The Technological Momentum of Data Centers in Northern Virginia

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Thomas Arnold

Spring 2025

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

Advisor

Kent Wayland, Department of Engineering and Society

Introduction

In the near future, you may be finishing up a tour of the historical Manassas National Battlefield Park in Manassas, Virginia. After learning about some of the most terrible battles in the Civil War, you decide to walk along the main trail of the national park in order to further soak in the history of the area. To your dismay, you look up and have your view obscured by a monolithic concrete cube consuming hundreds of thousands of gallons of water a day. This technological beast is a data center, and they have been popping up across Northern Virginia for decades, causing Northern Virginia to be the global hub for data centers. They have irreversibly changed the socioeconomic landscape of Northern Virginia with the help of tech companies and lawmakers who want Virginia to reap the rewards of the services they provide. In doing so, the industry has snowballed into having significant influence over Northern Virginia, and it has become harder to regulate its spread. *How is the technological momentum of data centers affecting Northern Virginia? What are data center companies and local lawmakers doing to sustain or slow this momentum?* This question is important because it demands that we think critically about the technological industries that are popping up all around us today. It demands that we consider the full scope of impacts of new technologies on groups previously underrepresented by the industry itself and by lawmakers.

Background

Data centers are buildings that hold extremely powerful computers that conduct operations such as data processing, data storage, algorithmic decision-making, and, more recently, training artificial intelligence (AI) models, and accepting queries to these AI models

(Fard, 2024). They are the technological backbone to popular computing services like Amazon's Amazon Web Services (AWS) and OpenAI's ChatGPT. These technologies have fundamentally changed the way that businesses operate, and, indeed, these data centers have had an enormous economic benefit for Northern Virginia.

Northern Virginia's role as a global hub for data centers can be traced back to the region's proximity to Washington DC and the housing of the Pentagon and the Central Intelligence Agency's headquarters. Since the Pentagon was constructed in 1943 in Arlington, Virginia, military personnel and intelligence operations have made their home in Northern Virginia. When the military started to increase their outsourcing of technical labor to government contractors, more and more technical government contractors set up shop in the region and began operations. When there was a decrease in federal funding to contractors in the 1990s, companies in cities like Tysons Corner began to close their offices, allowing non-contractor technology companies to move in. This coincided with the military's early experimentation with the internet, known then as the Advanced Research Projets Agency (ARPANET). The first private internet service providers started using these vacancies to establish the first Internet Exchange Points, buildings that facilitate IP network connections, the backbone of the internet. As more private internet companies began to establish operations in Northern Virginia, the network of fibre optic infrastructure exploded, leading to Northern Virginia being the global hub for internet traffic. Therefore, when companies like Google, Amazon, and Microsoft began to eye regions for establishing data centers to support their cloud computing operations, Northern Virginia was seen as a perfect candidate. Furthermore, the federal government is a major client for the services that data centers provide, so it became clear that data centers were there to stay.

In 2023, the industry created 12,140 operational jobs and an additional 14,240 construction jobs. The previous year, the industry paid $640 million in taxes to the State of Virginia, and an additional $1 billion to lower, local governments throughout Northern Virginia (*2024 NVTC Data Center Report*, 2024). However, there are extreme trade-offs. Data centers account for about 2% of global electricity demand, with their environmental footprint increasing rapidly due to recent advancements in AI. Additionally, they take massive amounts of fresh water for cooling. These factors put a pressure local electricity grid as well as the affected region's resource management. Data centers harm local wildlife, forests, and water, and emit tons of carbon. (Kshetri, 2024). Concerned Virginians note that data centers cause significant air and noise pollution, with the construction of some data centers causing residents to move due to the noise they create (Kshetri & Voas, 2024). There has been a one-sided war waging in Northern Virginia between those that want to see the data center industry keep growing in Northern Virginia, and those against this very notion. For example, in 2023, Fairfax County's Environmental Quality Advisory Council urged the requirement of renewable energy usage for data centers, in addition to a transparent disclosure of all carbon emissions and pollutants. Despite these concerns, counties like Prince William have approved data center construction in areas close to national parks, schools, and neighborhoods. Furthermore, these new data centers would shrink the drinking water supply of the area.

Literature Review

Big tech companies' data centers have become core to the political, economic, and physical landscape of the regions they reside in across the globe (Mayer & Velkova, 2023). Data center companies push a black box narrative of technological innovation that results in constant improvements for all, ignoring the fact that the industry is volatile and that socioeconomic success is not guaranteed by the presence of these centers. Negative effects on residents caused by data centers are washed away by big tech's ambitiously positive marketing, often aided by local governments and press outlets, who have a vested interest in advancing big tech companies' presence. Mayers & Velkova advocate for hearing the local voices ignored by Google in the regions which they inject their data centers into. Even in academia, these voices are frequently ignored. There exists a tension between those working on or with these new, futuristic data centers and those whose legacy telecommunications jobs have been supplanted by them.

The literature that I examined on the socioeconomic relationship between data centers and the regions they inhabit claim that there is not enough literature on this subject. Discussion of this relationship is obscured by the use of metaphors for data, steering discussion away from the material and infrastructural needs of data centers. These metaphors shape the societal knowledge and politics of data centers, and data center companies intentionally use them to promote data center expansion and advocate for increased prevalence in society (Fard, 2024). Current literature on data centers' sociotechnical effect on society has labelled politics as one of the main axes of relationship to society (Velkova & Plantin, 2023). The reliance that states and businesses have on data centers fundamentally changes the balance of power between these

businesses and the state, while policymakers and data center managers present the expansion of data centers as a necessity.

Theory

As suggested in my research question, I will be analyzing the Northern Virginia-data center industry sociotechnical system through the lens of technological momentum. Technological momentum is a theory that states that as technologies age and become adopted by society, they increasingly have an influence over society, causing the influence society has back on that technology to be biased, creating an echo chamber-like effect that leads to constant iteration of the technology (Hughes, 1969). In essence, it makes it increasingly hard to regulate a technology as it ages. I believe this is precisely what has happened in Northern Virginia over the past couple of decades, and it is a useful way to frame the system, given just how prevalent data centers have become in Northern Virginians' lives.

Methods

To analyze the development and impact of data centers in Northern Virginia, I conducted a multifaceted research approach that examined historical growth trends, policy decisions, economic and environmental consequences, and scholarly perspectives. To this end, I researched the history of data center development in Northern Virginia and sought out studies on how data centers have affected Virginia. I also examined various Northern Virginia policies and bills on data centers throughout the years. In order to understand the benefits of these data centers, I

looked for data that illustrated the jobs and state tax revenue these data centers brought to Virginia. On the other hand, I looked at the negative effects of these data centers. To this end, I searched for environmental impact assessments throughout time as more and more data centers have popped up. In order to get a full picture of how these data centers affect Northern Virginia. I interviewed former Virginia state senator Chap Petersen, as he has done a lot of work on pushing back against these data centers. I aimed to get his firsthand experience fighting back on data centers. Additionally, I wanted to get some insight into tech companies' strategies of expanding their operations by reading relevant press releases. On the other hand, I looked for what Northern Virginia lawmakers have said in support of data centers about the subject, so I could understand what their arguments are and how they have been involved in sustaining the technological momentum of data centers.

Of course, I consulted some STS literature on the sociotechnical system of data centers in Northern Virginia to see what STS scholars are saying on my topic. I scanned through public policy and political science databases for literature on Northern Virginian data centers, as politics are at the epicenter of the technological momentum of data centers. Additionally, I made sure to look through some general computer science databases for sources on the technical aspects of data centers, including how they operate and their environmental impact.

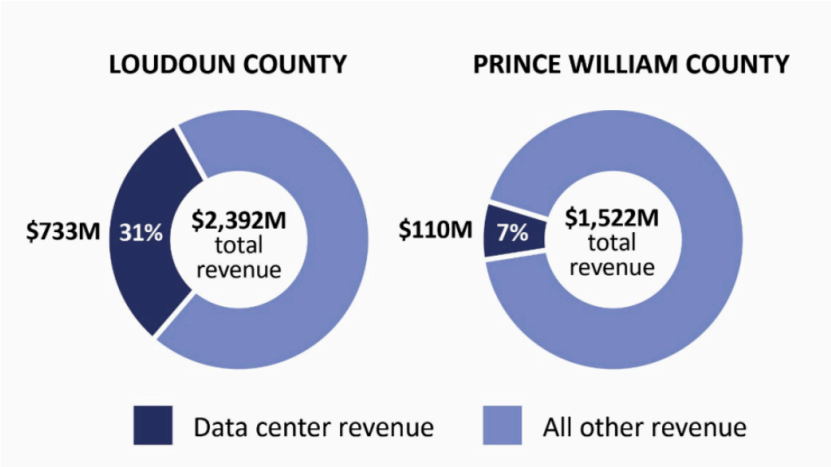
Money, Money, Money

The General Assembly of Virginia, the state legislature of Virginia, examined the growth of data centers in Northern Virginia and published their considerations in 2024, because they chose to delay passing resolutions and bills on data centers due to lack of information (Bryant,

2024). They observed, of course, that the data center industry has been very lucrative for Northern Virginia counties. Tax yields from data centers have skyrocketed to 1,535% over the past ten years. The Assembly commissioned the Joint Legislative Audit and Review Commission (JLARC) to perform a study on how data centers have affected Northern Virginia. JLARC found that data center investment comprised 84% of total capital investment projects reported by the Virginia Economic Development Partnership, a state board that oversees economic development (Sarte et al., n.d.). The industry provides about 74,000 jobs, labor income of $5.5 billion, and a Virginia GDP contribution of $9.1 billion. These comprise over 1% of total statewide employment, income, and GDP between 2021 and 2023. Between 2021 and 2023, Virginia's GDP had a growth of $103.9 billion (*Gross Domestic Product*, 2025). Data centers accounted for a whopping 8.76% of this GDP growth. In Loudoun county, data center revenue accounted for 31% of total local revenue in 2023 (Sarte et al., n.d.).

Figure 1

Data center tax revenue can be substantial for local governments (FY23)



SOURCE: JLARC staff analysis of revenue collections from localities and the APA Local Government Comparative Report, FY23.

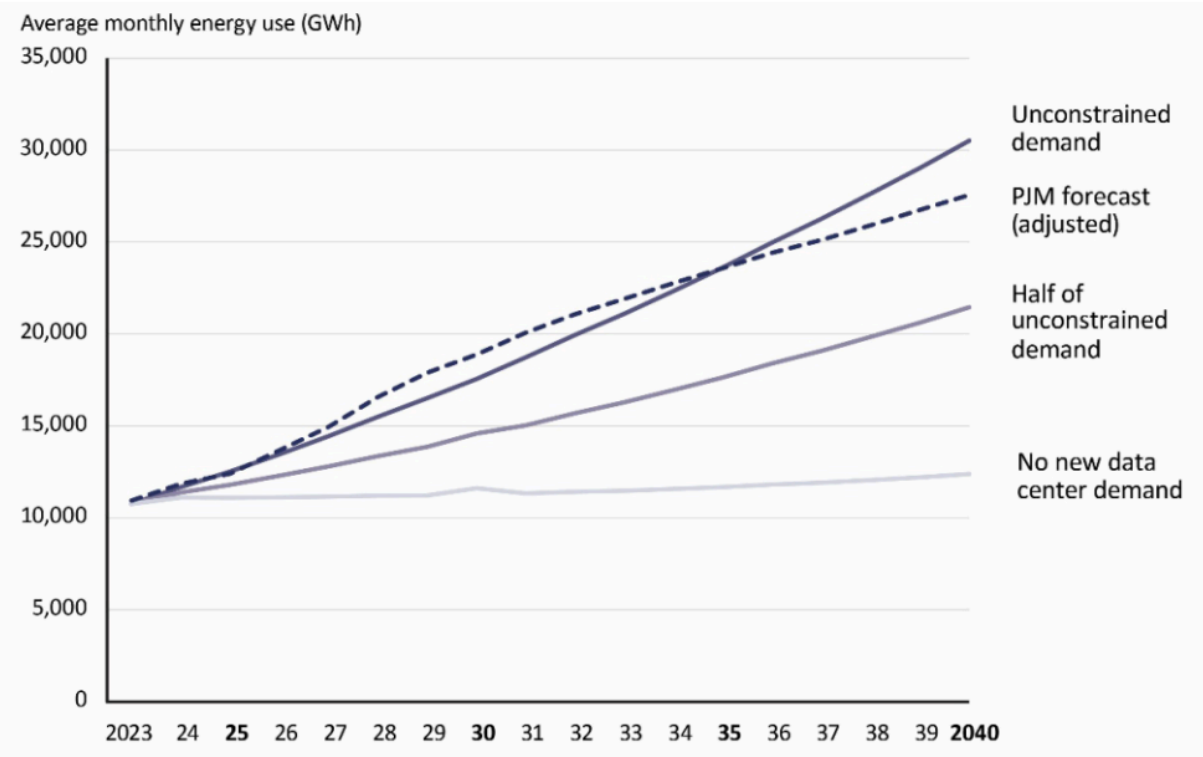
Note: Figure taken from Sarte et al., n.d. (2024, p. 17).

Power Struggles

The growth of the data center industry has caused the industry's energy demands to skyrocket at a concerning rate. The infrastructure improvements required to keep up with this are gigantic (Sarte et al., n.d.). Smaller Northern Virginia data centers tend to take 18 megawatts (MW) of power to run. This is about the same amount of power demanded from 60 large office buildings, 4,500 homes, or one medium-sized automobile assembly plant. The larger ones generally take between 100 and 200 MW, with some data center campuses estimated to use over 1,000 MW of power. In total, Virginia data centers use about 50,50 megawatts of power, equivalent to the electricity consumption of 60% of Virginia households. In response to this massive electricity demand, JLARC commissioned the PJM, a regional transmission organization that operates an electricity transmission system for Virginia, to forecast energy demand from the Virginia data center industry if the industry continued to grow unconstrained, half of that unconstrained demand, and if there was no new demand. This forecast predicts that if the data center industry continues to grow unconstrained, that Virginia's energy demand will double within the next decade.

Figure 2

Data center demand would drive immense increase in energy needs in Virginia, based on JLARC'S independent forecast and other forecasts



SOURCE: JLARC staff consultant analysis.
NOTE: A detailed note is provided for this figure in Chapter 3.

Note: Figure taken from Sarte et al., n.d. (2024, p. 28).

Sustainability Concerns

The Virginia Clean Economy Act (VCEA) was passed in 2020 and mandates investment in sustainable and renewable energy sources along with a complete phaseout of carbon-emitting energy generation by 2050 (Sarte et al., n.d.). Before the data center industry boom, Virginia has been able to keep up with the slowly increasing energy demand by gradually building more energy generation and transmission infrastructure. However, the rapidly increasing energy demand as forecasted by the PJM means that the retirement of fossil fuels as energy sources will be significantly delayed. This jeopardizes Virginia's ability to meet its carbon neutral goals mandated by the VCEA. In order to meet the unconstrained energy demand estimate while also meeting the sustainability goals of the VCEA, Virginia would have to implement sustainable energy infrastructure at a pace that is far greater than what Virginia has accomplished historically. Adoption of solar facilities would have to double the 2024 rate of adoption. Virginia's current and planned offshore wind plants fall 600 MW short of the 8,000 MW wind generation needed to meet demand while also hitting VCEA. If the sustainability goals of VCEA are ignored, one large 1,500 MW natural gas plant would have to be added per year for 15 years in order to meet the unconstrained energy demand.

Data center water demand increased between 2019 and 2023 increased by more than 250% in Loudoun County, a figure that gives the Piedmont Environmental Council significant pause (Bryant, 2024). In response to this, tech companies have publicly pledged to return more water than they use through processes like reusing and reclaiming water. However, when some

of these companies do not publish their exact resource usage statistics, it is hard to know how truthful or genuine these claims are.

Energy Costs

The ever increasing energy demands of the data center industry pose a significant risk at Virginia's power grid providing reliable electricity (Sarte et al., n.d.). This is likely to cause electricity bills for Dominion customers to increase. Not accounting for inflation, at the current rate of continued electricity demand due to data centers, customers' monthly electricity bills are expected to increase by $14 to $37 by 2040.

Figure 3

Generation- and transmission-related costs for residential customers would increase by 2040 because of data center demand (Dominion example)

	Projected increase in generation & transmission charges (not including distribution charges & some transmission costs; 2024 constant dollars)	
	2030	**2040**
Typical monthly residential generation and transmission charges (2023)	**$90**	**$90**
Scenario 1: Unconstrained demand		
- VCEA (very difficult to achieve)	+$23	+$37
- No VCEA (very difficult to achieve)	+$22	+$33
Scenario 2: Half unconstrained demand		
VCEA (difficult to achieve)	+$7	+$14
No VCEA (difficult to achieve)	+$6	+$14

Note: Figure taken from Sarte et al., n.d. (2024, p. 48).

Residential Impacts

Since 2020, data center space has more than doubled in Virginia. Over 25% of this space was built in 2022 and 2023 (Sarte et al., n.d.). As of September 2024, there are 70 data center sites under development. Now, there are about 340 data centers in Virginia. Data centers take up over 63 million square feet (2.26 square miles) in Virginia out of Virginia's total 27,878,400 square miles. A third of these data centers are near residential areas, with new data centers likely to continue this trend.

Figure 4

Proportion of data center sites near residential zoning varies by Virginia locality

	Proportion of data center sites within specified distance of residential zoning		Total data
Locality	**200 feet**	**500 feet**	**center sites**
Loudoun	24%	34%	71
Prince William	21%	21%	24
Fairfax	55%	70%	20
Henrico	38%	38%	8
Chesterfield, Culpeper, Fauquier, Virginia Beach [a]	25%	38%	8
Total	29%	37%	131

SOURCE: JLARC analysis of localities' interactive map websites and JLARC inventory of operational data centers.
NOTE: Six data center sites were excluded from the analysis because data on proximity to residential zoning was not available or reliable.
[a] These four localities are combined because the number of data center sites in each locality is very small.

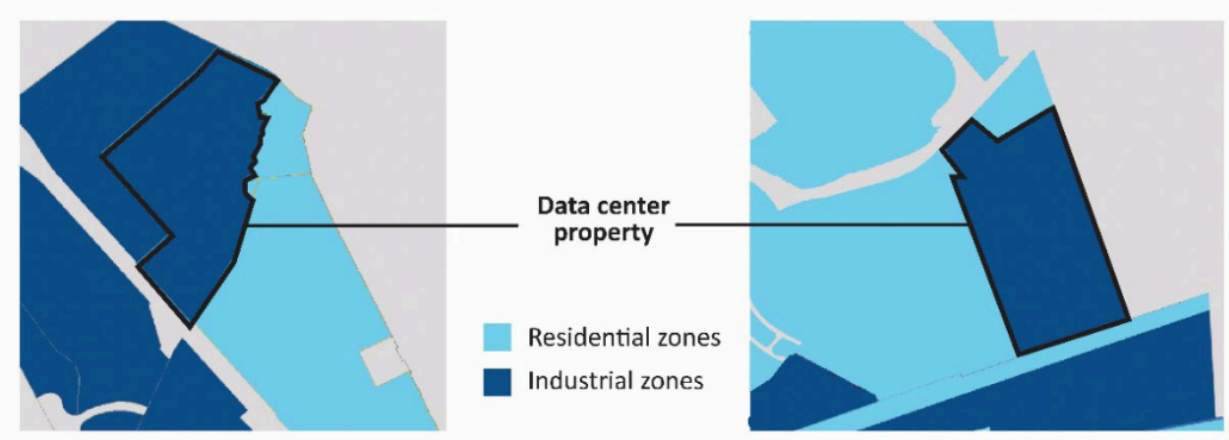
Note: Figure taken from Sarte et al., n.d. (2024, p. 103).

Many residents have complained about the noise that these data centers emit. Although the noise is not detrimental to hearing, the noise is on average a little quieter than a human conversation three feet away, residents have claimed that the noise is enough to negatively affect their wellbeing. Aesthetically, residents have described them as "a giant monolith in the wrong place" or "a prison" (Sarte et al., n.d.). Former Virginia State Senator Chap Petersen told me that

these data centers can cause residents in these areas to move (C. Petersen, personal communication, November 14, 2024). Until 2021, Fairfax considered data centers to be telecommunications facilities, erroneously allowing them to be built near residential areas. Loudoun county used to treat them as office spaces, resulting in similar residential impacts. Even if they are built in industrial areas, some industrial zones border residential areas anyways.

Figure 5

Some industrial zones border residential zones, allowing by right data centers too close to residential zones



Note: Figure taken from Sarte et al., n.d. (2024, p. 80).

The Legislative Battle

Northern Virginia counties generally act favorably toward the development of data centers (Bryant, 2024). Caroline, King George, Spotsylvania, and Stafford counties have all passed special zoning laws that have allowed data centers, particularly ones from Amazon, to

move in and establish or expand data center operations. Pushback and regulations on data center operations have been unsuccessful. In 2023 and 2024, all data center regulation and study bills introduced in the General Assembly failed. Democratic state Senators Danica A. Roem and J. Chapman Petersen were notably at the forefront of a lot of these bills. One of Roem's bills urged the State Water Control Board to rewrite their regulation on stormwater management for "any land disturbance related to the construction, expansion, or operation of data center operations...within one half mile of any national battlefield park and within one mile of any state forest to infiltrate, evaporate, or reuse the predicted stormwater runoff volume that exceeds the stormwater runoff volume experience at such site prior to such land disturbance." The Data Center Coalition, a pro-data center organization, rebutted, stating that the bill "specifically targets data center development while continuing to permit more intensive commercial uses, industries, and projects that may locate [sic] in the same sites and present larger and even more significant impacts on stormwater runoff." They continued, "Virginia is the world-wide leader in the data center industry...the Northern Virginia data center market alone is larger than the next five U.S. markets combined."

The Coalition feared that any such legislation would sour relationships with data center companies and mitigate further expansion of the industry into the region. In one of his bills, Petersen vehemently opposed data center construction next to the Manassas National Battlefield. Data center proponents rejected this line of logic, "suggesting it would dampen the industry' growth given Virginia's many disparate national and state parks," as Bryant puts it. While urging the General Assembly to pass one of his bills that mandated studies on the social, economic, and environmental impacts of data centers, Petersen declared that data centers will be "the largest growth industry in the state for the next generation, and we have no guardrails on it right now.

None. And we have historic sties, we have agricultural lands, we have vulnerable communities that are going to be sitting next to these data centers, which are again going to be absorbing the electric load, leading to the creating of high-transmission electric lines, sucking up the water table, and having...extraordinary environmental impact." This was in response to Governor Glenn Youngkin's announcement of Amazon's plan to invest $35 billion in Virginia data centers.

In 2024, the General Assembly was introduced to sixteen notable bills attempting to study or otherwise regulate data centers and their impacts. Their measures included mandating site assessment, preventing construction near parks and battlefields or at the very least requiring electricity transmission to be underground in those areas, limiting sales and use tax exemptions if energy efficiency standards are not met, regulating their noise pollution, and freezing how utility costs for ratepayers. All of them failed in lieu of letting the newly created JLARC Study of Data Center's Impacts on Virginia's Economy, Environment, and Energy Resources, which set out to assess the growth of the industry and its impacts. This commission stands as the most aggressive actions against data centers enacted so far. Republicans and Democrats alike are weary of scaring off data centers from Virginia. The House and Senate of Virginia have claimed that there is not enough information to make balanced policy decisions regarding the current state of the data center industry and its continued expansion.

Data Center Companies' Arguments

Google, who has invested over $4 billion dollars in Northern Virginian data centers, led the Virginia Grid Innovation Summit, where Governor Glenn Youngkin, Dominion Energy, and Rip Sullivan, a Democratic Delegate from Fairfax, were in attendance (Paullin, 2024). During

this summit, a spokesperson for Google stated that he was looking forward to "further [cementing] Virginia's legacy as a global technology hub and [continuing] to power Virginia forward." In response to the increased energy demand, a spokesperson for the Virginia Department of Energy said that it "presents a tremendous opportunity to evolve a stronger, more reliable energy system - these systems will support... Virginia's economy." Alongside this, Google announced its contribution of $250,000 to the Virginia Energy Efficiency Council's initiative to train workers on energy efficiency.

In my interview with former State Senator Chap Petersen, he explained how Amazon and other data companies plead their case for the expansion of data centers (C. Petersen, personal communication, November 14, 2024). They promise tax revenue to local governments, saying they pitch it as “free money for local governments.” He also told me that data centers tend to be located near rivers, where they install water intake devices that pump the freshwater into the centers. Amazon argues for them by implying they are for residential use, but the populations of these residential areas are stagnant and don’t need more water intake devices .

Analysis

Northern Virginia’s economic identity has been increasingly defined by the data center industry. This is the most obvious way in which technological momentum has affected Northern Virginia. By bringing the region tax revenue, jobs, and the interest of prestigious tech companies, Northern Virginia’s influence back on the data center industry is extremely skewed towards support of the industry. The industry has sunk its fangs so deeply into the economic climate of Virginia that data center development has been coupled with general development of the region.

Lawmakers frame data center development as being synonymous with more funding for education, more jobs, and lower real estate taxes (Byrant, 2024). Additionally, data centers have gained so much technological momentum that Northern Virginia is now inseparable from its prestige given by the tech industry. Among supporters, there is a baseline rationale that any attempts to regulate, control, or otherwise limit the scope of data centers would harm the prestige Northern Virginia has accumulated. Indeed, data center companies have adopted this line of logic in their arguments for expansion. Phrases like “powering Virginia forward” and mentions of Northern Virginia's “legacy as a global technology hub” have had resounding success in getting their proposals approved.

The data center industry has also irreversibly changed the energy climate of Northern Virginia. Energy demand in Virginia between 2006 and 2020 was relatively static, as the state experienced improvements in energy efficiency despite an increasing population (Sarte et al., n.d.). Now, the energy requirements demanded by the industry are growing at such a wild rate that Dominion Energy is scrambling to power it, and it is becoming less clear how the state is supposed to hit the VCEA’s carbon neutral by 2050 mandate. Virginia citizens are likely to be the ones to fit the bill for the cost of developing new energy infrastructure in the form of increased electricity bills.

Data centers affect Northern Virginia by taking up a huge amount of space. There is no end in site for new data center construction projects, and they often end up near residential areas and state parks. This causes residents’ wellbeing to be hurt and sometimes result in them leaving their neighborhoods entirely just to avoid the noise pollution the data centers create.

Opponents of the data center industry have struggled to claim significant ground in the political debate. Chap Petersen has stated that the industry has “no guardrails” and has been able

to have its way, unchecked, since its inception. This phrase captures just how much unregulated power technologies have when they gain technological momentum. Critics continually cite environmental, energy grid demand, water usage, and noise pollution concerns during Assembly meetings, town halls, summits, and bill proposals. No significant measure to curb the industry's growth has been passed by the Assembly or the office of the Governor. The most radical actions against the industry, instead, focus on commissioning studies. The Assembly claims that there is not enough information to make significant policy decisions. Therefore, the floodgates remain open for data centers to continue spreading and eating up natural resources–resolutions are passed to study the effects of the industry while new centers and expansion efforts are approved at an increasing rate. Commissioning these studies is a good first step, but new data centers are still being approved at an increasing rate, further exacerbating the issues they bring. Data center companies are offering band-aid solutions to the energy demand concern, like Google's $250,000 investment in energy efficiency training. Again, this is a welcome initiative, but it is not enough to offset the constrains data centers put on the electricity grid, especially when these same companies do not publish their resource usage reports.

Conclusion

The data center industry has irreversibly affected Northern Virginia. The industry has gained so much technological momentum that it has been allowed to continue expanding unchecked. Lawmakers opposed to its expansion have continually cited how local communities are affected by the centers using up water resources and energy and producing a nauseating humming noise around the clock. Additionally, it seems more and more unlikely that Virginia is

to meet its carbon-neutral goals as more of these power-hungry data centers are created and expanded. These complaints have so far fallen on deaf ears, as pro-data center lawmakers and data center companies have been able to successfully increase the industry's influence by arguing that the economic development of the region is directly tethered to the continued expansion of data centers. Furthermore, any harm to the industry would also harm Northern Virginia's prestige as a global hub for technology. It is not enough to merely research the effects of data centers, which is the approach the Assembly has been taking since the industry's inception. Regulations are needed to curb the negative socio-economic effects of the industry.

References

2024 NVTC Data Center Report. (2024). Northern Virginia Technology Council. https://info.nvtc.org/acton/attachment/45522/f-1c3915e6-b8b1-4914-818e-9fae14877a3d/1/-/-/-/-/2024%20NVTC%20Data%20Center%20Report.pdf

Bryant, L. P. (2024). The General Assembly's Consideration of the Data Center Industry's Growth in Virginia. *Richmond Public Interest Law Review*, *28*(2), 45–90. https://scholarship.richmond.edu/pilr/vol28/iss2/2/

Fard, A. (2024). Platforms and Palimpsests: Urban Landscapes of Data in Northern Virginia. *FOOTPRINT*, *17*(2), Article 2. https://doi.org/10.59490/footprint.17.2.6726

Gross Domestic Product: All Industry Total in Virginia. (2025, March 28). https://fred.stlouisfed.org/series/VANGSP

Hughes, T. P. (1969). Technological Momentum in History: Hydrogenation in Germany 1898-1933. *Past & Present*, *44*, 106–132.

Kshetri, N. (2024). The Environmental Impact of Artificial Intelligence. *IT Professional*, *26*(3), 9–13. IT Professional. https://doi.org/10.1109/MITP.2024.3399471

Kshetri, N., & Voas, J. (2024). Data Centers in Your Backyard? *COMPUTER*, *57*(1), 82–87. https://doi.org/10.1109/MC.2023.3319882

Lin, A. J. (2023, February 9). Bill of the Day: Data Centers' Impact on the Environment. *Virginia Conservation Network*. https://vcnva.org/bill-of-the-day-data-centers-impact-on-the-environment/

Mayer, V., & Velokva, J. (2023). The Social Mapping of Hyperscale Data Center Regions: Placemaking, Infrastructuring, Curating. In *Media Backends: Digital Infrastructures*

and Sociotechnical Relations (pp. 110–129). essay, University of Illinois Press. Retrieved 2025, from https://muse.jhu.edu/pub/34/edited_volume/book/114235

Paullin, C. (2024, November 14). Google, Virginia policy makers discuss growing data center demand • Virginia Mercury. *Virginia Mercury*. https://virginiamercury.com/2024/11/14/google-virginia-policy-makers-discuss-growing-data-center-demand/

Petersen, C. (2024, November 14). *Interview with Chap Petersen* [Personal communication].

Sarte, K. A., Gribbin, M., Miller, E., Berday-Sacks, S., Hopkins, K., & Saunders, S. (n.d.). *JLARC Report 598*. https://jlarc.virginia.gov/pdfs/reports/Rpt598-2.pdf

Velkova, J., & Plantin, J.-C. (2023). Data centers and the infrastructural temporalities of digital media: An introduction. *New Media & Society*, *25*(2), 273–286. https://doi.org/10.1177/14614448221149945