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Energy in the Carolinas

Data Centers and Air Permitting

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01

Why Air Permitting Matters for Data Centers

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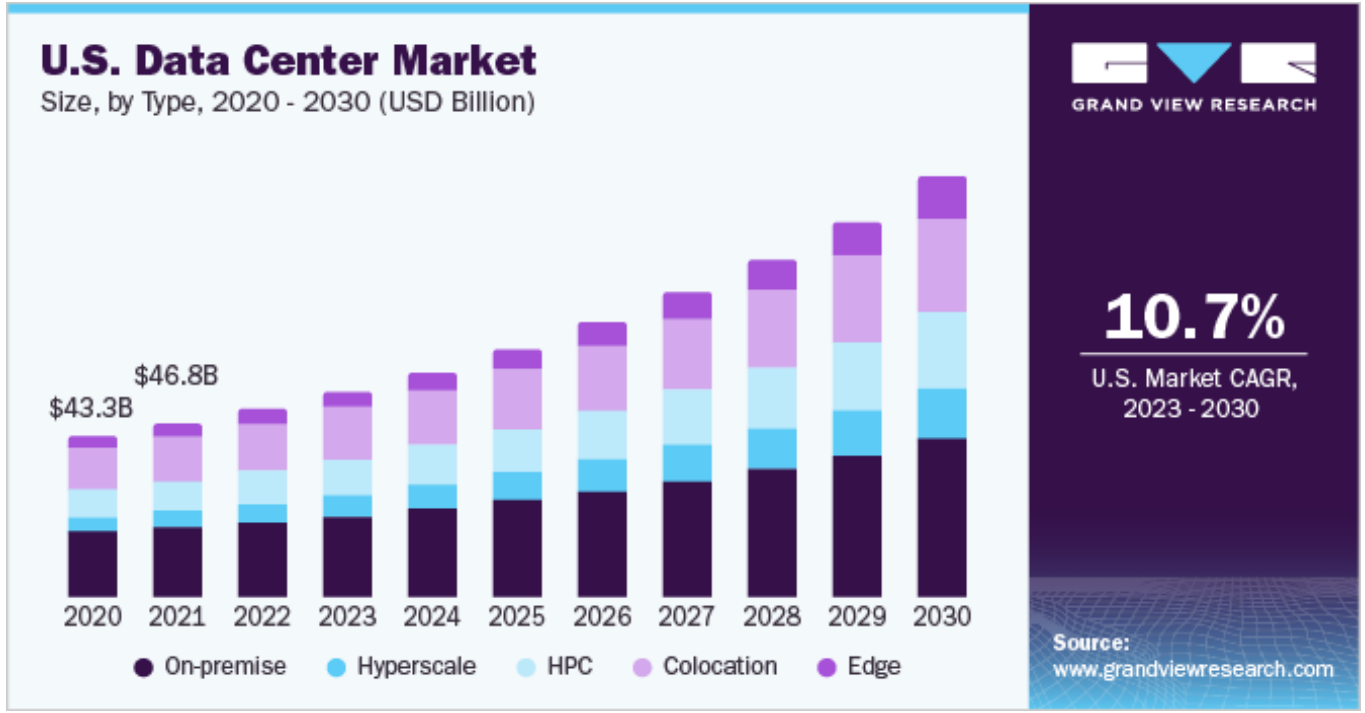
Data Center Market

Data Center Demand:

- Technology advancements
- AI datacenters
- Cloud services
- International data center expansion

Data Centers:

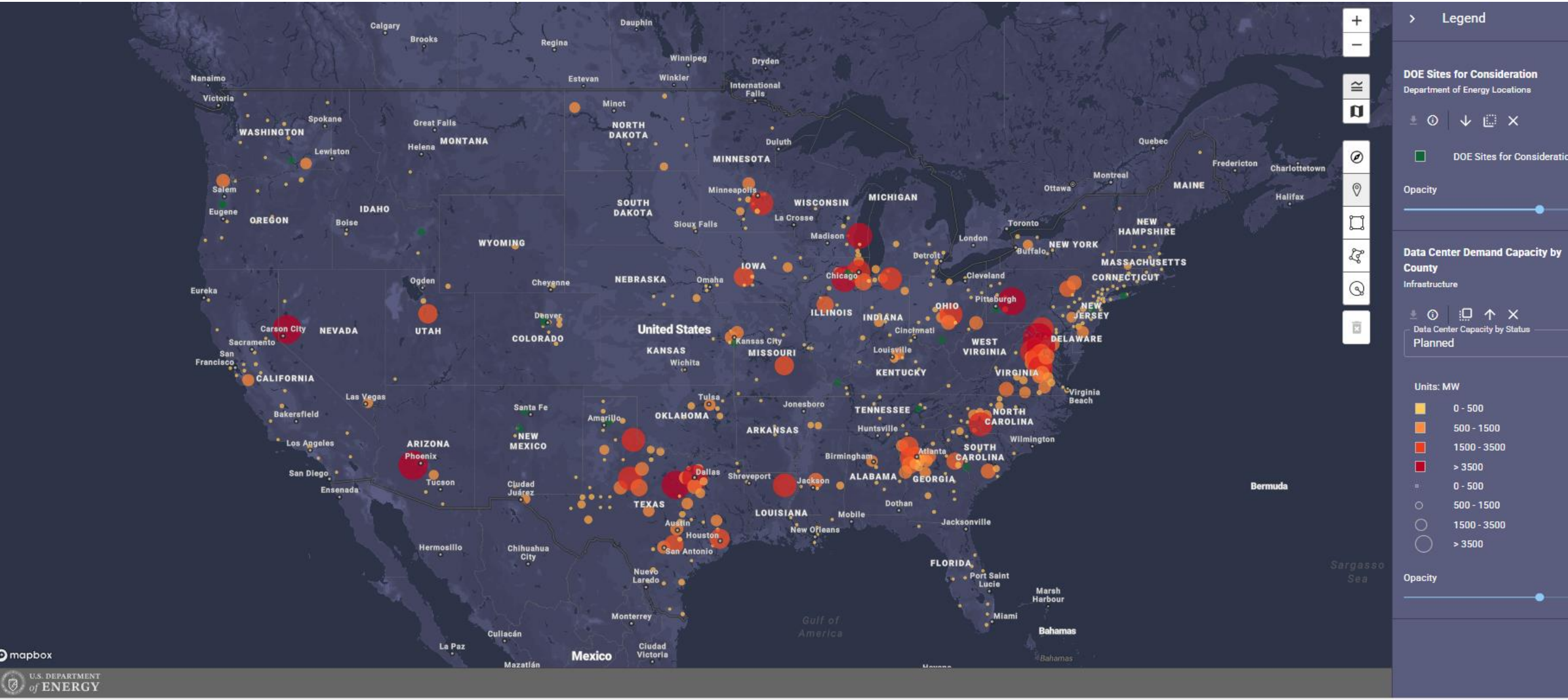
- **2022:**
  - 8,000 data centers globally, ~30% in U.S.
  - Global market = $194.81 billion
- **2024:**
  - 10,655 data centers globally, ~ 50% in U.S.
  - Global market = $347.60 billion
- **2025 – 2030 Growth:**
  - Global CAGR = 11.2%
  - U.S. CAGR = 10.7%
  - 2030 Expected Global market = $652.01 billion



Data Center Market Size, Share And Growth Report, 2030

Data Centers: Permitting and Powering One of the Top Growth Sectors, January 17, 2025
Presented by EBI Environmental Business International Inc.

Planned Data Center Demand Capacity by County (MW)



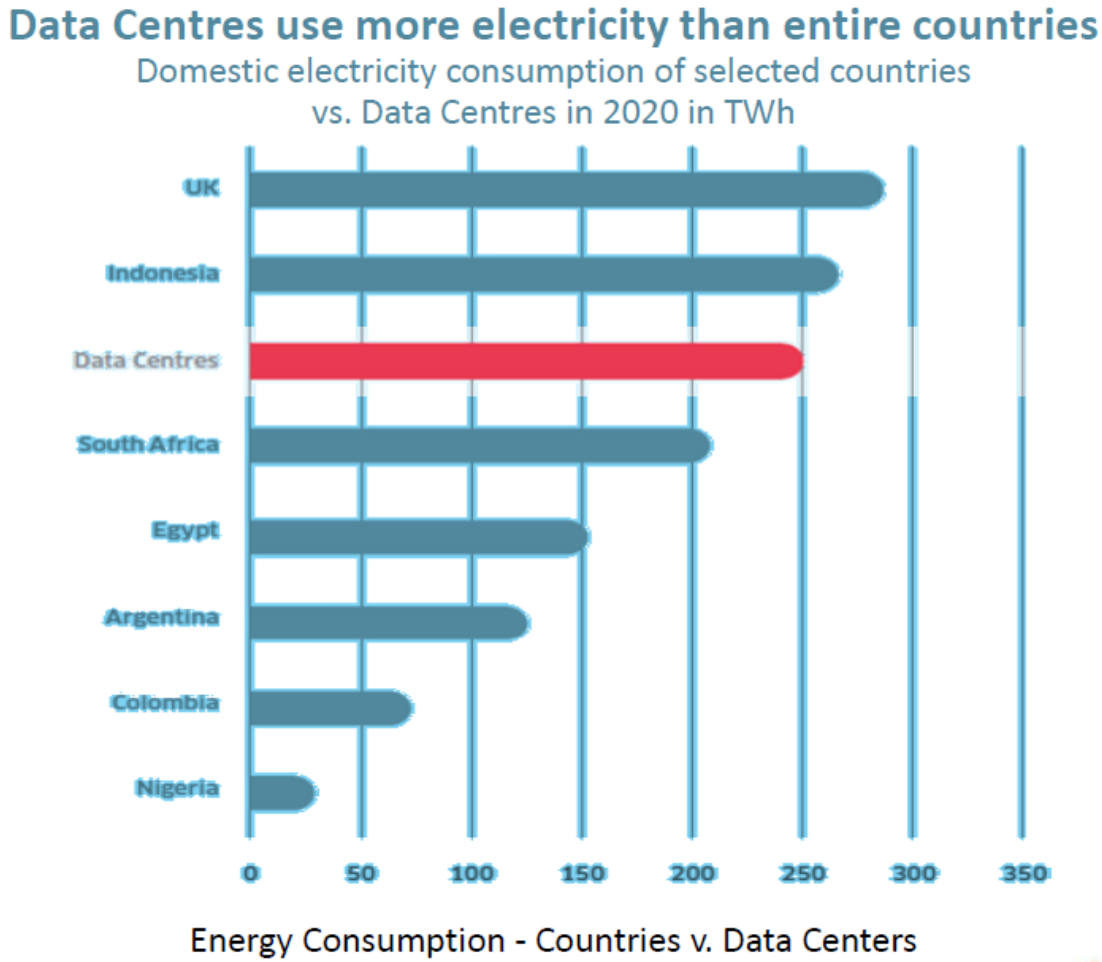
Data Center & Energy Demand

Data Center Electricity Demand:

- 40% computing
- 40% cooling
- 20% IT associated equipment

Data Center Electricity Uses:

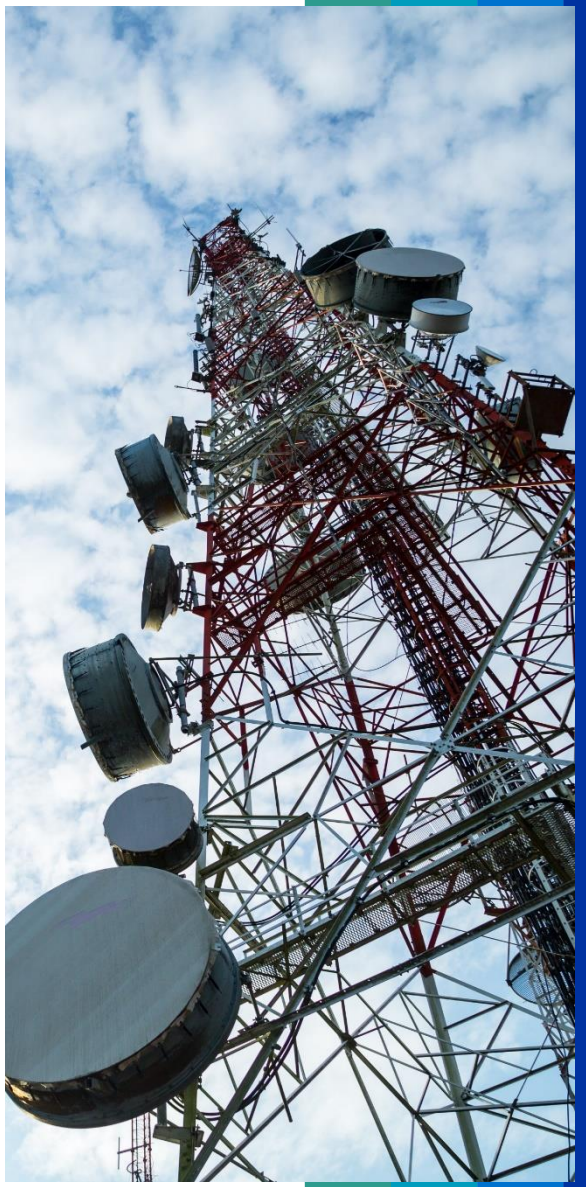
- **Global Capacity:** % of total global electricity use
  - **Current:** ~ 1% – 1.5%
  - **2030:** ~ 3% - 4%
- **U.S. Capacity:** % of total U.S. electric capacity
  - **2022:** 4%
  - **2030:** 11 - 12% (3x)



Energy Consumption - Countries v. Data Centers

- https://www.scientificamerican.com/article/the-ai-boom-could-use-a-shocking-amount-of-electricity/
- Data Centers: Permitting and Powering One of the Top Growth Sectors, January 17, 2025 Presented by EBI Environmental Business International Inc.

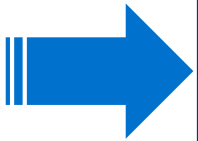
But I’m building a data center, not a power plant…



More than just an “engine project”?

Source Configurations:

- Emergency vs prime
- Redundancy
- Engines – NG vs Diesel
- Turbines – SCCT vs CCCT
- Stationary vs Mobile



Varying Environmental Needs:

- Timing sensitivity (creative, aggressive strategies)
- Source configuration and impact on Federal/State Regulatory Applicability
- Air Permitting – aggregated or separate source from other operations
  - Common control, adjacency, SIC two-digit classification / support facility
  - Nonattainment NSR (NNSR) – offsets/ERCs
  - Modeling including increment consumption
  - Expedited approval avenues
- Noise Assessment
- Wetlands/Cultural Resources
- Air Corrosion Testing
- Public Perception
- Changing Regulations

Regulatory Considerations

Data Center Nuances

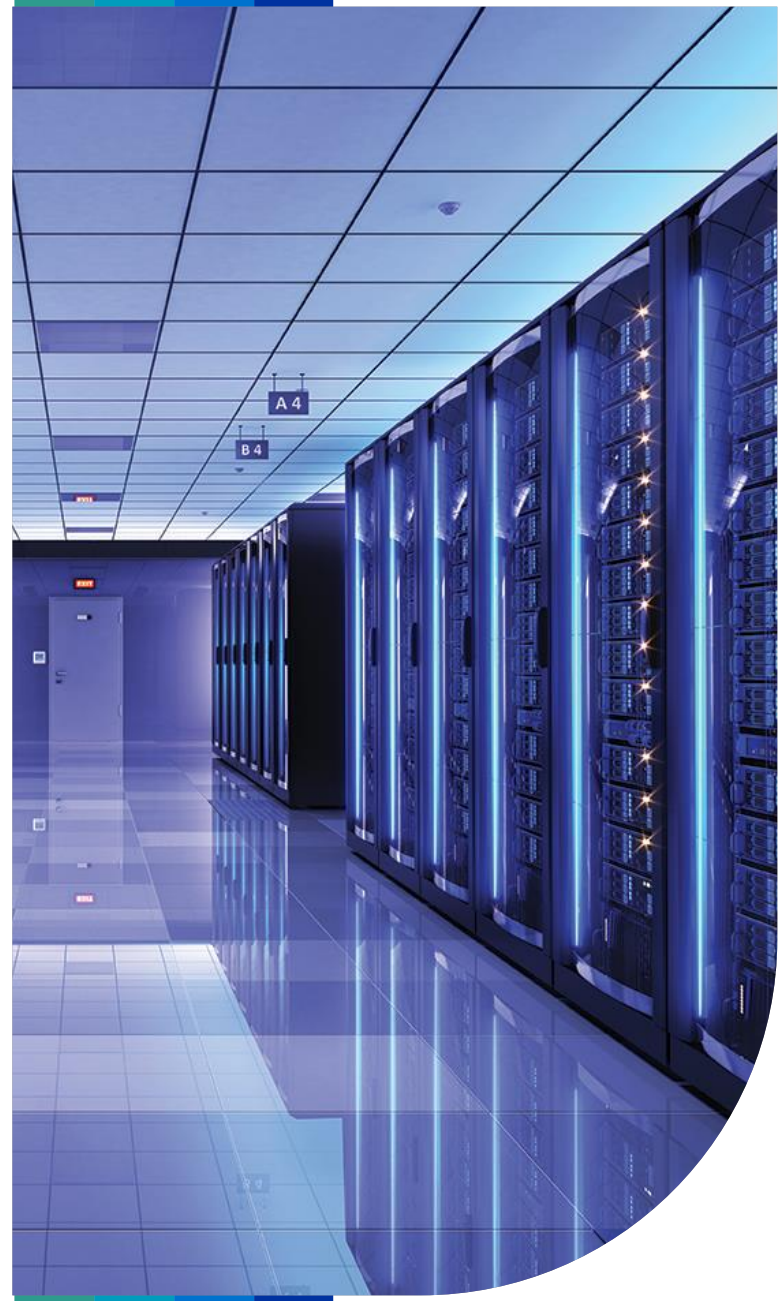
- Emissions guarantee – condensable PM, SCR, humidity/location specific EFs, EPA Tier-Certified
- Emission caps - site wide limits
- Emergency vs. non-emergency
- Temporary power/nonroad engines

Power Nuances

- Engines, turbines, nuclear, linear generators, and more
- List of 28 applicability
- NSPS KKKK, proposed KKKKa, TTTTa (+ Mobile Turbines)
- NESHAP YYYY
- Energy/Power Commission

Strategy

- Evaluation of several scenarios/configurations
- Single site determinations
- Nesting



Why Air Permitting Matters for Data Centers

Ok, but seriously… I only need standby power during power interruptions.

Why Air Permitting Matters for Data Centers

01

Large-scale data centers often include on-site stationary sources

- Standby/Emergency Power
- Cooling Equipment
- HVAC Systems
- Fuel Storage

02

These sources have emissions of regulated pollutants

- NOx
- CO
- $PM/PM_{10}/PM_{2.5}$
- VOC

03

State air permitting triggers exist

- Before construction/ modification of equipment
- Before operation

04

Failure to secure proper air permits can delay project schedules, add cost, restrict operations, and increase exposure to enforcement risk

Key Emissions Sources in Data Center Context

- Turbines: Gas-fired units used for providing standby, emergency, or even primary/back-up power
- Generators: units driven by diesel- or natural gas-fired engines used for power outages or maintenance – major focus of air permitting and our discussion today
- Cooling and HVAC systems: may involve combustion units (e.g., chillers, boilers) or large fan/ventilation systems
- Other indirect sources: potential fugitive emissions, fuel storage, maintenance operations

Specific Permitting Triggers for Data Centers

- Backup/emergency generators: If diesel or gas-fired, may require permit as stationary combustion source.
- Major vs minor source thresholds: Need to assess potential emissions (tons/year) of NO_X, CO, PM, VOCs and HAPs to determine permit classification
  - 15A NCAC 02Q .0502(a)(1) and SC Regulation 61-62.70.3(a)(1) set Title V major thresholds (100 tpy of each pollutant, 10/25 tpy HAP threshold)
- Equipment modifications or expansions: potentially require construction permit if adding new sources or altering existing ones.
- Ambient air quality impact: modelling may be required if near standard thresholds or in attainment & non-attainment areas.
- Operating permit: needed depending on size/class of facility and post-construction operations, with reporting obligations.

02

Key Components of a Permit Application

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North Carolina

- Facility description & process overview
- Emissions calculations: expected emissions of regulated pollutants
- Potentially applicable rules/regulations
  - State rules: 15A NCAC 02D
  - Federal rules: NSPS, NESHAP
- Control technology evaluations (if required)
- Ambient impact assessment/dispersion modelling (likely requested to *demonstrate no unacceptable risk*)
- Environmental Justice (EJ) analysis
- Public notice (draft permit, comment period, public hearing)
- Monitoring, recordkeeping, reporting requirements

South Carolina

- Description of the proposed construction/modification of emissions sources.
- Emissions calculations: expected emissions of regulated pollutants
- Potentially applicable rules/regulations
  - State rules: SC Regulation 61-62 (e.g., 61-62.5, 61-62.6…)
  - Federal rules: NSPS, NESHAP
- Engineering evaluation of control measures & compliance with ambient standards (dispersion modelling, if required)
- Public notice (draft permit, comment period, public hearing)
- Operating permit following construction: facility-wide equipment listing, emissions limits, record-keeping and reporting.
- ePermitting for submission and tracking

03

Potential to Emit (PTE)

Emergency Engines

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Potential to Emit (PTE)

40 CFR 52.21(b)(4)

- One of several ways to categorize how much a source emits
- PTE is the maximum capacity to emit – may be limited by:
  - Physical and operational restrictions
  - Air pollution control equipment
  - Restrictions on hours of operation
  - Type or amount of material combusted
- Limitations must be enforceable under the CAA, including:
  - NSPS (40 CFR 60) or NESHAPs (40 CFR 61 or 63)
  - Requirements within any applicable federally-approved state implementation plan (SIP)
  - Requirements contained in a state/local/tribal-issued permit or authorization IF program is SIP-approved
- Actual emissions should always be < PTE

Engines and Emission Calculations

$$E_x = EF_x \times Activity\ Rate$$

- EF = Emission Factor:
  - Lb/MMBtu, lb/MMscf, lb/gal, g/hp-hr, g/kWh
- Activity Rate, or throughput:
  - MMBtu/hr, MMscf/hr, gal/hr, hp, kW
- Make the units match and then just cancel the units
- Use correct fuel heating value, e.g., Btu/scf
- Consider adding a safety factor

What Emission Factor Should I Use?

- Direct source sampling:
  - CEMS or stack testing
- Vendor-provided data:
  - Watch for exclusions (e.g., formaldehyde)
  - Engine raw emissions vs. not to exceed (NTE) values
- Published “average” factors
  - AP-42
  - NC Emission Estimation Spreadsheets (for large and small engines)
- Tier/Certification standards…but be careful…
  - They represent sales-weighted averages based on model testing using unfamiliar methods across a family of engines
  - Within one family, all engines must be certified to the most stringent Tier even if some engines are in a different power range
  - Tier standards for CO for small engines are very large
  - Doesn’t consider add-on controls

What's My Annual Emission Rate Considerations?

- Operating Hours:
  - 50 hrs/yr/engine – NSPS/NESHAP Requirement
  - 100 hrs/yr/engine – NSPS/NESHAP Requirement
  - 500 hrs/yr/engine – EPA Memo, PTE for Emergency Engines (Sept. 9, 1995)
  - Cap considerations
- Fuel Throughput

04

Closing Remarks

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Considerations & Risks

- **Multiple backup engines** – each may trigger permitting action; test/maintenance operations may bump emissions.
- **Emissions modelling complexity** – multiple sources, ambient impact, surrounding land uses.
- **Community/neighbor concerns (noise, air emissions, visual)** – may trigger more stringent scrutiny.
- **Grid/utility issues** – increased load may tie into power supply; emissions from generator usage may increase.
- **Regulatory changes** – e.g., updates to rule interpretations could affect data center permitting.
- **Delay risk** – awaiting permit can delay construction schedule and investment.
- **Cost risk** – if major source, more stringent controls/monitoring could increase capital and operating expense.

Best Practices for Project Teams

- Engage with your air consultant early (during site selection) — integrate with overall site permitting strategy.
- Conduct preliminary emissions scoping: number and size of generators, fuel type, ventilation/cooling equipment.
- Determine permit classification early: minor, synthetic minor, or Title V?
- Integrate air permitting timeline with zoning/land use and utility interconnection timelines.
- Consider community outreach to address concerns about generator emissions/noise and demonstrate proactive involvement and controls.
- Build in buffer time for permit review, public comment (including public hearing).
- Evaluate & develop internal compliance program: monitoring, reports, equipment logs, fuel records.
- Monitor regulatory changes and seek assistance (hot topics are closely monitored!)

Thank you

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