As data centers boom, Virginians breathe the exhaust of 10,000 diesel generators

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Pollution from generators at data centers could cause respiratory symptoms and deaths in the region, analysis for The Washington Post finds. Virginia is home to roughly one quarter of the rapidly expanding data centers in the U.S.

STERLING, Va. — Not long after the enormous data center sprouted in Jessica Medeiros's residential neighborhood, she began seeing black smoke. "There are times when the generators are running and … soot falls to the ground," Medeiros said. "I have no idea what the long-term impacts on our health may be." On days when the bursts of smoke appear, she said, irritation in her throat and nose follows.

Data centers — warehouses stuffed with powerful computers — are spreading across the United States to support tech industry visions of a gleaming future powered by artificial intelligence. Most come bundled with polluting technology from last century: diesel backup generators the size of semitrucks that have made sporadic smoke plumes a fact of life for many in Virginia. The state is home to roughly a quarter of the nation's data centers.

The 10,500 generators attached to data centers in Virginia produce enough pollution to harm public health even if used rarely, according to a new analysis of emissions permits for the *Washington Post*. Operating them for less than an hour per week, on average, creates the same public health impact as five power plants the size of the large Possum Point gas-fired power station near Quantico, according to the analysis by Virginia Commonwealth University and the University of Washington. That's enough to worsen lung and cardiovascular conditions for people in the region and cause at least three premature deaths each year, the analysis found, based on state air permits and reported emissions from the data center owners.

The finding is based on state permits and company emissions filings through the end of 2024 for 132 data centers in Northern Virginia, where most of the facilities in the state are concentrated, in an area around Ashburn known as data center alley. Nineteen new data centers, each typically equipped with dozens of the generators, have been approved in the region since, increasing the potential public health risks.

Diesel exhaust contains nitrogen oxides, which help form smog, and fine particulate matter, including soot, which are linked to respiratory and heart disease. Data center generators in Virginia could trigger 14,000 episodes of asthma symptoms each year, according to a separate study from researchers at the University of California at Riverside and the California Institute of Technology that is undergoing peer review.

The analyses illustrate how recent moves by the Trump administration and state regulators to encourage data center operators to fire up their generators more often could increase harmful

pollution in the United States. Seven times this year, Energy Secretary Chris Wright issued orders authorizing power grid operators to direct data centers to run the generators to reduce strain on regional grids, which are struggling to accommodate surging demand from the tech industry.

The most recent order authorized the sprawling PJM Interconnection grid that serves 13 states and the District of Columbia to direct data centers to start their many thousands of diesel generators to help bolster overstressed power infrastructure amid the latest heat wave. Industry executives have argued that using generators more often can protect the electric grid and keep important services powered by data centers operating smoothly for citizens and businesses.

If all the data center generators in Virginia released the full amount of pollution allowed by state emissions permits, the public health impacts would be several times greater, the analysis for The Post shows. That could cause many more incidents of respiratory problems and 27 premature deaths, concentrated in Virginia, Maryland and Washington. Pollution concerns are among the reasons Virginia voters have turned sharply against data centers, according to a recent Post-Schar School poll.

Gregory Pirio, a 75-year-old who lives near the VA2 data center, has become a community leader voicing concerns about the data center's noise and pollution. (Video: Mariana Trujillo Valdes/The Washington Post)

"When you look at the cumulative effect of all these data centers close together, the result is significant exposure to communities nearby," said Damian Pitt, associate director of the Institute for Sustainable Energy and Environment at Virginia Commonwealth University, who obtained the emissions permits from the Virginia Department of Environmental Quality. "What we found particularly shocking is that it is even more pollution than you would have living near a large natural gas power plant."

State and industry officials questioned the findings of the analysis for The Post and pointed to government scientific modeling that shows more limited effects on air quality. The Virginia Department of Environmental Quality said in an email that the region meets National Ambient Air Quality Standards, and that the agency has launched a monitoring project to track data center impacts on pollution levels.

The Data Center Coalition, which represents large data center operators including Google, Meta, OpenAI and Vantage, said in a statement that diesel generators are used rarely "and existing state and federal regulations limit potential emissions and impacts." The group pointed to government studies that have concluded emissions from data centers are "at or below levels protective of human health." (The Washington Post has a content partnership with OpenAI.)

Amazon has the largest data center footprint in Virginia and operates 35 percent of the generators in the state, according to an analysis by the Sierra Club. The nonprofit has been tracking generator approvals and lobbying lawmakers to place more restrictions on them. It found that Microsoft has the second largest generator fleet in the state, with 10 percent of the total. (Amazon Executive Chairman Jeff Bezos owns The Washington Post.)

Vantage, which operates the VA2 data center where Medeiros lives, said state environmental regulators "independently reviewed actual operating data of our VA2 campus, not worst-case assumptions" and determined the levels are safe. The VA2 facility is powered by a small gas power plant installed on-site because the company was unable to quickly connect it to the already overburdened regional power grid. The plant's emissions make VA2 one of the region's most polluting data centers and were included in the analysis of health impacts for The Post.

The state modeling cited by the Virginia Department of Environmental Quality does not account for some harmful pollutants included in the analysis for The Post, including ground level ozone and nitrate particles created when diesel emissions react with other chemicals in the air.

"The modeling that permitting agencies use typically misses a lot of the public health impacts," said Julian Marshall, a professor of civil and environmental engineering at the University of Washington. At the request of The Post, his team assessed the potential health impacts of the permits and emissions data compiled by Pitt. The UW researchers did so with an approach known as screening level modeling, using conservative assumptions to generate a snapshot of how pollutants could affect residents in Northern Virginia.

Amazon spokeswoman Kylee Yonas said in a statement that the company runs its thousands of generators in Virginia, on average, only 10 hours per year and they emit only a fraction of the pollutants its permits allow. There was one outage in 2024 where generators at some of the company's data centers ran for 2½ days straight. "In the event of an emergency, our backup generators ensure critical services stay online, supporting hospitals, first responders, and national security infrastructure that millions rely on every day," the statement said.

Amazon declined to say whether it aims to run its generators more frequently in the future or comment on a letter it sent Virginia regulators in December lobbying for the state to align with more permissive federal rules governing when generators can be turned on.

The company said it has also started installing new, cleaner diesel generator technology that substantially cuts pollution. Virginia recently changed its rules to require any diesel generators approved after June 30 use that technology.

Some three-quarters of the generators already approved at Virginia data centers do not use it, according to a March study by the Better Data Center Project, a nonprofit founded by former senior Energy Department officials.

Microsoft is switching to using fuel known as renewable diesel for its backup generators in some regions, including Northern Virginia, a company spokesperson said. It burns more cleanly than conventional diesel, but still emits harmful pollutants.

States beyond Virginia are also weighing how to address surging emissions from data centers as tech companies race to build more of them.

Delaware state regulators recently rejected plans for a massive data center in Delaware City, citing concerns about the pollution its 516 backup diesel generators would cause.

The state's Department of Natural Resources and Environmental Control found that if a power crunch resulted in the data center running on backup diesel generators for 500 hours per year — the maximum amount allowed under federal rules — the facility would immediately become one of the biggest polluters in the state behind its oil refinery, which processes 180,000 barrels of crude per day.

Yet as utilities struggle to provide the electricity the tech industry needs to keep pace with the explosive growth of artificial intelligence and cloud computing, state and federal agencies are under pressure to allow expanded use of the on-site generation. Wright told Bloomberg in December that he wants to "unleash" the dozens of gigawatts of diesel generation that is largely sitting idle at data centers to power the vast expansion of AI infrastructure.

"The massive data center build out over the next few years — most of it we can meet with generators," he said. Virginia has permitted enough of the generators to create 27 gigawatts of power, roughly the equivalent of 27 large nuclear reactors.

"Blackouts cost billions of dollars and can have numerous negative health impacts, including death," said an email from Energy Department press secretary Ben Dietderich. "The negative consequences of blackouts far outweigh the temporary additional use of backup generators."

Data center generators generally release a fraction of the emissions their permits allow due to state and federal restrictions. Regulators in Virginia and some other states have relaxed those rules to free up more electricity from the power grid for other uses when supply is tight.

Memphis has become a flash point for concern about pollution from on-site power generation at data centers. Elon Musk's AI venture xAI raced to boot up its Colossus 2 data center outside the city by installing dozens of mobile natural gas turbines. The NAACP alleges in a federal lawsuit that the turbines are operating illegally, spreading harmful air pollution to the community. The company said in court filings that state regulators approved the use of the generators, and that their removal could threaten national security.

The Trump administration submitted a filing in the case on May 13 that said it is evaluating a possible intervention on behalf of xAI, writing that the case is relevant to its "priorities with respect to promotion of artificial intelligence infrastructure."

Back in Virginia's Data Center Alley, residents worry that the drive to feed the AI industry's hunger for more electricity will mean the many gigawatts of diesel generators there will be fired up at a moment's notice.

"I have woken up in the middle of the night congested when they are running them," said Gregory Pirio, a 75-year-old who lives adjacent to the VA2 data center. "We don't even get an explanation why they run them. They are supposed to be for an emergency. What is the emergency?"