Behind-the-Meter Power Generation for Data Centers

Emerging Regulatory Considerations for Fauquier County, Virginia

Summary

Data-center developers in Northern Virginia are increasingly proposing large-scale onsite power generation—fuel cells, natural gas turbines, reciprocating engines, battery storage, and integrated microgrids—as a primary component of facility design rather than as emergency backup. Utility interconnection queues and transmission lead times are the primary drivers: large transmission projects typically take 5–10 years, while onsite generation can be deployed in 12–36 months.

These facilities are not unregulated. State agencies (SCC, DEQ), federal authorities (FERC), utilities, and local governments all exercise existing oversight. The open question is narrower: whether local land-use ordinances provide clear and consistent frameworks for classifying, siting, and conditioning large-scale private generation facilities that may produce tens or hundreds of megawatts while serving a single customer.

Fauquier County is well positioned relative to peers. Its experience with utility-scale solar, battery storage, substations, and data-center policy provides a strong regulatory foundation. No Virginia jurisdiction has yet adopted a mature ordinance specifically governing large-scale behind-the-meter generation—Fauquier is not behind; the field is still forming.

This paper describes the current state of technology, the regulatory landscape, recent developments in Virginia and nationally, and three practical pathways the County may consider.

1. Introduction

For most of the data-center industry's history, onsite generation meant diesel backup generators—equipment sized to bridge utility outages, not to supply operating load. That assumption has changed in the past 18 months. Modern hyperscale and AI-oriented facilities are being designed at 100–500+ MW, and developers are now evaluating fuel cells, gas turbines, and battery storage as primary or supplemental sources, partly because reliable utility power at those scales cannot always be delivered within acceptable project timelines.

The resulting questions are land-use questions, not technical ones. How should a 200 MW fuel-cell installation be classified? Is it an accessory use, a utility facility, or something else? What standards govern noise, visual impact, fuel infrastructure, and decommissioning? This paper examines those questions through the lens of Fauquier County's existing regulatory framework and recent experience in Virginia and other jurisdictions.

2. Existing Regulatory Framework

A common misconception is that onsite generation exists outside traditional regulatory structures. In practice, oversight is distributed across multiple agencies. The challenge is not an absence of regulation but the limited guidance most local ordinances provide on land-use classification.

Authority	Primary Responsibility	Typical Approvals
Virginia SCC	Utility regulation, generation oversight, interconnection	CPCNs, utility approvals, interconnection oversight
Virginia DEQ	Environmental compliance	Air, water, and stormwater permits
Virginia Energy	Energy policy and technical coordination	Policy guidance and technical review
FERC	Interstate transmission and wholesale electricity markets	Transmission and market oversight
Electric Utilities	Power delivery and interconnection	Service and interconnection agreements
Natural Gas Utilities	Fuel supply infrastructure	Gas service agreements and pipeline connections
Local Governments	Land-use compatibility and community impacts	Zoning approvals, site plans, building permits
Fire Marshal	Emergency response and safety	Fire and life-safety approvals
Building Official	Structural and engineering compliance	Building permits and inspections

What the County Controls—and What It Does Not

The County's authority is substantial but distinct from state and utility regulation. The County does not decide which technology is appropriate or set energy policy. It determines where facilities may be located, how they relate to surrounding land uses, and what local conditions apply.

Generally within County control:

- Land-use compatibility, siting, and location
- Setbacks, buffering, and screening
- Visual impacts, noise standards, and lighting
- Site design and landscaping
- Public hearings, community engagement, and conditions of approval

Generally outside County control:

- Wholesale electricity markets and utility transmission planning
- Utility reliability standards and interconnection decisions
- State environmental permitting (DEQ)
- Technology selection and fuel procurement

Technology Selection and the Role of Proffers

Fauquier County cannot directly require a developer to use fuel cells rather than gas turbines. Virginia's Dillon Rule limits local authority to powers expressly granted by the General Assembly, and no such grant authorizes a locality to mandate a specific generation technology. A direct technology condition would also risk intruding on the SCC's jurisdiction over electric

generation. The County's proper tool is performance standards—noise limits, emission thresholds, setbacks—that describe outcomes rather than prescribe equipment.

In the current absence of codified performance standards, the most effective path to the least impactful result is a voluntary proffer in a rezoning or special use permit proceeding. A developer who commits to fuel-cell technology in a proffer is legally binding themselves—the County is accepting the commitment, not imposing a mandate. The distinction matters: courts have consistently upheld accepted offers while striking down coerced conditions.

This creates a structural dependency worth noting. Proffer leverage exists only when a rezoning is triggered. If large-scale on-site generation were treated as by-right or resolved through an administrative use determination, no negotiating moment would arise, and no proffer could be made. This is among the strongest arguments for establishing a special exception or rezoning requirement for facilities above a defined capacity threshold—not to obstruct development, but to ensure the County has a meaningful seat at the table before site design is fixed and technology choices are made.

Fauquier's Existing Experience

Fauquier has developed regulatory frameworks for utility-scale solar, battery energy storage, electrical substations, transmission infrastructure, and data centers. The Utility-Scale Solar Ordinance—requiring comprehensive submission materials, fiscal and viewshed analyses, environmental studies, setbacks, decommissioning plans, and financial assurances—is especially instructive. Many of the same analytical tools are directly applicable to onsite generation proposals. In anticipation of additional applications, the County should develop these regulatory authorities for large-scale onsite generation.

3. Scale of the Emerging Issue

AI applications and large language models have substantially increased the electrical requirements of modern data centers. Facilities are routinely planned at 100–500 MW; some announced projects exceed 1 GW. At those scales, supporting power infrastructure begins to resemble utility-scale generation regardless of ownership structure.

Several recent projects illustrate the trend:

Location	Facility	Technology	Capacity
Fairfax, VA	T5 Data Centers (proposed)	Fuel Cells	60 MW
Multiple U.S.	Equinix	Fuel Cells	100+ MW aggregate
New Mexico	Oracle Project Jupiter	Fuel Cells	Up to 2.8 GW announced
Multiple U.S.	CoreSite	Fuel Cells	Primary and supplemental power
Multiple U.S.	Bloom Energy deployments	Fuel Cells	400+ MW deployed or contracted

Large-scale onsite generation typically requires natural gas pipelines, compressor stations, electrical substations, cooling systems, water infrastructure, maintenance facilities, fuel storage,

and emergency response planning. These supporting facilities can occupy substantial acreage and generate impacts extending well beyond the data-center buildings themselves.

The key planning observation is that these facilities no longer resemble traditional accessory equipment. A 2 MW backup generator is clearly subordinate to a principal use. A 200 MW fuel-cell installation supported by dedicated fuel infrastructure raises a fundamentally different question—not whether electricity is generated, but whether the scale justifies independent land-use review.

4. Why Fuel Cells Are Receiving Attention

Among onsite generation technologies, fuel cells—particularly Solid Oxide Fuel Cells (SOFC) and Proton Exchange Membrane (PEM) fuel cells, supplied by Bloom Energy, FuelCell Energy, and others—are receiving the most attention from data-center developers. Key reasons: lower noise, lower criteria-pollutant emissions, modular deployment in 1–5 MW blocks, and faster deployment than major transmission projects.

Fuel cells are not emissions-free. Most current systems depend on natural gas. Bloom Energy reports a 37% CO_2 reduction compared to conventional generation, but that figure reflects higher electrical efficiency rather than the elimination of carbon. From a land-use perspective, the more relevant characteristics are noise and footprint.

Characteristic	Fuel Cells (SOFC/PEM)	Gas Turbines (Simple Cycle)	Notes
Electrical Efficiency	50–65%	30–42%	Fuel cells convert more fuel into power
CHP Efficiency	70–90%	65–85%	Both are high if waste heat is captured
Noise at Source	~60–75 dBA at 30 m	~85–105 dBA at 30 m	Fuel cells are among the quietest generation technologies
NOx Emissions	<1–2 ppmv (near-zero)	9–25 ppmv with controls	Actual emissions depend on turbine type and controls
CO Emissions	Near zero	2–50 ppmv	
Particulate Matter	Negligible	Low but measurable	
CO_2 Emissions	~0.7–0.8 lb/kWh	~0.9–1.3 lb/kWh	Reflects higher electrical efficiency
Water Use	Minimal (<0.1 gal/kWh)	0.1–0.5 gal/kWh	Highly dependent on cooling technology
Physical Footprint	~1–3 acres per 100 MW	~2–5 acres per 100 MW	Site layout varies
Modularity	High (1–5 MW blocks)	Moderate (20–300 MW units)	Fuel cells scale incrementally
Deployment Time	~12–24 months	~18–36 months	Project-specific

Characteristic	Fuel Cells (SOFC/PEM)	Gas Turbines (Simple Cycle)	Notes
Grid Independence	High	High	Both support islanded/microgrid operations
Commercial Experience at Scale	Limited (>100 MW rare)	Extensive	Turbines remain dominant at utility scale

Land-Use Implications

Fuel-cell installations typically lack cooling towers, tall stacks, and other visual markers historically associated with power plants. Developers frequently argue that they should be classified as accessory infrastructure. Local governments may reasonably question whether a facility producing hundreds of megawatts qualifies as accessory simply because it serves a single customer. That question is not yet settled in Virginia.

5. Virginia Experience

Fairfax County: The T5 Fuel Cell Proposal

In May 2026, T5 Data Centers submitted a request for a formal zoning determination in Chantilly, seeking confirmation that a proposed 60 MW fuel-cell installation should be classified as both a “Utility Facility, Light” and an accessory use to the principal data center. The filing implicitly acknowledges that Fairfax County’s ordinance does not clearly address large-scale on-site fuel cell generation. Rather than seek a zoning amendment, the applicant requested an administrative interpretation of existing language. The case is likely to become the first significant Virginia precedent on the treatment of large-scale behind-the-meter generation.

Loudoun County

Loudoun has taken the most proactive approach in Virginia. Recent actions include: elimination of by-right data-center approvals; requirement for a Special Exception review; and expanded review of supporting infrastructure, including on-site generation, energy storage, substations, transmission facilities, noise, and compatibility. Loudoun’s approach reflects recognition that supporting infrastructure may have impacts comparable to or greater than those of the data-center buildings themselves. Some of the impetus for this likely stemmed from the Vantage VA2 data center in Sterling, where the Loudoun BOS approved a 100-MW gas-fired turbine yard as the primary power source after Dominion Energy declined to provide power promptly. Ensuing public complaints about noise and declining air quality led to a public health study sponsored by the Piedmont Environmental Council and ongoing air quality monitoring by DEQ.

Other Northern Virginia Jurisdictions

Prince William and Fairfax Counties are increasingly focused on the broader infrastructure ecosystem that supports data centers. No Virginia jurisdiction has yet adopted a mature ordinance specifically governing large-scale private power generation associated with data centers. Virginia remains in the early stages of policy development.

6. Use Determinations vs. Ordinance Development

Local governments generally have two options when confronting new technology: interpret existing ordinance language through administrative use determinations, or amend the zoning ordinance to establish explicit standards. Most Virginia jurisdictions are currently relying on use determinations because ordinances have not kept pace with rapidly evolving technologies.

Advantages of Use Determinations

- Projects can move forward without waiting for ordinance amendments
- Flexibility as technologies evolve
- Applies existing standards where they fit

Limitations of Use Determinations

Use determinations to address only the classification of a specific project and do not establish broader policy guidance. As projects scale up, several concerns apply:

- Uncertainty and inconsistency: project-specific interpretations may produce different outcomes for similar facilities
- Limited public participation: administrative decisions typically involve less community engagement than legislative amendments
- Legal vulnerability: large-scale facilities may be more susceptible to challenge when classified under ordinance language drafted before utility-scale private generation existed
- Cumulative impacts: use determinations that focus on classification, not on infrastructure planning or long-term compatibility

Use determinations work best when the proposed use closely resembles existing uses, potential impacts are well understood, and scale is modest. Whether a 200 MW private power facility fits within that framework is a legitimate policy question.

7. Emerging National Regulatory Models

Three approaches are emerging nationally. None has become dominant.

Model 1: Accessory Use Classification

On-site generation is treated as supporting infrastructure subordinate to the principal data-center use. Simple and administratively efficient, but it becomes difficult to justify as facilities increase in scale. Most ordinances provide little guidance on where the accessory/principal threshold lies and may not provide adequate safeguards for adjacent communities.

Model 2: Separate Use Category

Large-scale generation receives its own definitions, setbacks, performance standards, submission requirements, and review criteria. Provides greater clarity and consistency but requires substantial amendments to the ordinance, which are lengthy and resource-intensive to process.

Model 3: Integrated Energy Campus

Rather than classifying individual components separately, the entire development—data-center buildings, substations, fuel cells, turbines, battery storage, cooling systems, and transmission facilities—is reviewed as a unified system. Emphasis shifts from ownership and classification toward cumulative impacts. This approach reflects how these facilities are planned and operated and is emerging as the most analytically robust model.

National Trends

Pennsylvania planning organizations in Chester and Montgomery Counties are evaluating frameworks that treat power-generation facilities serving data centers as distinct land uses. Texas, Ohio, Arizona, and Nevada are confronting similar questions as demand for AI accelerates. Common themes: supporting infrastructure matters; cumulative impacts outweigh ownership structure; existing zoning categories are insufficient; integrated review frameworks are more durable than project-specific classifications.

8. Implications for Fauquier County

Fauquier is not unique, and it is not behind. The issue is emerging across the country, and no peer in Virginia has resolved it. The County's prior work on solar facilities, battery storage, substations, and data-center policy provides a stronger analytical foundation than many jurisdictions possess.

Should the County determine that additional guidance is warranted, the following questions merit consideration:

Definitions

- What constitutes a private power-generation facility?
- How should fuel cells and microgrids be defined?
- Should "energy campus" be recognized as a distinct use?

Scale Thresholds

- At what generating capacity or physical footprint does an accessory energy facility become a principal use?

Performance Standards

- Noise, visual impacts, lighting, fuel infrastructure, decommissioning, and landscaping/buffering

Review Process

- Administrative approval, special permit, special exception, or integrated energy-campus review all need to be considered, and the availability of resources needs to be assessed.

9. Pathways Forward

Option	Approach	Trade-offs
Option 1: Status Quo	Evaluate proposals under existing ordinances and	Maximum flexibility; no amendment needed. Risk of inconsistency and increased legal vulnerability as project scale grows.

Option	Approach	Trade-offs
	administrative interpretations.	
Option 2: Targeted Amendments	Add definitions, classification rules, submission requirements, and performance standards for onsite generation.	Provides clarity with minimal regulatory complexity. Suitable if early proposals are relatively modest in scale.
Option 3: Comprehensive Energy Infrastructure Framework	Address data centers, substations, battery storage, fuel cells, turbines, and microgrids under an integrated framework	Most durable long-term approach. Requires 9–18 months: scoping/legal review (2–4 mo.), drafting (3–6 mo.), public engagement (2–4 mo.), adoption (1–3 mo.).

Conclusions

Six findings emerge from this review:

- Behind-the-meter generation is rapidly evolving from emergency backup to primary operating power. The trend is driven by transmission lead times, not technology preference.
- Fuel cells are receiving particular attention for their lower noise, lower criteria-pollutant emissions, modular deployment, and faster implementation relative to major grid upgrades. They remain dependent on natural gas infrastructure.
- These facilities are not unregulated. State agencies, FERC, utilities, and local governments already exercise substantial oversight. The open question is land-use classification and local review standards.
- The T5/Fairfax use determination is likely to be Virginia's first significant precedent on large-scale onsite generation. Its outcome will be instructive regardless of how Fauquier proceeds.
- Loudoun County's approach—treating supporting infrastructure as a distinct regulatory concern with impacts potentially exceeding those of the buildings—represents the leading edge of Virginia practice.
- Fauquier is not starting from scratch. Its regulatory frameworks for solar, BESS, substations, and data centers provide directly applicable analytical tools.

The central policy question is timing, not direction: whether to establish clear standards before a major proposal arrives, or to develop them through administrative interpretation afterward. Early-mover jurisdictions are finding that proactive frameworks are more defensible, more consistent, and more protective of community interests than project-specific determinations made under regulatory ambiguity.

Appendix A – Comparative Regulatory Matrix

High-level policy comparison. Not a legal analysis of any specific ordinance.

Topic	Fauquier	Fairfax	Loudoun	Prince William
Data Center Policy Framework	Yes	Yes	Yes	Yes
Data Center-Specific Ordinance	Limited	Yes	Yes	Yes
Special Exception Review for Data Centers	Case-specific	Yes	Yes	Yes
Utility Substation Standards	Yes	Yes	Yes	Yes
Utility-Scale Solar Ordinance	Yes	Yes	Yes	Yes
Battery Energy Storage Standards	Yes	Yes	Yes	Yes
Noise Standards for Data Centers	Limited	Yes	Yes	Yes
Fuel Cell-Specific Standards	None	None	Under review	None
Microgrid-Specific Standards	None	None	Under review	None
Private Power Generation Use Category	None	None	Under evaluation	None
Large Behind-the-Meter Generation Standards	None	Use determination pending	Under evaluation	None
Integrated Energy Campus Framework	None	No	Emerging	No

Key observations:

- Most Northern Virginia jurisdictions have developed increasingly sophisticated data-center regulations, but all have gaps regarding large-scale private power generation.
- Fairfax County is testing the issue through an administrative use determination; Loudoun is moving toward broader evaluation of onsite generation and supporting infrastructure.
- Fauquier's current position is consistent with most peer jurisdictions.

Appendix B – Questions for Future Policy Review

Should the County choose to evaluate this issue further, the following questions organize the analysis:

Definitions

- What constitutes a private power-generation facility vs. accessory equipment?

- How should fuel cells, microgrids, and energy campuses be defined?

Scale

- At what generating capacity or acreage does an accessory energy facility become a principal use requiring independent review?

Review Process

- Administrative approval, special permit, special exception, or integrated energy-campus review?

Performance Standards

- Noise, visual impacts, lighting, emergency response, fuel infrastructure, decommissioning, landscaping, and buffering

Community Considerations

- Public engagement requirements
- Compatibility with agricultural and rural land uses
- Long-term land-use and infrastructure implications

References

Virginia

- Virginia Code §15.2-2200 et seq. – Virginia Zoning Enabling Act
- Virginia Code §15.2-2280 et seq. – Local Government Zoning Authority
- Virginia Code §56-265.2 et seq. – Certificates of Public Convenience and Necessity
- Virginia SCC – Electric Generation Facilities
- Virginia DEQ – Air Permitting Program

Fauquier County

- Fauquier County Data Center Policy
- Fauquier County Utility-Scale Solar Ordinance
- Fauquier County Comprehensive Plan and Zoning Ordinance

Virginia Case Studies

- Fairfax County Data Center Zoning Ordinance Amendment
- T5 Data Centers Request for Use Determination (May 2026)
- Loudoun County Data Center Standards and Locations Initiative (Phase 1 and Phase 2)

Industry and Technical Sources

- Bloom Energy – Data Center Power Solutions
- FuelCell Energy – Data Center Applications

- Equinix Sustainability Reports
- CoreSite Energy and Sustainability Publications

Planning and Policy Sources

- Chester County and Montgomery County (PA) Planning Commission Data Center Guidance
- American Planning Association – publications relating to data centers and energy infrastructure
- Model Energy Campus and Data Center Ordinance Resources

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