse voices** by partnering with trusted local organizations and community leaders.
- **Evaluate cumulative impacts** using interdisciplinary evidence, lifecycle analysis, and community-defined success metrics.

The Data Center Lifecycle

The data center lifecycle encompasses planning, permitting, construction, operations, expansion, and decommissioning, with each phase creating environmental, economic, governance, and community responsibilities across generations.

- **Planning:** Evaluate sites, infrastructure, community needs, environmental impacts, and regulatory requirements collaboratively.
- **Permitting:** Secure approvals, negotiate agreements, complete environmental reviews, and finalize development conditions.
- **Construction:** Build facilities, utilities, cooling systems, electrical infrastructure, and network connectivity safely.
- **Operations:** Continuously provide computing services while managing energy, water, maintenance, and security.
- **Decommissioning:** Retire facilities, remediate sites, recycle equipment, and prepare future redevelopment opportunities.

Lifecycle Assessment: Looking Beyond Construction

Every AI system has a physical lifecycle. Planning should evaluate impacts across each stage.

Build
Land conversion
Materials
Construction emissions

Expand
Equipment replacement
Infrastructure upgrades
Additional demand

Operate
Electricity
Water
Cooling
Maintenance

Retire
Electronic waste
Building reuse
Site restoration

Who is Accountable?

Planning approval is not the end of planning. Infrastructure lasts decades. Accountability should last just as long.

Planning Phase Challenges

- Limited transparency surrounding incentives, resource demands, and long-term community impacts.
- Technical complexity restricts meaningful public participation during planning decisions.
- Economic promises may overshadow environmental and community concerns.

Accountability Responses

- Conduct transparent public engagement before major planning decisions occur.
- Publish independent environmental and fiscal impact assessments publicly.
- Establish measurable community benefit agreements before project approval.

Permitting Phase Challenges

- Regulatory reviews may overlook cumulative regional environmental impacts.
- Community concerns receive limited consideration during accelerated approval timelines.
- Benefit agreements often lack enforceable long-term performance measures.

Accountability Responses

- Require cumulative environmental and infrastructure impact assessments.
- Include community representatives throughout permitting and review processes.
- Tie permits to measurable public reporting and compliance requirements.

Who is Accountable?

Planning approval is not the end of planning. Infrastructure lasts decades. Accountability should last just as long.

Construction Phase Challenges

- Construction disrupts neighborhoods through traffic, noise, and temporary pollution.
- Infrastructure upgrades may burden taxpayers without proportional public benefits.
- Local hiring commitments may not achieve promised outcomes.

Accountability Responses

- Monitor construction impacts using transparent public reporting.
- Prioritize local workforce participation and supplier opportunities.
- Coordinate infrastructure investments benefiting both facility and surrounding communities.

Operations Phase Challenges

- High electricity and water demand strain community infrastructure resources.
- Environmental impacts may evolve beyond original planning assumptions.
- Community benefits can decline after initial public attention fades.

Accountability Responses

- Publish annual environmental and community performance reports.
- Continuously monitor water, energy, emissions, and community impacts.
- Regularly review community benefit agreements with public participation.

Who is Accountable?

Planning approval is not the end of planning. Infrastructure lasts decades. Accountability should last just as long.

Decommissioning Phase Challenges

- Communities may inherit aging infrastructure and redevelopment costs.
- Electronic waste and site remediation require long-term planning.
- No clear responsibility for restoring sites after facility closure.

Accountability Responses

- Develop decommissioning plans before initial project approval.
- Require financial assurances for cleanup and site restoration.
- Prioritize adaptive reuse benefiting future community development.

Accountability Across Time

Planning should define accountability throughout the facility lifecycle—not only during permitting.

Planning should ask:

- Construction: Promises
- Operations: Performance
- Expansion: Adaptation
- Retirement: Responsibility

Questions to Consider:

- Who monitors environmental performance?
- Who tracks promised jobs?
- Who verifies community benefit?
- Who updates agreements?
- Who pays when conditions change?

Evaluating Long-term benefit?

Community benefits should be evaluated across social, economic, and environmental outcomes throughout a facility's lifecycle—not solely by construction jobs or immediate tax revenues.

Social Benefits

Short-Term

Construction workforce opportunities
Community engagement begins
Local education partnerships
Public awareness increases
Temporary workforce housing needs

Medium-Term

Permanent technical employment
Workforce training programs
STEM education partnerships
Digital inclusion initiatives
Emergency service coordination

Long-Term

Higher educational attainment
Stronger regional workforce
Improved public services
Community trust
Better quality of life

Economic Benefits

Short-Term

Construction employment
Local contractor spending
Material purchases
Permit revenues
Infrastructure investment

Medium-Term

Permanent operations jobs
Supplier ecosystem growth
Increased business investment
Expanded tax base
Utility modernization

Long-Term

Diversified local economy
Innovation clusters
Higher regional competitiveness
Workforce retention
Fiscal resilience

Environmental Benefits

Short-Term

Brownfield redevelopment
Environmental mitigation
Infrastructure modernization
Stormwater improvements
Renewable energy commitments

Medium-Term

Efficient water management
Cleaner electrical infrastructure
Better environmental monitoring
Habitat restoration
Climate adaptation investments

Long-Term

Reduced community emissions
Improved environmental resilience
Sustainable infrastructure
Better ecosystem health
Resource stewardship

CBAs and Lessons Learned

A Community Benefit Agreement is a legally enforceable agreement between developers and communities establishing measurable commitments that deliver equitable, transparent, and lasting public benefits throughout development.

CBA Purpose

- Establish measurable commitments benefiting residents throughout the project's entire lifecycle.
- Ensure transparent reporting and independent monitoring of promised community outcomes.
- Prioritize equitable investments addressing locally identified community needs and priorities.
- Create enforceable accountability mechanisms when commitments are unmet or modified.
- Adapt agreements as community conditions, technologies, and infrastructure needs evolve.

Challenges with Community Benefit Agreements

- Benefits are vaguely defined and difficult to measure.
- Agreements lack meaningful enforcement mechanisms.
- Community participation begins too late.
- Benefits expire while impacts remain.
- Accountability diminishes after construction concludes.

(Some) Better Practices for Better CBAs

- Begin community engagement before site selection decisions.
- Define measurable performance metrics with regular public reporting.
- Include independent monitoring and transparent accountability.
- Revisit agreements as facilities expand or technologies change.
- Plan benefits across the complete facility lifecycle.
  - Workforce development & Local hiring
  - Local Environmental Monitoring
    - Traditional and Non-Traditional
  - Parks and Open Spaces
  - Educational Funding By Different Providers
  - Free Internet Access For All
  - Collaborative Resource Stewardship/Governance
  - Transparent Public Reporting

Advocating for Better Outcomes

Communities create stronger outcomes when negotiating measurable, enforceable benefits before development rather than relying upon voluntary commitments afterward.

- Define desired community outcomes before developers propose projects.
- Request independent environmental and economic impact analyses.
- Negotiate measurable, publicly reported community benefit commitments.
- Build coalitions among residents, nonprofits, businesses, and institutions.
- Monitor commitments throughout planning, operations, and facility expansion.

Stronger Benefits

Measurable
Can success be quantified?

Equitable
Who actually benefits?

Local
Will benefits remain within the community?

Long-Term
Will benefits continue decades later?

Enforceable
Can commitments be monitored and corrected?

The question is not whether AI infrastructure should exist. It almost certainly will. The planning question is whether communities have the tools, information, governance, and public voice to ensure that AI infrastructure serves both present residents and future generations.

Selected Resources on Planning for Data Centers

American Association for the Advancement of Science. Key Questions to Ask When Considering Data Centers in Your Community

Chester and Montgomery County, PA Planning Commissions. Data Center Ordinance Guide

Data Center Proposal Tracker (searchable national database)

Lincoln Institute of Land Policy. Policy Download on AI, Land, and Water (forthcoming)

NAACP. Stop Dirty Data Centers (website)

A. Pipa and A. Aley, Brookings Institution. The Local Implications of Data Centers for Rural Communities in the U.S.

M. Turner. Loudoun County, VA: Data Center Capital of the World – A Strategy for a Changing Paradigm

U.S. Green Building Council. Applying LEED to Data Center Projects

C. Walker and I. Goldsmith, World Resources Institute. From Energy Use to Air Quality, the Many Ways Data Centers Affect US Communities