APEX
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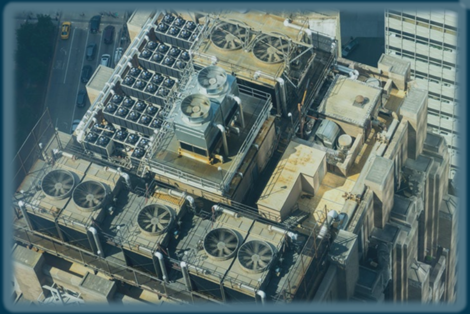
Joint Planning Board-Town Council Work Session on Data Centers

January 22, 2026

Data Center Presentation

- Data Centers
- Energy Consumption
- Water Consumption
- Environmental Impact
- Noise
- Land Use
- Economic Impact
- Traffic Generation
- Public Health & Safety
- Regulation Comparison



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Data Centers

What is a data center?

A data center is a facility that provides computational services such as cloud computing, data storage, artificial intelligence (AI), cryptocurrency mining, and high-performance computing. These facilities support critical services, including email, streaming, online banking, social media, and medical records.

Types of Data Centers

Enterprise and Internal:

Are typically owned, operated, and located on-site by a single company. They may be as small as a server closet, or as large as a server room/building that provides services to internal users.

Example of this would be the internal server room located within Apex Town Hall that allows staff to host and share internal information throughout the organization to better serve the Town's departments and daily operations.

Types of Data Centers

Colocation (small, medium, large scale):

Colocation data centers operate much like a multi-tenant shopping center, where businesses lease space from a data center owner in the form of individual server racks or, in some cases, entire dedicated server rooms.

In some cases, companies leasing space from the data center operator may need to have physical access to their servers to maintain specific equipment or operations. Due to this, companies prefer to utilize and partner with colocation facilities within roughly 30–60 miles of their offices.

Types of Data Centers

Hyperscale:

Hyperscale Data Centers are large-scale facilities that provide behind-the-scenes digital services supporting much of the modern internet. Unlike other types of data centers, hyperscale facilities are typically built for and fully occupied by a single company that owns and operates the site to support its own large-scale cloud, or AI (Artificial Intelligence) services.

Common characteristics of hyperscale data centers include:

- Energy demand: ~100 MW or more
- Water demand: ~1 Million Gallons Per Daily (MGD) or more
- Number of servers: ~5,000 or more
- Redundancy Tiers: III or IV

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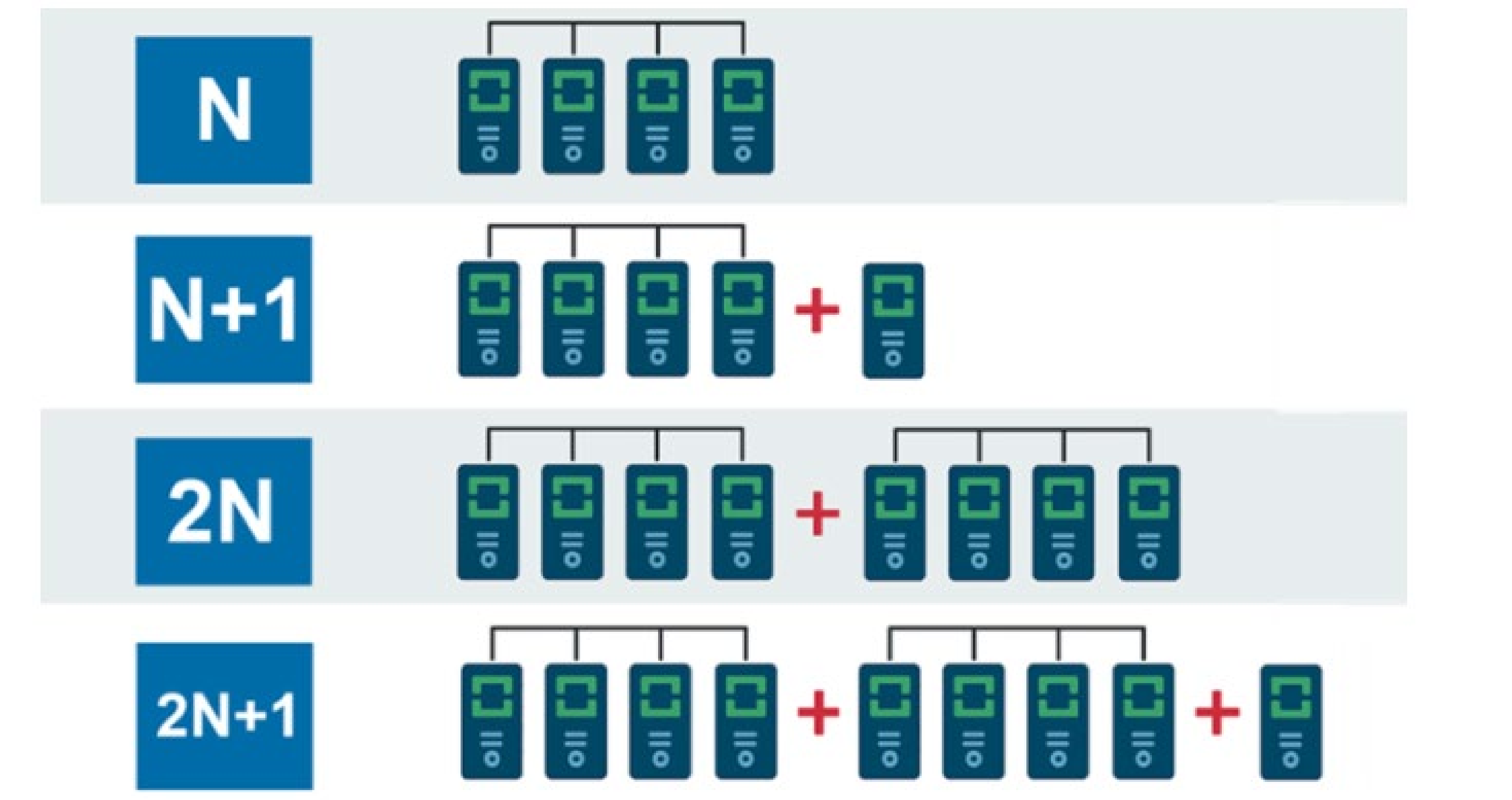
Data Centers

What are data center redundancies?

Level	Tier I	Tier II	Tier III	Tier IV
Redundancy	No	Partial; redundant components	N+1	2N or 2N+1
Redundant Distribution Paths (Energy, Cooling)	No	No	Yes, but only one path active at a time	Yes, all paths active simultaneously
Uptime Guarantee	99.671%	99.741%	99.982%	99.995%
Downtime per Year	28.8 hours	22 hours	1.6 hours	0.4 hours
Concurrently Maintainable	No; maintenance requires downtime	No; maintenance requires downtime	Yes, without taking data center offline	Yes, without taking data center offline
Cost	Moderate	High	Very High	Extremely High

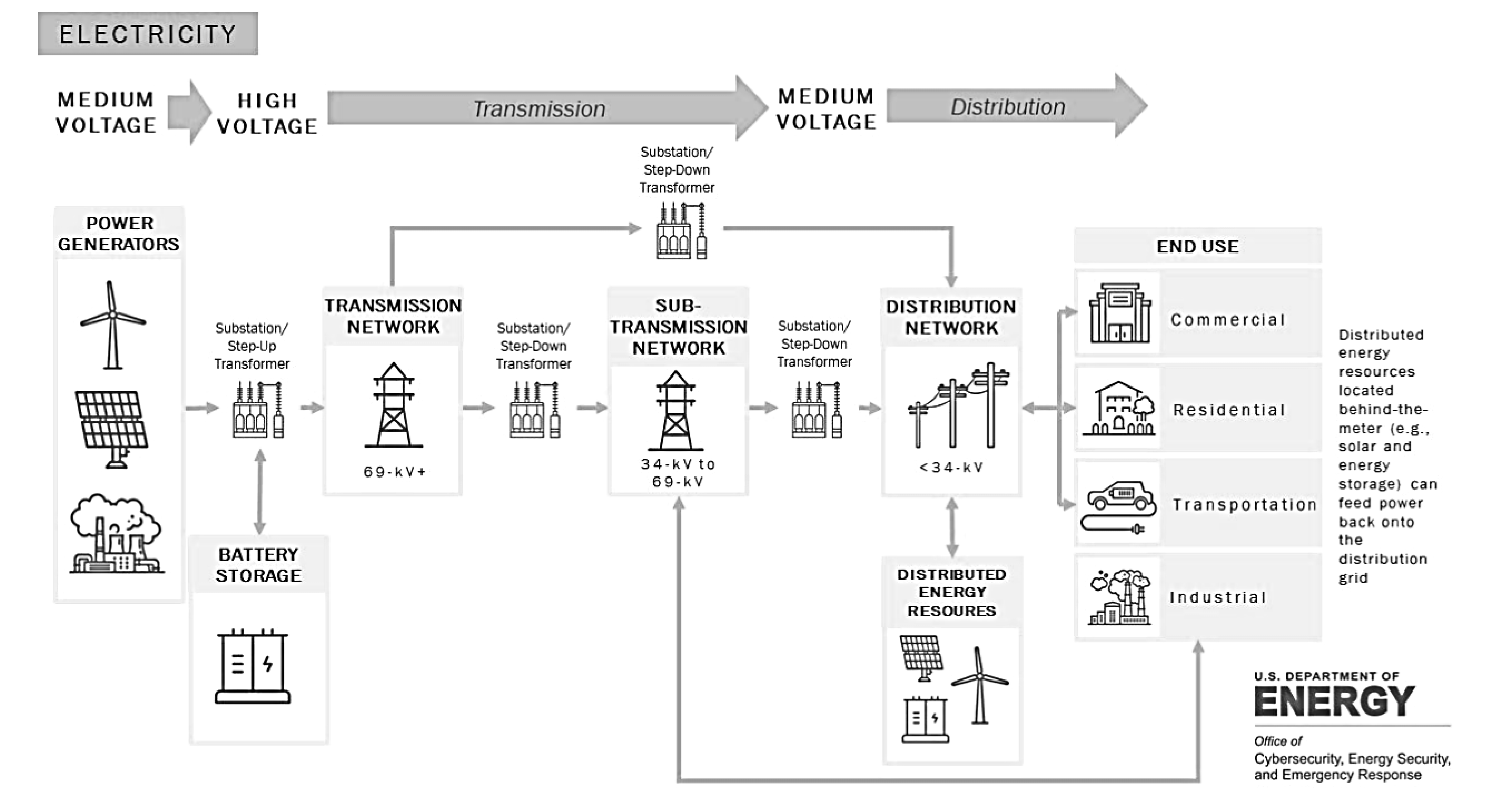
Data Centers

Visual example of redundancy tiers I-IV



Source: https://phoenixnap.com/

Understanding the Grid



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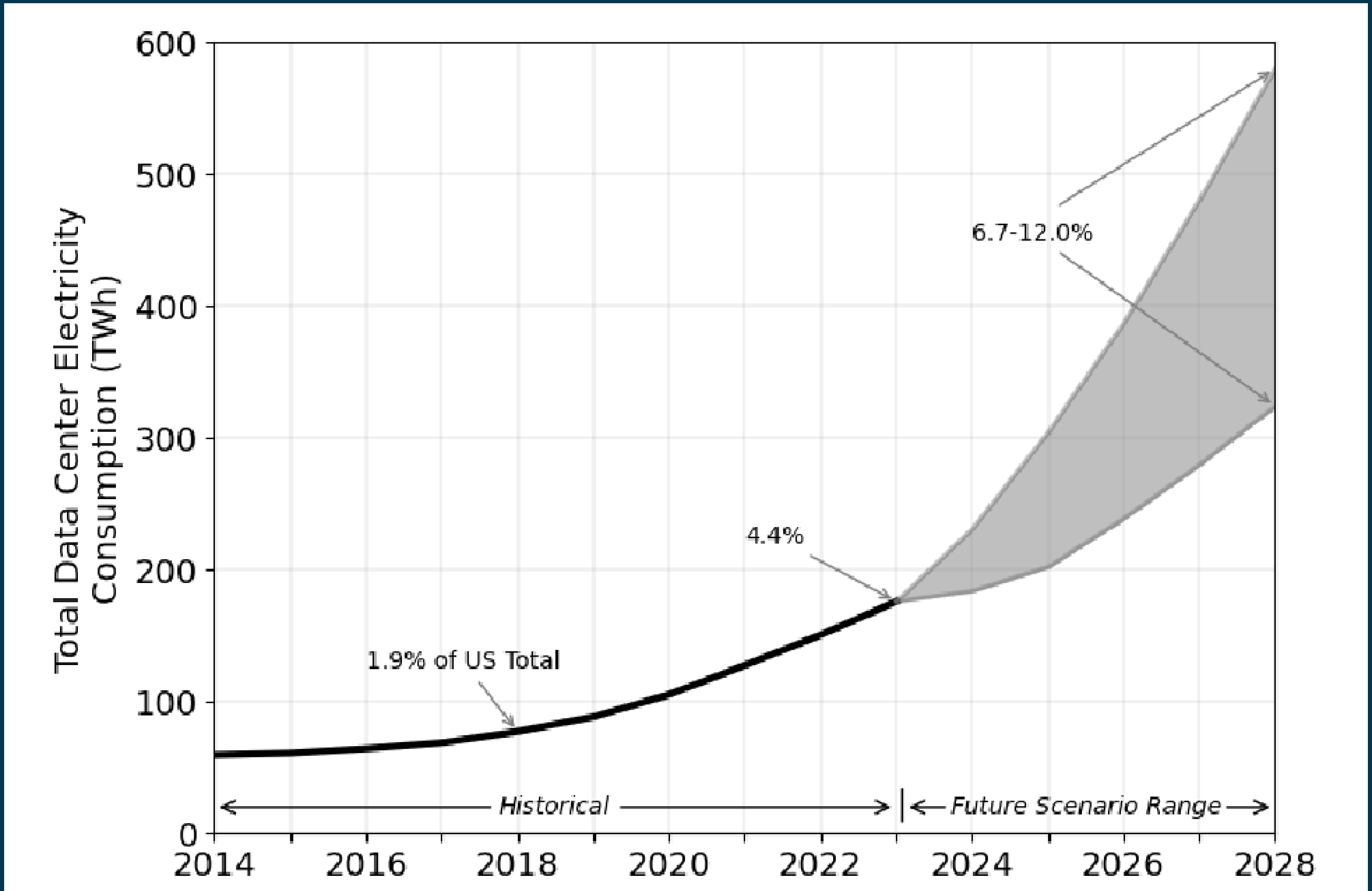
Energy Consumption
Total Data Center Electricity Consumption (TWh)



Source: Shehabi et al., 2024 United States Data Center Energy Usage Report, LBNL 2001637

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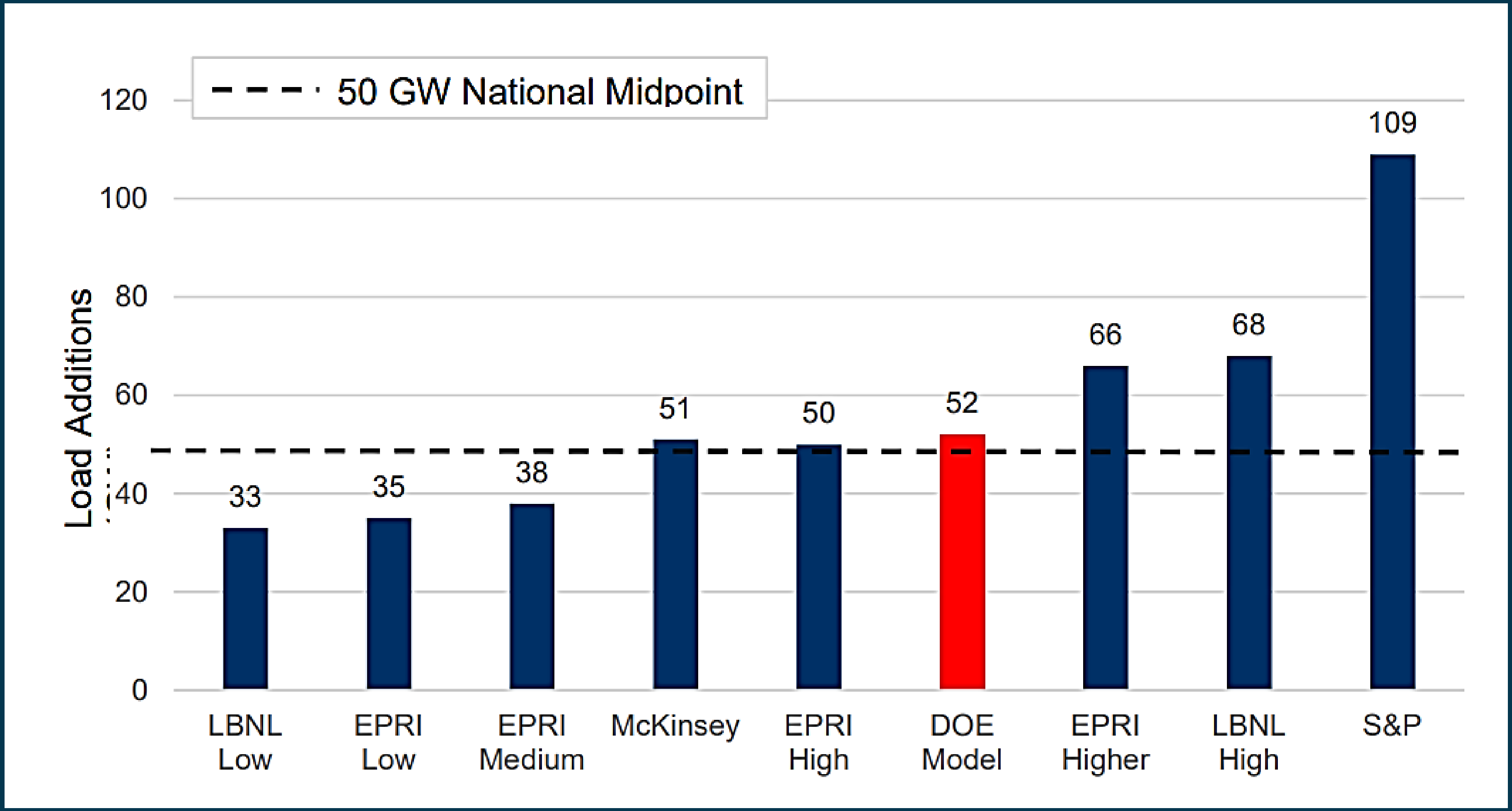
Energy Consumption
Additional Load Demand



Source: U.S. Department of Energy, Resource Adequacy Report – Evaluating the Reliability and Security of the U.S. Electric Grid, July 2025

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Energy Consumption

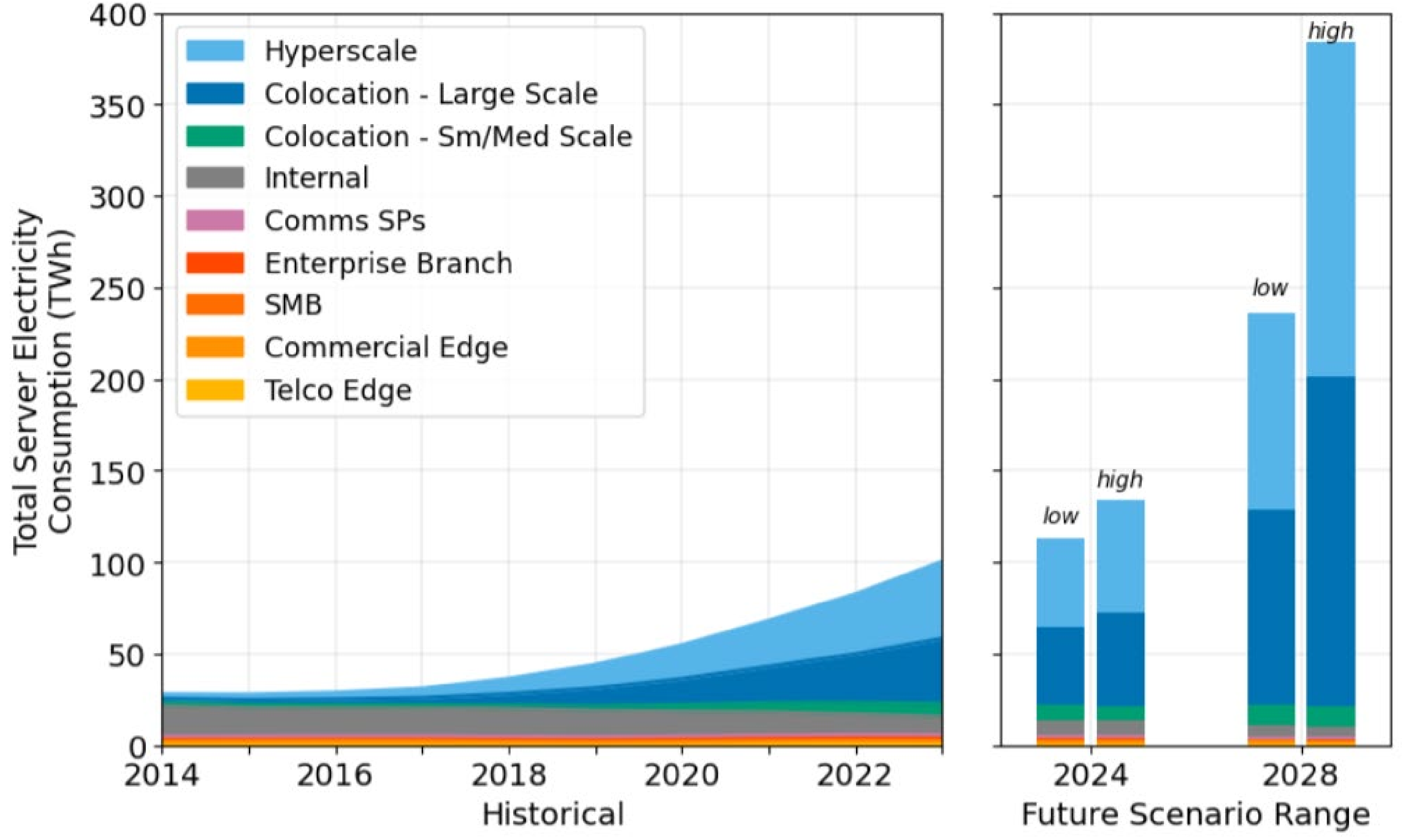

Figure 5.2. Server annual electricity use by space type.

Source: Shehabi, A. et al. (2024). United States Data Center Energy Usage Report. LBNL-2001637, Lawrence Berkeley National Laboratory.

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Energy Consumption
Anticipated mean peak load 2030

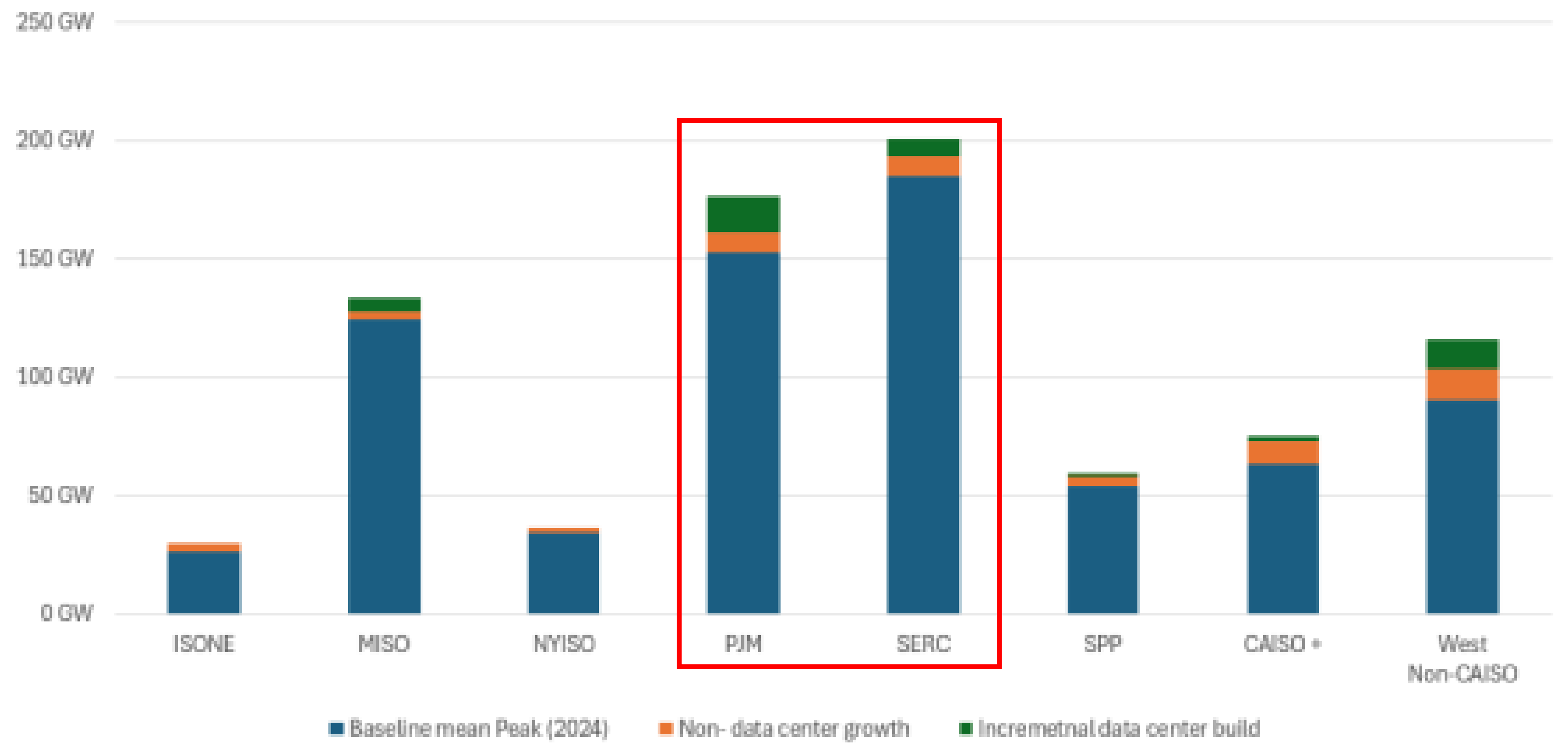

Figure 9. Mean Peak Load by RTO (Current Case vs 2030 Case)

Source: U.S. Department of Energy, Resource Adequacy Report – Evaluating the Reliability and Security of the U.S. Electric Grid, July 2025

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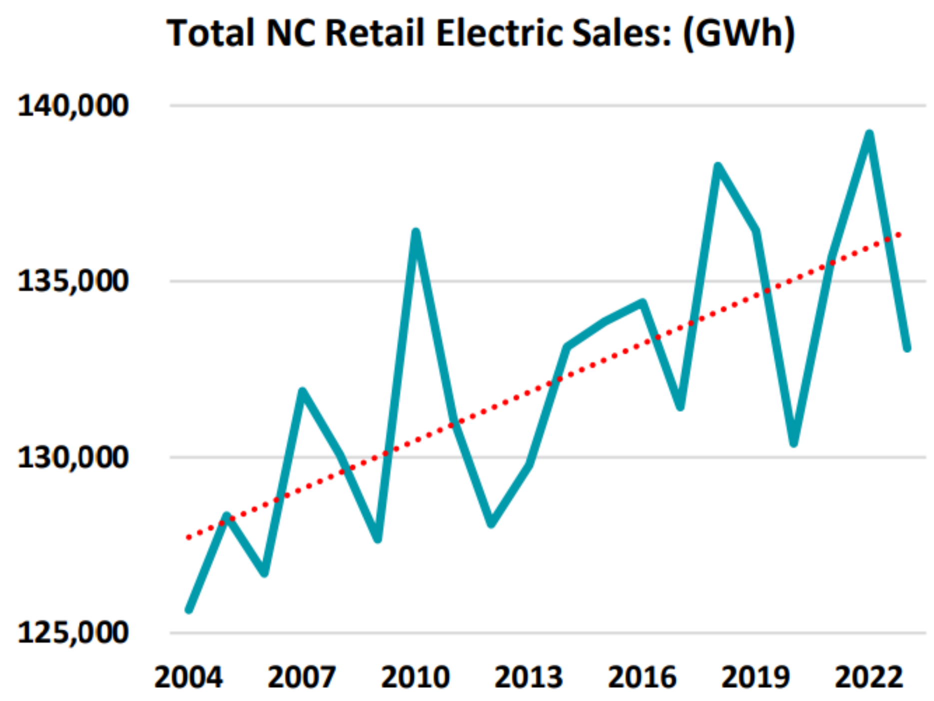
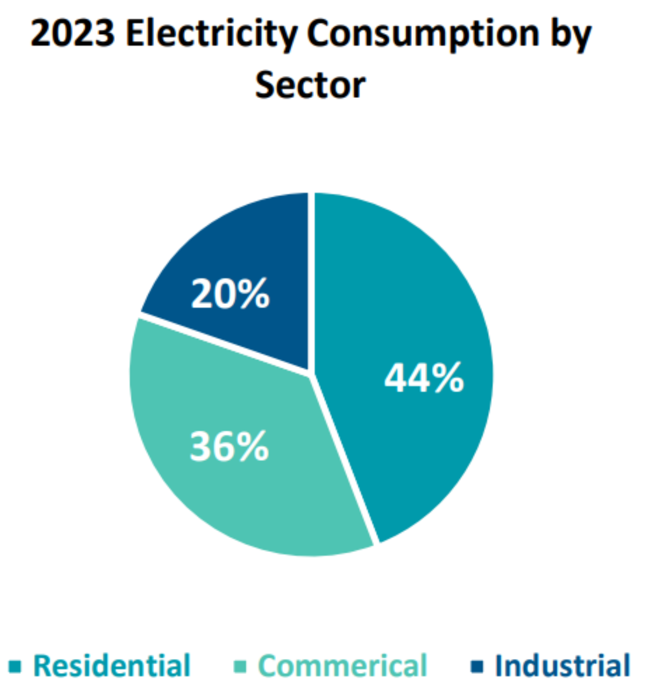
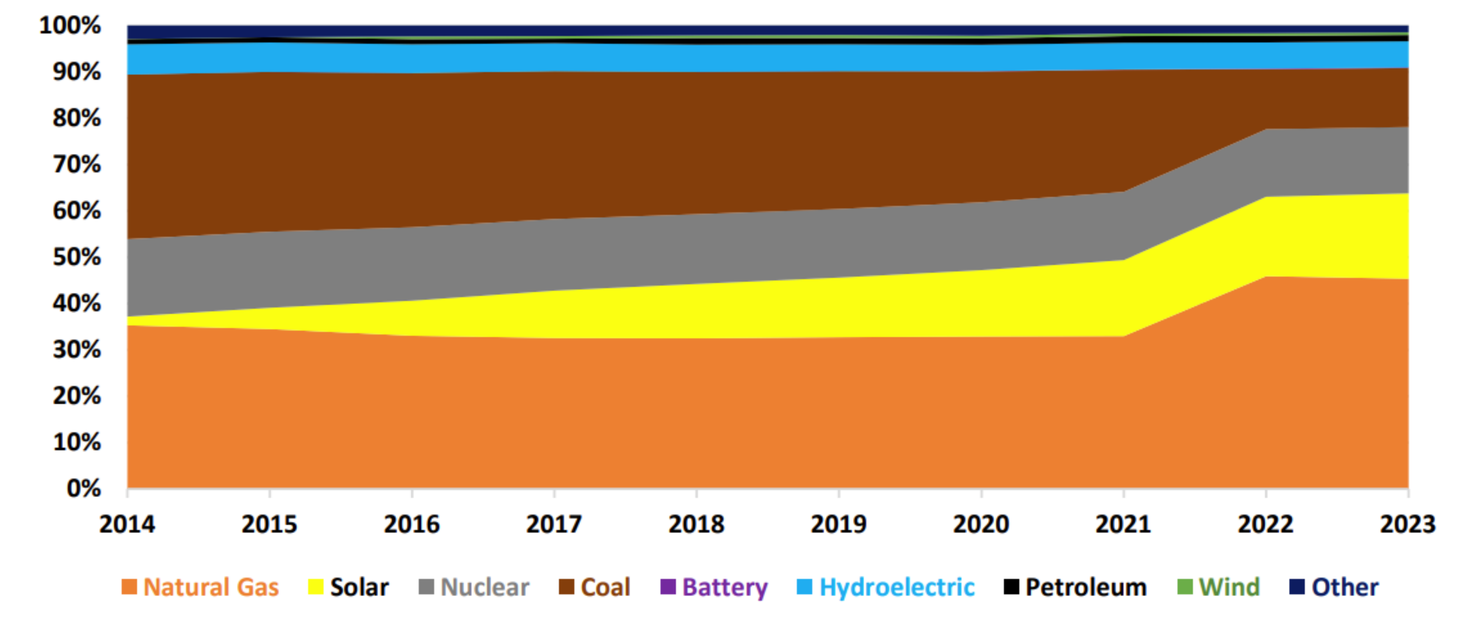
Energy Consumption



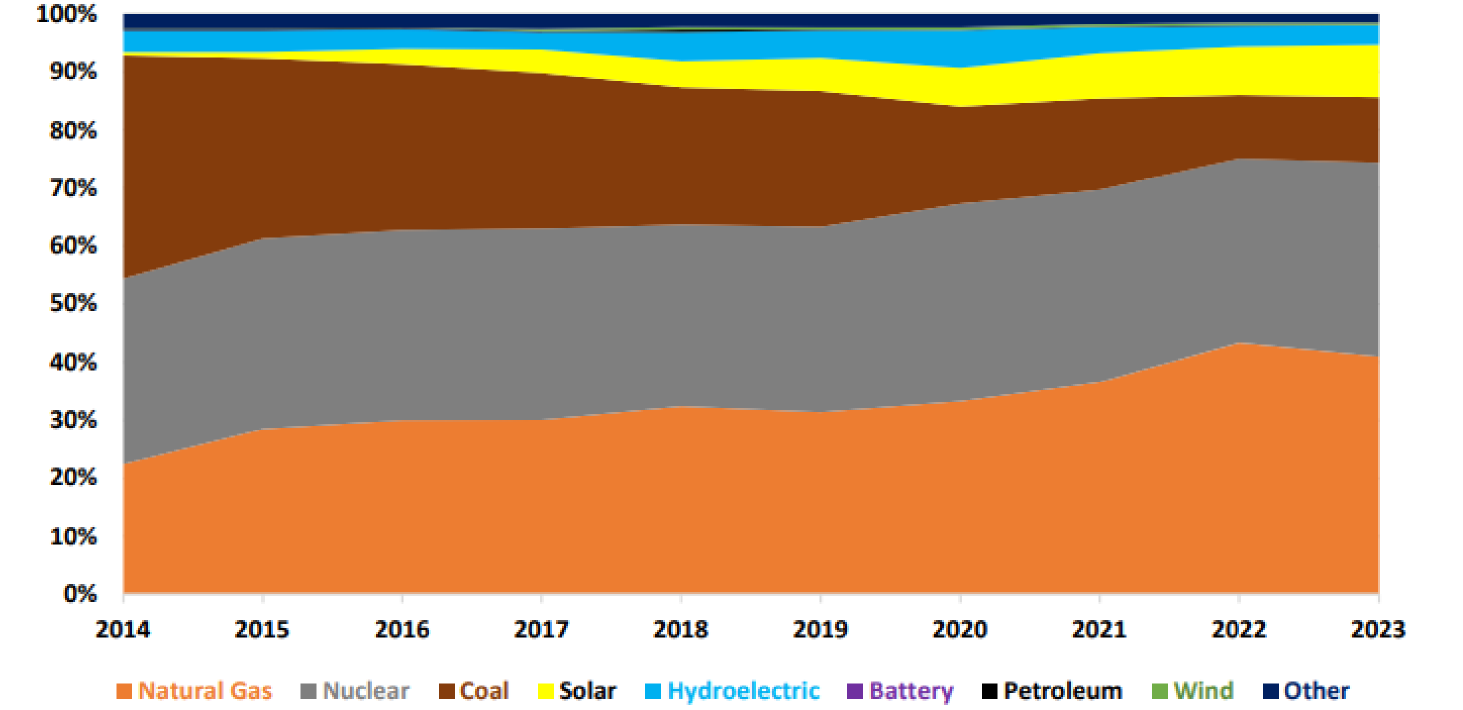


Source: NCDEQ. (2025). North Carolina Energy Security Plan: Final Report. State Energy Office.

Installed Capacity by Fuel Type

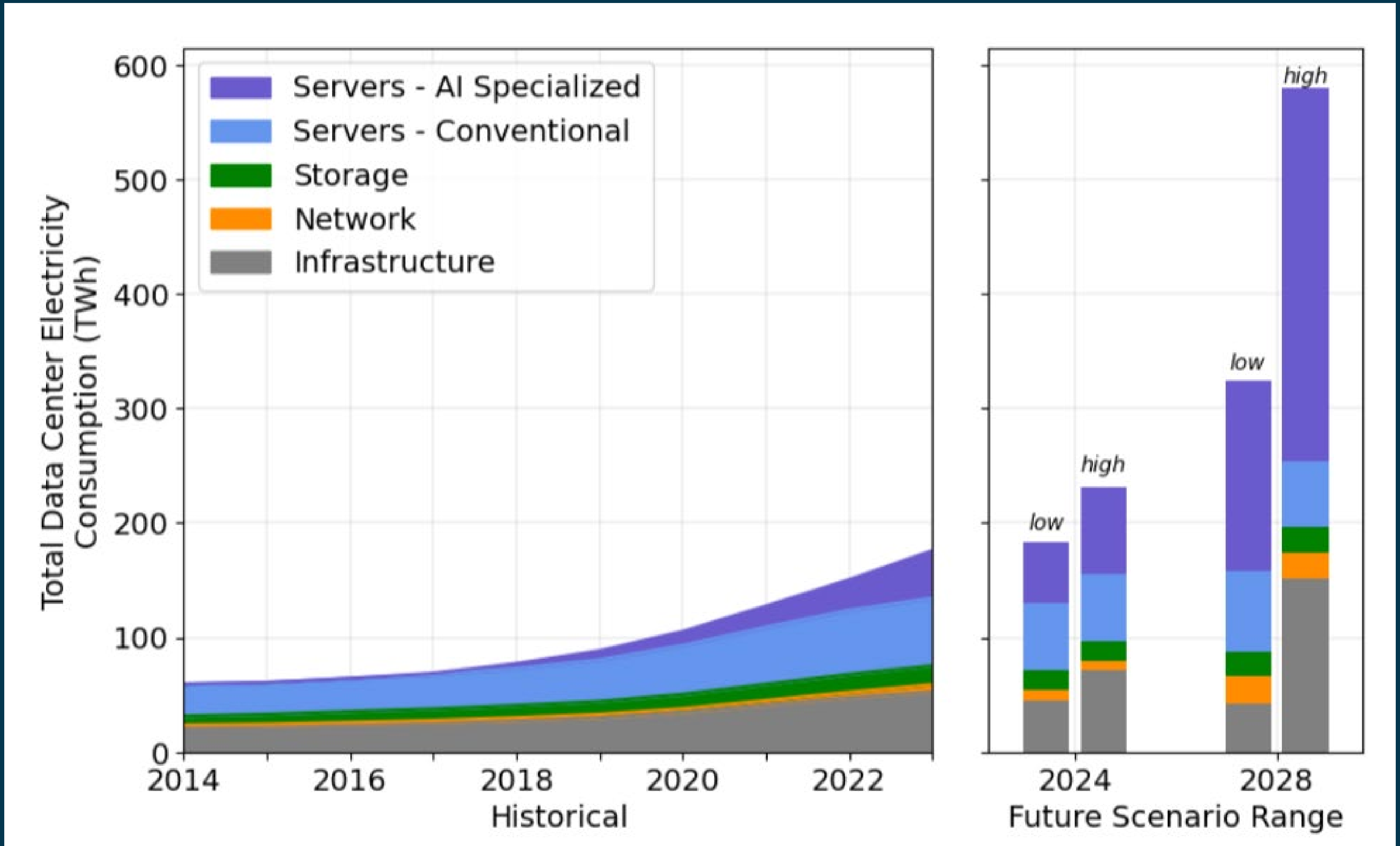


Generation by Fuel Type



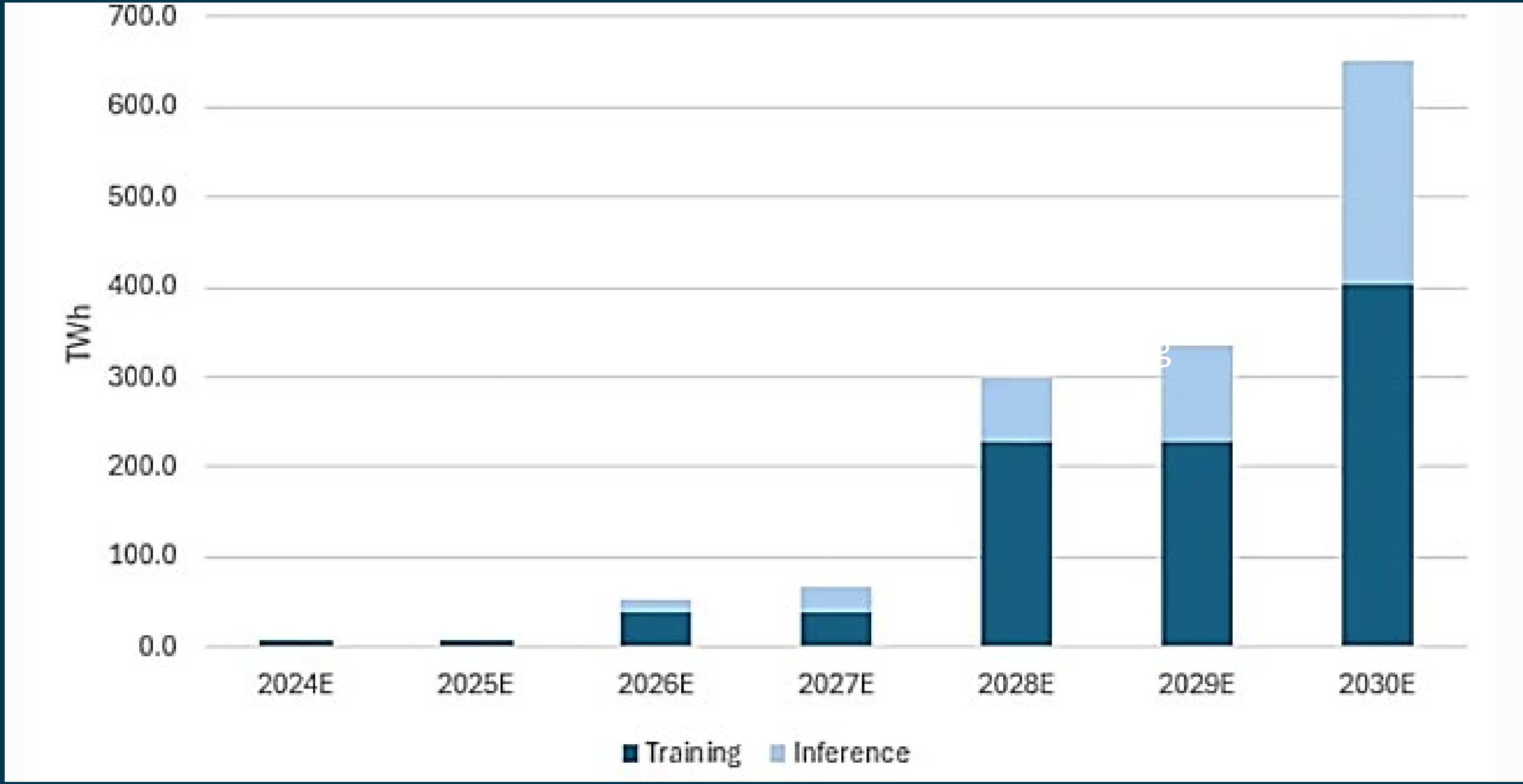
Source: NCDEQ. (2025). North Carolina Energy Security Plan: Final Report. State Energy Office.

Impact of Artificial Intelligence



Source: Shehabi, A. et al. (2024). United States Data Center Energy Usage Report. LBNL-2001637, Lawrence Berkeley National Laboratory.

Impact of Artificial Intelligence



Source: Beth Kindig, "AI Power Consumption: Rapidly Becoming Mission-Critical," *I/O Fund*, June 24, 2024

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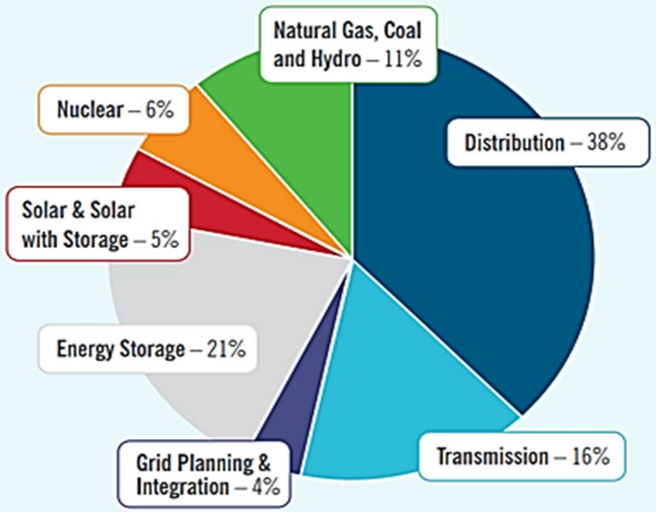
Energy Consumption

Future Generation (Near Apex)

- 356 MW of standalone Battery Energy Storage Systems (BESS) in New Hill
- 100 MW of Solar in Longleaf
- 900 MW of Nuclear at Shearon Harris

2027-2028 Multiyear Rate Plan Investments

*As part of this rate request, Duke Energy has proposed $8.3 billion in new investments represented in the chart below.**



Distribution – $3.2 billion across 436 projects
Transmission – $1.3 billion across 603 projects
Grid Planning & Integration – $302 million across 96 projects
Energy Storage – $1.7 billion across 13 projects
Solar & Solar with Storage – $391 million across 5 projects
Nuclear – $502 million across 48 projects
Natural Gas, Coal and Hydro – $934 million across 198 projects

**Represents North Carolina retail portion of system investments.*

Source: Duke Energy, *2025 NC Rate Case Fact Sheet*.

Proposed Rate Change by Customer Class

Customer Class DEC	% Increase Jan. 1, 2027	% increase Jan. 1, 2028	Customer class DEP	% increase Jan 1, 2027	% increase Jan. 1, 2028
Overall	10.9%	4.1%	Overall	10.9%	4.1%
Residential	13.5%	4.5%	Residential	13.9%	4.3%
General service	7.3%	4.0%	SGS	9.8%	4.8%
Industrial	9.0%	3.7%	MGS	6.4%	4.3%
OPT (Business TOU)	8.3%	3.6%	LGS	5.4%	3.6%

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Energy Consumption

Large Load Users

Duke Energy is exploring ways to work with large electricity users, such as data centers, manufacturing facilities, and any other use exceeding 50 MW of power.

In SC, Duke reached a settlement with the Sierra Club and other interested parties to petition the state's utility commission to require additional items as part of their review and approval of new energy request.

This may include:

1. Minimum contract period and contract demand for billing purposes;
2. Collateral requirements;
3. Exit policies and restrictions on customer capacity reduction;
4. Treatment of generation, transmission, and administrative costs;
5. Interconnection costs, including opportunities to support grid-enhancing technologies to manage interconnection costs;
6. Optional tariff provisions for flexible interconnections; and
7. Optional tariff provisions for management of clean behind-the-meter resources and optional clean transition tariffs to enable direct selection of new clean energy resources.

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Energy Consumption

Policy Considerations & Potential Mitigation Measures

- Evaluating if an Electrical Load Study detailing the project’s anticipated diversified load and peak demand for both summer and winter seasons would help the Town understand any potential impact to the local grid.
- Encouraging data centers to set a Power Usage Effectiveness (PUE) ratio goal to maximize efficiency (perhaps a goal of 1.25 or lower) and to provide the Town with annual report on the data center’s PUE.
- Evaluating alternative on-site generation or energy storage.

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Water Consumption

The primary water use for a data center comes from cooling computing equipment. The amount of water necessary will be dependent on factors such as:

- Size of the system (number of units, racks, etc.)
- Cooling method - liquid (evaporative) vs air cooling (less water)

A hyperscale data center may require ~1–5+ MGD (365 million gallons – 1.83 billion gallons annually).

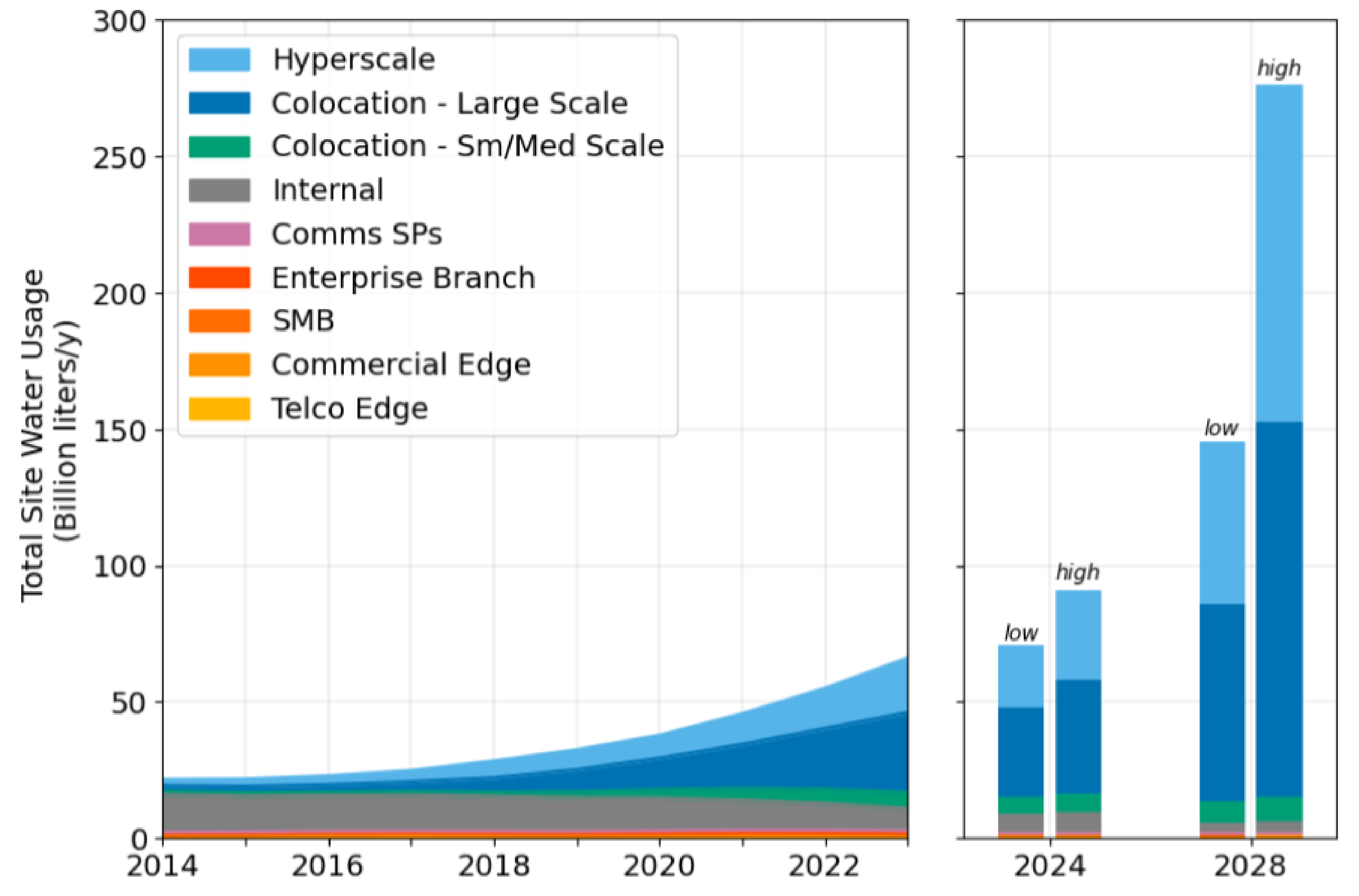

Figure 5.9. Direct water consumption by data center type.

Shehabi, A. et al. (2024). United States Data Center Energy Usage Report. LBNL-2001637, Lawrence Berkeley National Laboratory.

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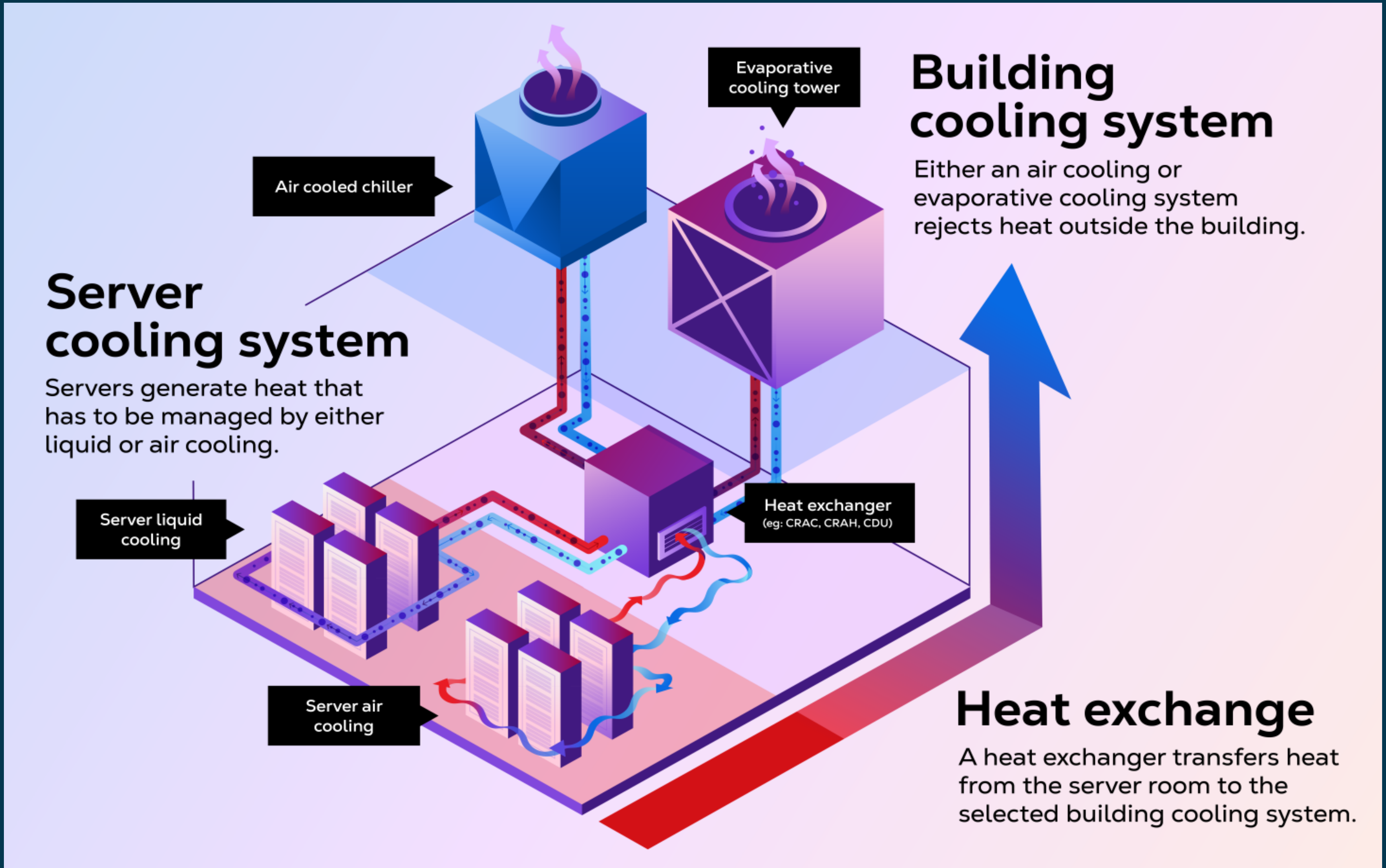
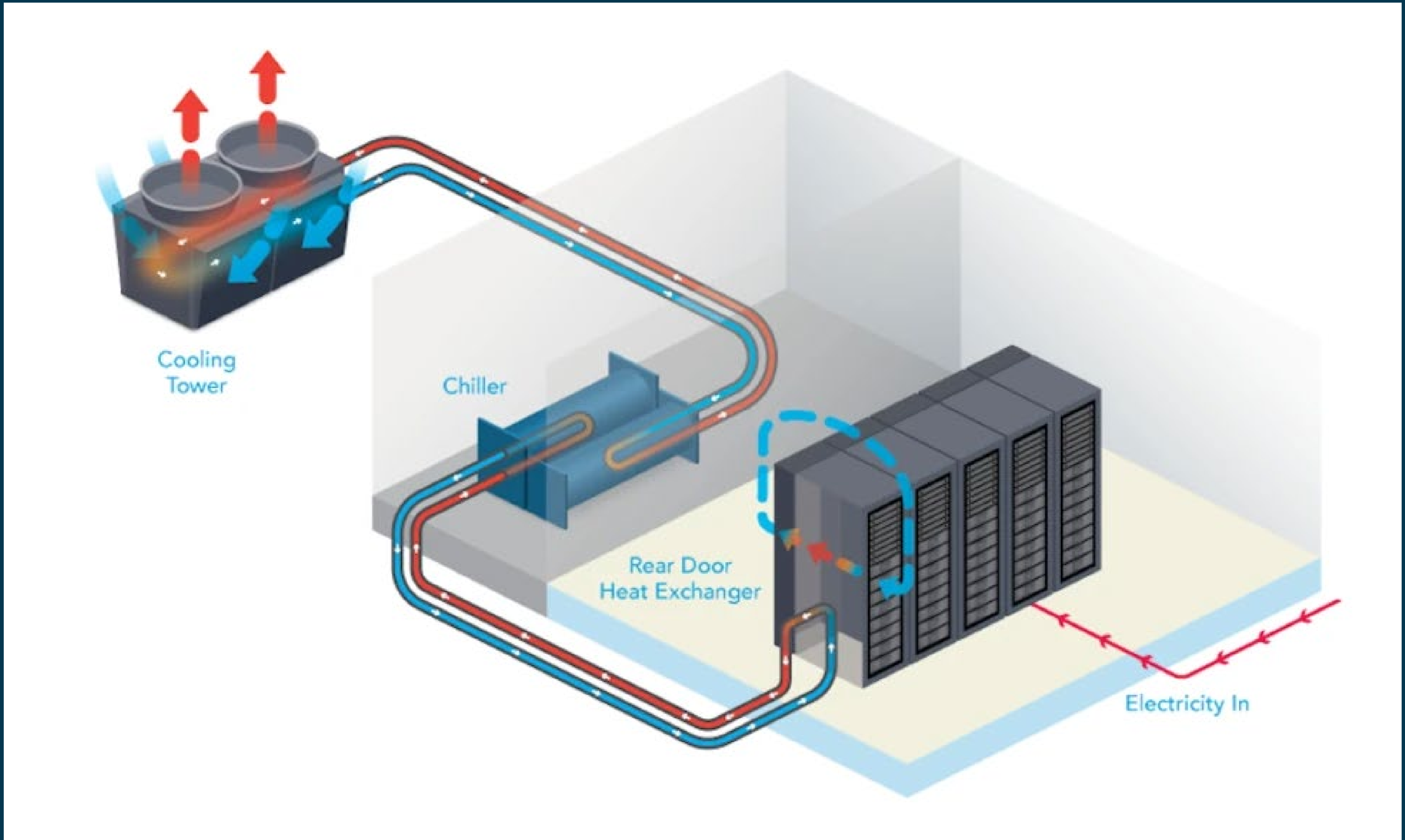
Cooling Systems



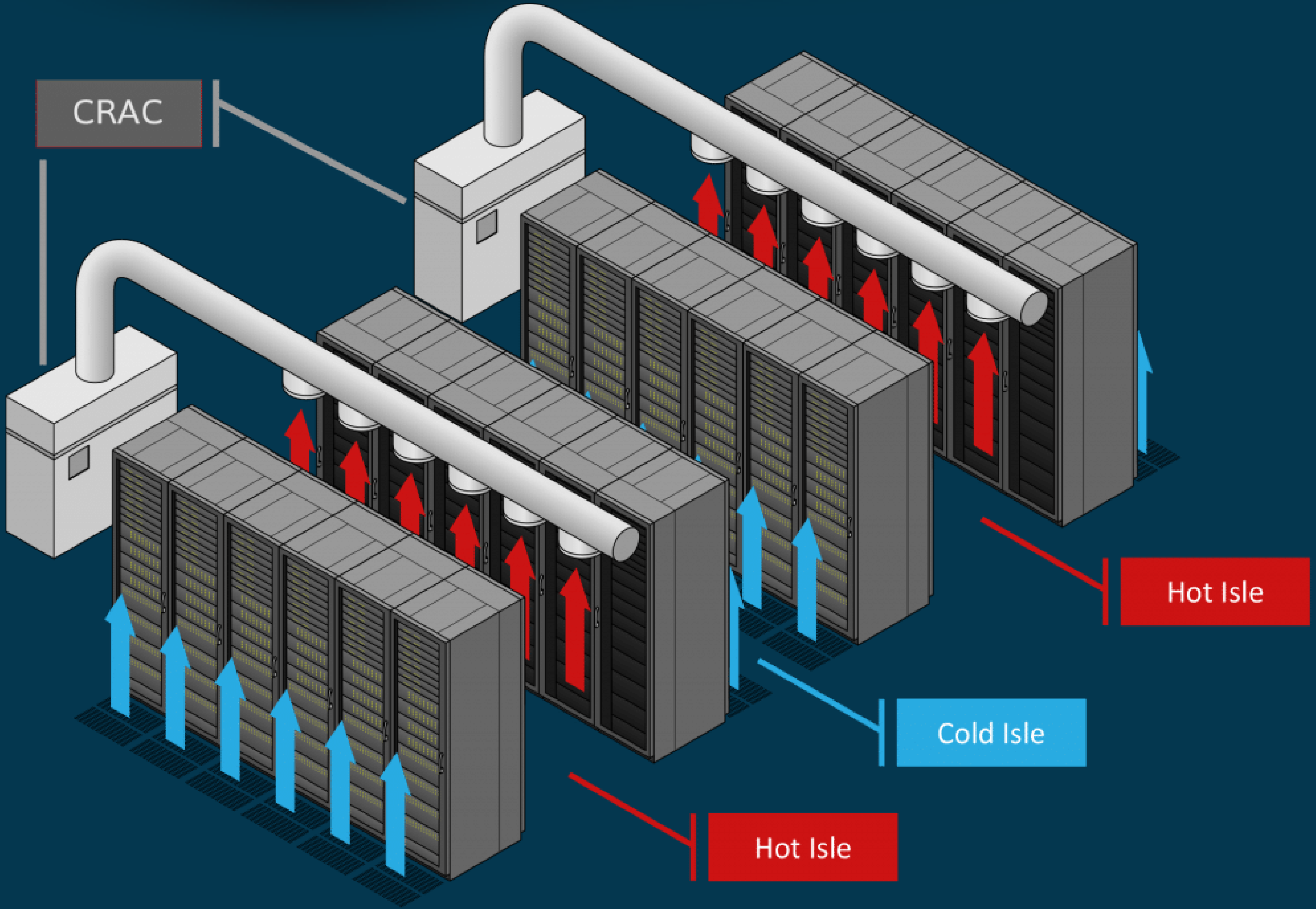
Source: equinix.com

Closed-Loop
Liquid to air cooling



Source: Upsite.com

Air Cooling



Source: nlyte.com

Comparing Water Use by Use Type

1,500,000 Gallons of water per day applied to each of the following uses.

Use	Design Flow Rate	Equivalency	Notes/Context
Multi-Family Residential/Apartments	250 GPD/unit	~6,000 units	Comparable to several large apartment complexes
Single-family residential	300 GPD/unit	~5,000 homes	Roughly a small town's worth of housing
Hospital	300 gal/bed	~5,000 beds	Equivalent to multiple large regional hospitals
Grace Christian School	~18,000 GPD	~83 comparable schools	Local reference point
Felton Grove High School	~35,250 GPD	~43 comparable schools	Local reference point
Light Industrial: Apex Light Industrial Phase 2	~69,130 GPD	~22 comparable buildings	Local reference point
Auto Manufacturing	~39,000 gallons per unit*	~38 vehicles per day	A single plant may create up to 100,000 to 400,000 vehicles per year
Bioscience Facility	~67, 000 GPD	~22 comparable facilities	Median of regional reference points

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Water Consumption

Policy Considerations & Potential Mitigation Measures

- Encouraging or requiring the use of reclaimed water for equipment cooling applications.
- Limiting potable water use for non-cooling site needs, emergencies, or reclaimed water system maintenance periods.
- Encouraging or requiring the use of geothermal closed loop for cooling.
- Discouraging or prohibiting the use of groundwater for cooling.
- Considering adoption of a potable water surcharge to discourage domestic water use, support water conservation and infrastructure costs. Encouraging onsite storage of reclaimed water to serve the use for a 24-hour period minimum.

Water Consumption

Policy Considerations & Potential Mitigation Measures cont.

- Requiring a water and sewer study detailing anticipated demand, necessary infrastructure and plant updates, and long-term operating impacts to the utility system.
- Encouraging data centers to set a Water Usage Effectiveness (WUE) ratio goal to maximize efficiency (perhaps a goal of 0.5 or lower) and to provide the Town with annual report on the data center's WUE.
- Applying monitoring and reporting requirements that follow the Towns Sewer Use Ordinance and pretreat wastewater if needed to meet local limits.
- Allowing a combination of air and liquid cooling methods to optimize efficiency and reduce waste.

Environmental Impacts

Data centers may impact the environment from daily operation (lighting, greenhouse gases, etc.) or from potential equipment failure that leads to leaks of hazardous material onsite, or fires and explosions.

Known Points of Concern:

- Light Pollution
- Air Quality & Greenhouse Gases
- Water Quality and Supply
- Ground and Air Contamination

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Environmental Impacts: Light Pollution

Data centers may store highly sensitive information regarding financial, medical, or in some instances national security-related information. As a result, data centers take security very seriously and tend to provide enough lighting to adequately monitor and ensure safety on the site.

Any lighting concerns not fully mitigated by the UDO's exterior lighting standards will need to be addressed through suggested zoning conditions at the time of rezoning to mitigate potential impacts on neighboring property owners and local wildlife. Such conditions may include additional standards for fixture height, additional shielding, and greater setbacks from the property lines.

Environmental Impacts: Air Quality

Direct Impact: Emissions from onsite generators can release greenhouse gases and other air pollutants, that contribute to climate change and can degrade local air quality. Additional mitigation measures may be necessary to reduce or control the emissions from onsite power generation.

Indirect Impact: Some fossil fuel power plants may have their life spans extended beyond their original retirement date to help meet the demand for electricity until newer plants are brought into service. When this occurs, it creates the potential for an increase in greenhouse gases and other air pollutants that may have negative impacts on communities near these power plants and thus results in indirect environmental impact from excess energy demand.

Diesel Emissions

The Environmental Protection Agency (EPA) states that exposure to diesel exhaust like that from diesel backup generators has been linked to serious health effects, including asthma and other respiratory illnesses, and can aggravate existing heart and lung conditions, particularly among children and older adults. These impacts can lead to higher rates of emergency room visits, hospitalizations, missed work and school days, and premature death.

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Environmental Impact: Water Quality and Quantity

Direct Impact: Data centers that withdraw large volumes of potable water from shared reservoirs may create direct impacts, such as stress on wildlife, degradation of habitat, and reduced water availability for surrounding communities.

Indirect Impact: Power generation facilities require large amounts of water to cool, and as demand for energy grows, the need for more energy to meet that demand will indirectly require an increase in water use.

Jordan Lake Water Supply Allocations

Allocation-holder	Allocation (% of Water Supply Pool)*
Cary/Morrisville & Apex	46.2
Chatham County –North District	13
Durham	16.5
Hillsborough	1
Holly Springs	2
Orange County	1.5
OWASA	5
Pittsboro	6
Total distributed allocation:	**91.2 (out of 100)**
Remaining allocation:	**8.8**

*Every 1% equals 1 million gallons of water per day (MGD).
100% = 100 million gallons of water per day (MGD).

Source: NC Department of Environmental Quality – Jordan Lake Water Supply Allocation, Current Allocations

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Environmental Impact: Ground Contamination

- Data centers that store coolants, diesel, battery backups, or biocides for cooling tower treatment must comply with state and federal requirements for safe storage and use of potentially hazardous materials.
- Equipment failure could result in leaks or spills of potentially hazardous materials, posing a risk to the local environment.

Environmental Impact: Air Contamination

A hyperscale data center typically requires multiple cooling towers to dissipate heat generated by large-scale computing operations. Depending on facility size, redundancy requirements, and cooling design, a hyperscale data center may utilize anywhere from fewer than ten to several dozen cooling towers at full build-out.

Improper maintenance of building water systems may contribute to the growth and spread of potentially harmful bacteria such as Legionella. The most common illnesses associated with Legionella exposure are Legionellosis and Legionnaires' disease.

In rare cases, research has shown that due to the aerosolization associated with cooling towers, the spread of Legionella may occur outside of the immediate area of the site, and under certain conditions, aerosolized mist may up to travel several miles from the source.

To prevent the growth and spread of Legionella, the CDC has developed an assessment and operational toolkit; adherence to these resources may help minimize the risk of releasing potentially harmful bacteria into the environment.

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Environmental Impact

Policy Considerations & Potential Mitigation Measures

- Applying existing UDO Section 8.6 *Exterior Lighting* and considering additional zoning conditions to address lighting concerns such as color temperature, brightness, fixture height, and light trespass.
- Considering the use of Tier IV or Tier IV equivalent backup generators to reduce the adverse impact on air quality.
- Considering the use of natural gas generators for emergency backup.
- Considering the use of spill containment berms, walls, and impermeable barriers to prevent off-site and ground contamination.

Environmental Impact

Policy Considerations & Potential Mitigation Measures cont.

- Considering closed-loop cooling alternatives, such as geothermal systems (e.g., Pit Thermal Energy Storage) or reclaimed water, to reduce impacts on local aquifers and shared reservoirs.

- Considering the use a closed-loop cooling system that does not create a mist that carry the legionella bacteria into the environment, and that can demonstrate compliance with CDC and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Guideline 12 2023 *Managing the Risk of Legionellosis Associated with Building Water Systems* standards.

Note: Additional environmental considerations regarding environmental assessments, testing, and monitoring were shared by residents on 1/14/2026; staff will need additional time to conduct research prior to presenting on these items.

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Noise

Data centers use large backup generators and have HVAC systems that often include cooling chillers, which are louder than standard HVAC units. Together, this equipment can produce continuous high- and low-frequency noise that may impact nearby properties.

The most common way that sound is measure by **Decibels (dB),** which measures sound intensity on a logarithmic scale, where every 10 dB increase represents sound that is perceived as roughly twice as loud.

Decibels are measured by comparing a sound's pressure level to a standard reference level, with A-weighting (dBA) reflecting human hearing sensitivity and C-weighting (dBC) capturing lower-frequency sounds.

Other analysis such as Octave-band measure decibel levels across additional frequencies (Hz) beyond the A or C weighted scales.

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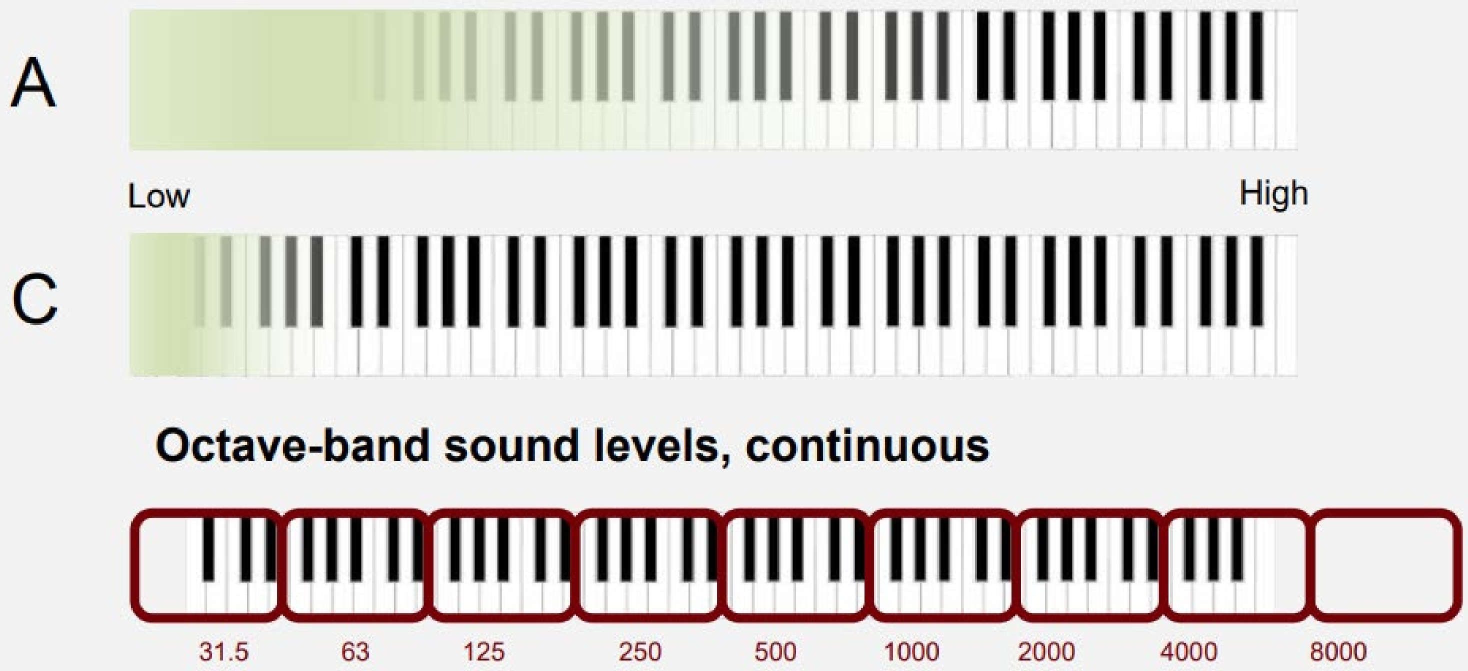
Noise

Measurement Levels – Being updated

Distinction between A/C Weighted Scale



Noise Source	Approx. Decibel Level (dB)	Potential Effect / Perception
Jet take-off (80ft)	150	Risk of severe physical injury; possible eardrum rupture at close range
Aircraft carrier deck	140	Extremely painful; immediate risk of hearing damage
Military jet take-off with afterburner (50 ft)	130	Painful; immediate hearing damage likely
Thunderclap; chain saw; oxygen torch	120	Threshold of pain for many individuals; hearing damage possible with short exposure
Jet flyover (1,000 ft); live rock music; horn noise – train (100 ft)	110	Very loud; hearing damage likely with short exposure
Gas lawn mower (3ft)	100	Hearing damage possible in as little as 15 minutes; ~8× perceived loudness of 70 dB
Diesel Truck (50ft) General Freight Train (100ft) Lawn mower (100ft)	90	Hearing damage possible with prolonged (8-hour) exposure; ~4× as loud as 70 dB
Garbage disposal (3ft); dishwasher; factory noise;	80	Hearing damage possible with long-term exposure; ~2× as loud as 70 dB
Passenger car at 65 mph; freeway traffic; vacuum cleaner (10ft); radio or TV	70	Upper range may be annoying to some individuals
Conversation in restaurant or office; background music; AC unit (100 ft); heavy traffic (300ft)	60	Generally comfortable; normal conversation level
Quiet suburb; conversation at home	50	Quiet; minimal disturbance
Library; bird calls; urban ambient sound floor	40	Very quiet
Quiet rural area	30	Extremely quiet
Whisper; rustling leaves	20	Barely audible
Breathing	10	Near the threshold of hearing

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Noise

AIR-COOLED CHILLERS

Data centers commonly rely on air-cooled chillers that are installed either at ground level or on the roof. Air-cooled chillers are a notable source of exterior noise due to the operation of large fans and compressors used to expel heat from the facility. These components can add significant noise to the site.

Source: Aircomfort.com

Noise

COOLING TOWERS

Cooling towers function by receiving heated water from the facility's liquid chillers and dispersing heat into the atmosphere. The cooled water is then recirculated back into the system. This process involves multiple mechanical components operating simultaneously, which can generate noise. Data centers typically employ one to several dozen cooling towers, often located on rooftops.

Source: bextel.com

Source: bextel.com

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Noise

BACKUP GENERATORS

Data centers are designed to operate continuously, with minimal tolerance for service interruptions. To maintain operations during power outages, facilities are equipped with diesel-powered backup generators. Although generator use is typically infrequent and limited to emergency events or testing conditions, their operation can result in substantial short-term noise impacts on adjacent properties.

Source: storagereview.com

Source: kaloengineering.com

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Noise

AIR HANDLING UNITS

Air handling units serve two primary functions within a data center: (1) providing adequate ventilation to remove heat and airborne contaminants, and (2) maintaining acceptable operating temperatures within server halls. These units are typically located on the rooftop. The quantity of air handling units may be significantly higher than that of typical office and industrial uses. When operating simultaneously, air handling units can generate combined noise levels above the typically accepted decibel level near residential uses.

Source: technical.ly

Example of site layout and location of generators and cooling equipment.

Source: Nathan Howard/Bloomberg via Getty Images

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Example of site layout and location of generators and cooling equipment.

Source: Piedmont Environmental Council, Hugh Kenny

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Example of site layout, including the location of generators and cooling equipment and their proximity to residential uses.

Source: Piedmont Environmental Council, Hugh Kenny

Example of site layout, including the location of generators and cooling equipment and their proximity to residential uses.

Source: Piedmont Environmental Council, Hugh Kenny

Noise

Policy Considerations & Potential Mitigation Measures

- Providing measurable and enforceable use standards and/or zoning conditions that address both high-frequency and low-frequency noise.
- Prioritizing the utilization of pre-construction and post-construction noise studies prepared by a qualified, third-party acoustical professional to evaluate compliance with adopted standards.
- Prioritizing maximum allowable noise levels at property lines (for example, 55 dBA and 50 dBC, or limits established as defined number of decibels above existing ambient conditions) with additional mitigation evaluated if standards cannot be maintained.

Noise

Policy Considerations & Potential Mitigation Measures cont.

- Exploring best practices for when the use of backup generators is appropriate (e.g., emergency operation and maintenance activities).
- Encouraging generator testing and maintenance to defined daytime hours (e.g., 10:00 a.m. to 4:00 p.m.) to minimize community impacts.
- Encouraging minimum separation distances between sound-generating equipment and property lines and encouraging placement of such equipment behind principal structures to provide additional shielding.
- Encouraging the use of parapet walls to screen all rooftop equipment. UDO Sec. 5.2.4.B.2 allows parapet walls to extend no more than 5 feet above the allowable height of the building, so the actual building height may need to be reduced in order to accommodate the needed parapet wall height.

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Land Use (Zoning, Site Design, Aesthetic Standards)

Data center zoning varies by jurisdiction: some require overlay districts with specific performance standards, others limit data centers to industrial zones, while some allow them in both commercial and industrial districts.

In recent years concerns related to noise, architectural designs, and specific use standards have resulted in other municipalities amending their zoning ordinance standards to attempt to mitigate these impacts via:

- Larger setbacks (100’ - 1,000’)
- Wider buffers (50’ - 200’)
- Additional screening for electrical and mechanical equipment.
- Increased separation requirements for noise producing equipment from property lines.

Additionally, large colocation and hyperscale data centers may require on-site electric substations to meet power demands.

- Substation placement and visibility can impact surrounding communities due to safety concerns, noise, and visual effects.

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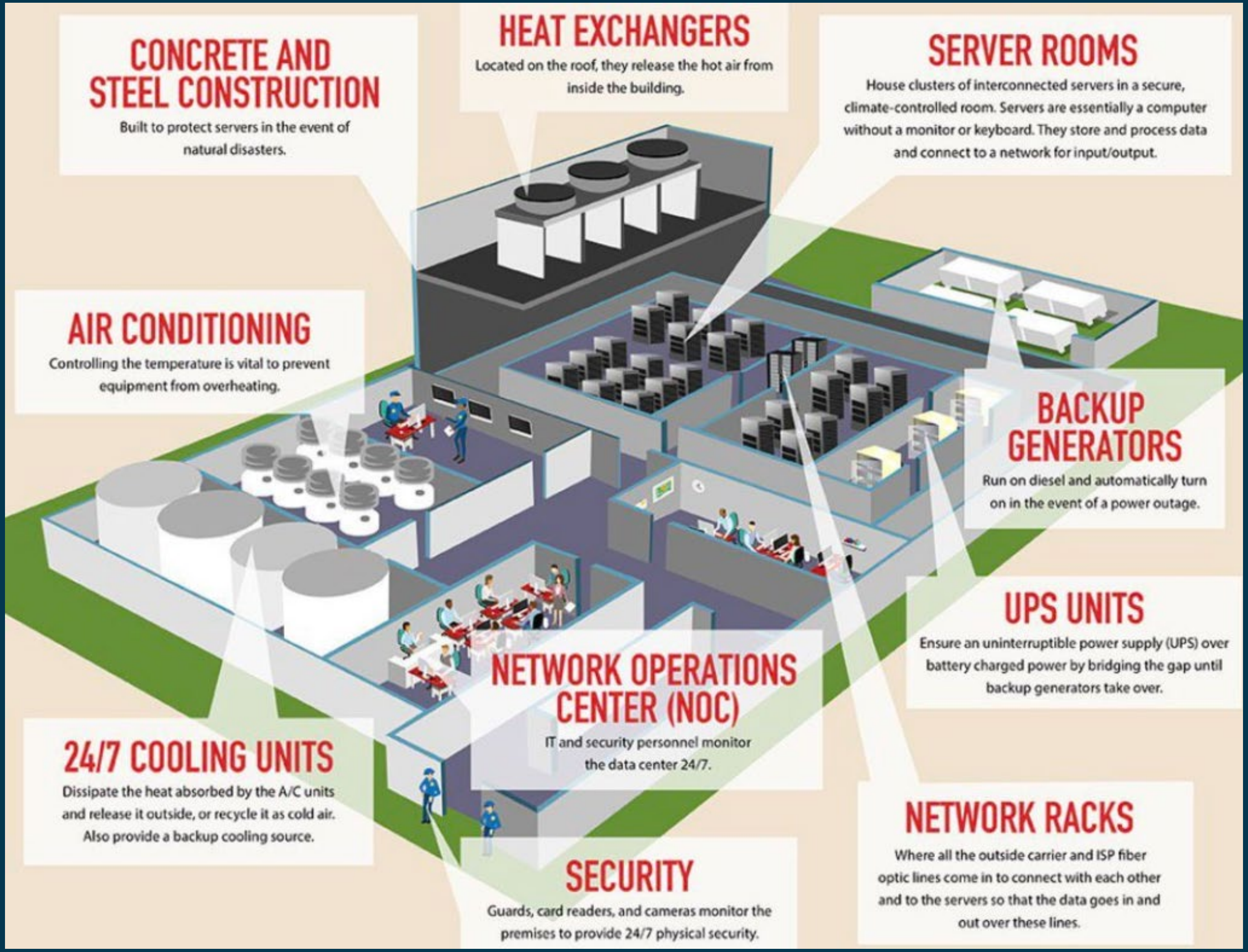
Land Use

Example of site layout and design of a data center.



Source: greenarchworld.com

Land Use

Example of site layout and design of a data center.

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Land Use

Example of the importance of site distance from residential uses.

Source: Gerville/Istock. Loudoun Meadows, Aldie, VA.

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Land Use

Example of electric substation constructed to support data centers.

Source: pecva.org

Land Use

Example of electric substation constructed to support data centers and roof-mounted mechanical equipment.

Source: energynow.com; Nathan Howard/Bloomberg

Design Standards

Data center designs can vary widely, and without strong architectural standards, developments may result in 60'-100' tall plain warehouse structures that can quickly age, diminish local character, and become visual eyesores.

Source: DPR.COM Meta's Henrico County Data Center

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Design Standards

Example building designs of a data center.

Source: dgtlinfra.com *Amazon (AWS) Data Center Location in Northern Virginia*

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Decommissioning & Reuse of Hyperscale Data Center Sites

- **Future reuse depends on decommissioning:** Retaining high-hazard infrastructure (fuel systems, batteries, substations) can limit redevelopment options, increase permitting complexity, and trigger higher building and fire code requirements.

- **Full removal increases flexibility:** Complete decommissioning supports adaptive reuse and aligns with a broader range of employment, commercial, or industrial land uses.

- **Change of occupancy matters:** Under the NC Building Code, new uses require evaluation of remaining infrastructure; retained hazardous systems may force higher-hazard occupancy classifications.

Decommissioning & Reuse of Hyperscale Data Center Sites cont.

- **Code implications:** Higher-hazard classifications can require enhanced fire protection, separation, egress, and life-safety systems under the NC Building and Fire Codes.
- **Hazardous materials process:** Reuse requires inventory, reporting, closure planning, removal, inspection, and approval by fire and environmental authorities.
- **Utility infrastructure considerations:** Private substations may be removed or retained; continued use requires full compliance with NC codes and updated electrical documentation.
- **Best practice:** Require a **decommissioning and reuse plan** at the time of approval to ensure long-term site adaptability and community protection.

APEX NORTH CAROLINA

Land Use

Policy Considerations & Potential Mitigation Measures cont.

- Following best practices for data center application review, including conditional zoning and developer agreements.
- Finalizing amendments to the Unified Development Ordinance (UDO) to create the data center use, definition, and related supplemental standards.
- Applying existing UDO Article 9 *Design Standards* and considering additional zoning conditions to address architectural concerns such as building massing, fenestration, facade articulation, and materials.
- Encouraging maximum height standards or minimum setback distances for data center structures to limit visual impact.

Land Use

Policy Considerations & Potential Mitigation Measures cont.

- Limiting hyperscale data center development to zoning districts intended for industrial use.
- Evaluating minimum site area thresholds (e.g., 100 acres or more) to ensure adequate separation from surrounding land uses and infrastructure.
- Prioritizing enhanced setbacks and wide buffers (e.g., 200' – 1,000') that prioritize the preservation of existing mature vegetation and the use of berms where little or no vegetation exists.
- Encouraging the applicant to provide a decommissioning and reuse plan to address long-term site viability and potential future redevelopment.

Land Use

Policy Considerations & Potential Mitigation Measures cont.

- Encouraging internal placement of equipment and screening of rooftop or ground-mounted equipment when internal placement is not practicable.
- Prioritizing minimum separation distances between potential hazard areas (such as fuel storage tanks and battery energy storage systems) and sensitive land uses, including schools, daycare facilities, hospitals, and similar uses.
- Encouraging early installation of perimeter buffers and screening in initial phase to mitigate visual impacts during construction and operation

Capacity and Regulatory Requirements

Water Treatment: Cary/Apex Water Treatment Facility

- Total Facility Capacity: 56 MGD
- Apex Capacity: 12.88 MGD (23% Ownership)
- Apex Avg. Daily Flow (2025): 5.05 MGD (39%)
- Apex Max Day Demand (2025): 6.9 MGD

Raw Water Intake: Jordan Lake

- Apex Capacity: 10.6 MGD (23% Allocation)
- Apex Avg. Raw Demand (2025): 5.83 MGD

Capacity and Regulatory Requirements (cont.)

Water Storage: Elevated Storage

- Hunter Street Tank: 0.5 MG
- Mason Street Tank: 1.0 MG
- Tingen Road Tank: 1.5 MG
- Available Storage: 3.0 MG
- Pleasant Park Tank: 1.5 MG (Under Construction)
- Planned Storage (2026): 4.5 MG

Capacity and Regulatory Requirements (cont.)

Water Storage: Regulatory Requirements

- **MINIMUM**: ½ Average Daily Flow
- 2025 Avg. Daily Flow: 5.05 MGD
- Required Elevated Storage: 2.52 MGD
- Current Available Storage: 3 MGD
- Planned Available Storage (2026): 4.5 MGD

Water Storage: Purpose

- Water Pressure
- Emergency Supply (water main break, pump failure, etc.)
- Fire Flow/Demand
- Peak Flow Demands

*Apex also holds 23% of clear-well storage at CAWTP excluded from above

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Capacity and Regulatory Requirements (cont.)

Wastewater Treatment: Apex Water Reclamation Facility

- Total Facility Capacity: 3.6 MGD
  - Functional Capacity: 2.8 MGD
- Apex Avg. Daily Flow (2025): 1.1 MGD (39.3% Functional)

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Capacity and Regulatory Requirements (cont.)

Western Wake Regional Water Reclamation Facility (WWRWRF)

- Total Facility Capacity: 18 MGD
- Apex Capacity: 6.12 MGD (34% Ownership)
- Apex Avg. Daily Flow (2025): 5.05 MGD (82.5%)

Capacity and Regulatory Requirements (cont.)

Wastewater Treatment: Pretreatment Requirements

- Apex Sewer Use Ordinance (Div. 4.5, Sec. 19-92) sets parameters on characteristics of wastewater prior to entering the public system.
  - Cary Sewer Use Ordinance applies additionally on projects flowing to Western Wake Regional Water Reclamation Facility

- Industrial Use Permit (IUP) required for projects with discharge characteristics not meeting the required ordinance
  - IUP are site specific and designed based on the materials found in discharge
  - Required pre-treatment onsite, at the cost of the discharger
  - Sampling Requirements to verify pretreatment requirements are met

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Capacity and Regulatory Requirements (cont.)

Constituent	Collection & Treatment Concern	Effect
TDS (salt)	• Water quality (pass-through) • Interference	• Effluent toxicity • Elevated effluent TSS
Biocides & fungicides (QAC and organics)	• Interference	• Elevated effluent NH_3-N • Effluent toxicity
Corrosion inhibitors – Metals, orthophosphate, organics	• Interference • Water quality • Biosolids	• Elevated effluent NH_3-N • Land application restrictions • Effluent toxicity
Metals – Mo, Cr, Al, Cu, Zn	• Biosolids • Nitrification inhibition • Water quality	• Land application restrictions • Effluent toxicity
Antiscalants	• None	• None

Source: Cheslek, H. Black and Veatch

Water System Impacts

- Instantaneous, inconsistent peak water demand
- Infrastructure needs for peak demand
  - Initial Capital Costs (Developer/Owner)
    - Distribution Improvements and Expansion (Pipe)
    - Treatment Capacity and Expansion
    - Elevated Storage Needs
  - Long-Term Operation and Maintenance (Town)
    - Water Quality and Age Impacts during off-peak (flushing, water loss)
- On-Site Storage
  - Provide on-site stability during peak demand
  - Reduced conveyance costs for the Town
  - Reduced treatment costs due to offset demand

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Reclaimed Water

- Treated wastewater being used for purposes other than drinking; not discharged to a body of water
- Operated like a domestic water system, commonly distributed through purple pipes
- Currently no reclaimed distribution network at either Apex WRF or Western Wake Regional WRF.
- Water Source Capacity Protection (Jordan Lake)
- Increased treatment capacity due to offset
- Reduces available water supply to downstream partners

Economic Impact – Employment Generation

- Few workers typically employed for day-to-day operations, with research showing floor area–to–employee ratios as high as 5,000 square feet per employee.
- A 250,000-square-foot data center may require only about 50 full-time employees to operate once constructed.
- Significant temporary construction employment is associated with data center development, particularly during site preparation, building construction, and infrastructure installation.
- Permanent jobs, while limited in number, are generally well-paying, with technology professionals averaging $108,100 annually, network support technicians $76,060, and data center roles ranging from $42,000–$149,000.
- These wages exceed U.S. median household incomes (which in 2024 were $44,870 for female nonfamily households and $58,000 for male nonfamily households) highlighting the high-wage nature of data center employment.

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Economic Impact – Tax Revenue
Real and Personal Property

- Data centers are subject to ad valorem property taxes for real and personal property
  - Real (buildings and land)
  - Business property (equipment)

- Assessments are conducted by County tax office
  - Real property per schedule
  - Business property annually during listing cycles

- Data provided by Wake County –
  - Real property values per square foot stable 2016-2024
  - Business property values per square foot volatile 2016-2024

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Economic Impact – Tax Revenue Illustrative Example (Wake County Data)

- Using 2024 Assessed Values:
  - Average Data Center has $38,000,000 of real value
  - Average Data Center has $115,000,000 of business personal property (subject to depreciation)

Type	Per $100	Apex Property Tax (Estimate)
Real Value	$380,000	$135,280
Business Personal Property	$1,150,000	$409,400
	Total	$544,680

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Economic Impact – Tax Revenue Depreciation

- Data center depreciation is more volatile than traditional real property due to the high concentration of equipment
- Equipment depreciates at a significantly faster rate than real estate assets
- While rebuilds and upgrades may restore value, there is limited historical data to reliably project or guarantee long-term outcomes

- An example from Wake County Tax Administration shows data processing equipment depreciated by approximately **95% within five years**

Business Personal Property (BPP) of $115,000,000			
Year	Depreciation	BPP Per $100	Property Tax Estimate
Installed	-	$1,150,000	$409,400
1	20%	$920,000	$327,520
2	39%	$701,500	$249,734
3	59%	$471,500	$167,854
4	80%	$230,000	$81,880
5	95%	$115,000	$20,470

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Economic Impact – Tax Revenue
Sales and Use Taxes

- Qualifying data centers are exempt from sales tax on electricity and certain support equipment (7% and 7.25%, respectively).

- Other tax exemption/incentives for eligible data centers exist under North Carolina law, but are not available in Wake County.

- Apex receives 3.29% of Wake County sales tax collections.

Traffic Generation

Policy Considerations & Potential Mitigation Measures

- Requiring coordination between Town staff, NCDOT (if involving NCDOT maintained roadways), the applicant, and the applicant's traffic engineer to determine the scope of any trip generation letter or full TIA.
- Considering mitigation measures identified in a TIA or traffic letter, such as turn lanes, signal modifications, or other operational improvements, to maintain roadway safety and capacity.
- Encouraging coordination between Town staff, the applicant, and the applicant's traffic engineer to determine the scope of any trip generation letter or full TIA.
- Considering mitigation measures identified in a TIA or traffic letter, such as turn lanes, signal modifications, or other operational improvements, to maintain roadway safety and capacity.

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Traffic Generation

Policy Considerations & Potential Mitigation Measures cont.

- Evaluating traffic impacts using Land Use Code (LUC 160) in the ITE Trip Generation Manual (11th Edition), which defines a data center as a free-standing warehouse-type facility primarily used for off-site storage of computer systems, applications, and secure data. Some facilities may include maintenance areas and small office spaces and may be occupied by single or multiple tenants.

- Recognizing that LUC 160 reports an average daily trip generation rate of 0.99 trips per 1,000 square feet, while acknowledging that sample sizes are small and additional data may be needed to refine anticipated trip generation.

- Coordinating with NCDOT's Congestion Management group, as recommended, to evaluate trip generation methodology on a case-by-case basis.

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Hazards

Hazards associated with Data Centers may include:

- Chemical Hazards
  - Data centers may have large volumes of coolants, refrigerants, and biocides (for water treatment).
- Fire & Explosion Hazards
  - Data centers may have large volumes of stored fuel onsite to power backup generators.
  - Volume of stored fuel will depend redundancy requirements, energy demand, and number of generators.

Scenario:

A hyperscale data center with 96 diesel generators may have ~500,000 gals or more of diesel fuel onsite (each generator may carry ~6,000 gals each 6,000 x 96 =576,000 gals).

Hazards

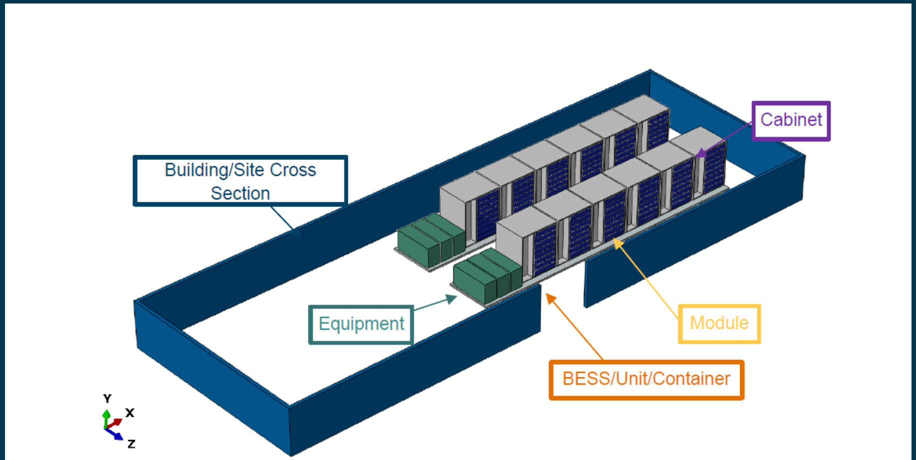
Fire & Explosion Hazards cont.

Battery Energy Storage Systems (BESS)

What is a BESS?

- Stores excess energy on-site from renewable sources or grid various battery chemistries: lithium-ion, lead-acid, sodium-ion, solid-state, etc.
- Discharges energy during peak demand, service interruptions, or sells back to the grid.
- Typically consists of modular container units housing 200–1,000+ batteries per container.
- Can include multiple containers for larger capacity needs.
- Supports various battery chemistries: lithium-ion, lead-acid, sodium-ion, solid-state, etc.

Source: Americas.rwe.com



Source: Landscape of Battery Energy Storage System Hazards & Mitigation Strategies (NFPA FPRF, 2023).

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Key Hazards of BESS

Thermal Runaway

- Overheating of battery cells can trigger self-sustaining chemical reactions.
- Risk of fire or explosion increases rapidly.

Toxic and Flammable Gas Emissions

- Fires may release hydrogen, carbon monoxide, CO_2, methane, hydrogen fluoride, VOCs.
- Health hazards and emergency response complications.

Stranded Energy

- Residual electrical energy can persist after damage or discharge.
- Risk of shock, arc flash, arc blast, or delayed re-ignition.

Particulate & Environmental Hazards

- Combustion produces soot, fine particulates, and potentially toxic byproducts.
- Can contaminate air, soil, and nearby environment.

Planning & Safety Implications

- Hazards affect fire suppression, emergency response, and post-incident remediation.
- Requires: proper system design, operational controls, site location consideration, and coordination with fire/emergency services.

Fire Response Capabilities

- Town of Apex Fire Department (current and future)
- Cary, Apex, Morrisville (CAM) partnership
- Mutual-aid Agreements
- Hazmat response contract

Data Centers – Related to Fire Protection

- Research was conducted related to fires and other emergencies at data centers.
- Data centers are typically in fire resistive buildings with automatic fire detection and suppression systems.
- The majority of the internal components are computers/servers. They also have battery back-up power systems, which can created challenges if a fire occurs.
- There are an estimated 12,000 data centers in the world, 5,500 in the US. Between 2014-2023, 22 fires were reports world-wide, less than 1% of them having a fire.

FIRE: Policy Considerations & Mitigation Measures

- Early & Frequent Engagement
- Independent Fire Protection Review
- Water Supply & Runoff Containment
- Department Training & Guidance

Police: Emergency Access and Operational Independence

Given the sensitive or restricted nature of many data centers, the police department must ensure that officers can access the facility in emergencies without unnecessary delays or dependence on on-site staff.

This includes:

- Pre-establishing secure access procedures for both emergency and after-hours responses.
- Ensuring APD has direct access to relevant areas of the property during time-sensitive events such as alarms, medical emergencies, or security breaches.
- Clarifying expectations with the facility operator regarding gate access, credentialing, and key control.
- Any delays in gaining entry hinder the Department's ability to protect life and property.

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Police: Community Concerns and Increased Calls for Service

Even when operations run smoothly, data centers can generate community complaints related to:

- Noise (HVAC systems, backup generators)
- Light pollution
- Traffic
- Contractor activity
- Environmental concerns
- Perceived public safety risks

The majority of these complaints—regardless of whether they are police matters—are typically routed to APD as the initial point of contact. This will likely increase call volume and necessitate ongoing coordination with other Town departments for appropriate follow-up and resolution.

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Police: Traffic and Construction Impacts

The construction phase of a data center can significantly impact local roadways due to heavy equipment, frequent deliveries, and a large contractor workforce. Post-construction, traffic patterns may remain elevated depending on staffing levels and ongoing maintenance activity.

Impacts may include:

- Increased collisions or near-miss incidents due to large vehicle movements.
- Road obstruction complaints.
- The need for periodic traffic control or special patrol assignments.
- Longer-term roadway wear or congestion.
- APD may also need to coordinate with NCDOT, Town Engineering, and facility leadership to mitigate traffic impacts and ensure safe ingress and egress.

Police: Specialized Response Considerations

Data centers often house large quantities of electrical equipment, lithium-ion batteries, cooling systems, and backup generation infrastructure. In emergency situations—particularly fire, hazardous material releases, or electrical failures—response may require specialized equipment or training.

Public safety considerations include:

- The need for detailed pre-incident planning with APD and Fire.
- Potential need for additional PPE or tools for safe ingress.
- Coordination with the Fire Department on rescue procedures, evacuation routes, suppression methods, and incident command.
- Understanding of any high-voltage, chemical, or battery-related hazards that may affect law enforcement operations.

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Police: Alarm Response and False Alarms

Data centers typically utilize extensive alarm and monitoring systems. Historically, facilities of this nature can generate high volumes of alarms—security breaches, access control notifications, and sensor alerts—some of which default to police response.

Key considerations:

- Increased demand on APD for alarm verification response.
- Possible need for specialized training on interpreting alarm categories.
- Developing clear expectations with facility management to reduce unnecessary dispatches.

Police: After-hours Activity and Contractor Presence

These sites frequently operate 24/7 and may involve after-hours vendor access for maintenance, upgrades, or emergency repairs.

APD often becomes the first responder for:

- Suspicious persons calls.
- Verification of contractor authorization.
- Securing the premises during system outages.
- This adds to routine patrol workload.

Police: Conclusion

While these challenges are manageable with proper planning and resource support, they represent meaningful impacts to police operations that should be considered when evaluating any data center project.

Regulation Comparison

Planning Staff reviewed the development standards from several communities that permit data centers.

- Charlotte, NC
- Maiden, NC
- Loudon County, VA (updates to standards are underway)
- Fairfax County, VA
- Frederick County, VA
- Prince William County, VA
- Edgecombe County, NC (standards adopted November 2025)

Regulation Comparison

In general, the use is permitted in Industrial zoning districts, with some communities allowing the use in other zoning district types subject to certain conditions being met.

Most communities have requirements related to the following:

- Additional setbacks from roads and/or residential uses
- Additional buffers from roads and/or residential uses
- Standards for the location and/or screening of ground- and roof-mounted mechanical equipment
- Building design standards
- Time limits on generator testing
- Location and screening of onsite electric substations, storage tanks, etc.
- Requirements for noise studies (pre- and post-construction)

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UDO Amendment Process Summary

- UDO Sec. 2.3.2 states that "an amendment to the text of this Ordinance may be proposed by the Town Council, the Planning Board, the Board of Adjustment, the Planning Director, or pursuant to Sec. 2.2.1 *Authority to File Applications*". Sec. 2.2.1 states applications may be submitted "by the landowner, lessee or person holding an option or contract to purchase or lease land, or an authorized agent of the landowner".
- UDO Amendment applications are accepted on the 1st business day of the month.
- Staff provides comments to the applicant on the proposed revisions, and the applicant resubmits revisions for staff review. This continues until the application is ready to be scheduled for public hearing.
- The Planning Board hears the proposed amendment as a New Business item and makes a recommendation to the Town Council.
- The Town Council holds a public hearing and makes the final decision to approve or deny the proposed amendments.

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