Data Center Planning Framework

Larimer County & Fort Collins

Full Draft – v6

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Table of Contents

EXECUTIVE SUMMARY

Like the Internet in the late 1990's, today, Artificial Intelligence is rapidly integrating into almost every aspect of daily life. This is driven by an economic and international race for AI Supremacy. This unprecedented growth has made Data Centers an essential piece of infrastructure. They are now an extremely large portion of the economy, and can bring significant stimulus, jobs, and tax revenues to local jurisdictions.

However, Data Centers require an immense amount of power, water, land, equipment and capital. States and jurisdictions are attempting to craft responsible regulations to incentivize lower impact solutions and earn the community's trust.

The following framework discusses the main considerations for data center development, and recommends plausible, mutually beneficial regulatory solutions for Larimer County, Colorado.

INTRODUCTION

WHY THIS MATTERS

On November 30th, 2022, the world changed dramatically when OpenAI released ChatGPT to the public. This was the first **Large Language Models (LLMs)** to capture the public's attention, growing rapidly to 100 million users in the first 2 months[i]. Built on the collective knowledge of the internet, it provided a human-like interface to discover, query, and generate virtually any digital experience. Recognizing the paradigm-shift, this model was quickly followed by thousands of competitors across the world, creating what many call an **AI Arm's Race**.

There are two major steps for modern artificial intelligence. First, a model must be **"trained"**, which involves "scraping" trillions of webpages, images, datasets, and digital interactions, to discover repeated patterns. Once a model has been trained, **"inference"** is the process of querying trained models to give users billions of responses daily[ii]. Both processes require massive amounts of digital storage, memory, and processing power, that exceeds the capacity of any individual computer or server.

To centralize and satiate this demand, companies utilize data centers to maintain and deliver their product. Unlike personal computers or company servers, data centers typically provide storage and compute to thousands of businesses simultaneously. By installing hundreds of thousands of servers in one location, data center operators can rent storage and compute to customers as needed and allow businesses to scale workloads very quickly. Data centers first rose to prominence in the 2010s, to support cloud computing and streaming services. Today, with the creation of generative video applications like Sora, and rapid adoption of **"AI agents"** (digital workers), demand for data centers is exploding to train and maintain the most computationally complex workloads.

In response, technology companies have been building data centers as fast as possible. In attempts to outpace their competitors and capture market share, companies have asked jurisdictions to forego many typical planning and permitting requirements, in exchange for numerous construction jobs and economic stimulus. Previously, most data centers were either "**multi-tenant"** (enterprise cloud), or "**edge"** (telecom and IoT), but today, it is expected that 67% of data center capacity[iii] will be built, or leased, by "**hyperscaler"** cloud service companies. Though data centers enable the magic of artificial intelligence, they consume massive amounts of electricity and freshwater, and can create acute sources of air and noise pollution. They also can lead to higher utility prices, generate few permanent jobs, and are typically incompatible with human-scale environments.

CLIENT CONTEXT

Larimer County is situated on the north-end of the Front Range Corridor, within the South Platte River Basin. Fort Collins is the county seat and largest city. There are seven other incorporated jurisdictions, many of which are growing quickly. Since the county has significant amounts of connectivity, freshwater, and a highly educated workforce, it is likely an attractive location for data center developers.

Though they have not received any recent applications for data center developments (as of December 2025), this is only a matter of time. In January 2026, Laramie County, Wyoming approved a $1.2 billion, 1.8-gigawatt data center campus just north of the state-line. The 113-acre campus has plans to scale to 10-gigawatts, which would make it the largest in the entire country[iv]. Similarly, the company Global AI recently bought 438-acres in Weld County, Colorado to develop 18–60-megawatt facility. This project is being built in partnership with the Saudi firm Humain and could expand to nearly 1-gigawatt.[v]

To more thoughtfully address data center's impacts on their community, Larimer County implemented a 6-month Moratorium on Data Center Applications.[vi]

How many data centers in Larimer County and scale

PURPOSE

To determine the best planning and regulatory approach, the county is looking to develop a "Planning Framework" for data center applications. This framework should describe and quantify the environmental, economic and community compatibility impacts of data centers.

It also should suggest appropriate definitions, thresholds, and regulatory tools that can easily be integrated into existing land use codes and permitting processes. These figures should be legally robust and based off logical engineering and economic considerations. This could include, but is not limited to Colorado Revised Statute 24-65.1-101, better known as the **"1041 Powers"**, which gives local jurisdictions the power to regulate matters of statewide concern, like power generation and excessive water use[vii]. Larimer County has adopted these powers as **Article 10** of their land use code[viii]. Since data centers are becoming very large and may require significant infrastructure, many can be considered projects of "state concern".

Even if a county does not have legal authority to regulate all aspects of private property, commerce and permitting, they can structure some tax incentives to be contingent on aspects outside their control, to encourage specific outcomes for data center development.

OBJECTIVES

The goals for this project include but are not limited to the following:

- Research and distill other existing Data Center regulations
- Define "Data Centers" and related terms for Larimer County and the City of Fort Collins Land Use Codes
- Describe environmental, economic and community compatibility impacts of data centers. Propose research-backed thresholds, ratios and mandates that could be incorporated into Land Use Codes
- Research and advise on how, when, and if tax incentives should be allocated
- Develop a Regulatory Scoring Matrix based on tiered spectrum of regulations and incentives

FRAMEWORK OUTLINE & APPROACH

The remainder of this framework is structured with the following sections:

- Background Research
    - Data Centers
    - Regulatory Landscape
- Methodology
- Recommendations
    - Priorities & Decision Points
    - Regulatory Tools
    - Recommended Definitions & Thresholds
- Conclusion & Next Steps
- Appendices: Regulatory Scoring Matrix

DATA CENTER RESEARCH

HISTORY

Since their inception, data centers have had 3 consistent requirements: storage, compute and connectivity. “**Storage”**, refers to the disks/drives that store digital data; “**compute”**, refers to the processing of that data; and “**connectivity”**, refers to the sharing of data across a network.

The earliest “data centers” we're just very large computers. Mostly housed at universities, national labs and military installations, these early computers and mainframes stored and processed critical military, financial, and scientific information. Leveraging new communication protocols, these computers were later connected in the 1980s into the prototypical internet like the National Science Foundation Network (NSFNET), NASA Science Network (NSN), Energy Sciences Network (ESnet), and MILNET. Leveraging new private fiber optic backbones, the first true “data centers” housed the routers, switches and webservers that made the rise of the Internet in the mid-1990s possible. MAE-East in Northern Virginia and MAE-West in Silicon Valley, were the first hubs (IXPs) of the Internet, and transferred most of the internet traffic across their routers. MAE-East in particular, was thought to have carried over 70% of worldwide internet traffic in 1997.

Expecting unrelenting growth, many early internet companies built their own private enterprise data centers to service thousands of simultaneous users visiting their websites. However, after the dot-com crash in the early 2000s, the remaining internet giants had to find ways to generate revenue from their over-sized assets. Amazon in particular, who had built capacity for a peak-Christmas shopping customer base, found that for the other 11 months of the year, their hardware was underutilized. They started the second revolution in data centers, **cloud-computing**, with the launch of Amazon Web Services (AWS) in the mid-2000s. Now, instead of companies buying and maintaining their own servers, they could lease digital hardware capacity from AWS.

The demand for data centers increased dramatically again in the late 2000s with the introduction of Facebook, the launch of the iPhone, and the rise of streamers like Netflix & YouTube. Previously, most of the information on the internet was text, which requires much less storage and compute capacity to manage. However, once Americans started to record videos of their daily lives, companies again invested billions in hardware to meet this demand.

The fourth revolution in data centers was the adoption of machine learning in the late 2010s. This wave was enabled by the tremendous advancement of **Graphical Processing Units (GPUs)** and parallel processing. GPUs, unlike CPUs, were architected to repeat simple tasks, millions of times per second, like rendering pixels on a screen. To do this, they utilize hundreds of processing **cores** to render different parts of a screen simultaneously. This feature was particularly helpful for machine learning, since it enabled millions of calculations needed for neural networks. By binding hundreds of GPUs together with proprietary software, the GPU designer NVIDIA soon became the most important and valuable company in the world. This era also coincided with the rise of cryptocurrency mining, which similarly used GPUs to perform similarly simple, yet vast, decryption algorithms to unlock digital tokens.

The Generative AI and Large Language Model (LLM) revolution we are witnessing today is an extension of the machine learning breakthroughs of the late 2010s. However, to enable ChatGPT, there were a couple more inflection points. First, instead of focusing on specific machine learning tasks, like Data Science workflows, companies like OpenAI decided to train **"foundational models"** that ingest every piece of data on the internet. This, unsurprisingly, requires significantly more storage and compute, than other traditional data centers. Second, the **"transformer model"**, a deep-learning algorithm, enabled queries to have the thinking-like qualities we observe in modern AI. This phenomenon is called **"attention"** and occurs in part because the model reruns after every new word, or token, is chosen. This methodology generates fantastic results, but again, requires significantly more memory and compute capacity for inference.

Though some exceptions for Edge or Enterprise, Data Center's typically reflect the era they were built

Commercially competitive Data Center's will upgrade equipment to meet customer needs and refresh data

TYPES

Legally speaking, the definition of data center spans multiple industries, sizes, uses, and eras. As previously discussed, data centers evolved significantly based on the year/era they were conceived. Though many of the first "data centers" occupied the basement server rooms (or MDFs) of commercial buildings, and could legally still be construed as data centers, most practitioners consider modern data centers to be larger stand-alone structures.

Today, there are about five main types of data centers:

Type	Use	Capacity (MW)	Layout	Other Names
Edge	Telecom/IT, IoT	0.05 - 1.0	Outdoor Enclosures with 1-10 Server Racks	"Micro"
Enterprise	Bank, Hospital, Federal Gov, Other Private Data	1.0 - 10	Regional Offices, Server Rooms	"On-Prem"
Colocation	Owner Leases space for multiple tenants, Private Cloud, Large Websites	5 - 50+	Larger Industrial, converted Office/Telcom Buildings	"Managed"
Hyperscaler	Public Cloud Service Providers (AWS, Google Cloud, Oracle, IBM, Meta)	10 - 100+	Large Campuses	"Public Cloud"
AI Factories	Training and Hosting LLMs/Foundation Models	20 - 1000+	Typically Large Campuses, often more remote locations	"AI Clusters" Often owned by Hyperscalers

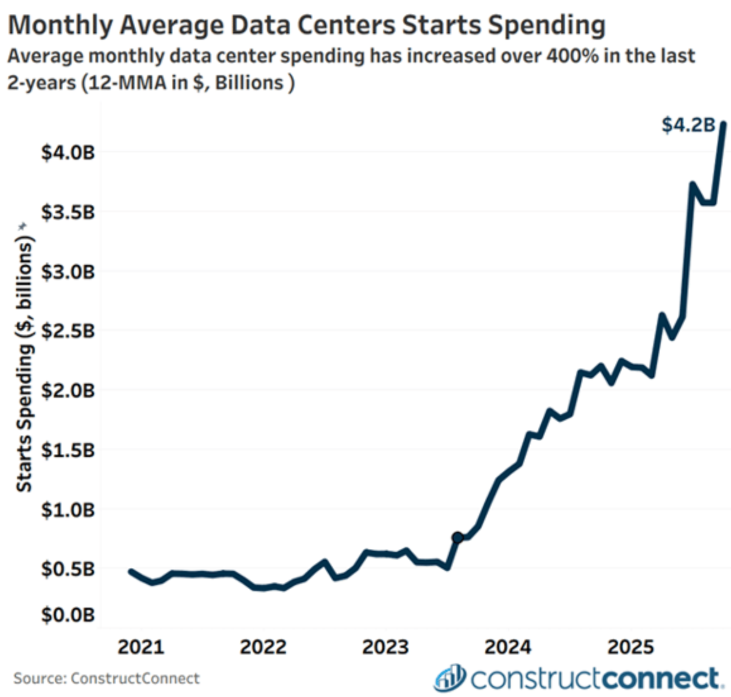
ix, x

In addition to data center categories, there are four tiers. Data center **"tiers"** refers to required reliability/uptime and redundancy for a given facility. Most Colocation, Hyperscale and AI Data Centers are expected to be at least Tier III. These facilities therefore require redundant sources of power, cooling, and data storage to maintain their expected reliability, which adds significant cost, materials and energy consumption.

Tier	Uptime	Redundancy	Downtime	Description
Tier I	99.67%	N	28.8 hours	Basic capacity with no redundancy, suitable for small businesses with minimal uptime requirements.
Tier II	99.74%	N+1	22 hours	Features partial redundancy in power and cooling, commonly used by mid-sized organizations.
Tier III	99.98%	N+1	1.6 hours	Supports dual-powered equipment and multiple uplinks, allowing concurrent maintenance. This tier is preferred by large enterprises.
Tier IV	99.995%	2N+1	26.3 minutes	Fully fault-tolerant with 2N+1 redundancy, ensuring the highest reliability. This is ideal for mission-critical operations such as stock exchanges, air traffic control, and financial institutions.

xi

Since the ChatGPT moment in November 2022, data center construction has grown by nearly 600% in the past 3-years[xii], from $1.2-billion to over $4.2-billion[xiii]. As more AI companies train foundational models, enterprises use inference for AI Agents (expand?), and consumers generate entire novels and videos from prompts, data center developers and hyperscalers are scrambling to get as much capacity as possible.



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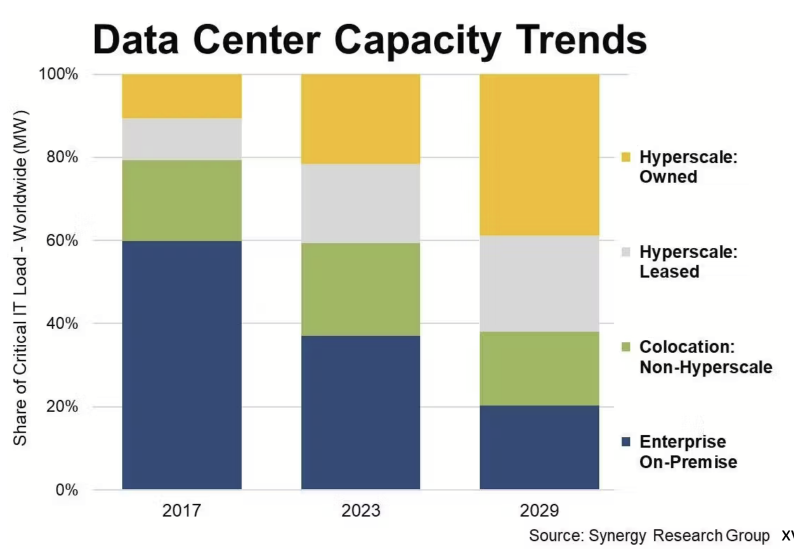
As machine learning applications have grown since the mid-2010s, the proportion of data centers spend has shifted away from enterprise, to hyperscalers, and now to AI Factories. Instead of prioritizing latency and proximity to customers/employees, enterprises now prioritize their data to be as close to computing clusters as possible, and AI Clusters prefer the cheapest power, land and tax schemes.



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Though some exceptions for Edge or Enterprise, Data Center's typically reflect the era they were built (duplicate)

WORKLOADS

Would discuss traditional Data Center Workloads: WebServers, Data Storage, Streamers & CDNs

% of Existing workloads of internet traffic and data center storage

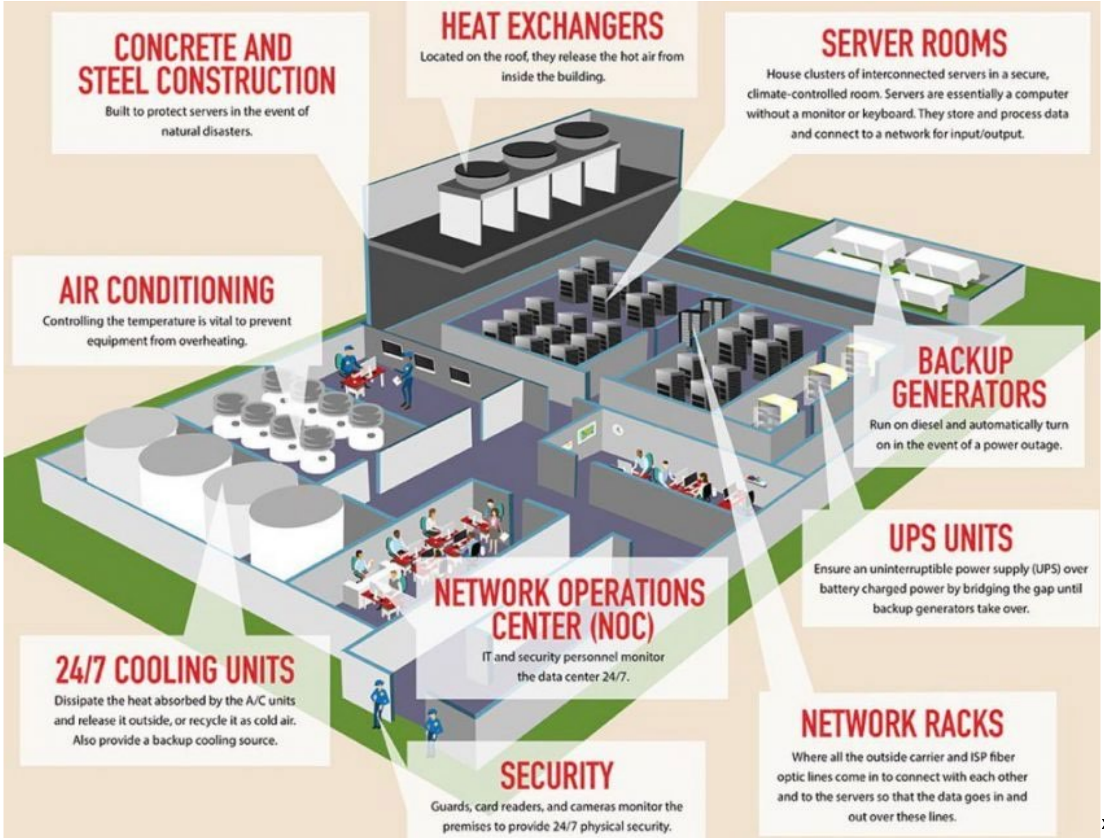
Also discuss Modern Workloads like: AI Queries, vs Renderings, vs Video Generation, vs AI Agents

Query Type	Energy Use (Watt-hours)	Real-World Equivalent
Fast / Chat Query	~0.3 Wh	Running a microwave for 1 second
Document Summary	~1.0 Wh	Running a fridge for 12 seconds
Generate Study Plan	~0.8 Wh	10 seconds of TV streaming
Write a Full Paper	~5.0 Wh	Charging a smartphone to 25%
Generate Code snippet	~2.5 Wh	Powering a laptop for 5 mins
Deep Research (Reasoning)	30 – 50 Wh	Charging 1-2 smartphones fully
Image Generation	~2.9 Wh	One full smartphone charge
5-Sec Video Generation	~940 Wh	Running a microwave for 1 hour
AI Agent: Market Analyst	~35 – 120 Wh	Powering a lightbulb for 4 to 12 hours
AI Agent: Code Refactoring & Debugging	~50 – 250 Wh	Riding an electric scooter for 3 miles

Quick Discussion of Tokens & cost disparity

DESIGN & LAYOUTS

Modern data centers have common systems and components, including the power, backup power, cooling, air-handling, operations, security/fire suppression, networking equipment, and of course server racks. They are extremely expensive to build and require few full-time employees (typically 10-15 employees per 100,000 square feet) but can provide revenue 24/7. A typical layout for a smaller enterprise or colocation data center would typically look like this.



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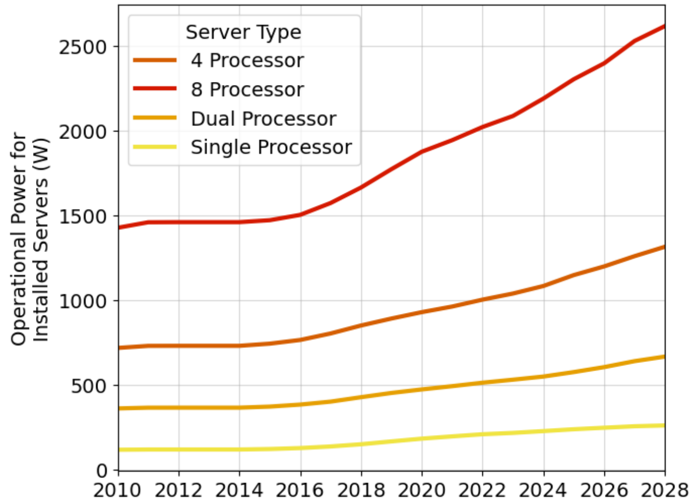
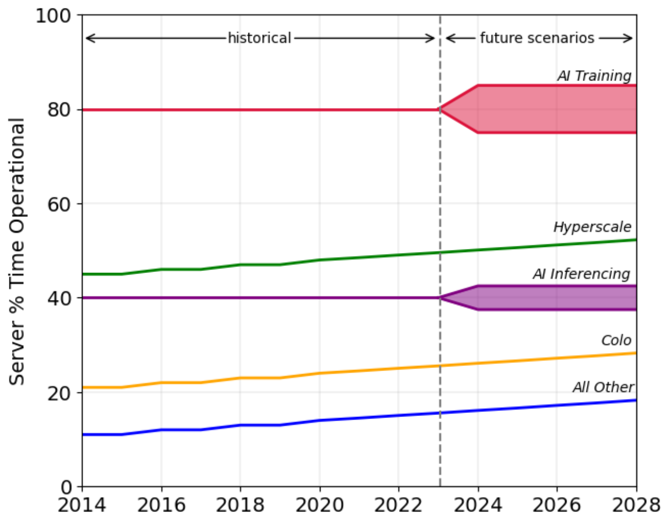
The interiors of Data Centers are primarily designed to manage and dissipate heat. Most heat comes from the processors (CPUs, GPUs, NPUs), which contain billions of **transistors**, or logic gates, used to calculate and transmit information. A **server**, which is only a single shelf in a **server rack**, a metal support structure for servers, storage drives and network cables, typically has 2-8 processors. Today, an 8-Processor Server typically consumes 2500-watts, which is as much power as a typical household dryer, running continuously for 40%-90% of each day. Large AI Cluster campuses can have over a thousand server racks, with more than a hundred thousand servers, and sometimes over a half million processors. For instance, xAI's Colossus cluster in Memphis has over 550,000 GPUs, and cost more than $18-billion, making it more expensive than even the most extravagant and expensive sports stadiums.

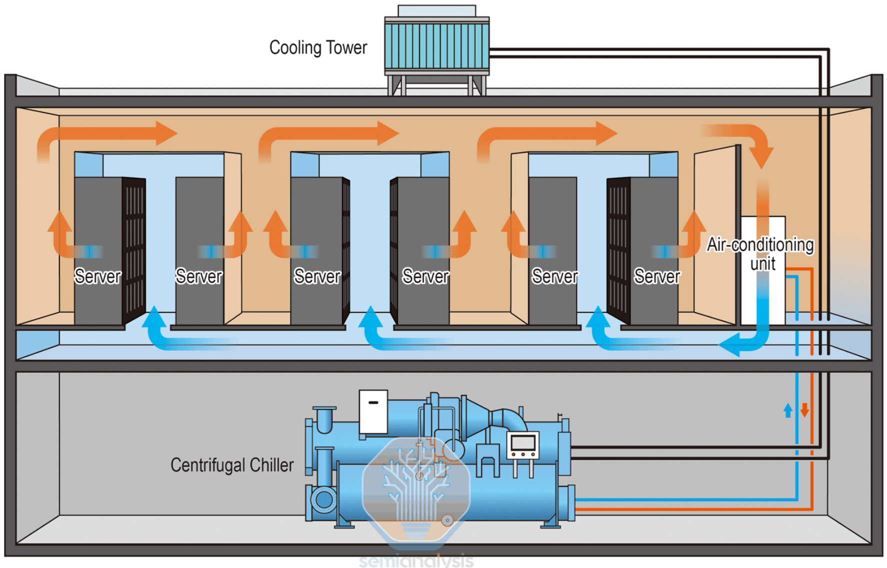




[xvii]

To dissipate this heat, **data halls** (rooms full of servers) traditionally used fans and clever geometries to move heat either out through exhausts or internal air-conditioning components like CRACs/CRAHs. To ensure the most efficient geometric airflow management, data centers are typically divided into hot- and cold-aisles, to continuously reject heat and replenish with cold air. Most processors have a maximum operating temperature of ~195°F (90°C), leading to hot aisles often maintaining an exhaust temperature of 90-110°F (34-44°C).

To reject heat into the atmosphere, data centers utilize cooling towers, evaporative coolers or adiabatic coolers, typically on the roof of the building. Though these devices are thermally and financially efficient, they consume massive amounts of water. To use less water, **chillers** (or large compressors) can be added to the refrigeration loop to compress the working fluid and lower the temperature before it goes to the outdoor condensing units. Though this can help reduce water usage, operating massive chillers consumes more electricity.



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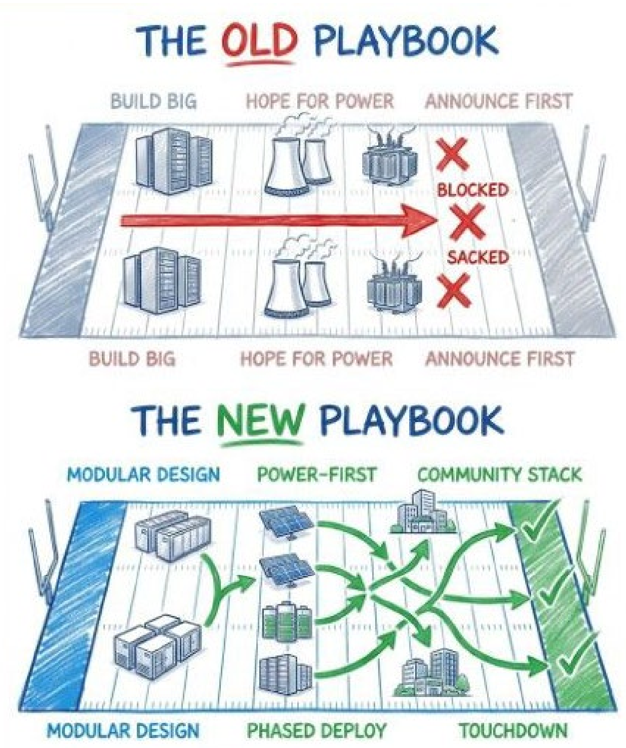
To provide electricity to data centers while meeting strict reliability standards, data center developers need two categories of power: primary and backup. **“Primary power”**, is used for every-day operation and typically comes from the grid. **“Backup power”**, ideally should only be used when the grid, or local power-generation, goes down.

POWER

For modern AI Factories, power is typically the largest constraint on project viability. Since AI Training Clusters are almost entirely made from GPUs, operating 80% of each day, they consume massive amounts of power. Due to this constraint, most modern data centers, or AI Factories, are described by the power required to operate the facility. For example, the new 600-acre, Project Jade, campus outside Cheyenne, will open with 1.8-gigawatts of capacity. This alone, is more than 5x the electricity that all 238,000 homes in Wyoming currently consume.[xix] To feed this capacity, the facility will be installing dozens of new grid-scale gas turbines to generate power, making the campus likely one of the largest powerplants in the state. Though only permitted for now, the facility could eventually expand to up to 10-gigawatts, which is equivalent to the entire electrical generation capacity of Wyoming in 2024.

For primary power, data centers have traditionally wanted to connect to the electrical grid, due to its massive scale and proven reliability. However, AI Factories with over 100-megawatts of capacity may consider, or can be forced, to pursue on-site generation. **“On-site generation”**, which is sometimes called “colocation power”, means that a facility intentionally generates its own primary power, either on the same campus, or close by. Since modern AI companies are racing for “**AI Supremacy”**, or to “become the next Google Search” (which has a 90% market-share), they are typically unwilling to wait for grid-interconnections or build their own renewable energy generation, like wind, solar or nuclear. Instead, they typically opt for natural gas turbines, or occasionally **reciprocating engines**, which are massive diesel generators. Though some companies will commit to buy future renewable power generation, through renewable **power purchase agreements (PPAs)**, most +100-megawatt AI factories will start by installing new gas turbines, on their own isolated micro-grid.

Today, many states will not permit +20-megawatt facilities, let alone 10-gigawatt facilities, without extensive environmental and engineering review. To avoid permitting delays, data center developers who require onsite generation for primary power, now often pursue a **"modular approach"** when submitting their development applications. This approach has a few advantages. First, developers can scale their facilities to meet demand, instead of committing themselves to build everything at once. Second, modularity allows developers flexibility when purchasing expensive and supply constrained equipment, like turbines, transformers, and batteries. Third, dividing projects into smaller portions allow data center developers to avoid higher review thresholds, described in existing State and local regulations.



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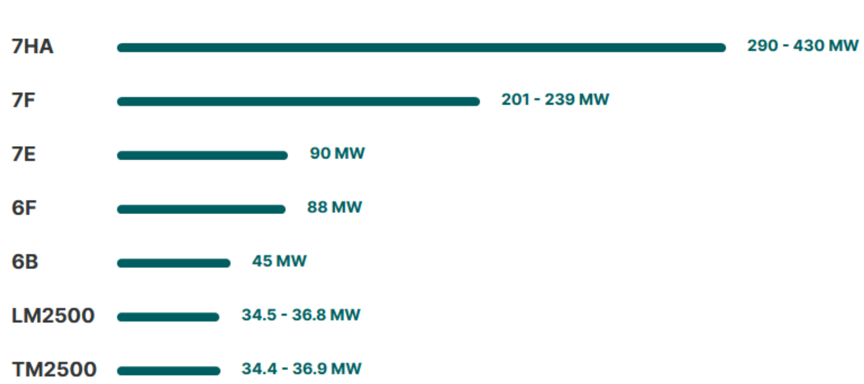
In the modular gas-turbine business, there are 3 primary manufactures: Siemens, GE Vernova and Solar Turbines (by Caterpillar). Notably, though numerous states and jurisdictions regulate power generation over 50-megawatt, these manufacturers produce many models that can be built under these regulatory limits. Since companies are essentially building new powerplants, that may eventually be added to the grid, state and local governments should scrutinize and regulate this onsite generation.



[xxi]

Since colocation, hyperscaler, and AI data centers are expected to maintain at least Tier III reliability, they must also be able to produce an equivalent amount of backup power if the primary power source goes offline. This backup power is typically provided by diesel generators, which often produce acute pollutants and noise. Though these typically only run for 10-50 hours a year, for maintenance and emergency backup, they are a big topic of concern for many communities. This is particularly pronounced if an area does not have reliable grid power. This can occur in areas where the grid is overtaxed by existing demand, triggering a grid **"demand response"**, or in places where weather and hazards require involuntary grid shutdowns, like wildfire prone areas.

Though Data Centers pride themselves on always being available to their customers 99.999% of the time, **computing load**, or usage, varies depending on the data center type and customer. If an AI Factory is used mostly for model training, the electric demand on the grid can move in massive +20MW swings when training starts or stops. This **load volatility** is very hard for utilities to accommodate. In response large data centers are investing form of energy storage, like lithium Battery Energy Storage Systems (BESS), Iron-Air Batteries, and large mechanical Flywheels, to smooth **load demand curves**, and conduct **peak-demand shaving**.

To address these dynamics on a regional basis, my utilities and data center providers are turning to new **Grid Optimization Software**. These systems coordinate when data centers should start and stop AI Training, based on excess electrical capacity of the grid, to ensure the grid never gets overwhelmed. Though this technology can only be used with grid-connected data centers, it is critical for reducing peak demand and limiting use, or new construction, of heavier polluting **peaker plants**. By smoothing the demand curve, and balancing **daily grid utilization**, grid optimization software can also significantly mediate rising electricity prices for consumers.

When crafting data center policy, it is important to understand how much electricity is being consumed by each system. In older, smaller enterprise, edge, and multi-tenant data centers, a plurality of electricity was consumed by non-IT systems, like cooling, lighting and power distribution. These data centers therefore would have **Power Usage Efficiency (PUE)**, or the ratio of Total Load to IT Load, that was >2. Modern hyperscale data centers and AI factories, have been able to reduce their PUE to as low as 1.1 in certain climates and configurations. Future data center regulations should likely tier PUE metrics with electrical capacity, to allow for some flexibility for smaller competitors with smaller facilities.

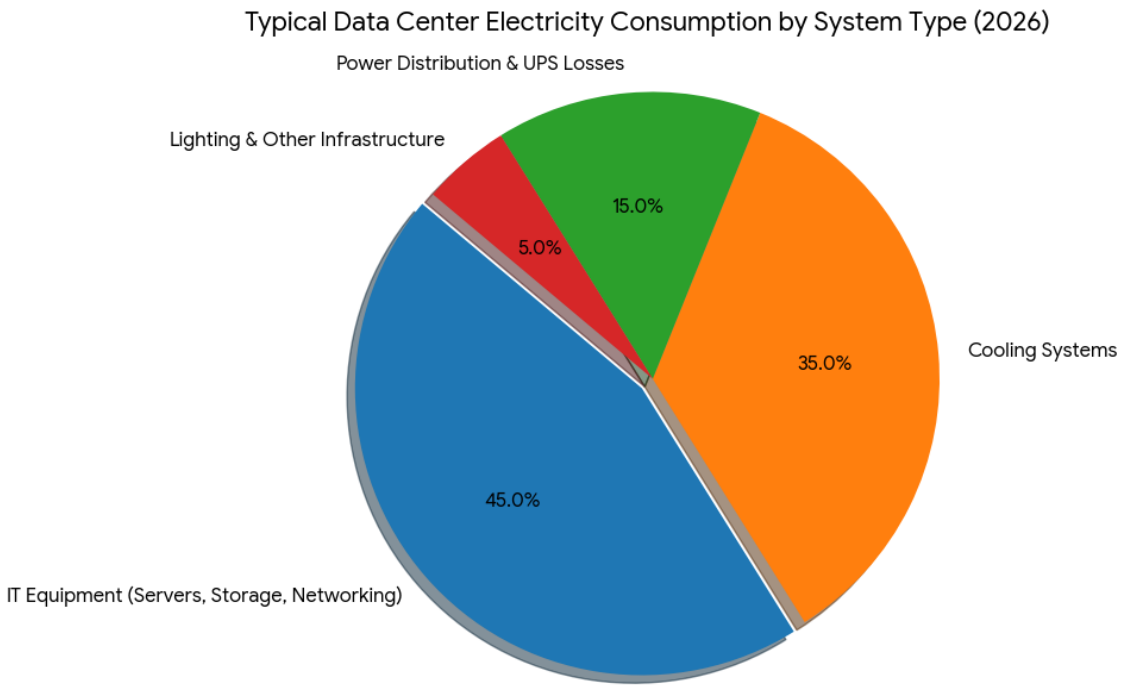
Grid optimization software?

AI is a Marginal Extra Use

Electricity Rate Implications

Emissions per each generation type

3 Emission Scopes and Reporting



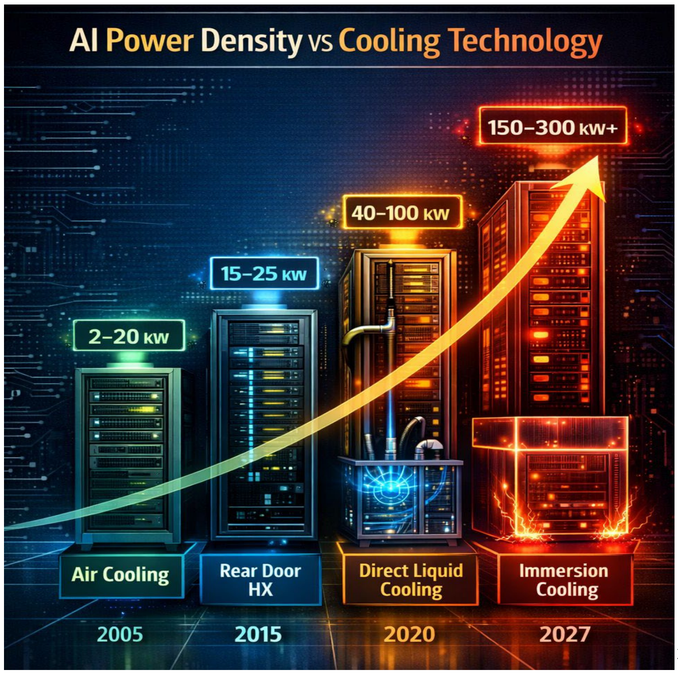
WATER & COOLING

As mentioned previously, modern data centers and AI Factories produce a tremendous amount of heat. To ensure the extremely expensive processors don't melt or malfunction, data centers are constantly cooling their equipment. Though there are many variations of this process, there are a few fundamentals that almost every cooling system follows.

First, the **cooling load** represents the excess heat being generated by data equipment within a data center. In traditional air-cooled facilities, this excess heat is sucked away from the source using a combination of Computer Room Air Conditioners (CRAC) and Computer Room Air Handlers (CRAH) at the end of each hot-aisle in the server rooms.

In modern Data Centers and AI Factories, space has often become a premium asset, and engineers have found new ways to pack processors more tightly, while keeping them cool. Today many new facilities use **rear-door heat-exchangers** to capture heat more quickly, and prevent it from contaminating supply air in cold-aisles.

In addition to these air-cooled architectures, some of the largest and most innovative data centers are turning to **liquid cooling technologies** to further increase power density, and thermal efficiency per watt. **Direct-to-Chip** cooling pumps cold water (or refrigerant) through heat-exchangers (or "cold plates") directly mounted to processors, to take advantage of the greater heat capacity of liquid water. **Immersion Cooling**, which is starting to go mainstream, immerses processors in a bath of inert liquid, to capture excess heat emanating from processors in every direction. Collectively, the indoor cooling equipment described above are called the **Technology Cooling Systems (TCS)** but are also known as the "Server Side", or "White Space", cooling system.



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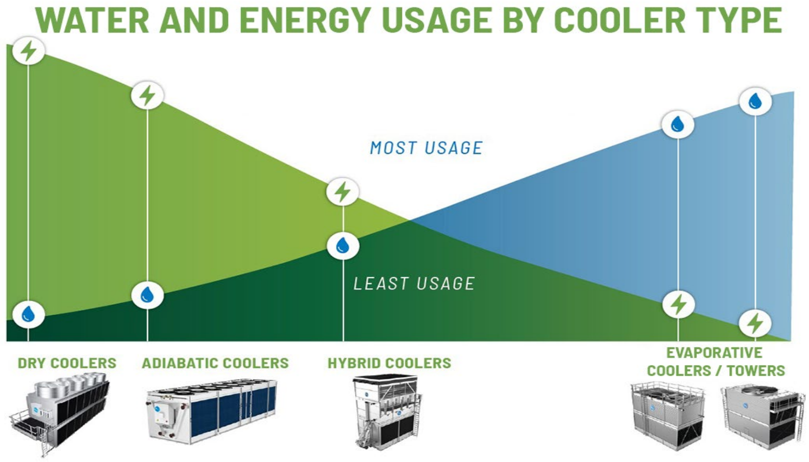
Once heat is taken from the cooling loads (and surrounding air) into cooling loops of refrigerant, the excess energy still needs to be exhausted into the outside air. This can be done by using different types of outdoor cooling units/architectures, which are called **Facility Cooling Systems (FCS)**, "Heat Rejection" or "Gray Space" cooling. Many traditional industrial facilities achieve this by utilizing **evaporative coolers** or **cooling towers**. These systems take advantage of sensible and latent heat-transfer, by pouring water over heat-exchanger fins to evaporate. This process is often needed in warmer climates, and much more cost-effective than utilizing fans alone. However, this technique is particularly problematic in regions where water is in short supply.



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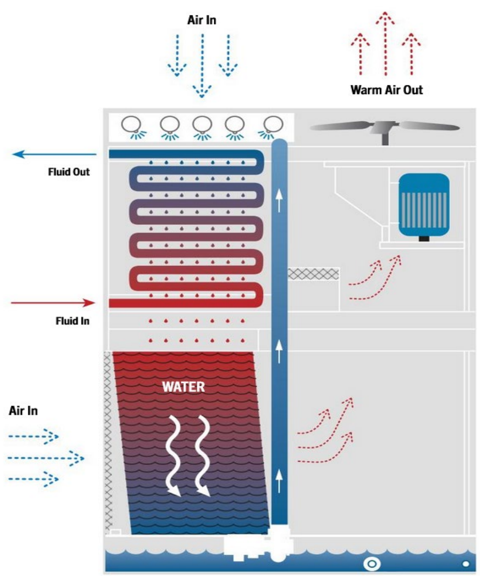
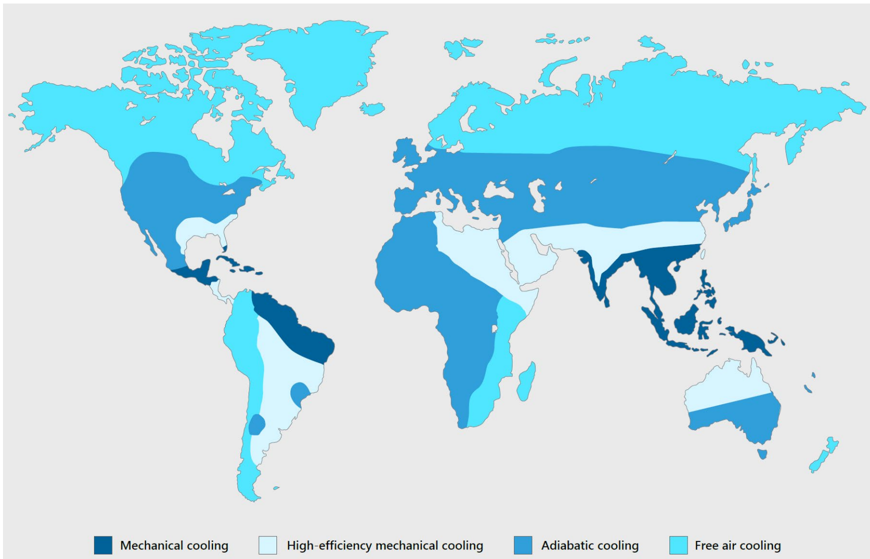
On the other end of the spectrum of outdoor units are **dry coolers**. As the name suggests, they do not pour any water over heat-exchanger fins but instead utilize larger and more numerous fans to suck excess heat into the atmosphere. Dry coolers can typically only be utilized in more temperate climates, often need to be paired with compressive chillers, and can consume significantly more electricity. Dry coolers, which are often called "Air-cooled chillers", are what the industry calls a **"closed-loop"** system, since there is no water being externally evaporated and exhausted. To compare water efficiency between projects, the industry regularly uses the **Water Usage Effectiveness (WUE)**, which is the ratio of Total Water Consumed over Energy Consumed by IT Loads (i.e. servers, data storage).



xxiv

In between are **adiabatic coolers** and **hybrid coolers**, which utilize misting and special membranes to consume less water. Some systems can collect some portion of the evaporated water as it exits the cooler and reuse it for cooling. On paper, these systems can strike a balance between electric and water consumption, particularly in warm to temperate climates. In these systems, when water is recaptured and reused within the cooler, the process is often called **"closed-circuit".** Though closed-circuit hybrid coolers are more water efficient than cooling towers and evaporative coolers, they should not be confused for “closed-loop” systems. Importantly, many audits[xxv] have found that adiabatic cooled data centers consume much more water than promised. This can be caused by unexpected weather patterns, improper engineering, or intentional operator overuse, so jurisdictions should insist on transparent water reporting when approving these systems.



[xxvi]

It is also important to recognize the role that climate and weather have on data center cooling and electricity consumption. Since excess heat must be exhausted into the atmosphere, it is easier to do this in cooler climates. Cooling systems typically account for 35-40% of electricity usage in data centers, so locating a facility in more a temperate climate can significantly reduce relative emissions. Cooler night-time temperatures can also enable **free-cooling** architectures, which allows for the cold atmospheric air to be fed directly to the cool-air supply, which is by far the most efficient, but requires a **hybrid** architecture with extra louvers/economizers in addition to the traditional cooling loop.

Lastly, jurisdictions should be aware that different types of grid power generation consume varying amounts of water, or what is often called **indirect water use**. For instance, nuclear and coal plants consume orders of magnitude more power than the equivalent amount wind or solar electricity. Depending on the size of the data center, moving from a water-cooled to air-cooled chiller can raise PUE by 0.1-0.5, or about an 8%-40% increase in energy use.[xxvii] Even though this can reduce water by about ~80%[xxviii], 1.2 gallons/kWh (cite) will be lost to indirect water consumption, on average. Therefore, if incentivizing dry coolers for data centers, it is important to understand the local grid energy generation mix. (add sources)

Concerns over ground water?

NOISE & ACUTE POLLUTION

Modern data centers and AI Factories bare many of the same hallmarks of other heavy industrial uses. Due to their unmatched power density and electrical consumption, data centers can be sources of local noise, heat, and air pollution. Heat pollution is hard to avoid unless a facility utilizes wide-scaled waste-heat recovery, like district heating loops. Heat plumes from larger data centers can significantly change the local climate and often need to be reported to the Federal Aviation Administration.

Noise pollution is a growing area of concern for many residents near data center developments. Though AI factories with onsite primary power generation are particularly problematic, noise pollution can come from many equipment types. Though all systems can be slightly muffled with noise suppression devices, large facility setbacks may be necessary to protect the surrounding environment. Most regulatory bodies, like the World Health Organization (WHO) and EPA suggest that typical operational noise levels at the edge of the industrial property line should not exceed 55-60 dBA. For industrial facility staff, it is considered hazardous is the average occupational noise exposure is over 85 dBA.[xxix] It is also important to remember that decibels (dB, dBA, dBC), are a logarithmic unit, so every increment of +3dBA doubles perceived loudness. (add sources, typical outside codes)

As seen below, onsite primary and backup power generation will likely be the loudest data center equipment. This includes Gas Turbines, Diesel Generators and Reciprocating Engines (which are essentially Diesel Generators that provide primary power). Therefore, strict noise regulations and monitoring are a good method to either restrict onsite combustible fuel power generation, or ensure the developer utilizes enough setbacks to achieve noise requirements at the property line, or nearest residential structure.

Equipment Type	**Typical Noise Level (dBA)**	**Primary Noise Source**	**Common Placement**
Backup Generators (Diesel)	**85 – 110+**	Engine combustion & exhaust	Exterior Yard
Gas Turbines	**90 – 105**	High-speed rotation (whine)	Exterior Yard
Reciprocating Engines	**100 – 110**	Mechanical vibration/pistons	Exterior Yard
Air-Cooled Chillers	**85 – 100**	Compressors & large fans	Roof / Ground
Cooling Towers	**80 – 85**	Water cascade & fans	Roof / Exterior
Dry Coolers	**75 – 85**	High-speed fan arrays	Exterior
Air Handling Units (AHU)	**80 – 95**	Large blower fans	Interior/Roof

Air pollution from data centers is typically caused by onsite primary or backup power generation. Gas turbines typically produce fewer NOx or SOx pollutants than diesel generators; however, both can significantly degrade local air quality. Today many jurisdictions are requiring diesel generators to meet Tier IV EPA emissions standards, or require installing Selective Catalytic Reduction (SCR) exhaust scrubbers on existing Tier II generators to achieve emission levels equivalent to Tier IV.

Infrasound

More definitions (bold)

Heat

Water Discharge?

Solid Waste

TRANSPARENCY & REPORTING

In the race for AI supremacy, most AI companies, hyperscalers, neo-clouds and data center developers don't openly share their information. Many reviewing jurisdictions and regulatory bodies are asked to sign Non-Disclosure Agreements and may cancel projects if these agreements cannot be met. Though these companies have numerous trade secrets, reporting transparency can also lead to compliance delays and lawsuits, which they want to avoid at all costs. Some developers ask for reporting to only be shared after 1 or 2 years of operation, to give the operator time to calibrate their facility, but this contingency can also be used as a bargaining chip during development review negotiations.

To ensure grid stability and proper natural resource management, jurisdictions should ask for both aggregate and proportional reporting metrics. Published in 2017, **ISO/IEC 30314** standards provide many of the most used operational and proportional metrics for data centers, including **Water Usage Effectiveness (WUE)**, and **Power Usage Effectiveness (PUE)**, or the ratio of Energy Consumed by IT Loads over the Total Energy Consumed. Setting aggressively low targets for these metrics can encourage data center developers to install the most efficient, state-of-the-art equipment, like direct-to-chip IT cooling, closed-loop dry air coolers, and waste heat recovery systems.

To get annual reporting, many communities require Energy Star for Data Centers. List other certifications as well

The best method to improve waste heat recovery, and significantly improve overall thermodynamic efficiency, is a **district heating loop**, which pumps heated liquid into neighboring apartments, offices or agricultural facilities like greenhouses. These are a popular solution in Europe but require close proximity between data centers and other facilities. If data centers are not located near other facilities, there are new developing technologies to capture waste heat. These include Absorption Chillers and Sorbent-Based Atmospheric Harvesters. The best proportional metric to encourage waste heat recovery is the **Energy Reuse Factor (ERF)**.

Though waste heat recovery, free-cooling hybrid systems, and PUE reductions can improve onsite efficiency, renewable energy sources are the most important factor in long term GHG emissions. To encourage onsite or grid-connected renewable energy and storage, Colorado jurisdictions can encourage large loads to purchase renewable **Virtual Power Purchase Agreements (VPPAs)**, or Direct Investment rebates, by setting an aggressive **Renewable Energy Factor (REF)**. Ideally, renewable energy VPPAs or Direct Investment Rebates should only be eligible for projects within the **Rocky Mountain Power Authority (RMPA)** electric grid subregion. This is because electricity can only be transferred so far on the grid, and offsetting other users will undermine any state or regional net-zero goals. Physical Power Purchase Agreements

REF is likely the single most impactful metric that the county can regulate. To make this airtight, specify that data center REF must be met through bundled **Renewable Energy Certificates (RECs)** or Power Purchase Agreements (PPAs) that bring new renewable generation to the local grid, rather than buying unbundled, cheap historical RECs. To ensure this renewable power truly offsetting carbon intense baseload power, jurisdictions can ask for some proportion of **"Hourly Matching"**, or **Carbon Free Electricity (CFE)**, reporting. Unless the region has green sources of baseload power, like hydro or nuclear energy, 100% Hourly Matching can only be achieved with significant investments in energy storage. Expand

To make this airtight in an ordinance, specify that the REF must be met through bundled Renewable Energy Certificates (RECs) or Power Purchase Agreements (PPAs) that bring new renewable generation to the local grid, rather than buying unbundled, cheap historical RECs. The most progressive policies are now pushing for "24/7 Hourly Matching" rather than just annual net-matching.

In addition to projected ratios, it is useful to have cumulative water and energy consumption reporting requirements. There are also federal, state and local cyber-security and data-security requirements that jurisdictions should be aware of. The following isn't really an example

For instance, Xcel Energy, which is the local utility provider in most of Larimer County, recently submitted three new rate structures ("tariffs") and agreement requirements for large loads to the Colorado Public Utility Commission (PUC).[xxx] These include the following:

- **Xcel Large Load Tariffs** = Establishes standard financial and infrastructure rules for massive energy users and applies direct assignment of new generation and transmission costs to the customer.
- **Xcel Clean Transition Tariffs** = Aligns large-load growth with Colorado's clean energy goals, but is an optional premium paid by the customer to fund emerging carbon-free technologies.
- **Xcel Speed to Market Agreement** = Provides an accelerated, flexible pathway for developers with urgent timelines. This is a bespoke contract negotiated outside the standard tariff, subject to Colorado PUC approval.

JOBS & COMMUNITY IMPACTS

Modern Data Centers, and in particular AI Factories, are massive investments. According to Dgtl Infra, data center design and build costs about \$7-\$12 million per megawatt.[xxxi] For instance, the new 177-megawatt QTS facility in Aurora is expected to cost over \$1 billion, with an additional \$28 million electrical substation from Xcel Energy.[xxxii]

These large investments tend to create hundreds of construction jobs but typically require fewer long-term permanent jobs. According to the Hamm Institute at Oklahoma State University, new facilities typically generate about 0.7-2.0 construction jobs per megawatt.[xxxiii] For ongoing operations, the Hamm Institute estimates about 0.15-0.35 permanent jobs for ongoing operations. Other rules of thumb have estimated that about every 100,000-sf of facility generates about 15-20 permanent jobs.

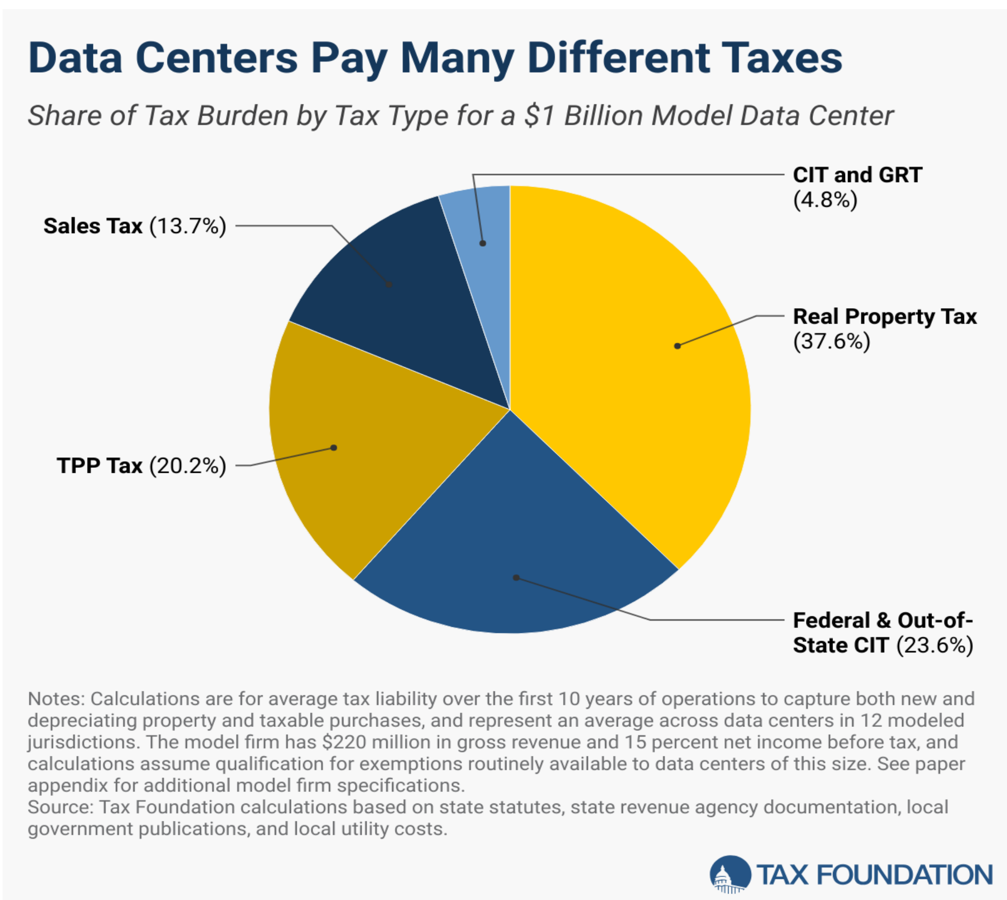
Since these are large industrial facilities, construction can significantly impact traffic and infrastructure around a site. To accommodate this, communities can ask for Data Center developers to pay impact fees or contribute to local infrastructure upgrades. However, it is important to remember that impact fees must be financially proportionate to their impacts.

In addition, jurisdictions can ask for other concessions from developers, such as community benefits agreements and revenue sharing agreements, which are not subject to proportionality scrutiny, and can fund significant and visible benefits.

TAX REVENUES & INCENTIVES

Many modern data centers cost billions of dollars to construct. Like other industrial facilities, much of the cost comes from valuable equipment and not the building or land. Therefore, Data Centers are subject to numerous taxes, including Real Property Tax, Tangible Personal Property Tax, Sales & Use Taxes, Zoning & Entitlement Fees, Permitting Fees, and possibly Impact Fees. The table below captures the averages of 12 data centers in 2024, however modern AI Data Centers likely have a higher proportion of personal property tax than these examples.

Data Center Cost Pie Chart?



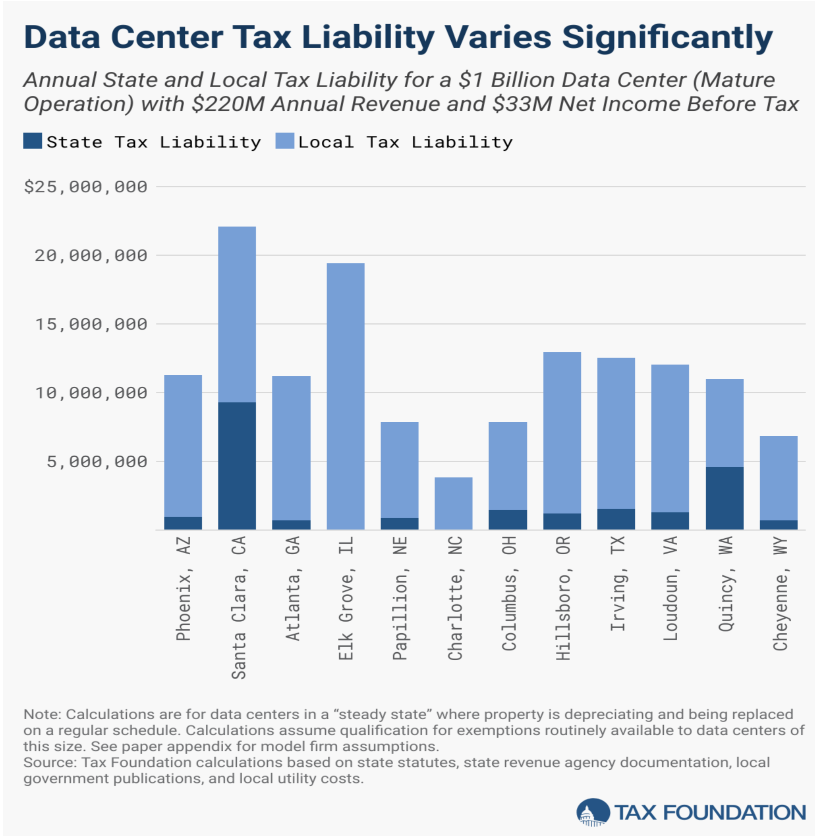
[xxxiv]

The following is a typical depreciation table for data center equipment. In modern data centers, IT Equipment tends to be the largest portion of Personal Property Tax (PPT) liability, since cutting edge processors are very expensive, and increasingly hard to procure at market prices. Therefore, data center developers and tenants, prioritize accelerated IT depreciation, for tax write off purposes. (expand on this?)

Asset Category	**Initial Portion of Personal Property Tax**	**MACRS Tax Life (Average)**	**Operational Useful Life**	**Key Components**
IT Equipment	55% – 65%	5 Years	3 – 5 Years	Servers, storage, switches, and high-speed networking.
Power Infrastructure	25% – 30%	5 – 15 Years	15 – 25 Years	UPS systems, generators, PDUs, and switchgear.
Cooling & Mechanical	10% – 15%	15 Years	12 – 20 Years	Chillers, cooling towers, and CRAC/CRAH units.
Building & Facility	< 5%	15 – 39 Years	20 – 50+ Years	Building shell, raised flooring, and fire suppression.

Maybe breakout cooling by: Technology Cooling System (TCS), typical Facility Cooling System (FCS), Closed-Loop Incremental Cost, Free-Cooling Incremental Cost, Water Cooled IT Incremental Cost, Waste Heat Recovery Incremental Cost, District Heating Incremental Cost

For expected tax revenue, analysis by the Tax Foundation found that every $1 billion in Data Center investment, led to $5-20 million in local tax revenues, depending on incentives. Expand and bold this, add other examples about Louden county This doesn't account for any tax loopholes that large corporations can pursue. Either way, this is a tremendous source of incremental tax receipts, especially under current economic conditions.



xxxv

In Larimer County, they can Utilize 1041 Powers, or Tax incentives. Including PPT rebates, opportunity zone contingencies (also pair with state enterprise zones), or even conditional use with custom requirements

2026 MARKET CONDITIONS

Despite the immense costs and complexity, companies are still attempting to blitz-scale to become the next big monopoly. (creating the dominant app or foundational model). AI has the opportunity to become the "Everything App" for consumers and create unlimited **"Digital Workers"** (AI Agents) in the enterprise. This means hyperscalers, private equity, and AI firms are subsidizing AI workloads, and customers types, by up to 90% of true cost. (graph and cite) This has caused some economists and reporters to speculate about an AI bubble, but this will likely not happen for many years. (cite)

The second growing trend is the industries need for **Guaranteed Power**. ("powered land") Despite many electric utilities agreeing to provide service, interconnection delays are increasingly frequent, and even if data centers are willing to pay for grid upgrades, they're opting for Primary Onsite Power Generation instead. For most onsite power projects, gas turbine generation is most common, but Solid-Oxide Fuel Cells (SOFCs), reciprocating engines and modular data centers are becoming increasingly popular. possibly small modular nuclear reactors

For AI workloads, foundational model training was dominant in 2023 and 2024, but we are now seeing the rise of inference and agentic AI. Inference workloads require more CPUs and memory, and AI Agents typically consume much more power and compute than traditional queries. This transition from training to inference may push data center developers to care more about **latency**, which is the time it takes to get data to and from the end users, which could encourage them to build underbuilt Data Center regions like Colorado.

Dedicated Inference Facilities and Office to Data Center Conversions

Public backlash against data centers has also increased significantly in 2026.

Utilities under lots of pressure. Some are being bought by private equity to infuse cash and data center expansion

Lastly, historical workloads, like telecom, cloud storage, streaming and social media, still exist, but many larger Colocation/Multi-Tenant data centers are upgrading their facilities to handle the power densities required for AI Factories. Add power density numbers and likely equipment differences

PUBLIC CONSIDERATIONS

There are numerous public **costs and fears** caused by AI and Data Centers a municipality must consider. Some notable Data Center concerns include: (more), should this section be in prose?, (Figure out capitalization)

- Data centers utilize numerous Scarce Resources
- Data center Power Consumption seems to usurp any Environmental Pledges or Net-Zero Goals
- Can be source of acute pollution (air, noise & heat)
- Enable AI agents who are perceived to be taking jobs
- Can increase future electricity costs
- Can increase local land prices
- Public engagement is tough
- Even if regulated, Data Centers performance can be hard to monitor

However, despite the cost, there are numerous public **benefits** a municipality or county must consider: (more)?

- Very significant local Tax Revenues, with relatively low long-term liabilities, such as road degradation
- Opportunity for well-funded community benefits agreements
- Numerous high-paying construction jobs
- Can fund Electric Grid Upgrades
- Can fund Renewable Energy and Storage Investments

REGULATORY LANDSCAPE

CLIENT CONSIDERATIONS

For Larimer County, there are a few key factors when setting data center regulations. These include but are not limited to: (expand)

- Colorado, and the RMPA Grid Subregion, are currently Water & Electricity constrained.
- In 2023, the RMPA Subregion Grid, had an average CO_2 Emissions of 1036 lb-CO_2/MWh, 269 more than the national average of 767 lb-CO_2/MWh[xxxvi].
- RMPA needs investment in renewable energy and energy storage, and data centers can support this.
- 2026 State Tax Incentive Bills (HB26-1030[xxxvii], & SB26-102[xxxviii]) failed, but had good elements.
- National Executive Orders are attempting to prevent local regulations and FERC Regulatory Decisions are imminent.
- Onsite Natural Gas and SOFC Fuel Cells are starting to dominate the market. The county must decide if these are acceptable options.
  - If Onsite Combustible Fuel Power generation is allowed, are there efficiency standards they must meet, or green hydrogen capability requirements.
  - Determine when and if these onsite generators need to be phased out for renewable energy or a grid connection.
- Industry is focused on massive AI Factories, which are focused on AI training. Market may shift to smaller (5-30 megawatt) inference only facilities. Regulations should account for these as well.
- Taylor-rule counties like Larimer have limited regulatory authority, but can encourage desired behaviors with tax incentives, in particular, local Personal Property Tax Rebates. (cite)
- Should the county create data center opportunity zones or innovation districts, with district heating, reclaimed water, and green hydrogen generation?
- Does the county want to set a precedent for the State and Region?

LOCAL ORDINANCES & STRATEGIES

From current research, there are numerous regulatory tools to craft local ordinances and strategies. These include but are not limited to: (sorting logic, Table?)

- Conditional Use
- Opportunity Zones
- Certificate of Occupancy Restrictions
- Application Requirements: Power & Water Disclosures, Corporate Transparency, Renewable Energy Plans (REPs)
- Renewable Energy Plan (REP): Renewable Energy Ratio, CFE Hourly Matching, within X years of energizing

- Permits, Expedited Permitting
- Fee Waivers
- Ban Jurisdiction Staff from Signing NDAs
- Reporting Requirements: Water, Power, Noise, Emissions, Photometric/Lighting, Decommissioning
- Monitoring: Noise, Water, Power, Emissions
- Impact Studies: Environmental, Traffic, Power, Water, Noise, Sewer/Discharge, Utility Rate, Grid Modernization, Sustainability, Community, Emergency Services, Solid Waste, Viewshed Analysis, Dark Sky, Municipal Finances
- County Resource Use Caps
- 1041 Powers: Facilities >50-megawatts or Facilities with new associated >65-kilovolt Substation, Facilities requiring Electric Transmission upgrades, Regulate Buy-and-Dry, Conversion of Fuel, more
- Land Use Codes: Siting, Lot Coverage, Screening, Design, Height Restrictions, Lighting, Parking, Setbacks/Buffers
- Certifications: Energy Star for Data Centers, LEED BD+C: Data Centers, BREEAM Certification
- Community Engagement Requirements
- TIF with Urban Renewal (Municipality Only)
- Load Shift Optimization Software Requirement
- Grid Upgrade Obligations
- Local Hiring Requirements

STATE & NATIONAL LEGISLATION

On the national level there are numerous developments the county should monitor: (expand a lot, prose?)

FERC Docket RM26-4-000 Decision

Xcel Proposed Large Load Rate Structure ("Tariff")

State Bills (SB26-102, HB26-1030) Failed

Executive Orders (EO14318)

Other federal legislation

Strategies for 1041 Powers

METHODOLGY

RESEARCH - DATA CENTERS

Not Particularly Useful for you, but required by School. Will Finish Later

Spoke to:

Best Resources:

- Data Center 101
- WRA - Policy Solutions for Water and Energy Use
- Berkeley Lab Report
- SemiAnalysis Engineering - Data Center Anatomies
- Baltimore Air Coil - Energy and Water Efficiency Metrics
- EPA - eGRID Data Explorer
- Halcyon
- Podcasts?

RESEARCH - REGULATORY

Not Particularly Useful for you, but required by School. Will Finish Later

Spoke to:

Best Resources:

- Georgia Data Center Ordinance Hub
- Chester County - Data Center Ordinance Guide
- Enki - Data Center Power Regulation 2026: Why States Are Trading Incentives for Accountability
- Prince William County - Statutory Framework Review
- Tax Foundation - Data Center Taxation Synopsis
- K&L Gates - Insider Considerations

DataCenterTracker - Legislation Tracker

MultiState - State Data Center Legislation

Larimer County - Economic Development Policy

Brookings - Turning the data center boom into long-term, local prosperity

EXEMPLARY LAND USE CODES

From current research, these are the municipalities with the most innovative ordinances and strategies. These include but are not limited to: (make table with best use of each)

- Spalding, Georgia (links)
- Marana, Arizona
- Fauquier County, Virginia
- Aurora, Illinois
- Linn County, Iowa
- Stafford County, Virginia
- Tower Hamlets, London, United Kingdom
- Expand

Florida CS/CS/SB 484 - Data Centers - Ban data center development NDAs via SB 484

Illinois SB 4016 / HB 5513 (POWER Act) - clean energy procurement requirements, utility cost responsibility, water use reporting, pollution controls, and community engagement.

Mass H.5151 - Shield residential ratepayers from data center costs in MA

HB 270 / SB 116 - Data Center Impact Analysis - Require data centers to report energy consumption in MD

Minnesota HF 4077 - Ban data center development NDAs via SF 4298

Missouri HB 3362 / HB 3364 - AI Infrastructure Grid Integrity and Water Resource Protection Act

New Jersey - S3379 - Data Center Water and Energy Reporting

Pennsylvania - HB 2150 - Data Center Energy and Water Reporting Act

Utah HB 76 - Water Disclosure

Virginia (SB 553 water disclosure)

REGULATORY RECOMMENDATIONS

DECISION POINTS

The following are the recommended questions the county must answer when setting data center regulations. These include but are not limited to: (order by importance and explain how I got here)

- What is a qualified Data Center? Large Load Only? What is a Large Load?
- When are Data Centers By-Right? Conditional Use? Opportunity Zone? Independent Zone District?
- Which Traditional Land Use regulations should the county enforce? Or are performance metrics preferred?
- Does the county offer local tax incentives to encourage behaviors outside the county's regulatory authority, like Power Efficiency, Water Efficiency, and Renewable Energy Factors?
- Should the country require Impacts Studies? And if so, which ones?
- If monitoring is required, who should perform it? And for how long?
- Does the county wish to discourage groundwater use?

PRIORITIES

The following are the suggested priorities the county should pursue. In order of perceived impact and importance:

(order by importance/ease of implementation and explain how I got here, maybe a table?)

- Reporting
- Noise Compliance
- Renewable Energy and Energy Storage: VPPA, Direct Investment
- Power Efficiency
- Water Efficiency
- Waste Heat Reuse
- Onsite Generation Phaseout and Transitioning
- Environmental Integration
- Community Benefit Agreements or Revenue Sharing
- Permanent Jobs
- Ensuring New Revenues

DEFINITIONS

Remind that we don't want regulate everything and that existing Larimer county data centers are as such

Qualified Data Center = 5-megawatts or greater

Large Load Data Center = 20-megawatts to 50-megawatts

Article 10 Data Center = 50-megawatts or greater, or

Onsite Primary Power

IT Load

Technology Cooling System (TCS) - "Server Side" or "White Space"

Facility Cooling System (FCS) - "Heat Rejection" or "Gray Space"

Closed Loop System

Facility Shell

REGULATIONS

The following are the suggested regulations the county should pursue. These include but are not limited to:

- Application Requirements: Must have confirmed power, or water rights
- Conditional Use in limited industrial districts
- Annual Reporting: Water Use, Power Use, Noise, Pollution
- Impact Studies and Fees: Environmental, Power, Water, Sewer/Discharge, Emergency Services
- Noise Requirements at property line (or 100-300ft from property). Average Daily (not daytime v nighttime) dB(A) and dB(C)
- County Administered Noise Monitoring or Annual Noise Reporting Requirements. For at least 5 years after system is built
- Land Use Code: Screening, Fenestration, Environmental Buffers, Drainage only
- Community Benefit Agreements or Revenue Sharing Template
- Ban Staff for signing NDAs
- For Article 10 (1041 Powers) Triggers, such as Facilities requiring Substation over 69-kilavolts, Large Loads over 50-megawatts, Electrical Transmission Line Upgrades, Transmission Line Easement Adjustments, Water Transmission Upgrades, and using Buy-and-Dry Water Rights, the county should have the following Power and Water regulations:
    - PUE requirement
    - WUE requirements
    - ERF requirements
    - REF requirements or legally binding Renewable Energy Plan (REP), at least 70%-90%
- Tax Incentives: Bonus Depreciation for local Personal Property Tax up to 50%
    - PUE Requirement

  - WUE Requirements
  - ERF Requirements
  - REF Requirements
  - Equipment Incentives: Free-Cooling Hybrid Systems, Waste Heat Recovery, Water-Cooled IT Systems
  - Legally binding Renewable Energy Plan (REP), at least 70%-90%
  - Renewable Energy Direct Investment Incentive
  - Energy Storage Direct Investment Incentive
  - Minimum Onsite Generation Efficiency Requirement
  - Fossil Fuel Phaseout Agreements, including Green Hydrogen
  - Mandatory Compliance with any Large Load Tariffs
  - Demand Response or Grid Optimization Software Requirements
  - Emissions Requirements
  - Water & Heat Discharge Requirements
  - Decommissioning and E-waste Requirements
  - Claw-backs Provisions
- Note, if local Home Rule Municipality, Tax Incentives could also include:
  - Sales & Use Tax Abatement
  - Property Tax Abatement
  - TIF with Urban Renewal
- Overlay Opportunity Zones
  - By-Right Development
  - Mandatory Reporting
  - Waste Heat Reuse Requirements
  - *Other Regulatory the County Prioritizes
- State Enterprise Zone Strategy. State is currently offering Income Tax Reduction for: 3% of Facility Investments, 3% R&D Increase Tax
- Colorado Advanced Industries Accelerator Programs Collaborative Infrastructure Grants strategy

These regulations have been tabulated in an attached Scoring Matrix named: “Regulation_List”. This matrix includes the suggested regulations in addition to others. Each regulation has a corresponding “Options & Thresholds” and “Tax Incentives” when applicable. They also have an “Impact Grade”, which captures the perceived positive impact and feasibility of regulation. The recommended, and non-conflicting regulations, were put into four “Strategy Bucket(s)” to provide a tiered regulatory spectrum, with “1” being the most lenient and “5” being the most stringent.

The suggested tiered regulations can be found in the appendix section: “Regulatory Scoring Matrix”.

KEY THRESHOLDS

Similarity to Definitions?

See Spreadsheet? Appendix?

CONCLUSION

TAKEAWAYS - INDUSTRY

The following are the most impactful industry takeaways from this framework report. These include but are not limited to: (better intros)

- Most existing Data Centers were built for Telecommunications, Cloud Computing, Streaming & Social Media. AI Factory architecture is much more power hungry.
- Race for AI Supremacy is driving growth, not AI profits (yet).
- Evaporative Cooling is thermodynamically efficient but consumes tons of water. Water-cooled rack technologies and air-cooled closed loop systems can optimize PUE and WUE.
- Waste Heat Recovery is very impactful. District heating loops are ideal, but internal reuse options exist.
- Electric Grid has limited capacity, and long interconnection cues.
- Onsite Power usually means modular gas turbines.
- Data Center Boom provides opportunity to upgrade the electric grid and invest in Renewable Energy.

TAKEAWAYS - REGULATORY

The following are the most impactful industry takeaways from this framework report. These include but are not limited to: (better intros)

- Since onsite generation, with combustible fossil fuels, tends to be very loud, local noise ordinances are probably simplest way to encourage grid connected data centers. This naturally will also encourage equipment screening where needed.
- Larimer County's largest other regulatory tool is the 50% local Business Personal Property Tax (PPT) rebate. With this carrot, the county can encourage, but not mandate, regulations traditionally outside their purview.
- Data Centers are a rare opportunity for new tax revenue, without incurring many municipal liabilities.

SUGGESTED NEXT STEPS

The framework and recommendations presented are based on initial research and limited legal knowledge. The county should engage stakeholders and other experts to further refine these recommendations. Some areas of needed further research include: (better intros)

- Explore Contingencies for State Enterprise Zone and Local Opportunity Zone Overlays.
- Refine Tax Incentive Requirements & Thresholds.

APPENDICES

REGULATION SCORING MATRIX

The following are the tiered suggested regulations for Larimer County. Each progressive tier is assumed to inherit all (or most) of the regulations suggested in the lower tier. Tier 1 is the most lenient and could even be crafted to invite data centers to the county. Tier 4, is the most stringent, but feasible set of regulations the county could include. Tier 5, includes some regulations data center developers will likely never agree to.

Tier 1

Recommendation	Category	Options & Thresholds	Tax Incentives	Grade	Tier
Noise Monitoring	Noise	Can install Class 1 Sound Level Meters at the property line		A	1
Load Shifting Optimization, demand response or grid balancing	Power	Signed Agreement between Developer, Utility & Optimization Software Provider		A	1
Power Usage Reporting	Power	All Data Centers >50MW or Facilities with new associated 65kV Substation		A	1
Power Impact Study	Power	Required for all Applications >5MW		B	1
Water Impact Study	Water	Required for all Applications		A	1
Water Use Reporting	Water			A	1
Large Load Differentiation	Land Use	10MW for Colocation Power, 50MW for 1041 Consideration		A	1
Opportunity Zone	Land Use	*Pick desired Requirements*	5% Rebate on **All** PPT	B	1

Tier 2

Recommendation	Category	Options & Thresholds	Tax Incentives	Grade	Tier
Noise Reporting	Noise			A	2
Noise Requirements	Noise	Average Daytime Limit: <55dBA & <70dBC at property line		A	2
Power Sources Disclosure	Power	Required for all Applications >5MW		A	2
PUE Requirement	Power	1.6 for Medium sized Data Center (5-20MW), 1.4 for Large Loads (>20MW), 1.3 for Data Centers >50MW		A	2
"Energy Star for Data Centers" Certification Bonus	Power		2% PPT Rebate on Cooling Equipment	B	2
REF (Renewable Energy Factor) Bonus	Power	REF > 0.75, where Renewable Power must be online in 5 years	25% Rebate on **All** PPT	B	2
WUE Requirement	Water	0.6 liters/kWh (efficient adibiatic), 0.2 liters/kWh (dry coolers only)		A	2
Diesel Generators must meet Tier 4 EPA emmssions standards, or Tier 2 Emmisions Standard with installed Seclective Catalytic Reduction System or Equivalent Technolorgy	Enviro.	All Data Centers >20MW		A	2
Environmental Impact Study	Enviro.	Required for all Applications >5MW		A	2
Emergency Reporting, Inlcuding Spills	Enviro.			B	2
Water Discharge Requirements	Enviro.			B	2
Server Side Liquid Cooling Bonus (Including Rear Door Heat Exchangers, Direct-to-Chip, Immersion Cooling)	Equipment		5% PPT Rebate on Cooling Equipment	A	2
Community Benefits Agreement	Land Use			A	2

Tier 3

Recommendation	Category	Options & Thresholds	Tax Incentives	Grade	Tier
ERF (Energy Reuse Factor) Bonus	Power	0.10 for grid connected Data Center, 0.20 for onsite generation with combustable fuels	50% PPT Rebate Waste Heat Equipment when grid connected, 20% PPT Rebate Waste Heat Equipment for onsite generation with combustable fuels	A	3
Verifiable Renewable Virtual Power Purchase Agreeements (within RTO/ISO	Power		1.1:1 PPT Rebate dollar matching on IT Equipment, until 30% Value of IT PPT	A	3
Mandatory enrollment with any existing or applicable Green Tarrifs (rate structures) within the Local Utility's	Power	All Data Centers >20MW		A	3
"LEED BD+C: Data Centers" Certification	Power		3% PPT Rebate on Cooling Equipment	B	3
ISO 14001 Standard for Environmental Management Certification	Power	All Data Centers >50MW		B	3
ISO 50001 Energy Management	Power	All Data Centers >50MW		B	3
Mandatory enrollment with any existing or applicable Large-Load Tarrifs (rate structures) within the Local Utility's	Power	All Data Centers >20MW		B	3
ITEEsv (IT Equipment Energy Efficiency) R	Power			B	3
Decommissioning Reporting	Enviro.			B	3
Hybrid "Free Cooling" (Airside Econimizer) Bonus	Equipment		10% PPT Rebate on Cooling Equipment	B	3
Community Engagement Requirements	Land Use			B	3
Conditional Use	Land Use	In all zoning Districts, Just some		B	3

Tier 4

Recommendation	Category	Options & Thresholds	Tax Incentives	Grade	Tier
BREEAM Certification Bonus	Power			A	4
Direct investment in renewable energy or energy storage projects Bonus (within RTO/ISO Region)	Power		1.1:1 PPT Rebate dollar matching on IT Equipment, until 40% Value of IT PPT	A	4
24/7 Carbon-Free Electricity (CFE) Scores, "Hourly Matching"	Power	CFE Score > 0.5	10% Rebate on **All** PPT	A	4
Reclaimed Water Bonus	Water	Reclaimed Water must come from offsite source	20% PPT Rebate on Cooling Equipment	B	4
Community Equity Endowment (Revenue Sharing)	Land Use		1:1 PPT Rebate dollar matching on all Equipment, until 5% Value of PPT	B	4

Tier 5

Recommendation	Category	Options & Thresholds	Tax Incentives	Grade	Tier
Ban officials from Signing NDAs	Land Use			B	5
Resource Caps. No more than 1-2% of County's Annual Water or Power	Land Use			B	5
Single Primary Use Zones: Ban use of Power Generation and Data Centers on	Land Use			C	5

DATA CENTER PROFORMA - TAX INCENTIVE TOOL

The following is a sample of a proforma used for a theoretical 100MW Data Center in norther Colorado. Using 2026 pricing, this proforma was used to develop the personal property tax incentives values for corresponding equipment choices. To encourage developers to elect more costly or complicated solutions, the tax incentives are intended to reimburse incremental system costs by 110%. A copy of this file is available as “Data Center Proforma – Tax Incentive Tool”.

Global Assumptions

Parameter	Value	Unit
Total IT Load	100	MW
Total Facility Square Footage	500000	SqFt
IT Equipment Ownership	1	%
Electricity Cost	0.07	$/kWh
Water Cost	0.005	$/Liter
Larimer County Effective PPT Rate	0.025	%
Revenue per MW per Month	150000	$
Exit Cap Rate	0.08	%
Loan-to-Cost (LTC)	0.65	%
Standard Interest Rate	0.075	%
Greenium Discount	0.005	%

Operational Efficiency

Metric	Low Case	High Case	Selected Case
Power Usage Effectiveness (PUE)	1.15	1.35	1.2
Water Usage Effectiveness (WUE)	0.1	0.4	0.2

CapEx & Lifecycle					
Category	**Cost per SqFt ($)**	**Total Cost ($)**	**Subject to PPT (Y/N)**	**Depreciation Term (Yrs)**	**Expected Useful Life (Yrs)**
Land Acquisition	10	5,000,000	N	0	0
Soft Costs	50	25,000,000	N	15	0
Building Shell	200	100,000,000	N	39	50
Technology Cooling System (TCS)	178.99	89,493,202	Y	7	10
Facility Cooling System (FCS)	128.57	64,285,714	Y	15	15
Free Cooling Equipment	50	25,000,000	Y	15	12
Waste Heat Recovery Equipment	66	33,000,000	Y	15	15
IT Equipment (Servers/Racks)	1500	750,000,000	Y	5	4
Electrical Systems	436	218,000,000	Y	15	20
Parking & Landscaping	20	10,000,000	N	15	0
Lighting & Other Infrastructure	40	20,000,000	Y	15	15
Onsite Primary Power Generation	300	150,000,000	Y	15	20
Backup Power Generation	150	75,000,000	Y	15	20
Grid Interconnection Equip/Fees	80	40,000,000	N	15	30
Offsite Renewable Power (VPPAs)	315.36	157,680,000	N	15	0
Total Initial CapEx		1,762,458,916			
Total PPT Applicable CapEx		1,424,778,916			

15-YEAR CASH FLOW SUMMARY					
Year	**0**	**1**	**2**	**3**	**4**
Revenue	-	180,000,000	180,000,000	180,000,000	180,000,000
Power OpEx	-	(73,584,000)	(73,584,000)	(73,584,000)	(73,584,000)
Water OpEx	-	(876,000)	(876,000)	(876,000)	(876,000)
Personal Property Tax	-	(35,619,473)	(32,057,526)	(28,851,773)	(25,966,596)
Carbon / REC Revenue	-	10,512,000	10,512,000	10,512,000	10,512,000
Total OpEx	-	(99,567,473)	(96,005,526)	(92,799,773)	(89,914,596)
Initial CapEx	(1,762,458,916)	-	-	-	-
Refresh CapEx	-	-	-	-	(750,000,000)
Debt Service	-	(80,191,881)	(80,191,881)	(80,191,881)	(80,191,881)
Facility Sale	-	-	-	-	-
Net Cash Flow	(1,762,458,916)	(99,326,827)	(92,202,932)	(85,791,427)	(830,021,072)
RETURN METRICS					
15-Year IRR	-17%				

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