

Virginia Explained: Data center expansion, with all its challenges and benefits

Groups discuss how Virginia's data center developments impact historic spaces, the environment, electricity and local revenue

By: [Charlie Paulin](#) - May 28, 2024 5:59 am



Data centers in Ashburn, Virginia (Gerville/Getty Images)

Humanity is almost a quarter of the way through the 21st century and Virginia — home to 70% of the world's data centers — is on the frontlines of the latest emerging technology: artificial intelligence, or AI.

The prevalence of data centers and the rising role of AI don't equate to a dystopian battle between humans and machine control, though (at least at the moment). Rather, these issues are at the center of a debate over localities' authority and revenue benefits, historic preservation, environmental considerations, and electricity demand and utility rate projections, all shaped by ever-increasing internet use.

The state is studying data center development

Northern Virginia, the densely populated suburbs and exurbs located just outside the nation's capital, is home to 70% of the world's data centers, the huge warehouses that store computers' processing equipment, internet network servers and data drives. With people increasingly using web-based programs on an average of 22 internet-connected devices in homes, data centers are seen to be needed more than ever.

While data centers are proposed as potential drivers of economic benefits for localities, a number of Virginians have expressed concerns about the proliferation of the warehouses in the state and their effect on communities where they're located.

"Is it worth losing all your water, and having noise pollution and everything else to get revenue for some of the things you need?" said Mary Damone, 67, who moved to the Orange County area a few years ago, where a 732-acre data center park development has been proposed.

Fairfax County resident Chris Ambrose, 63, who, like Damone, was also at a recent press conference raising concerns over data center development, said the development of thousands of homes in the proposal is bad enough.

"Then you add the data centers to it, and the transmission lines, the impact on the battlefields," Ambrose said. "If they need more revenue, you would think it would be something more measured. The magnitude is just crazy. It's off the charts."

Josh Levi, president of the Data Center Coalition, said the industry looks forward to supporting JLARC and discussing the findings when the study is done.

"Virginia continues to distinguish itself as one of the most dynamic and important markets for the digital infrastructure that enables our innovation economy and meets the growing, collective computing demands of individuals and organizations of all size," Levi said.

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NETWORKS
Central Virginia

 **Meta**

BANK OF AMERICA 

FLEXENTIAL

INFOTEL

Greater Richmond

MFX  **LU**
NET
Roanoke Region


BRUSH MOUNTAIN
DATA CENTER

New River Valley



DP

SAIC



A map of data centers in Virginia (Courtesy of Virginia Economic Development Partnership)

This past legislative session, lawmakers introduced over a dozen [bills](#) to address some of the public's concerns over how data centers could impact water demand, power delivery costs and more, but they were all [sent](#) to the Joint Legislative Audit Review Commission, the state's policy research arm, to develop policy proposal recommendations.

"We have a number of research activities planned or underway for this study," said Mark Gribbin, the JLARC project lead for the data center study, at a meeting last week outlining the study's goals.

"Foremost, we'll have a high level of engagement with local communities and data center companies," said Gribbin. "We're also working closely with utilities, local governments and state regulators, especially on questions related to development, water, air and energy."

In the few months since those legislative deferrals, a battlefield in Orange County has been listed as one of the 11 most endangered sites in the country because of data center development, and Google announced a \$1 billion investment to expand their data center campus in Reston.

Both events have re-upped the conversation over how to provide data centers their needed electrons, which could be delivered through an improved transmission system, after a recent regulatory [overhaul](#) of how such systems are planned.

"If the generation isn't there to meet a proposed data center's needs, the data center doesn't [need to] locate in Virginia or anywhere else that can't meet its load," said Walton Shepherd, Virginia Policy Director with the Natural Resources Defense Council. "Virginia is not responsible for the running of the internet, the data center operators largely are. The solution we need to solve is a cleaner grid. We have the tools to do so, and that's with or without data centers."

Local, historic concerns


In Orange County, Wilderness Crossing data center received national attention for its proposed development near a Civil War-era battlefield, fueled by concerns after data centers were built near other historic sites in Loudoun and Prince William counties in addition to other parts of the state.

The proposed Wilderness Crossing [site](#) near Wilderness Battlefield sprawls across 2,600 acres, 732 of which would accommodate data centers — which can typically have a footprint of over 100,000 square feet each and reach 90 feet tall — and distribution warehouses. The site plan also envisions over 5,000 residential units and 200,000 square feet of mixed commercial use buildings, and a realigning of Route 20.

"If this development goes forward as approved, there will be intense pressure on the existing road network," said Bob Lookabill, president of the Friends of the Wilderness Battlefield, at the press conference announcing concerns over the Wilderness Crossing proposal.

The development would also obstruct the views of Virginia's hillside, take up forested land, sit on abandoned gold mines and draw on water from the Rapidan River, which experienced drought-like conditions last year. Concerns about data centers' impact on local waterways have been echoed around the state.





A press conference about the Wilderness Crossing data center proposal. (Charlie Paullin/Virginia Mercury)

The area's water is served by the Rapidan Service Authority. According to its [recently approved water permit](#), obtained by the Virginia Mercury, the Department of Environmental Quality rejected an initial request finalized after the Wilderness Crossing rezoning that sought to pull more water for projected demand increase.

"What if there is a drought?" said Tim Cywinski, communications director for the Virginia chapter of the Sierra Club, while speaking about another data center proposal in Caroline County during a webinar. "Are we going to continue to supply what becomes a diminishing resource to an industry that's powering AI? Or are we going to give it to families to make sure they need it? ... This is why protective policy is so important."

Other data center proposals appear to show that the developments would encroach on historic sites statewide, such as Manassas National Battlefield Park, Culpeper National Cemetery, Brandy Station, Sweet Run State Park and Savage Station Battlefield.

Two historic Black [graveyards](#) belonging to the Gaskins family in the Brentsville area of Prince William County are alleged to have been damaged from the construction of a data center and a nearby power substation.

"Without comprehensive action from our elected leaders, countless historic sites [and] national parks may continue to fall victim to this unchecked and unregulated data center growth," said Kyle Hart, mid-atlantic field representative at the National Park Conservation Service during the May 1 press conference.

The pressure to these sites has already been largely seen in Loudoun and Prince William counties, which have been dubbed Data Center Alley, and recently approved a Digital Gateway [rezoning](#) in their respective jurisdictions.

"We have to have a better way [to] think it through and it needs to be transparent," said Chris Miller, president of the Piedmont Environmental Council, a conservation organization focused on preserving central Virginia's countryside. The group won a lawsuit against Orange County that forced the release of previously withheld information on the Wilderness Crossing proposal. "I think everyone wants a continued investment in the economy and [to be] prosperous, but you want it done in a way that doesn't destroy the underlying quality of life."

Data center developments have been continually proposed throughout Virginia and are welcomed by some communities. A 1,200-acre data center [site](#) was recently approved in Hanover County. The Delta Lab, an energy innovation initiative focused on Southwest Virginia, has studied locating one in that region that could use water from mines for [cooling](#).

Del. Mark Sickles, D-Fairfax County, said at the recent JLARC meeting, two vacant buildings along the beltway in his district are being converted into an Amazon Web Services data center, without controversy.

"It was a perfect place for it, actually," Sickles said. "We need to find more perfect places in Virginia that are close to power, and can be shielded from the public. It's going to be a challenge for everybody because I don't think we want to give up on this industry."

\$1 billion investment

Just days before the concern over Wilderness Crossing became public, Gov. Glenn Youngkin announced that Google, one of the biggest companies in the world, would expand its data center campuses from two facilities to three.

"We're super excited about it," said Ruth Porat, president, chief financial officer and chief investment officer of both Google and its parent company Alphabet, of the expansion. "The investments we've made today are not only important investments in infrastructure, but they've also added 3,500 jobs in Virginia, and they supported a billion dollars of economic activity."

Google completed the first phase of construction on the first two data centers in [2019](#) with a \$1.2 billion investment in the state.

The third center's creation will usher in an AI Opportunity Fund seeded with \$75 million from the company's philanthropic arm, Google.org. The fund will help people around the county earn online training certifications. The program joins a separate Grow with Google program, already underway, that [teamed](#) with Northern Virginia Community College to offer a new free cyber security career certificate.

"Since 2019, this innovative public-private partnership has increased opportunities for students to join the technology workforce," said Anne M. Kress, president of NOVA, in a statement. Kress added that the partnership "helps close the skills gap and greatly expands the region's talent pool."

A driving force for the online certifications through the opportunity fund, would be leveraging AI. The governor leaned into the "accelerator" allegory during the announcement, highlighting AI's ability to hasten the pace for certifications to be awarded.

"What's been so exciting is that this parallel path, this moment of accelerator and brakes, is enabling confidence as we move forward to move forward with an expedited pace," Youngkin said. "That is where breakthroughs can occur."

Data centers in Virginia have provided \$2.2 billion in wages for citizens, and 25% of revenue to Loudoun County have gone into "essential services" like schools, social services and other public programs, Youngkin added.

Impact on power demand

Increased internet usage, including AI, requires data centers to use more electricity. Computing for AI is measured by an entirely new computing graphic processing unit, or [GPU](#).

"Historically, a single data center typically had a demand of 30 megawatts or greater," Dominion Energy Virginia President Bob Blue said in the utility's first quarter earnings [call](#). "However, we're now receiving individual requests for demand of 60 megawatts to 90 megawatts or greater, and it hasn't stopped there."

Larger data center campuses with multiple buildings can "require total capacity ranging from 300 megawatts to as many as several gigawatts," Blue added.

The utility has connected 94 data centers to date and expects to connect another 15 this year, Blue also told investors. Power Engineering [reported](#) on a Securities Exchange Commission annual filing that in 2023 and 2022, 24% and 21% of electricity sales from Dominion were to data centers, respectively.

"The concentration of data centers primarily in Loudoun County, Virginia represents a unique challenge and requires significant investments in electric transmission facilities to meet the growing demand," the SEC [filing](#) states.

While the data center computers have become more efficient through a power usage effectiveness score — a rate that determines how efficiently energy is processed for the web-based service to reach internet users — a [study](#) from McKinsey & Company found that data center power demand is expected to more than double across the country from 17 GW to 35 GW. Some of that power could come from Dominion's 176-turbine offshore wind project, expected to generate 2.6 GW of electricity, or enough to power 660,000 homes.

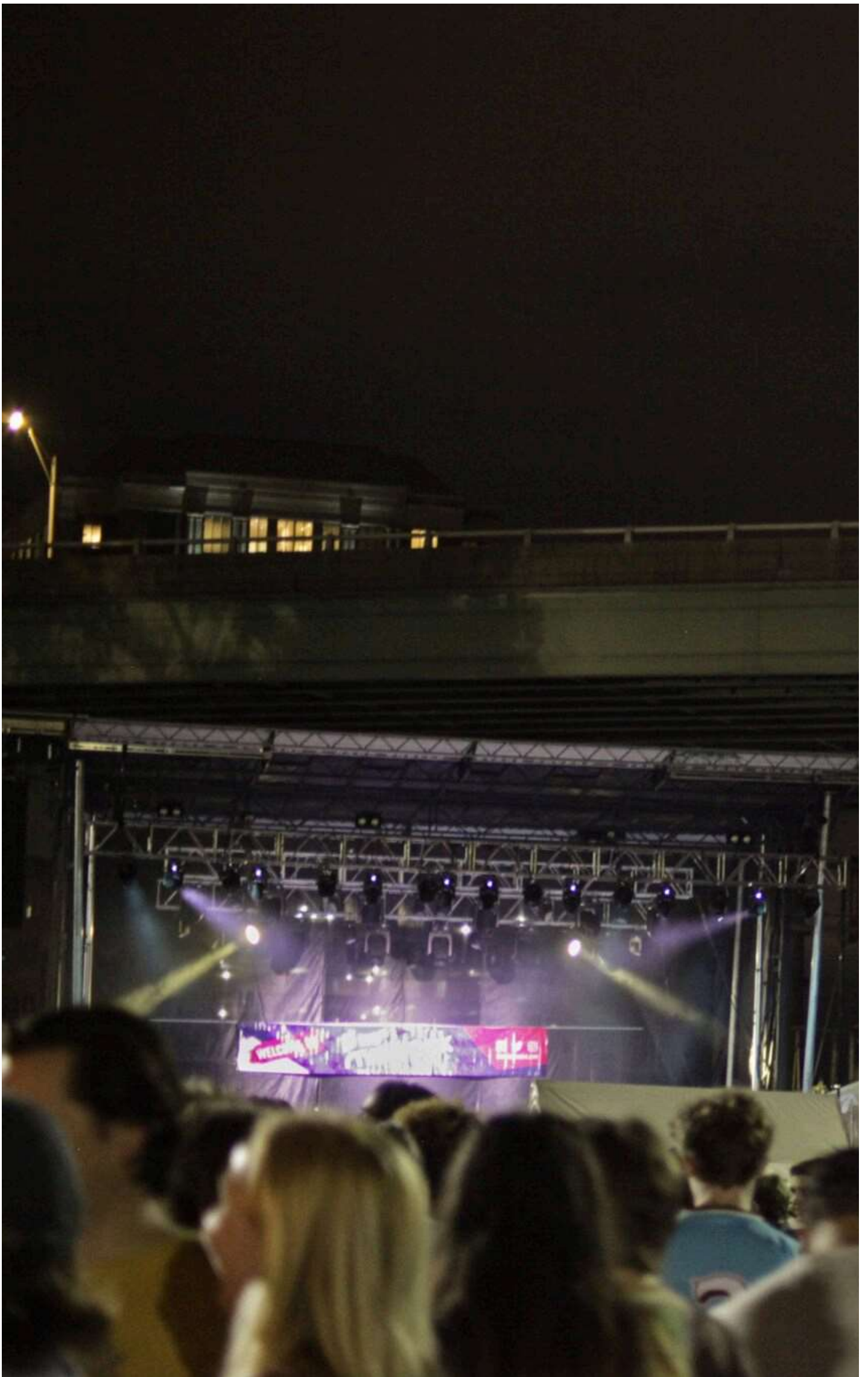
"The point is that they're packing more and more into less space," Miller said. "How are we going to meet that load?"

Dominion [projects](#) its load growth, which includes data centers and vehicle electrification, to increase from 17 gigawatts in 2023 to 33 gigawatt in 2048, though environmental groups are [skeptical](#) of growth proposals being modeled accurately.

Northern Virginia Electric Cooperative [expects](#) to increase its peak electric load by more than 12% per year over the next 15 years, "driven almost exclusively by data centers."

"NOVEC works one-on-one with each new data center, as each new high-load customer presents unique issues to NOVEC and its distribution facilities," said Jim East, communications manager at electric cooperative. "Part of this includes meeting the special energy supply and construction schedule needs, while always maintaining the high degree of reliability and affordability for all remaining customers."

To meet the demand for data centers, Dominion has included renewable energy technology in its long-term, non-binding integrated resource plan, but is also proposing a natural gas plant, which environmental groups continue to oppose, including protests at a Richmond outdoor festival the utility sponsored.



Protestors to Dominion's proposed natural gas plant display a sign during the Riverrock festival in Richmond. (Courtesy photo)

Teresa Hall, a spokeswoman for Appalachian Power Company, Virginia's second largest utility that serves Southwest Virginia, noted that "annual power generation over the last 20 years has stayed relatively flat until now." The uptick, she said, is thanks to data centers.

"With data centers/increased internet use and AI, the landscape is changing quickly," Hall said, adding that data centers present a unique challenge because they "require a lot of power – commonly 300 MW or more, which is enough to power all of the homes in a medium-size city."

The company is facing the challenge head-on, Hall said.

“To date, we’ve been able to accommodate almost any size customer that has expressed an interest in our service territory. As we go forward, we know we will need additional cooperation.”

Virginia’s leaders have increasingly [expressed](#) the need for new technologies such as small modular reactors, tinier versions of traditional nuclear plants that could power a small [city](#) like Roanoke with a population of 100,000. Proponents say SMRs could provide baseload, around-the-clock power when renewable technology can’t produce it. The SMRs are intended to provide between 300 to 500 megawatts of power, but none have been turned on in the United States since NuScale pulled the plug on its effort to build one in Idaho due to cost concerns.

Shepherd, with the NRDC, said that if SMRs are built, “they’re so far off. I don’t think those are going to implicate the data center’s decision on where and when it builds in a place where it is able to get power.”

Another part of the dialogue focuses on technologies like battery storage and a recently announced 1920 rule from the Federal Energy Regulatory Commission, or FERC, to increase planning for transmission lines across state lines. FERC’s new guidance includes transmission lines that may need to be upgraded from a traditional 110 kilovolt to up to 500 kilovolt capacity, in order to supply data centers.

“Transmission developers can now plan projects that address a multitude of needs that are anticipated to develop over a long-term horizon more efficiently and cost-effectively for customers,” stated Ben Fowke, president and CEO of American Electric Power, the parent company of Appalachian Power Company, in U.S. Senate committee [testimony](#) this week.

The regional rule will also help areas pull on generation sources that may be located in other areas of the PJM Interconnection regional grid that Virginia is a member of.

“Every resource backs up every other, but only if you have the transmission required,” said Gamlich.

Figure 4.1.2.1: 2023 Company Load Forecast

Year	DOM LSE Summer Peak Forecast (NCP) (MW)	DOM LSE Energy Forecast (GWh)
2023	17,730	95,423
2024	18,010	98,589
2025	18,157	99,262
2026	18,828	104,669
2027	19,173	107,384
2028	19,597	110,829
2029	20,021	114,070
2030	20,650	118,579
2031	21,346	123,503
2032	22,153	129,998
2033	23,019	135,928
2034	23,963	143,154
2035	24,972	151,046
2036	26,111	159,909
2037	27,220	168,151
2038	28,483	177,740
2039	29,629	186,513
2040	30,541	194,620
2041	31,361	199,934
2042	31,953	204,088
2043	32,230	206,250
2044	32,594	209,102
2045	32,821	210,586
2046	33,141	212,733
2047	33,509	214,902
2048	33,786	217,747

A chart showing the load growth for Dominion. (Courtesy of Dominion’s Integrated Resource Plan)

In 2023, Virginia’s legislature passed [a bill](#) to truncate a State Corporation Commission review of a transmission line proposal from PJM Interconnection. The line is needed to deliver power for data center development in Virginia and the \$670 million project cost is recovered from ratepayers in Virginia.

There’s also an opportunity to strengthen existing transmission lines through grid enhancing technologies, or [GETs](#), and separate ways to utilize a demand side management and energy efficiency programs to reduce the amount of strain on the grid. It can also help get around the 26 gigawatts of electricity stuck in a queue awaiting approval from PJM, 23% of which is from Virginia, said Kim Jemaine, director at Advanced Energy United.

“In the states where they have been adopted at a medium level, GETs have unlocked 30% additional capacity from existing infrastructure and have allowed twice as many new energy projects to be integrated,” said Kim Jemaine, director at Advanced Energy United. Jemaine said GETs “can be installed with little to no downtime and at a fraction of the cost of new infrastructure.

Utilities have said they can’t rely on energy efficiency efforts, like homeowners using smart thermostats to control consumption, because the end use may not keep up with those behaviors. But that dismissal is a “red herring,” Shepherd said. Measuring the load reductions delivered through energy efficiency programs and making actionable plans based on those measurements is not impossible, Shepherd added.

“I think folks need to chill out and recognize the regular nature of grid planning. It’s just a matter of rolling up our sleeves a little further to make sure it’s done correctly.”

Perhaps ironically, as manufacturing and society in general electrifies more, AI might be able to help with those demand side management programs, as noted by the [U.S. Department of Energy](#).

“AI has the potential to significantly improve all these areas of grid management,” the report stated, and can be a tool that models for capacity and transmission studies, compliance and review for federal permitting, forecasting renewable energy production and creating applications to enhance resilience.

Levi, with the Data Center Coalition, said the “industry is committed to leaning in as an engaged partner at this pivotal time. Collectively, we can meet the moment and ensure a clean, reliable, affordable, and resilient electric system that supports the digitization of our economy, widespread vehicle and building electrification, the onshoring of advanced manufacturing, growth in controlled environment agriculture, and other 21st-century economic drivers.”

Local Revenue

But the money.

The local revenue generated by data centers supports Loudoun and Prince William counties — the latter of which could add \$54 million in revenue, with \$19 million going toward schools and \$21 million offsetting a real estate tax increase — as a result of increasing its data center [tax](#) from \$2.15 to \$3.70 per \$100 assessed value.

Henrico County created a \$60 million affordable housing fund with revenue from data centers in order to waive water and sewer connection fees and building permit fees.

“We’re doing something different,” Board Chairman Tyrone Nelson said, according to Richmond [BizSense](#). “We may be the only locality in the commonwealth, maybe in the country, dedicating a single revenue source to address a crisis like this in our community.”

Even property owners that sell their land for development of a data center can reap benefits. But, as evidenced by a Prince William County lawsuit, the spoils don’t always go to the seller if a legal challenge over the rezoning holds up their profits as the property value and tax [increase](#) remains.

The [report](#) on Project Oasis proposal in Southwest Virginia said development of a 250,000 square foot “hyperscale” data center with 36 MW of demand could generate an estimated \$464 million in capital investment and 40 indirect jobs.

Another [report](#) by the Virginia Economic Development Partnership found that 35 data centers, which are cited as the largest industry in the state, invested \$23 billion into the economy while getting almost \$1 billion in tax relief in exchange for its economic inputs. The report found a 14% average annual return on incentive for the years 2022 through 2027.

“JLARC estimated [in 2019] that 90 percent of the data center investment made by the companies that benefit from the DCRSUT exemption would not have occurred in Virginia without the exemption,” the report stated.

Table 1: Summary of Reported Jobs, Investment, and Tax Benefit

	FY 2022	
Data Center Operators Reporting Tax Benefit	30	
Existing Jobs	4,639	
Added Jobs	1,350	
Total Jobs	5,989	
Land/Building Acquisition	\$1,025,192,717	\$1,667
Site Improvements	\$63,514,221	\$507
Real Property / Building Improvements	\$1,686,311,955	\$4,409
Taxable Tangible Property	\$1,403,449,709	\$629
Exempt Equipment or Software	\$9,422,882,997	\$15,594
Other Investment	\$211,364,223	\$371
Total Investment	\$13,812,715,822	\$23,180
Reported Tax Benefit	\$673,479,918	\$903

A breakdown of investment and tax breaks. (Courtesy of Virginia Economic Development Partnership).

Although localities may be raking in local revenue benefits, those tax incentives for data centers cancel out cash that could be padding state coffers, which similarly could go toward education and other services.

“There’s different layers to look at,” said Jackson Miller, director of state power sector policy, also at the NRDC. “We just think that if you’re going to give away that revenue, which is taxpayer public money, then it needs to be [conditioned](#) with requirements to maximize energy efficiency, with requirements to maximize and ensure that that facility is bearing its costs and paying for it on the grid so ratepayers don’t get a double- whammy.”

Along with a bill to study if data centers or ratepayers foot the bill for transmission upgrades, a separate bill sent to JLARC this session came from Del. Rip Sullivan, D-Fairfax, and Sen. Suhas Subramanyam, D-Loudoun, that would’ve required data centers to achieve a certain computing efficiency score, known as a PUE, in order to receive state tax breaks.

The data center companies have climate improving commitments, but local permitting [pushback](#) to renewable energy sources, including solar, present challenges.

The centers should “ be required to be 100% renewable before they turn the lights on if they’re serious about their publicly stated comments,” said Hart, with the National Park Conservation Service.

The data center [industry](#)’s benefits to Virginia’s economy include the creation of 12,140 direct jobs, including engineers, building control specialists, security, server technicians, logistics professionals, construction management, health and safety specialists, and food services. The future benefits — and challenges — of data center development in the state remain to be seen.

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