# The Making of Data Center Alley: Proponents and Critics

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# **Quinn Early**

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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## Introduction

Virginia has the largest concentration of data centers in the world, with over 35% of all hyperscale centers operating within the state (Barnett, 2024). Many facilities support generative artificial intelligence programs, which have become mainstream with remarkable speed since their public release two years ago. However, the computationally intensive nature of these products – Goldman Sachs (2023) estimates that one ChatGPT search uses 6-10 times the power of a traditional Google search – compels engineers to improve their efficiency to meet sustainability goals. There are countless methods to pursue more efficient computing. Some, like campaigns that promote traditional searches over AI products, rely on social rather than technical innovations. Other solutions use cutting-edge tech like quantum computers, which Villalonga et al. (2020) proved can solve complex math problems with 50,000 times less energy than standard supercomputers. Regardless, to promote energy security and carbon neutrality, computing and data center efficiency must be addressed if we are to meet the rapidly increasing demand for computing resources.

The intertwining environmental, social, and economic effects of data center operations have sparked fierce debate at their epicenter. This paper will therefore investigate how advocates and critics of new data centers have advanced their agendas in Virginia. By characterizing relationships between technology companies, utilities, and data center constructors, the Actor-Network framework explains how the data center boom affects consumers.

## Methods

Data is gathered through documentary research and database searches. Case studies of Virginia development projects are also analyzed and compared to successful foreign projects. The work is best defined by the terms data center, lobbying, energy transition, and social acceptance of infrastructure. The strategies for advancing or mitigating new data center development are grouped by their environmental, social, or economic values. These techniques also connect to their actors for simpler evaluation from an efficacy standpoint.

### **History & Important Actors**

"Data Center Alley" emerged from a confluence of factors including proximity to federal agencies/contractors, a favorable business climate, and relative safety from natural disasters. Northern Virginia's precedent as the site of early fiber optics research made it an attractive candidate for the first Internet Exchange Point in 1992 (VEDP, 2019). Soon after, companies like Equinix built high-capacity data centers that centralized global internet traffic. Once Amazon, Facebook, and Microsoft began using the region's facilities, a tidal wave of construction ensued. Now, Northern Virginia is a nexus, with over 70% of the world's web traffic passing through the area. However, the growth of Data Center Alley has inspired a highly organized opposition. Groups that oppose further data center construction take part in a complex interaction that also includes utility providers, facility operators, local governments, and tech corporations, a few of which are introduced here.

Powerful technology corporations like Amazon drive data center development as their cloud computing and AI products expand rapidly. Since 2011, Amazon Web Services has spent an eyewatering \$63 billion building a footprint in Virginia, with plans to invest \$35 billion more by 2040 (Swinhoe, 2024). Corporate leaders tout these figures as victories for the state, saying that they create "hundreds or even thousands of jobs to build and run their data centers," developing a workforce of "cloud engineers, electricians, fiber optic cable splicers, and more" (Swinhoe). Meanwhile, Amazon makes a windfall taking advantage of Virginia's generous sales

tax exemptions and subsidies, with a recent AWS earnings statement showing a \$10.45 billion quarterly profit (CNBC, 2024).

Amazon's massive physical footprint in Virginia drew the attention of national advocacies like Greenpeace, whose 2019 report detailed how the company turned its back on transitioning to 100% renewable energy. The report casts Amazon's relationship with Dominion (Virginia's utility provider) as concerning because it created additional pressure to build the Atlantic Coast Pipeline and accelerated Dominion's shift toward natural gas (Greenpeace, 2019). In doing so, Greenpeace emphasizes Amazon's "greenwashing" to slow further expansion efforts and prevent environmental degradation.

At a local level, community organizations like Citizens for Fauquier County pursue legal action to block new data center construction, citing non-compliance with zoning ordinances, tree removal, traffic, noise, and potential property value loss as concerns. (Schumaker, 2024; PEC 2024). Since these projects usually receive final approval from town/county legislators, lawsuits and direct appeals to elected officials are valuable, accessible tools for citizens concerned about the expansions. Other local groups like the Coalition to Protect Prince William County appeal directly to fellow citizens' morality, decrying data centers as threats to natural and historical sites. They even compare the takeover of land to forest destruction in Dr. Seuss's The Lorax, posting the whole story on their website (Protect PWC, 2023).

Data centers tend to exist outside the public eye due to their unremarkable appearance, yet they form an increasingly vital part of our modern infrastructure. Therefore, lobbying, lawsuits, and state environmental & financial reports become important tools for data center proponents and critics to quietly advance their agendas.

#### **Evaluating Infrastructure Booms: Social Frameworks**

The effects of large-scale construction projects have been studied within the Actor-Network framework. For example, the "social acceptance of infrastructure" sub-theory outlines community, sociopolitical, and economic dynamics that affect the likability of new projects (Devine-Wright, 2017). Miller et al (2015) analyzed renewable energy policy with a "socioenergy systems framework," considering human as well as technical values. Devine-Wright et al (2017) also highlight prioritizing social acceptance with engineering and economic considerations since well-liked infrastructure projects are far more likely to be replicated.

Similar dynamics govern opposition to infrastructure development and data center construction. Cohen et al. (2013) identify welfare-decreasing aspects of new infrastructure that are similar across project types and foment public opposition. These include "noise, pollution, ecological change, decreased property values and others." On the other hand, social acceptance of infrastructure occurs when the project's "welfare increasing aspects leave each agent *at worst* welfare neutral and indifferent, or better off and supportive of the project." Cohen also suggests avoiding areas with high environmental value, compensation for those with diminished property values, and including the public in planning processes to improve renewable energy project acceptance. Virginia state and corporate officials promote new data centers with insufficient consideration of developer-public relations, citing economic benefit to quell opposition.

Applying Jevon's paradox for computing efficiency is another powerful framework for evaluating relationships within the network. It is also a useful strategy for data center opponents to refute industry claims of sustainability. Jevon's paradox is the idea that increasing a technology or procedure's efficiency will increase its resource demand, contrary to expectation. Woodruff et al (2023) calls this phenomenon "rebound," noting that computing efficiency gains

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from 2000-2005 were more than offset by increased server loads worldwide, generating a power consumption increase of 260%. Due to rebound, the authors recommend that tech companies transition quickly to renewable energy, a suggestion that developers have publicized but not yet embraced. Woodruff's rebound study falls within the purview of the social acceptance of infrastructure since energy demand and source type affects its cost to consumers, which affects the likelihood they'll support the infrastructure project in question.

Contrarily, Cordella (2010) suggests that ANT be applied to developing information architecture rather than the more common retrospective studies. Many ANT studies relating to digital infrastructure imply a static relationship between users and tech companies, driven by fixed motives such as profit, environmental benefit or social cohesion. Cordella suggests these motives are dynamic, since digital infrastructure transforms much faster than physical infrastructure. Therefore, he values human decision-making and the technology itself as equal and intertwined in the network. Cordella notes that under ANT, "the actors of the socio-technical interplay do not predate the relationship," but take form because of interactions with other actors. Essentially, no actor exists in a vacuum. Viewing the data center boom as a dynamic and tightly connected interplay makes the Actor Network Theory a more robust analytical tool.

#### **Results and Discussion**

### Sustainability Measures: Adoption Takes Accountability

Appealing to consumers' environmental conscience is a powerful strategy used to justify or mitigate the data center boom. Since sustainability measures are broadly popular, companies and local legislators publicize lofty goals to improve support for their work regardless of whether they are accomplished. "Greenwashing" will likely spread during the new administration, given Trump's abandonment of past carbon-transition goals and embrace of fossil fuels. Dominion Energy's 2023 Sustainability and Corporate Responsibility Report exemplifies the greenwashing trend. In the United States there are no mandates or standards for corporate ethics reports, leaving companies to publish data as they see fit. Dominion takes advantage of this freedom in their 30-page report, which has sections about clean energy, affordability, reliability, community impacts, and corporate safety. The report also emphasizes that electric power is a necessity through usage and reliability statistics. For example, they mention that Virginia, North Carolina, and South Carolina customers had electric service 99.98% of the time, excluding storms (Dominion, 2024).

More importantly, the Dominion report highlights progress towards net-zero transmission, even though the company was only 34% carbon-free in 2022 (Dominion, 2022). The utility is making strides towards their goals, especially through an offshore wind project that will be the largest in the country. Dominion also counts scope shifting as part of their strategy, where the CO2 emissions of power generation (Scope 1 emissions) are reduced or transferred to emissions from transmission or energy purchasing (Scopes 2/3). With scope shifting, Dominion increases its "percent net-zero" metrics artificially, garnering support for new investment. However, the report does not discuss the growing share of energy needed for power data centers, and whether this will delay the transition. Since there is no reporting accountability, the Dominion report is a reputation piece to convince consumers and governments of their good work. CSR reports reduce friction when Dominion seeks price hikes, which are discussed below.

Legislators incorporate environmental concerns in their policy strategy to delay data center construction. In Virginia, this takes the form of 2020's Clean Economy and Environmental Justice Acts, which mandate the shift to 100% renewable sources by 2045. These laws constrain energy use by preventing new fossil fuel plants from being built. One case from 2024 was a

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natural gas plant in Chesterfield which state Democrats lobbied against. According to a Virginia Public Media report, state Sen. Ghazala Hashmi opposed the plant because of worries that communities previously burdened by environmental damage would bear the brunt of this new plant. The plan was eventually approved with a site relocation. Therefore, legislators cannot fully constrain the environmental impacts of electrical utilities, even including organized local critics and legal hurdles. Dominion's lobbying prioritized reliability over environmental concerns to win over politicians of both parties, implicitly supporting data center expansion. However, this example demonstrates that more binding environmental legislation could curtail unsustainable development due to a finite energy supply.

Data centers' inner workings are a mystery to many since their product is digital rather than physical. Therefore, media outlets sway public opinion by detailing data center operations through an environmental lens. The Washington Post has done a fair share of community reporting about the computing boom, including a fascinating explainer of resource use. Using graphics, maps, and pictures, Olivo and Neff paint the facilities in a negative light for providing minimal benefits to locals while vacuuming up water and electricity. For example, Equinix DC15 requires 85,000 gallons of water and 28.8 MW of power to run (Olivo, 2024). Since data centers and residents rely on the same power grid, environmental considerations link these actors even if many are unaware of the connection. Constructors rely on the lack of publicity about the data centers' massive resource needs (as there are relatively few reports like *The Post*'s) to advance projects more freely. Known companies also escape scrutiny about their environmental goals by working with third party builders. For example, Equinix is one of Northern Virginia's largest players, hosts data for Netflix, Zoom, Red Bull, and others, yet hardly anyone has heard of them. In this way, corporations launder their reputations by offloading sustainability concerns to the lesser-known companies who host data.

Environmental legislation, corporate sustainability reporting, and avoiding consumers' scrutiny are three strategies that advance data center construction in Virginia. However, activists also subvert these methods to delay or reduce buildout, with some success. In one case, advocacy groups Appalachian Voices and the Southern Environmental Law Center challenged Dominion's Integrated Resource Plan in court. They argued that more sophisticated planning measures are more prudent than building the Chesterfield power plant, because over 80% of Dominion's growth forecast was based on the projections of five companies (Vogelsong, 2024). Advocacies point out that Dominion inflates expected energy demand to expedite new plants and delay sustainability initiatives. Exaggerating demand is deceptive and creates a cycle where data center companies encourage the utility to expand, justifying more centers. Growing environmental concerns at times have motivated legislators to reject proposals. For example, Loudoun County supervisors rejected plans to build a data center larger than zoning limits would permit, only allowing a small version of the project. As supervisor Turner noted, "We do not have enough power to power the data centers we have" (Styer, 2024). These comments demonstrate the power of local lobbying and prove the region may be reaching an environmental saturation point.

## Building Social Acceptance: No Small Task

Developers must mitigate negative aspects like noise, pollution, and ecological damage to ensure social acceptance of new infrastructure. However, when residents' opinions are overlooked or projects move too quickly, strong and organized opposition forms to resist further development. Many Loudoun County residents voice their concerns about data centers through Homeowners Associations (HOAs), which are neighborhood-level governing organizations. For example, a 2023 Washington Post report describes how residents reacted to new data centers in their neighborhoods. The 24-7 noise from fans near their backyard brought Carlos Nunes's family to install expensive soundproof windows, which didn't help. Nunes later worked with the HOA to solve the problem. Amazon, the site's owner, finally "installed wind bands on the fans and replaced the blades with quieter ones," (Olivo, 2023) after pressure from the HOA president. Although the HOA only led to upgrades on an already existing facility, this interaction shows that tech companies will take actions to approve their public opinion at a low cost. When developers don't accommodate local needs, they become targets for legal action that delay project development. For example, Citizens for Fauquier County pursue lawsuits to block new data center construction, citing non-compliance with zoning ordinances, tree removal, traffic, and potential loss of property value as concerns. (Schumaker, 2024; PEC 2024). Two years after an Amazon project was first approved in Warrenton, CFC secured a third year of delays by suing the town and Amazon. Residents concerned about a lack of planning for environmental damage and construction noise found success through legal action.

Well-liked international projects rely on local factors like geography and integration with renewable projects. For example, a White & Case report mentioned solar powered roofs on data centers in Australia and geothermally powered facilities in the Nordics (Hill, 2024). By understanding the local culture, developers integrate the facilities into the landscape, making them feel like less of an imposition. These successes even led other jurisdictions like Prince William County to incorporate native trees, noise buffers, and naturally appropriate building colors into their design recommendations (Olivo, 2023). This way, constructors seem like partners rather than invaders, smoothing the approval process. Studies have proven that community investment and education improve public acceptance of data centers. CyrusOne surveyed over 13,000 individuals in six European countries about attitudes towards projects in their towns. The survey found varying levels of understanding of data centers' purpose, with less than half of Brits correctly choosing their function from a list. Meanwhile, locals strongly agreed (83%) that centers bring value through increased job opportunities. However, respondents mentioned that "amenities like biodiverse spaces for public use, cycle paths and playgrounds" would improve their perception of computing facilities. As described in Cohen et al., these are "welfare-increasing" facets of new infrastructure that brighten public perceptions at low to medium cost. Social benefits are often overlooked since tech companies have far more lobbying power than local groups, even including lawsuits. The study itself was also a strategy for self-promotion because it was sponsored by a data center company, not an independent research group.

## Who Foots the Bill for Expensive Computing Facilities?

Tech corporations, data center operators, and utilities are driven by profit more than commitment to communities. They therefore tend to ignore the welfare-increasing aspects of new projects while facing minimal consequences. For example, Dominion relies on its status as Virginia's primary electric utility to increase consumer prices to pay for new data center-related demand. Activists from the Sierra Club and Virginia Mercury go so far as to say that "ordinary customers are subsidizing Big Tech with their money and health" (Main, 2024). The same 2024 article noted that Dominion greatly overstates electricity demand growth to justify rate hikes. Excluding data centers, demand is forecast to plateau through 2034, emphasizing that customers are subsidizing Dominion's profits through unnecessary power plant buildout. The State Corporation Commission (SCC) is also drawn into the interaction by setting legal limits for electrical rate increases. Indirectly, the SCC holds tremendous power over the data center boom, since energy availability is paramount. Lobbying the SCC is thus a critical strategy for consumers to voice dissent about infrastructure bloat.

In 2010, Virginia legislators created the largest economic development incentive in the state, an exemption for state sales and use tax for data centers if they led to \$150 million in new capital investment and 50 new jobs located at the data center associated with the facility's operation or maintenance, where each job must be paid >150% of the annual average wage. (VEDP)

As one of 11 incentives for attracting computing facilities, the measure has helped Virginia keep its status as America's data center capital, but growing electricity and water footprints have prompted recent reevaluation. In 2023, the state's Joint Legislative Audit and Review Commission began a study about the industry's effects on energy infrastructure, considering citizens' concerns and noting that policy changes may be in order if current incentives are not effective (JLARC, 2023). Legislators propel Virginia's economic interests through tax breaks, which supported an estimated 27,642 industry related jobs in 2023 (Burns, 2024).

There is a similarly strong relationship between construction companies, data center operators, and technology providers. As these three types of actors are all profit-driven, they seek to maximize demand for their products. A recent report from S&P Global summarizes these motivations with economic forecasting, finding land procurement and energy investment to be the key constraints (Lai, 2024). The authors found that expensive contracts – like an additional \$8.6 billion in Microsoft data center leases for data centers – fuel rent growth in the area. S&P also expects that the boom in AI spending (~\$650 billion by 2028) will benefit the area's IT services sector greatly. However, since AI requires more electricity, they think transmission buildout, grid interconnections, and labor shortages may limit the field's growth. The financial advisory company draws attention to these factors to encourage more investment, since it could lead to higher profits (including for S&P itself). Treating AI as a necessity or something that's inevitable is a powerful strategy for speeding data center construction because it creates a sense of urgency. Consumers adopt the new tech faster while software providers and facility operators race to build facilities – a nearly unstoppable snowball effect. Emphasizing the technological arms race with China also makes AI extremely resistant to environmental/social lobbying.

Finally, the economic relationship between the tech sector and utility providers is fleshed out through interviews in a recent Reuters article. One CEO, Bill Fehrman of American Electric Power (AEP), said they continue to see huge demand from data center customers, even with the advent of the high-efficiency DeepSeek (Kearney, 2025). The article lists facilities with a capacity of up to 1 gigawatt on a single site, enough power for all homes in a small city. Therefore, data centers' unparalleled power use can endanger energy security for regular consumers if unmanaged. Like the S&P report, Kearney pushes for maximal investment in grid infrastructure but mentions that the buildout increases consumers' power bills. Assessing who should pay for new data centers is complicated, since they house the computing services on which we're increasingly dependent. However, increasing consumers' bills to pay for new power plants is a sneaky tactic. Utilities can increase data center-related profits while delaying the transition to renewables and providing minimal service improvements. The Reuters article highlights how power companies and large tech customers reduce economic resistance to new facility construction without consumers noticing.

Analysis of agenda advancement strategies in this actor network is limited by the research scope. Primary source testimony is one useful example. Locals' accounts are timely and

relevant but suffer from selection bias in that the most outspoken critics/supporters of the industry boom tend to speak up. The secondary sources were mostly from corporate sponsors like Dominion who have a vested interest in portraying the facts in the most favorable light, forcing a more careful analysis. Finally, for the purpose of a clearer argument, it was useful to identify concrete relationships between actors with each source. The reality is much more complex, with economic, social, and environmental strategies deeply intertwined, meaning that some nuance is lost by sorting into rigid categories. Analyzing equity impacts, like data centers' impact on historically black or low-income neighborhoods, would be an important extension.

# Conclusion

A complex network relates consumers, power companies, state governments, and tech corporations advancing data center-related interests. Citizen groups organize at the local level, drawing on environmental lawsuits and negative public opinion to stop further construction. Facility operators and their high-tech tenants improve their economic prospects through tax breaks. Utilities are rapidly building plants to power data centers, passing costs to consumers through higher energy rates. Companies do an expert job hiding their economic strategies with arguments about necessity, making them the most effective in advancing new data center construction. Contrarily, social strategies like negative public opinion or perceived environmental negligence are highly visible but less effective for changing the material reality. Data centers tend to exist outside the public eye due to their unremarkable appearance, yet they form an increasingly vital part of our modern infrastructure. Therefore, lobbying, lawsuits, and power purchasing agreements become important tools for data center proponents and critics to quietly advance their agendas.

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