

Issue Paper Data Center Permitting, Oversight, Compliance Failures, Enforcement, and Accountability Focus: Loudoun County and Henrico County, Virginia August 2026

1. Purpose

This issue paper examines the evolution and current state of local permitting frameworks, oversight mechanisms, documented compliance shortcomings, enforcement practices, and accountability structures for data centers in Loudoun County (the core of “Data Center Alley”) and Henrico County (an emerging Richmond-region market). It highlights differences in regulatory maturity, resident impacts, and lessons relevant to other Virginia localities considering data center policy.

2. Background

Loudoun County hosts the world’s densest concentration of data centers (roughly 250+ facilities, with significant additional capacity in the pipeline). Rapid growth occurred under permissive by-right zoning for more than two decades. Public opposition over noise, emissions, visual impacts, power infrastructure, and quality of life intensified, prompting major regulatory changes.

Henrico County has a smaller but growing inventory (approximately 37 operating data centers plus roughly 17 previously approved projects in the pipeline). Growth accelerated later than in Loudoun. In response to rising resident concerns, the county adopted stricter local controls in mid-2025 and has signaled limited appetite for new projects.

Both counties operate within the same state framework: Virginia Department of Environmental Quality (DEQ) issues air permits for generators and turbines; Dominion Energy and PJM handle power interconnection and reliability; localities control land use, zoning, noise, and certain site standards.

3. Permitting Frameworks

Loudoun County

- Pre-2025: A 2000 zoning administrator determination treated data centers as “office” uses, enabling extensive by-right development with limited public process or Board discretion.
- March 18, 2025 (Phase 1 of Data Center Standards & Locations process): Board of Supervisors eliminated by-right data center uses countywide. New projects require Special Exception (SPEX) approval, including Planning Commission and Board public hearings. Certain applications accepted before February 12, 2025, were grandfathered under prior rules (with conditions).

- Phase 2 (underway, with draft amendments expected later in 2026 and potential adoption in 2027): Focuses on refined use-specific standards for noise (including tonal/low-frequency issues), onsite power generation and energy storage, setbacks, building height, parking, utility substations, and Comprehensive Plan policy guidance.
- Recent discussions (July 2026): Supervisors directed staff to explore a temporary pause on new applications while Phase 2 standards are completed; legal authority under Virginia law remains under review.

Henrico County

- Pre-June 2025: Data centers were allowed by-right in many industrial, office, and business districts.
- June 10, 2025: Board adopted ordinance amendments requiring a Provisional Use Permit (PUP) for principal data centers countywide. This mandates public hearings before the Planning Commission and Board of Supervisors. Key standards include: – 500-foot setback from residentially zoned or used property plus vegetative buffering. – Pre- and post-construction noise studies. – Generator operation limited to emergencies and testing/maintenance only Monday–Friday, 10:00 a.m.–4:00 p.m. – Requirement for public water and sewer; preference for closed-loop or recycled water cooling systems. – Screening of mechanical equipment and generators.
- The changes applied to pending applications without broad vesting protections. Vested-rights claims (e.g., Centra Logistics Darbytown site) have been denied.
- County leadership has publicly indicated low interest in advancing new rezoning or PUP applications, creating a de facto soft pause alongside the formal process change.

4. Oversight Mechanisms

- **Local zoning and site-plan review:** Both counties now route new projects through discretionary public processes (SPEX or PUP). Loudoun has expanded zoning enforcement staffing for after-hours and weekend response.
- **Noise:** Loudoun’s ordinance sets a 55 dBA limit at residential property lines (measured under specific conditions). Henrico requires noise studies but has limited quantifiable countywide numerical standards independent of permit conditions.
- **Air emissions:** Primary oversight rests with DEQ via minor New Source Review or Title V permits for diesel generators and, in some cases, natural-gas turbines. Recent state guidance and legislation (effective for applications received on or after July 1, 2026) establish Tier 4-equivalent best available control technology as a presumptive baseline.
- **Water:** Henrico requires connection to the public system and favors closed-loop cooling. Loudoun has seen rising potable and reclaimed water demand tracked by the county.
- **Power and transmission:** Largely outside local control; State Corporation Commission and Dominion handle certificates and interconnections.

5. Documented Compliance Issues and Failures

Loudoun County

- Persistent resident complaints regarding continuous low-frequency/tonal noise (“hum”) from cooling systems and turbines, particularly at facilities such as the Vantage VA2 campus in Sterling. County measurements frequently fail to record violations of the 55 dBA standard because the ordinance emphasizes overall sound pressure rather than tonality or intermittency.
- Generator and turbine emissions and fumes during outages or testing events have prompted health-related complaints (throat/lung irritation, odor).
- On-site natural-gas generation at certain campuses has drawn scrutiny; community analyses of potential health impacts were contested by DEQ, which defended permitted emission levels.
- Cumulative effects (visual bulk, lighting, traffic during construction, transmission line expansions) have fueled broader opposition even when individual facilities meet technical standards.
- Grandfathered and older facilities operate under less stringent original conditions, limiting retroactive application of newer standards.

Henrico County

- Fewer formal enforcement cases publicly documented than in Loudoun, consistent with later and smaller-scale growth.
- Resident concerns at and near White Oak Technology Park (Meta, QTS, and expansions) focus on generator emissions, potential cumulative air-quality effects, construction impacts, and noise.
- DEQ has issued clarifying guidance limiting non-emergency generator runtime; operators state that actual runtime is typically brief and infrequent.
- The county’s newer ordinance standards have not yet been tested extensively through long-term operation of post-2025 facilities.

Statewide, DEQ has recorded isolated permit exceedances at data center sites (e.g., opacity or NO_x during commissioning elsewhere in Virginia), illustrating that even permitted facilities can experience operational noncompliance.

6. Enforcement Record and Accountability

- **Loudoun:** Zoning staff conduct regular noise monitoring with calibrated equipment. Formal violations under the existing ordinance have been rare despite high complaint volume. New enforcement officers are intended to improve real-time response. DEQ retains primary air-enforcement authority and has limited ability to halt emergency generator operation once a grid outage occurs. Accountability for cumulative or tonal impacts remains incomplete pending Phase 2 standards.
- **Henrico:** Enforcement experience is more limited because the stronger PUP regime is recent. The Board has demonstrated willingness to deny or discourage new projects and to reject vested-rights claims. Generator testing windows and screening requirements provide clearer, enforceable conditions for future facilities.
- **Shared limitations:** – Local governments cannot directly regulate bulk-power reliability or force operators to “ride through” grid disturbances. – Many operational impacts

(especially emergency generator use) fall under state air permits that historically assumed limited runtime. – Fiscal incentives are strong—data centers contribute substantial real and personal property tax revenue (Loudoun reports figures approaching or exceeding \$1 billion annually in recent years; data centers have comprised a large share of the General Fund). This creates tension between revenue dependence and resident quality-of-life concerns. – Grandfathering and pipeline projects in both counties mean that stricter rules apply unevenly.

Emerging accountability tools include the GS-5 large-load rate class, state energy-consumption taxes, tighter DEQ generator standards, NERC ride-through initiatives, and enhanced local discretionary review. Full operational accountability for dynamic grid behavior and tonal noise remains a work in progress.

7. Comparative Assessment and Implications

Loudoun’s long experience illustrates both the fiscal benefits of data centers and the long-term costs of permissive early permitting followed by reactive regulation. The shift to SPEX and ongoing Phase 2 work represent significant progress, yet enforcement gaps (especially tonal noise and emergency emissions) and grandfathered inventory continue to generate friction.

Henrico acted earlier relative to its growth curve, imposing PUP requirements, numerical setbacks, generator runtime limits, and water standards before the industry reached Loudoun-scale density. Its current leadership posture of limited support for new projects further constrains expansion. The county’s experience demonstrates that clear, upfront standards and public-process requirements can reduce later conflict, though residual concerns about already-approved pipeline projects persist.

For other localities (including those considering first-time ordinances), the combined record underscores the value of:

- Requiring discretionary public approval from the outset.
- Explicit, measurable standards for noise (including tonality), generator use, setbacks, screening, and water.
- Coordination with DEQ on air permits and with utilities on interconnection timing.
- Transparent tracking of cumulative impacts and fiscal trade-offs.
- Mechanisms to limit or condition grandfathering of pending applications.

8. Conclusion

Loudoun County’s regulatory evolution from by-right proliferation to mandatory Special Exception review, coupled with ongoing Phase 2 standards development, reflects a maturing but still incomplete accountability framework. Persistent noise, emissions, and cumulative-impact complaints reveal gaps between current ordinance metrics and resident experience. Henrico County’s 2025 Provisional Use Permit regime and leadership signaling of restraint represent a more proactive local response relative to its stage of industry growth.

In both jurisdictions, state-level air permitting and the limited local authority over power-system behavior constrain full accountability. Stronger local standards, clearer enforcement tools, and better alignment with evolving state and regional reliability rules are necessary to ensure that data center development occurs with transparent oversight, enforceable compliance, and meaningful remedies when impacts exceed acceptable levels.