GEORGETOWN CLIMATE CENTER

Local Ordinances for Climate Adaptation & Mitigation | Oct. 2025

Local Ordinances to Help Bring Data Centers into Alignment with Climate Goals

The Opportunity

For the first time in decades, demand for electricity in the U.S. is growing rapidly, driven by onshoring of industry, economy-wide electrification, and the exponential growth of the data center industry.[1] In the next five years, nationwide electricity demand can be expected to rise by 15.8 percent.[2] Large data centers, among the fastest growing sources of new demand, are

[1] Electricity Demand Growth and Forecasting in a Time of Change, Brattle Group, at ii-v (May, 2024), https://www.brattle.com/wp-content/uploads/2024/05/Electricity-Demand-Growth-and-Forecasting-in-a-Time-of-Change-1.pdf; PA Consulting, Grid Flexibility Study (Jan. 2025),

[2] See https://gridstrategiesllc.com/wp-content/uploads/National-Load-Growth-Report-2024.pdf at 3.

expected to be the primary source of this growth.[3] In total, data centers now comprise 4.4% of overall electricity demand in the United States, more than double their demand in 2018 and poised to grow further.[4] The rapid growth in electricity demand from data centers is driven in substantial part by new artificial intelligence workloads, which are sometimes added on the same data center campus on top of more traditional data center workloads.[5] Traditional data centers, which have been around for years to carry out activities like data storage, streaming, and cloud computing, typically demand between 10 and 25 megawatts (MW) of electricity.[6] In contrast, the largest data centers, called hyperscale data centers, can combine a variety of functions including AI workloads on a single large tract of land, and can place huge power demands on the electric grid, often in excess of 50 MW.[7] For example, one large data center site owned by Meta occupies 1,200 acres of land in New Carlisle, Indiana, and is planned to consume as much as 2.2 gigawatts (GW) of electricity annually — enough electricity to power a million homes — which will be supplied primarily by natural gas power plants.[8] Many state and local government officials see data centers like the one under development by Meta as potential sources of new economic development and tax revenue and have adopted incentives to attract data centers such as tax breaks and streamlined permitting.[9]

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[3] See https://gridstrategiesllc.com/wp-content/uploads/National-Load-Growth-Report-2024.pdf at 3.

[4] Arman Shehabi *et al.*, Lawrence Berkeley National Laboratory, United States Data Center Energy Usage Report, 2024 (Dec. 2024), https://escholarship.org/content/qt32d6m0d1/qt32d6m0d1.pdf.

[5] *Energy and AI,* International Energy Agency (IEA) 14 (April, 2025), https://iea.blob.core.windows.net/assets/601eaec9-ba91-4623-819b-4ded331ec9e8/EnergyandAI.pdf.

[6] *Id.* at 38.

[7] NESCOE, *Data Centers and the Power System: A Primer* 3 (Spring 2024), https://nescoe.com/wp-content/uploads/2024/06/Data-Centers-Primer-Spring-2024.pdf ("...the largest data centers can range from 100,000 square feet to several millions of square feet and can demand anywhere from 20 to over 100 MW of power."). *See also* Ling Zhu, *Data Centers and* Cloud *Computing: Information Technology Infrastructure for Artificial Intelligence*, CRS (Feb. 5, 2025), https://www.congress.gov/crs-product/IF12899 (noting industry defines hyperscalers as greater than 100 MW).

[8] Karen Weise and Cade Metz, New York Times, *At Amazon's Biggest Data Center, Everything Is Supersized for A.I. On 1,200 acres of cornfield in Indiana, Amazon is building one of the largest computers ever for work with Anthropic, an artificial intelligence start-up*, NY Times (Jun. 2025) https://www.nytimes.com/2025/06/24/technology/amazon-ai-data-centers.html

[9] Melissa Farney, *Incentivizing the Digital Future: Inside America's Race to Attract Data Centers*, Data Center Frontier, (Aug. 2025). https://www.datacenterfrontier.com/site-selection/article/55307797/incentivizing-the-digital-future-inside-americas-race-to-attract-data-centers

Due to their high energy consumption, the growth of data centers can drive increased emissions of harmful air pollution, including greenhouse gas emissions, depending on their source of energy. These emissions present a significant risk to public health and affect the ability of local governments to achieve their climate and clean energy goals. The International Energy Agency estimates that at present, approximately one percent of global CO_2 emissions, or 330 million metric tons, can be attributed to data center electricity consumption.[10] Absent appropriate action by regulators and industry, this number can be expected to rise significantly with the expansion of data centers over the nation and the globe.

Data centers can also present localized challenges such as onsite air emissions. Many data centers rely heavily on back-up diesel generators that emit harmful greenhouse gasses into surrounding communities, together with pollutants that can impact the health and welfare of local communities.[11] Counties in the state of Virginia, which early on evolved as a global locus of data centers and remains an international hot spot,[12] have faced sharp increases in such pollution. In 2023, data centers in Virginia sought air permits for 13,000 tons of emissions of nitrous oxide (NO_x), a greenhouse gas and air pollutant that can result in lung disease, asthma, and premature death.[13] For comparison, the EPA reports that the state's largest coal plant, the Clover Power Station, emitted approximately 1,400 tons of NO_x in 2023, significantly less than the emissions from diesel back up generators for data centers.[14]

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[10] International Energy Agency, *Data Centres and Data Transmission Networks, CO2 emissions,* https://www.iea.org/energy-system/buildings/data-centres-and-data-transmission-networks?utm_ (last visited Aug. 2025).

[11]Dara Kerr, *Elon Musk's xAI accused of* pollution *over Memphis supercomputer,* The Guardian, (Apr. 2025) https://www.theguardian.com/technology/2025/apr/24/elon-musk-xai-memphis.

[12] See *Data Centers in Virginia*, JLARC, at i (2024), https://jlarc.virginia.gov/pdfs/reports/Rpt598.pdf ("Northern Virginia is the largest data center market in the world, constituting 13 percent of all reported data center operational capacity globally and 25 percent of capacity in the Americas.").

[13] David Danelski, *AI's Deadly Air Pollution Toll*, UCR News (Dec. 9, 2024), https://news.ucr.edu/articles/2024/12/09/ais-deadly-air-pollution-toll. *See also* Yuelin Han *et al.*, *The Unpaid Toll: Quantifying the Public Health Impact of AI*, arXiv (Dec. 9, 2024), https://arxiv.org/html/2412.06288v1 (a UC Riverside and Caltech study examining the health impacts of data centers).

[14] EPA, *Clover Power Station, Facility Information*, (2023) https://ghgdata.epa.gov/ghgp/service/facilityDetail/2023?id=1001093&ds=E&et=&popup=true. Note that there is a distinction between permitted amount and actual amount emitted. A facility does not necessarily emit every metric ton of a greenhouse gas that it is permitted to emit. However, we do not presently have data on actual emissions.

At the same time, state and local governments often seek to attract data centers in order to bring economic benefits to communities, including a significant source of new tax revenues. Tax revenues collected from data centers in Prince William County, Virginia demonstrate the potential scale of economic benefits. Between 2012 and 2023, tax revenues in Prince William County from data centers increased twenty-fold,[15] accounting for 74% of the county's new commercial tax revenue in 2023.[16] In a recent speech, Virginia State Senator Russet summarized some of the tradeoffs local and state leaders face in his state and across the country: "Virginia has become the center of the global data center industry….[W]hile this industry has brought economic growth, its rapid expansion is outpacing the state's ability to manage its impact on energy, water and communities."[17]

However, local governments need not choose between tax revenues and pollution control. Local governments often have relevant authority over land use policy, including through zoning, which can mitigate or reduce the impacts of data centers and help ensure data center development aligns with local policy. Furthermore, data center developers are eager to get new facilities on-line quickly. According to Josh Levi, President of the Data Center Coalition, "access to reliable electricity has become the pacing challenge to building out America's digital infrastructure."[18] Local governments that are in a position to provide developers with expedited development timelines, particularly if paired with access to reliable power, are well-positioned to attract data centers even with conditions that allow them to preserve local priorities, such as clean energy goals and emissions limits. This memo identifies an ordinance that local governments, such as counties or towns, can adopt to help keep on track with their climate and environmental goals without foregoing the potential economic benefits associated with data center development.

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[15] *2023 Data Center Industry Tax Revenue Report*, Prince William County 18 (Oct. 1, 2024), https://www.pwcva.gov/assets/2024-10/TY2023_Data%20Center%20Industry%20Tax%20Revenue%20Report_09.24.2024.pdf.

[16] *Id.* at 6.

[17] Hanna Pampaloni, *Perry Leads Data Center Legislation for 2025 General Assembly Session*, Loudon Now (Jan. 2025) https://www.loudounnow.com/news/perry-leads-data-center-legislation-for-2025-general-assembly-session/article_6b6946fc-d2ce-11ef-be7c-afc45ae2740e.html.

[18] Derek Robertson, *5 questions for the Data Center Coalition's Josh Levi,* Politico, (May, 2025) https://www.politico.com/newsletters/digital-future-daily/2025/05/16/5-questions-for-the-data-center-coalitions-josh-levi-00354319.

Proposed ordinance

GCC recommends that local governments concerned about the climate pollution from new data centers consider adopting ordinances that establish an overlay zone that includes specific provisions to reduce climate pollution. Overlay zones are zones that are overlaid on top of one or more existing zoning districts to designate areas where specific permitting requirements or other obligations or opportunities for specific kinds of development apply.[19] Overlay zones usually have special rules designed to encourage, discourage, or otherwise regulate a specific type of land use.[20] In the context of data centers, local governments use a variety of monikers for these types of zoning districts, including "opportunity zones,"[21] "technology corridors,"[22] and "hubs."[23] For consistency, this paper refers to overlay zones that are specific to data centers as "data center opportunity zones."

Local governments can establish data center opportunity zones with provisions that provide for conditional access to local financial incentives and/or permitting for data center developers that meet specified criteria, including, but not limited to, energy efficiency requirements and the use of onsite solar generation and battery storage. Data center opportunity zones have been adopted by municipal and county governments in many parts of the country. However, we have not found examples of such zones that require clean energy and energy efficiency measures.

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[19] Dorothy Ariail, *Property Topics and Concepts: Overlay Zones,* American Planning Association (2007), https://www.planning.org/divisions/planningandlaw/propertytopics.htm.

[20] *Id.*

[21] *See* Prince William County, Code of Ordinances § 32-509, https://library.municode.com/va/prince_william_county/codes/code_of_ordinances?nodeId=CH32ZO_ARTVOVDI_PT509DACEOPZOOVDI ("Data Center Opportunity Zone Overlay District").

[22] *See* Tennessee Technology Corridor Development Authority, Design Guidelines, at 3 (Sept. 2011), https://archive.knoxplanning.org/plans/dguides/ttcda.pdf (depicting technology corridor zoning, but note that the Tennessee Technology Corridor Development Authority has been disbanded); City of Norwalk, Iowa, *Southwest Development Corridor*, https://norwalkiaswdevelopment.com/ (a Development Corridor offering "an exceptional location for data centers…") (last accessed Aug. 2025).

[23] *See* City Council, *Recommendation regarding an Ordinance to amendment the Norwalk Zoning Ordinance to create the Norwalk Technology & Industry Overlay District*, City of Norwalk, (Feb. 2, 202), https://drive.google.com/file/d/1wWK_-X8lf6kbxR0d5x-RXtxj0blaxL8E/view (proposing a Technology & Industry Overlay District).

We recommend that ordinances establishing a data center opportunity zone require or encourage data center developers to:

1. Reduce the need for new electric generation by incorporating best available energy efficiency into the design of data center servers, cooling units, and building envelope;
2. Cover a minimum percentage of all roof space (e.g. 75 percent) with solar arrays to offset some of the new demand on the electric grid and reduce onsite emissions;
3. Utilize battery storage as a backup energy source for a minimum percentage (e.g. 50 percent) of total onsite back-up energy needs to reduce or eliminate the pollution associated with diesel backup generators; and
4. Monitor and report on energy efficiency and emissions data on a periodic basis (e.g. quarterly).

Local governments that wish to go one step further can establish these terms as minimum requirements for siting in opportunity zones — or as prerequisites for accelerated consideration of siting permits — with additional financial incentives available to data centers that agree to go further, for example by using low-carbon technologies such as solar and/or wind plus storage, or geothermal energy, for a greater portion (e.g. 80% or more) of on-site energy requirements.

Where has this been tried?

While data center zoning ordinances and opportunity zones have been adopted by local governments in many places, those ordinances frequently focus on streamlining permitting for proposals that address certain broader environmental or community-impact concerns. We have not found examples that include the specific provisions we recommend to mitigate the emissions impacts of data centers.

Prince William County, Virginia provides one example of a local government that has adopted a zoning ordinance that streamlines and guides permitting for data centers but does not contain the emissions-reducing provisions we recommend.[24] In 2016, the Prince William County Board of Supervisors created a zoning overlay district that the county refers to as a data center

[24] Prince William Cnty, Code of Ordinances § 32-509, https://library.municode.com/va/prince_william_county/codes/code_of_ordinances?nodeId=CH32ZO_ARTVOVDI_PT509DACEOPZOOVDI, *supra* (lacking emissions control provisions).

opportunity zone.[25] The Prince William County Opportunity Zone designates defined geographic areas throughout the county in which data centers that meet certain conditions can receive "by right" permits — i.e. permits subject to very limited review processes at the staff level, without the need for additional meetings and review.[26] Data centers that are built outside of the opportunity zone, or that do not meet the specifications laid out in the ordinance, are required to receive special use permits from the county, which entail a much lengthier regulatory process than "by right" permits.[27]

Although Prince William County's zoning ordinance does not focus on clean energy requirements, importantly the county does make accelerated "by right" permitting conditional on meeting certain requirements that would mitigate other impacts of data center development. For example, Prince William County's Data Center Opportunity Zone Ordinance stipulates that data center overlay zones be placed near 115 kV transmission lines and that overlay zones shall not be extended into the County's agricultural or residential areas.[28] The ordinance also restricts by right permitting to data centers that meet certain aesthetic design standards, such as shielding substations and other data center infrastructure from public view.[29]

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[25] Prince William Cnty. Board of Supervisors, Ord. No. 16-512, Adopt Zoning Text Amendment #DP A2016-00003, Data Center Opportunity Zone-Countywide (May 17, 2016), https://eservice.pwcgov.org/planning/documents/DPA2016-00003.pdf.

[26] Prince William Cnty., Code of Ordinances § 32-509.03, https://library.municode.com/va/prince_william_county/codes/code_of_ordinances?nodeId=CH32ZO_ARTVOVDI_PT509DACEOPZOOVDI_S32-509.03USPERI; Prince William Cnty., Code of Ordinances § 32-100, https://library.municode.com/va/prince_william_county/codes/code_of_ordinances?nodeId=CH32ZO_ARTITEDE (defining "by right").

[27] Prince William Cnty., Code of Ordinances § 32-100 (defining "special use"); Prince William Cnty., Code of Ordinances § Sec. 32-509.03 (allowing data centers to permit by right in Data Center Opportunity Zone Overlay District in certain zoning districts).

[28] Prince William Cnty., Code of Ordinances § 32-509.06,509.02(1), https://library.municode.com/va/prince_william_county/codes/code_of_ordinances?nodeId=CH32ZO_ARTVOVDI_PT509DACEOPZOOVDI_S32-509.01PUIN.

[29] Prince William Cnty., Code of Ordinances § 32-509.06,509.02(4) (requiring data centers to have certain design elements in building façades, to screen mechanical equipment, to create a buffer yard from residential zoned properties, and to limit fencing design choices).

Identifying potentially promising local jurisdictions

We suggest identifying local communities for adoption of the proposed ordinance based on the extent to which they meet two primary criteria.

First, screen communities based on the amount of interest they have received for data center development. Our premise is that the greater the potential for data center development, the higher the need to prepare for and mitigate the impacts of data centers.

Second, identify local governments that already have climate goals in place, such as greenhouse gas emissions reductions targets. By adopting these local goals, a local government signals a willingness and interest in mitigating the public health and environmental impacts of facilities, presumably including data centers.

About this Research

This memo is part of the *Local Ordinances for Climate Adaptation & Mitigation* series produced by the Georgetown Climate Center with support from the Esther A. & Joseph Klingenstein Fund. **Learn more on the Georgetown Climate Center website**.

Cover image: High-capacity data center at sunset. Creative Commons License.