Monday, 18MAY2026
GFDA Third Data Center Task Force
Approx. 40 people attended

Slide presentation by Cushing Terrell, Alan Bronec and Tony Houtz

Presentation Notes

Agenda:
Data Center Types
Data Center Growth
Economic Opportunities
Infrastructure Impacts – Power and Water
Noise Impacts
Ordinances and Regulations
Data Center Examples
Architectural Considerations

Five main types of data centers

1. Enterprise, privately owned within a company's facility (100 kW – 10 MW)
2. Co-Locate, compartmentalized with cages for multiple entities to lease space (1 MW – 50 MW)
3. Hyperscale/AI, purpose built & cloud compute (50 MW – 2,000 MW)
4. Edge, smaller centers, often in residential areas, provide services to residential areas (example: Ziply Fiber) (10 kW – 40 kW)
5. Crypto, often crude buildings without cooling and back up power (10 MW – 240 MW)

By 2030 data centers will use 12% of total US Energy. Current use is 5%. In 2014 it was 1.4%.

AI search uses 1,000X more electricity than a traditional web search.

NorthWestern energy MT Grid is approximately 1,200 MW
University of Montana Missoula campus is 5 MW
Montana State University Bozeman campus is 6 MW

Economic Development Drivers, 1 data center job = approx. 3.5 community jobs developed. Data centers can be an economic anchor as a catalyst for innovation hubs.

Indirect Jobs:
Architect, engineering planning
Local equipment suppliers
Construction industry
Long term maintenance – HVAC/Technicians

Typical Concerns:

1. Overwhelm the power supply
2. Drain the local water supply
3. Use of open land
4. Noise
5. Architectural aesthetics

Power solutions depend on site selection: natural gas availability and cold climate are considered siting advantages.

Onsite Power generation

- Microgrids
- Gas fired turbines
- Solar PV (takes up about 4- 5 acres per MW during peak time)
- Micro nuclear (likely to solve power problems over the next 10 years, new reactors are all cooled with molten salt)

Over 5 MW of power is considered a choice customer with NorthWestern energy and a company can purchase power where they want. NorthWestern does a lot of studies on the facility, the feasibility, the system impacts (i.e. can the grid handle it and what are the costs of the upgrades?).

NorthWestern has recently filed a large load tariff.

Missoula electric cooperative charges a large load capacity charge of $86.1/kW or $8,600/MW

Flathead electric cooperative charges a high density load charge

The developer pays for all grid and substation upgrades.

Water consumption

- New data centers are all closed loop systems
- Direct chip cooling where water goes in pipes over the chips
- NVIDIA's new chips are 113 degrees F inlet and 139 degrees F outlet

Noise can be generated by cooling fans or backup power generators.

Develop local regulations and ordinances:

1. Model zoning ordinance
2. Clear rules benefiting both parties
3. Don't lump all data centers into one category
4. Define allowable sound levels at the property line
5. Require a noise study prior to permit/construction
6. Define screening and architectural requirements
7. Define renewable power requirements

Architecture information:

- Break down the scale
- Create a "front" civic facing side
- Integrate security
- Resource appropriately
- Make the building more compatible with daily life in a community context

<u>Q&A for Cushing Terrell</u>

Q: What do you know about the power available off the Berkshire Hathaway line?
Cushing Terrell is unfamiliar with the particulars of that.

Q: Why is geothermal not being discussed as a power source?
Not all regions have enough hot water and volume for large data centers. Some smaller date centers use bore hole wells to supplement cooling. Nevada has good geothermal resources. Cooling is being utilized locally more around Great Falls than heating. There is a pretty large geothermal situation in Yellowstone.

Q: I want to talk about wafers.
NVDIDA is the king of chips for data processing. They use a cold plate that chips sit on and the water circulates to cool them. Not particularly familiar with wafers.

Q: How do consumers avoid the cost that Billings or Butte might pay for electricity?
The biggest upfront cost is large load costs for distribution and transmission. Utilities and coops can implement a capacity charge – a charge per MW to put in the bank if upgrades are needed down the road.

Q: If we had nuclear powered data center in our area, would there be an issue with waste? What do you do with nuclear waste?
Lot of development happening now to recycle spent fuel, some can be used in the medial industry for imaging. Idaho national labs may have a repository program for some waste.

Q: If we have cloud processing, why do the centers have to be so large. In Finland, they use the waste heat. Why don't we do that?
Can absolutely design to use waste heat with a complementary business like a greenhouse.

Q: Is there an optimum size of data center? Can they be sized smaller? Why 600 MW?
It has to do with compute power. The more power, the faster.

Q: Any studies of long term job replacement stack up against the short term job gains?
There are different sides to the story. Will entry level or middle management possibly be reduced, depends on the situation and industry. Pretty clear that jobs will change, not much doubt about that. There are many things that cannot be automated at this point. There are reports coming out of the tech industry where code is being automated. The jury is still out on what will happen overall with job impacts.

Q: Have you seen effective ordinances put into municipal packages that describe eventual blight if a data center leaves?
Some jurisdictions have decommissioning clauses and have to take care of electrical waste, solar farms absolutely have this (an insurance policy) if the AI hyperscaler goes bankrupt.

Q: Do you know what percentage of the data centers around can compute qubits?
Cushing Terrell is not familiar with this.

Q: Are the facilities proportionate in size? Do they scale linearly?
It depends on the rack density. 20 years ago rack density was very different from what it is today. It is all about how much power the GPUs are driving. Companies try to design

infrastructure can be flexible so GPUs can be changed out. Elon Musk also looking at data centers in space. GPUs can be super lightweight, panels could get sun 24 hours per day.

Q: Explain impact on water with a closed versus an open loop data center?
A car engine is a closed loop. Heats, circulates, heat dissipates, comes back as cool. Can do this because of inlet temperature (113 to 139 F) – outdoor environment or couple with complementary business. Today is all closed loop, all data center developers are going away from open loop. Fill the loop, don't add water to it. Just like the car.

Open loop would use adiabatic cooling, water drips over fins of radiator to cool it down.

Q: How well are we building the lines? Are failing lines a concern? Last 100 years? What's the maintenance?
Not much maintenance. Lines made of materials that last a long time. Add glycol to reverse osmosis or distilled water.

Q: How many loop cycles, how much glycol in the cooling water systems?
40% propylene glycol and glycerin to get to 30 below zero. There is a makeup system to inject additional fluid as needed.

Q: Does water gain toxicity from going over the equipment?
No, it's all stainless steel. No material of construction compatibility issues.

Q: (For Jolene)- How is this information feeding back into the Great Falls growth plan?
GFDA is a private non profit, not the city. GFDA shares information with the city regarding best practices, what we are hearing, what we are finding, here are things we want to look into such as the regulatory environment, decommission, ordinances, closed loop, etc. We use this information to evaluate companies if and when we have a company that says we want to be in Great Falls. We need to have a community forum and present to companies that here is what we need to know, this is the information we as a community want to know. Companies should talk to our community early and often. Whether or not companies take GFDA's/Jolenes' advice or not is another topic.

Q: Any there any programs to ensure local people are trained for permanent jobs? Like similar to nursing programs?
There was considerable discussion from the group on this topic but not directly from Cushing Terrell. There was conversation around various training programs in the state

from a union perspective and construction job numbers and opinions on how companies like Vision Net are filling their jobs.

Comments:

- Concerns on transparency and wanting to ensure that any decision about businesses who many want to come here are being transparent. Do not want deals and contracts behind the curtain.

- Concerns and curiosity on the likelihood of the federal government or military putting data centers in place in an eminent domain fashion.

-A data center was the only workable solution to preserve the old Rainbow Dam powerhouse due to security issues at the dam. It would have been a wonderful industry, and NorthWestern Energy would have accepted the 6 people working there to preserve the historic building. The building did get torn down.

- Concern is longevity of the data centers. Look at China, data centers are just skeletons now. Google wants to put data centers into space. Technology is moving so fast. Will be obsolete in 5 years.

-In 2012 Cheynne, WY got their first data center. Cheyenne has reaped a lot of jobs and tax base from data centers. Construction jobs have been ongoing in Cheyenne since 2012. Only in the past two years have they received any complaints. The economic development team in Cheyenne has perspective on crypto, the big ones, the small ones. GFDA will schedule a presentation with the Cheyenne economic development team.

-Concerns over how the community will benefit from a data center and why Great Falls would even want one.

-Concern that data centers will not do the right thing and the community will have to fight them on everything to try and get them to be decent corporations.

- Concerns about surveillance that comes with AI.

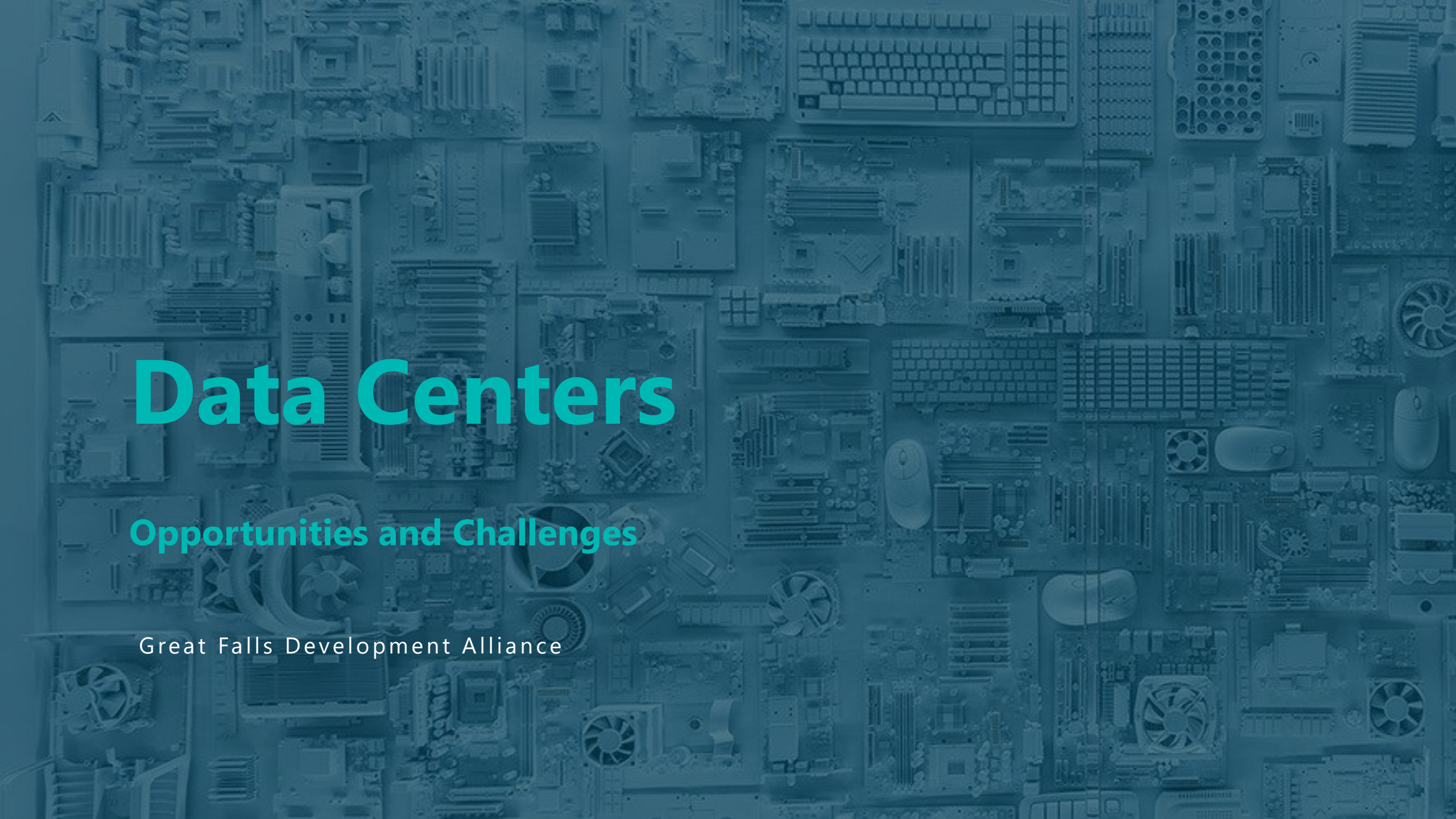
-Concerns about an AI data center coming in and taking all the power from Malmstrom since Malmstrom federal government inside the fence.

-Comments on Janicki tax abatements and the perception that Janicki was paid money up front to come into town. Clarification was made that companies are offered tax abatements after they are set up and abatements are negotiated in specific circumstances.

-Comments about being insulted by data centers and how much money they have and they will ruin the environment. The money should be able to mitigate problems but it seems like the private sector will not fix things to make the public have an easier time.

-Discussion among the attendees on varying opinions regarding construction jobs and out of state versus in state workers. Some comments indicated that companies will try to hire locally and training centers could be established in places like Butte or Great Falls to maintain technological skills. Concern over ongoing jobs in electrical, HVAC, etc. would be contractor and not on a full time payroll. Comment that the electrical and HVAC jobs are full time jobs for the companies they work for, just not full time jobs on the data center payroll necessarily.

-Comment regarding Montana has a history of natural resources being controlled by a few people and we are all being snookered by the public service commission.



Data Centers

Opportunities and Challenges

Great Falls Development Alliance

Cushing Terrell®

Founded in 1938

+550 Talented Professionals

8 states with 17 Locations

Serve Clients in Government, Commercial, Retail, Residential, Education, Healthcare, and Infrastructure

Hundreds of Green Certified Projects

Scores of Data Centers with Millions of Square Feet of High-tech, Data-driven Facilities

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Electrical Engineer

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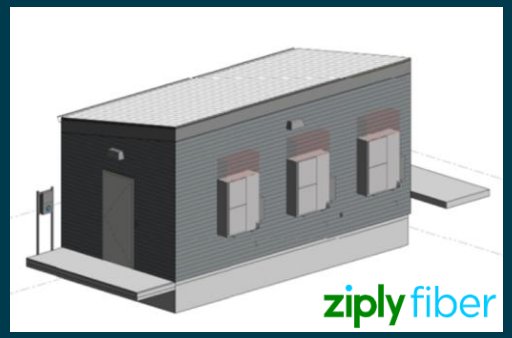
- Ordinances and Regulations
- Data Center Examples
- Architectural Considerations



Types of Data Centers

- Enterprise
- Co-Locate
- Hyperscale/AI
- Edge
- Crypto

Data Center Growth

2014

1.4% total US electricity

2016

1.9% total US electricity

2026

5% total US electricity

2030

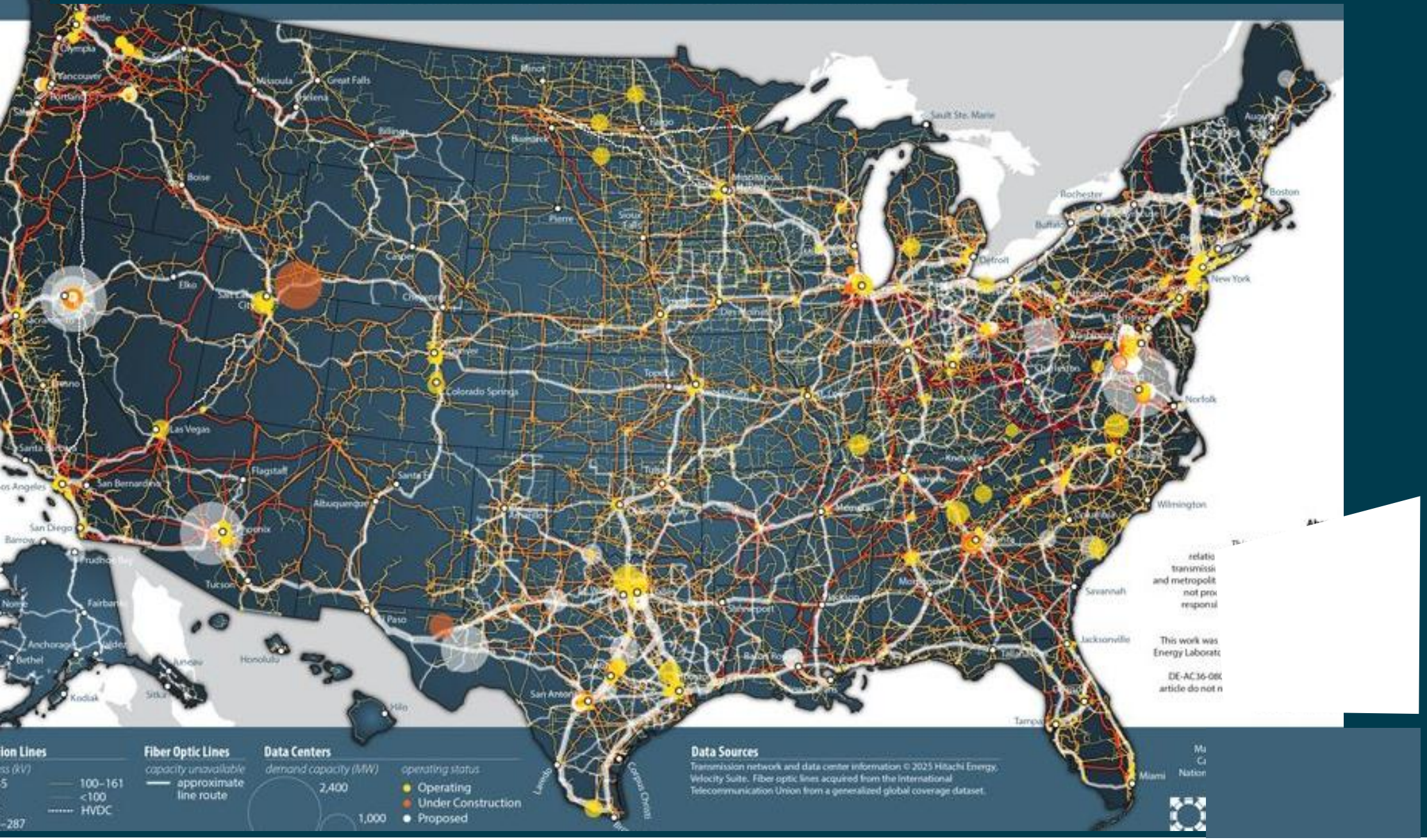
12% total US electricity

AI search uses 1000X electricity as a traditional web search

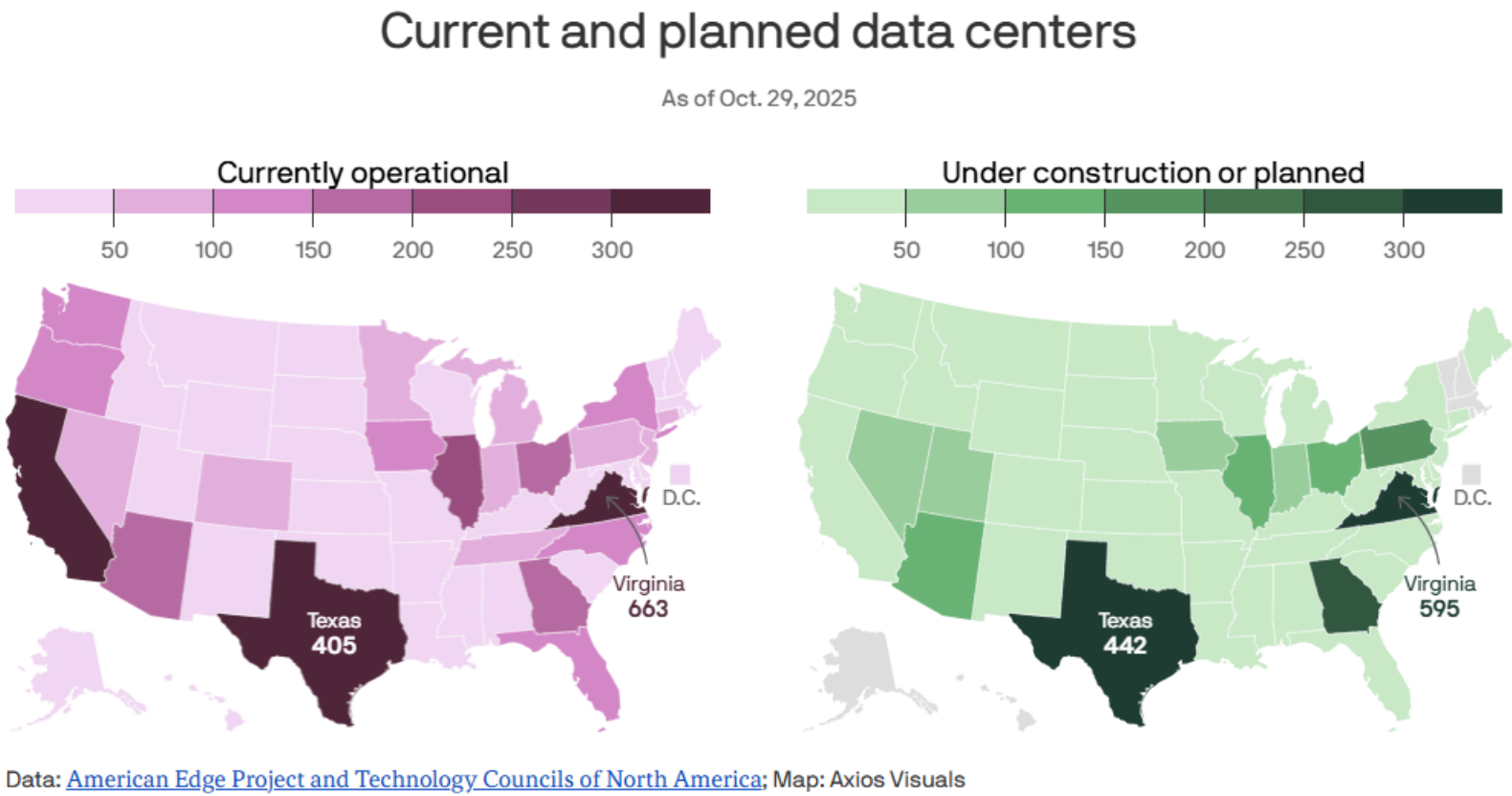
2.5-3x growth by 2030

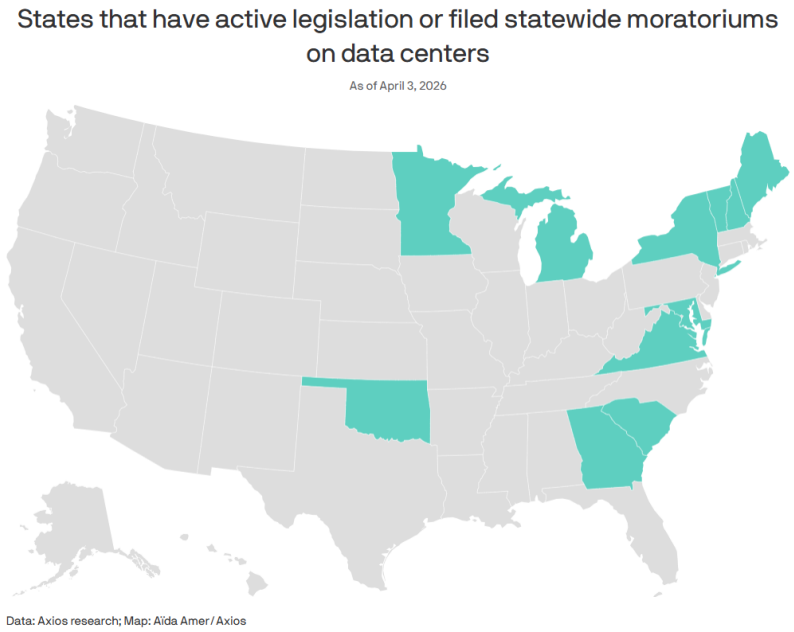
Data Center Growth

Global > National > Regional > Local



Data Center Growth | *A Tale of 3 Maps*





Growth ***More Growth*** ***Not Growth***

Economic Development

Economic Multiplier Effect

Economic Anchor

(Catalyst for Innovation Hub or High-Tech Campus)

Employment Opportunities

(1 Data Center Job = 3.5 Community Jobs)

Local Tax Revenue

- **Architect Engineering Planning**
- **Local Equipment Suppliers**
- **Construction Industry**
- **Long Term Maintenance**

Data Center Growth
Not Without Concerns

#1 Overwhelm the power supply
#2 Drain the local water supply
#3 Use of open land
#4 Noise
#5 Archtectual aesthetics

Typical Power Requirements

- Enterprise: 100kW-10MW
- CoLo: 1MW-50MW
- Hyperscale/AI: 50MW – 2000MW
- Edge: 10kW-40kW
- Crypto: 10MW – 240MW

- University of MT Campus = 5MW
- NWE MT Grid = approx. 1200MW

Characteristics of the AI Load Profile

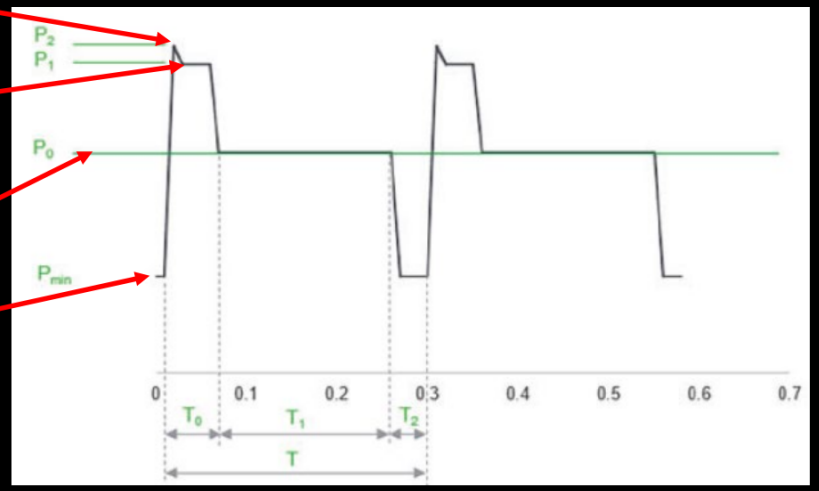
P2 – Instantaneous Peak with PSU Overshoot ~+15% EDP

P1 – Electrical Design Power Peak 100% to 150% of Po

Po – Chip Thermal Design (TDP) ie "Nameplate"

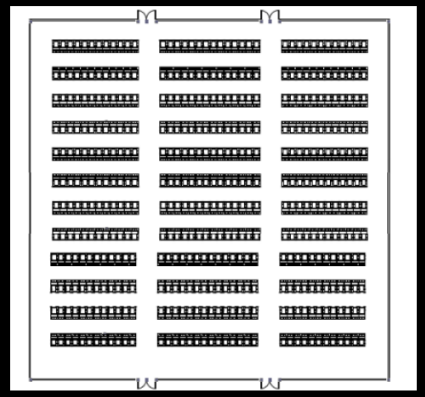
PMIN – Minimum Chip Load During Training

To = ~50ms
T1 = 200ms to multi seconds
T2 = 0 to multi seconds
T = 250ms to multi-seconds



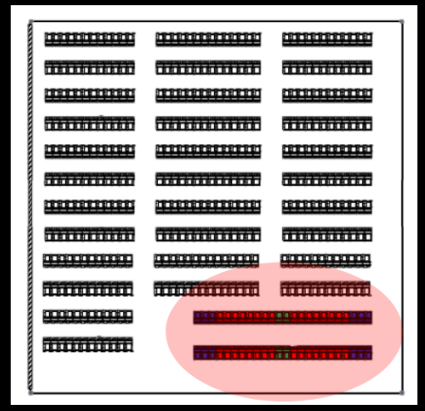
AI Drives Densification at the Data Center Level…..

Traditional Data Center Density



- 10kSq Ft White Space
- ~456 Useable Rack Positions @ 6kW/Rack.
- 2,736kW Critical IT Load.
- ~781 Tons Critical Cooling

Accelerated Parallel Compute



- 1174 Sq Ft White Space
- 32 Rack Positions @ 132kW/Rack. 4,224kW Variable, Accelerated Parallel Compute Load + 404Racks @ 6kW 2,424kW = 6,648kW
- ~1,880 Tons Critical Cooling (Liquid + Air)

Power Concerns

- Grid capacity
- Substation capacity
- Power quality impacts
- Generation capacity
- Rate increases

Power Solutions

- Site selection
  - Natural gas availability
  - Cold climate
- On site power generation
  - Microgrids
  - Gas fired turbines
  - Solar PV
  - Battery Storage
  - Micro-nuclear

Who Pays for Grid Upgrades?

NorthWestern® Energy

MISSOULA ELECTRIC COOPERATIVE

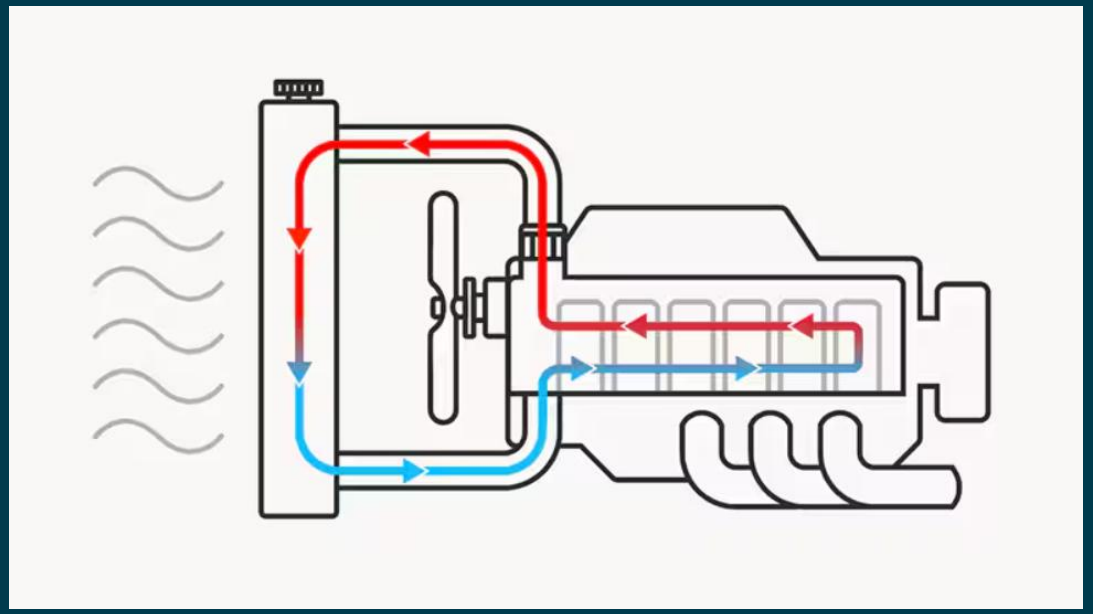
Large Load Capacity Charge $86.1/kW

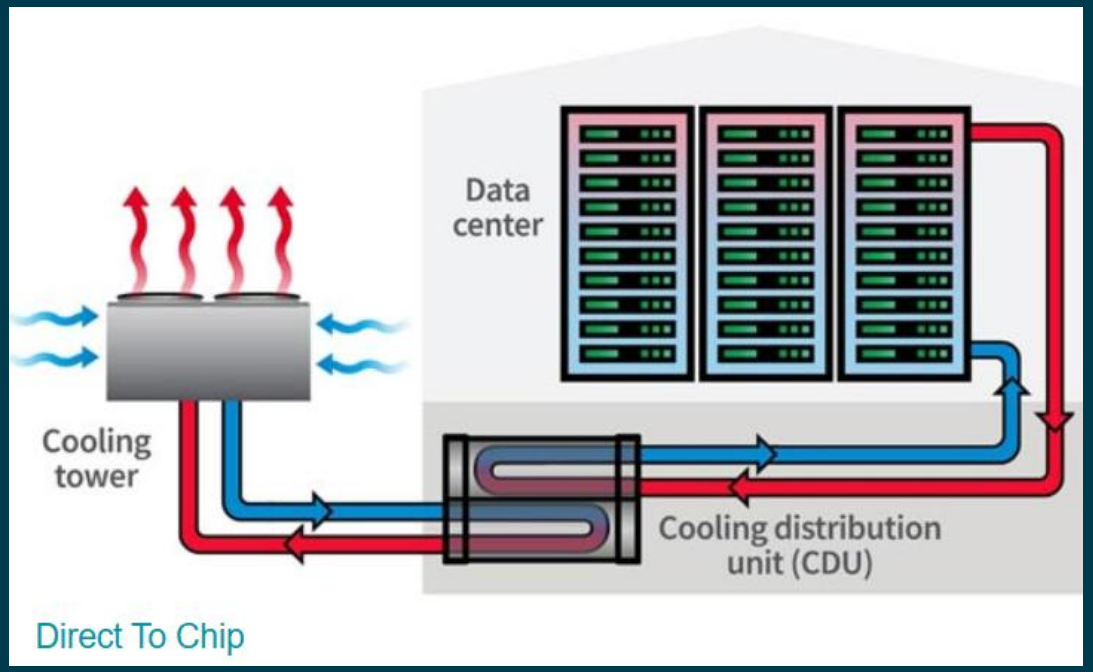
FLATHEAD ELECTRIC COOPERATIVE

High Density Load Charge

- NWE Choice Customer 5MW
- NWE Large New Load Tariff
- NWE Studies
  - Facility Study
  - Feasibility Study
  - System Impact Study
  - Can the grid handle the load?
  - Cost of the upgrades?

- Developer pays for all grid and substation upgrades





Water Consumption

- Direct Chip Cooling
- No Water Consumption
- Closed Loop System
  - 104 deg F inlet temp
  - 122 deg F outlet temp

NVIDIA's New Rubin Vera Chip Uses 45°C (113°F) Liquid for Cooling

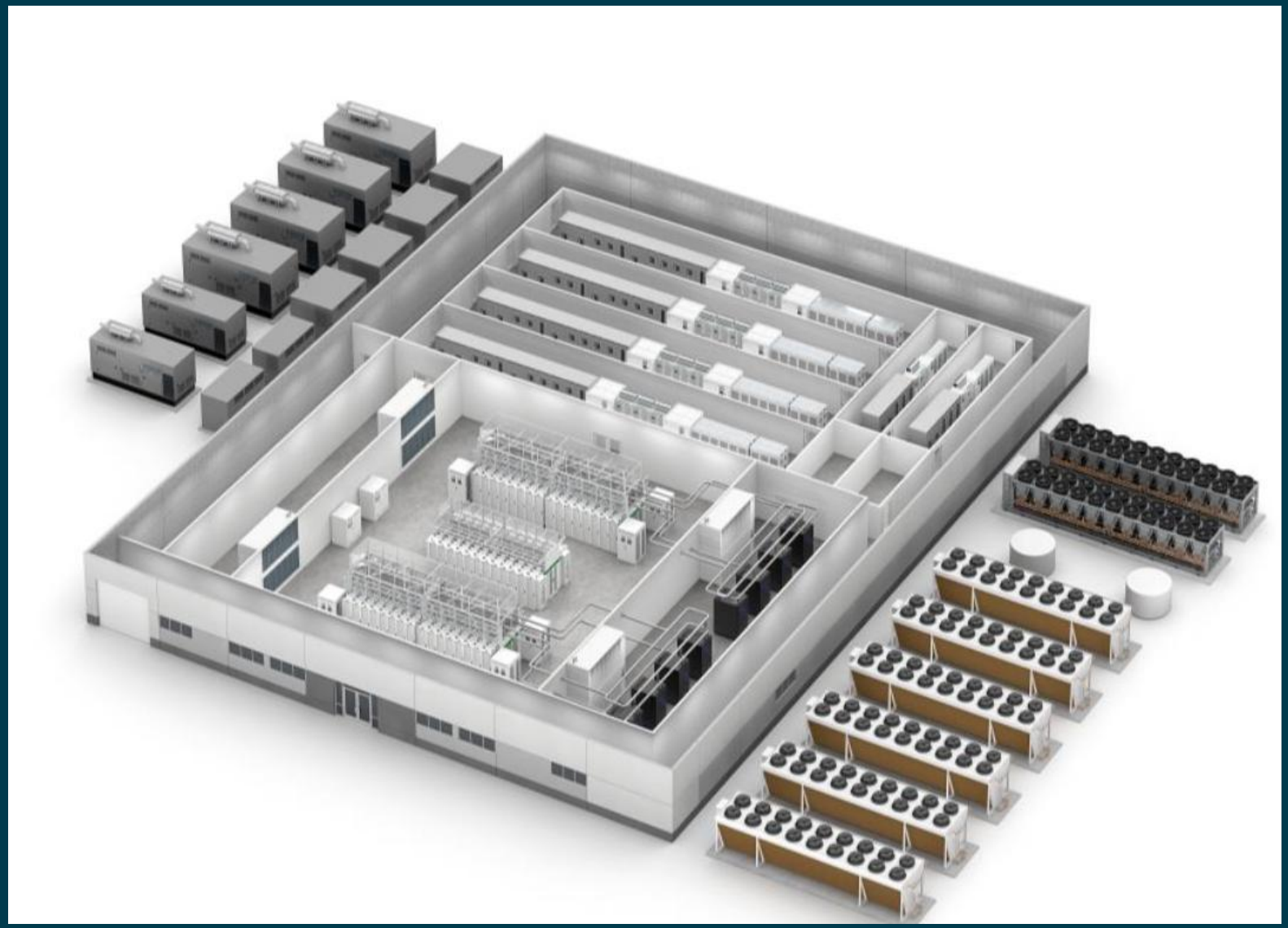
Noise

- Cooling fans
- Backup power generators

Develop Local Regulations and Ordinances

- Model Zoning Ordinance
- Clear rules benefit both parties
- Don’t lump all data centers into one category
- Define allowable sound levels at the property line
- Require a noise study prior to permit/construction
- Define screening and architectural requirements
- Define renewable power requirements

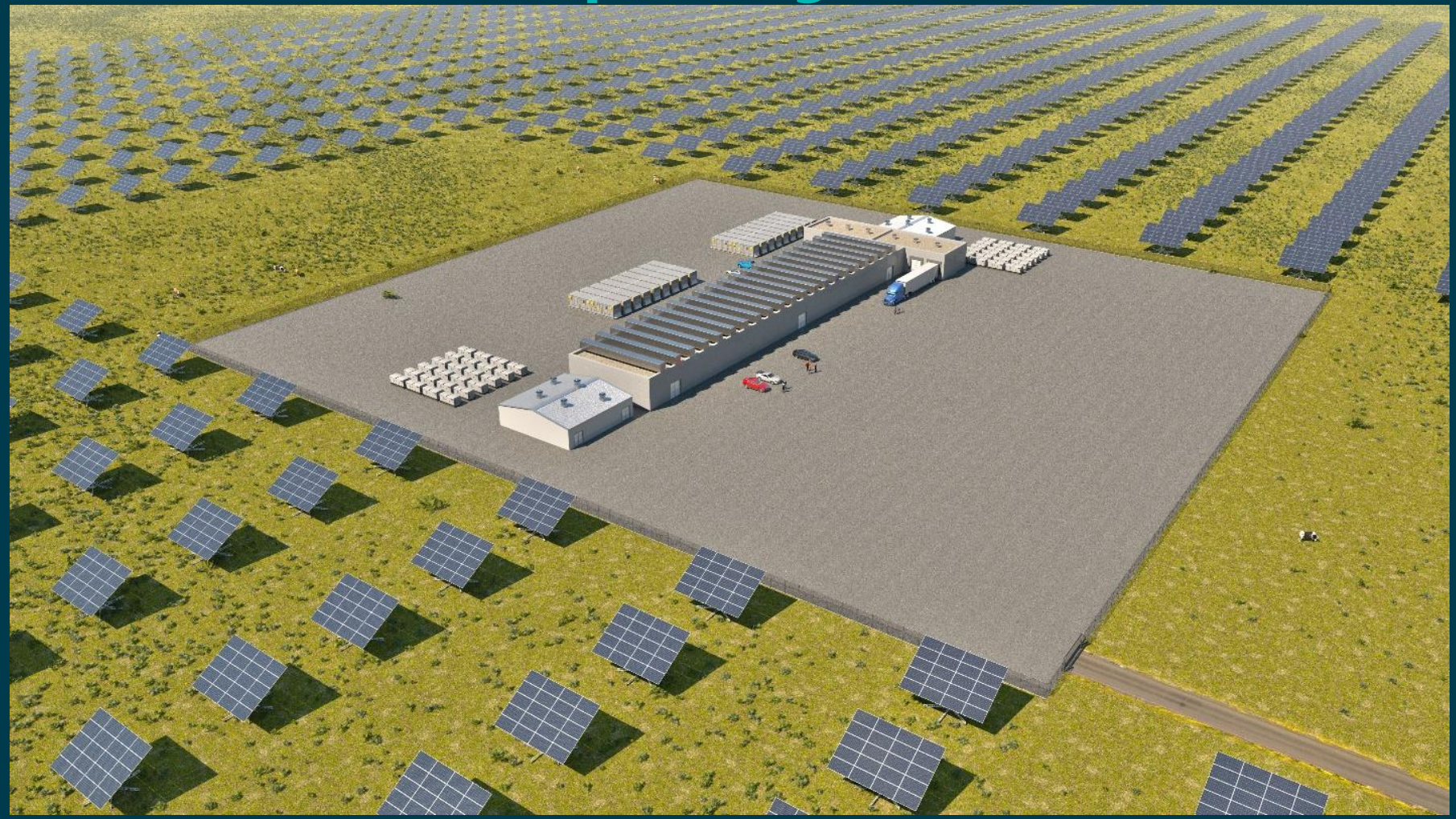
Typical 12MW AI Data Center

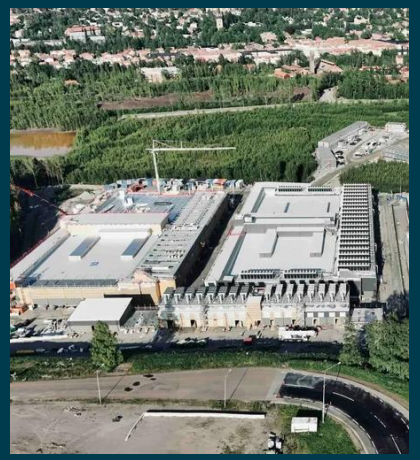
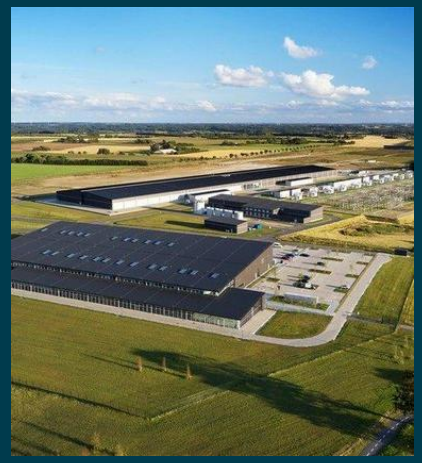
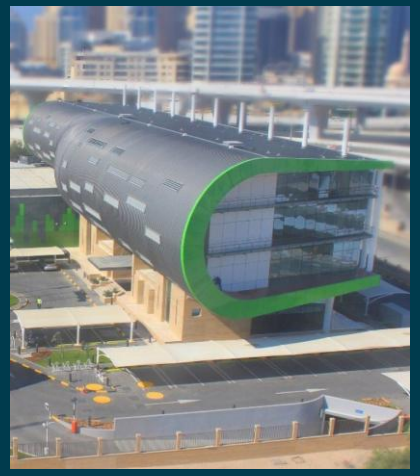


- 227kW/Rack
- 37,391 sf building

AI Data Center

- 10MW
- Power from solar PV + BESS
- Gas fire power generators






Top Nine
100% Renewable

EcoDataCenter, Sweden 90MW
Viborg – Apple, Denmark 100MW
Moro Hub, UAE 100MW
Meta, Denmark 300MW
Switch, Las Vegas 495MW
Scala's Tamboré, Brazil 600MW
Switch Citadel, Reno 650MW
Eagle Mntn-Meta, Utah 800MW
SINES DC-Start, Portugal 1.2GW

NSA. Utah

NO

Microsoft. Virginia

Architecture.

Policies for Better.

Comarch. Arizona

Architecture.

Break down the Scale.

Stratos. Utah

Coresite. California

Architecture.

Break down the Scale.

Civic-Facing Side.

Fannie Mae. Maryland

Architecture.

Break down the Scale.

Civic-Facing Side.

Integrate Security.

Wonder Valley. Utah

Architecture.

Break down the Scale.

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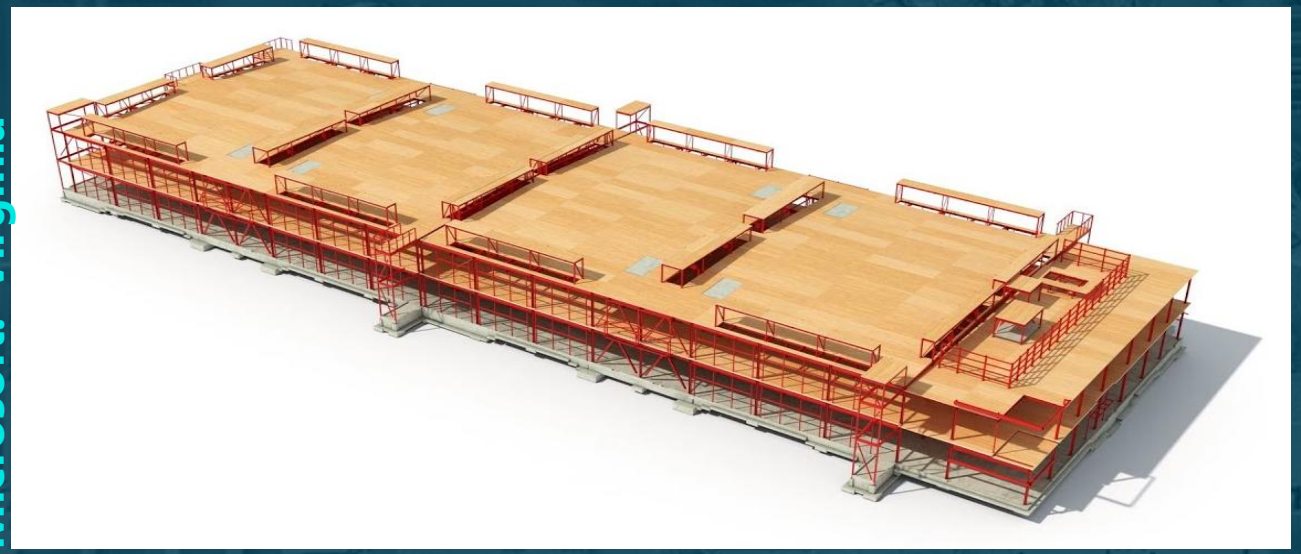
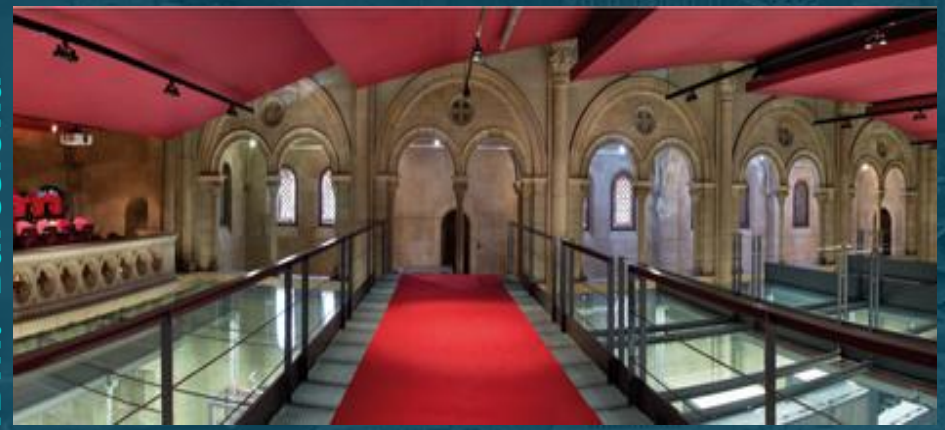
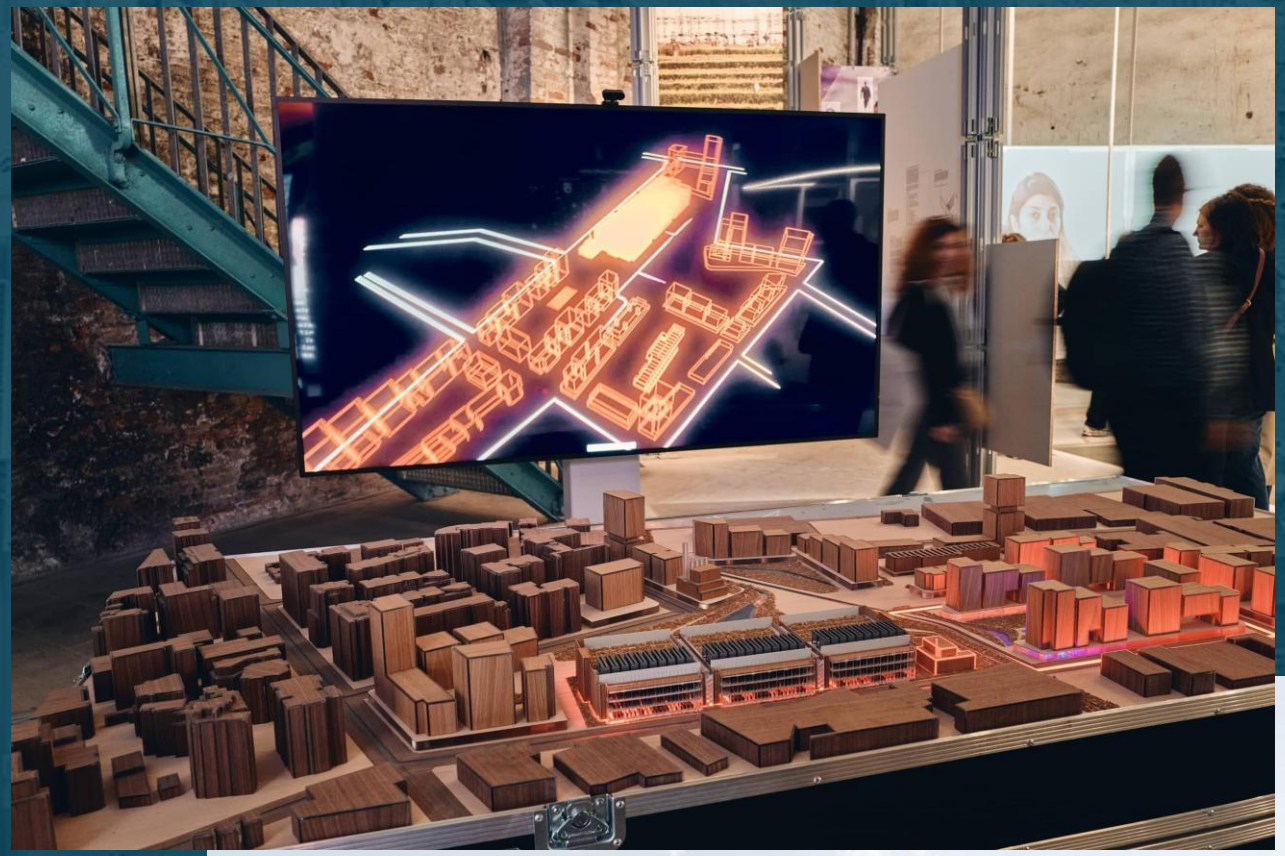
Resource Appropriately.



Microsoft. Virginia



IBM. Barcelona



Goodman. Venice Biennale

Affinius. London

Architecture.

Break down the Scale.

Civic-Facing Side.

Integrate Security.

Resource Appropriately.

Community Context.

Questions

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