THE FARM–COMPUTE COMPACT

A Framework for Responsible Data Center Development in Agricultural Communities

Executive White Paper, Version 1.0

Draft for Public and Technical Review

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Executive Summary

Artificial intelligence is driving the fastest expansion of computing infrastructure in history. Global data center power demand is projected to rise from roughly 104 gigawatts in 2025 to 132 gigawatts in 2026, and to reach approximately 290 gigawatts by 2030, nearly triple today's capacity. [1]

In the United States, the Department of Energy, citing estimates from the Electric Power Research Institute, has reported that data centers could consume up to 9 percent of national electricity generation annually by 2030, up from roughly 4 percent in 2023. [2] A subsequent Lawrence Berkeley National Laboratory update put the 2030 range higher still, at roughly 9.5 to 15.3 percent. [3] Much of this new capacity is being sited in rural and exurban areas, where land is cheaper, parcels are larger, and transmission access is more readily available, including on land currently or previously used for agriculture. No comprehensive national dataset yet establishes what share of new data-center development is occurring specifically on agricultural land.

For agricultural communities, this growth is arriving as an ultimatum rather than an invitation. Farmers are offered sums far above agricultural land value, in some cases ten times or more, creating pressure to sell that has little to do with the productivity or suitability of the land. Counties are asked to approve rezonings, tax incentives, and water allocations with limited information about long-term impact. Neighbors who do not sell are left absorbing the noise, water competition, and landscape change created by neighbors who do.

Public debate has largely collapsed into two camps: communities that welcome data centers for tax revenue and jobs, and communities that oppose them outright to protect farmland and water. Both positions are understandable. Neither, on its own, produces a durable outcome for agriculture, for technology companies, or for the rural communities caught in between.

A Third Position

The Farm–Compute Compact proposes that responsible development is possible when it is built on farmland avoidance, transparent resource use, enforceable community commitments, and long-term investment in agricultural resilience, not on goodwill or one-time payments.

This is not a certification program, and it does not claim to speak for all farmers or all technology companies. It is a voluntary framework, developed with agricultural communities from the outset, that gives technology companies, farmers, utilities, local governments, and researchers a shared, measurable standard for what responsible siting and investment actually look like.

What This Paper Contains

This paper documents the scale and character of the conflict between data-center growth and agricultural land (Sections 2–3), presents the Compact's guiding principles and standards (Section 4), describes concrete areas of technical partnership between computing infrastructure and agriculture (Section 5), proposes a first pilot in Virginia (Section 6), and sets out the governance and funding disclosures the initiative commits to before any certification or scoring function is introduced (Section 7).

The Compact is offered as a starting point for discussion, not a finished standard. Material factual claims in this paper are accompanied by sources, and the initiative welcomes corrections and stronger evidence during public and technical review. Every proposed metric is labeled as a draft subject to revision.

The Scale of the Challenge

Infrastructure growth is outpacing precedent

U.S. data center power demand is projected to climb from 31 gigawatts in 2025 to 41 gigawatts in 2026 and 66 gigawatts in 2027, more than doubling total U.S. capacity in two years. [4] An increasing share of new campuses are being built at gigawatt scale: a single 1-gigawatt campus can draw as much electricity as roughly one-fifth of New York City's entire load. [5]

In Virginia, the Joint Legislative Audit and Review Commission (JLARC) found in 2024 that the data-center industry is "driving an immense increase" in the state's electricity needs. An independent forecast commissioned by JLARC found that unconstrained power demand in Virginia would double within the next ten years, with data centers as the principal driver, and that meeting either full or half of that unconstrained demand would require an exceptionally difficult buildout of new generation and transmission, regardless of whether the Virginia Clean Economy Act's targets are also met. [6]

Water demand is significant and highly variable

Individual facilities may consume hundreds of thousands, or in some cases several million, gallons of water per day; actual demand varies substantially by facility size, cooling architecture, climate, operating load, and whether the reported figure measures withdrawal or consumption. [7] Lawrence Berkeley National Laboratory estimated that U.S. data centers directly consumed roughly 17.4 billion gallons of water in 2023 (a figure distinct from the substantially larger indirect water footprint associated with generating the electricity data centers use), and consumption tends to rise further during hot-weather peaks. [8]

In Virginia's Caroline County, the county has pursued authority for a Rappahannock River withdrawal approaching 14 million gallons per day, with a substantial portion of the proposed capacity associated with anticipated data-center development. [9]

Farmland is converting faster than communities can plan for

USDA's 2022 Census of Agriculture found that Virginia's land in farms declined by approximately 488,000 acres between 2017 and 2022 alone (a five-year period), more farmland loss than the state recorded in the prior fifteen years combined. Separately, the American Farmland Trust estimated that more than 340,000 acres of Virginia agricultural land were converted or compromised by development between 2001 and 2016. A decline in USDA-reported "land in farms" is not identical to documented permanent conversion to industrial or residential use, since it can also reflect consolidation or reclassification, but agricultural organizations in the state describe the overall trend as accelerating. [10]

The scale of individual proposals illustrates the pressure: Prince William County's Digital Gateway project proposed more than 2,000 acres of rural and agricultural land for 37 data centers; a project in Germantown, Tennessee was reported to affect roughly 2,100 acres of productive farmland; and in Hanover County, Virginia, a 430-acre rezoning of agricultural land for a single data center was rejected by local officials in 2026. [11]

Land-value premiums illustrate the pressure development places on neighboring farms. In one widely reported Northern Virginia transaction, Amazon paid approximately $700 million for roughly 188.5 acres of land in Prince William County's Devlin Technology Park, land that had already been rezoned from residential to light industrial use for data-center development before the sale, and whose assessed value at the time was reported at roughly $115 million. The transaction illustrates the scale of the premium attached to land that has secured zoning and grid access; further research is needed to quantify how such premiums affect assessments and operating costs on neighboring farms that are not rezoned. [12]

A live and contested policy environment

It should be said plainly: not every observer views this as a crisis. Some analysts argue that data centers generate more tax revenue per acre than almost any other land use, that farmland values rising due to development pressure benefit farmers who choose to sell, and that parcels with limited agricultural productivity, poor soils, or compromised access may be more appropriate for nonagricultural development than highly productive or strategically important farmland. Others, including national farm and environmental organizations, have called for moratoria on new data-center construction on agricultural land. Both positions are represented in current public debate, and the Compact does not attempt to adjudicate between them. What the record does show is that the current pattern of ad hoc, deal-by-deal negotiation is generating conflict in one community after another, from Virginia to Indiana to Michigan to Pennsylvania, and that a shared, transparent standard is largely absent from that process.

That pattern is visible nationally: rezoning proposals have failed or been withdrawn following community opposition in Kosciusko County, Indiana; Saline Township, Michigan; and Montour County, Pennsylvania, while Linn County, Iowa adopted new restrictions on data-center siting on unincorporated land in early 2026. [13]

Why the Current Model Creates Conflict

Three structural features of the current development pattern explain why data-center siting keeps producing local conflict, regardless of the merits of any individual project.

1. Land use decisions are negotiated privately, then presented as final

Site agreements, tax incentives, and utility arrangements are typically negotiated between a company and a small number of officials before farmers, neighboring landowners, or the broader public see meaningful detail. By the time a rezoning reaches a public hearing, the practical alternatives have often already narrowed to approve or reject.

2. Resource use is disclosed inconsistently, if at all

A widely cited estimate from Lawrence Berkeley National Laboratory's data center efficiency resources found that fewer than one-third of U.S. data center owners and operators measured and tracked their own water consumption; more current, comprehensive industry-wide disclosure data remain limited. [17] Few companies publish site-level water or electricity data, which leaves communities and regulators estimating impact from national averages that may not reflect the specific facility being proposed.

3. Benefits are one-time and disconnected from agriculture

Tax revenue and one-time community payments are real, but they do not address the specific pressures data-center development places on agriculture: rising land values and assessments, competition for water and grid capacity, and the loss of contiguous farmland needed for modern operations. A benefit structure aimed at the general public does not necessarily strengthen the agricultural economy the community depends on.

These are solvable problems. They require standards that are set before negotiations begin, not after a project is already contested.

The Farm–Compute Compact Framework

Core proposition

Technology infrastructure should earn its place in agricultural communities by helping keep agriculture viable. Development should be judged not only by what it avoids destroying, but by what it leaves stronger.

Four guiding actions

- Avoid: Use industrial, brownfield, and previously disturbed sites before working agricultural land.
- Minimize: Reduce water, energy, noise, emissions, and land impacts through design and technology choices.
- Restore: Protect or restore land and natural resources affected by unavoidable development.
- Strengthen: Invest in farms, rural infrastructure, and agricultural resilience for the life of the facility, not just at construction.

The Agricultural Community Bill of Principles (draft)

The following ten principles form the current draft standard. They are offered for public and technical review, not as a finished or enforceable code.

- Productive farmland should be the last siting option, after industrial, brownfield, and previously disturbed sites are ruled out.
- Agricultural communities should participate before major siting and financing decisions are finalized, not after.
- Water and electricity use, by site, should be publicly disclosed on a recurring basis.
- Residents and farms should not unfairly subsidize private infrastructure through tax shifts or utility rate impacts.
- Where permanent agricultural land conversion occurs, it should produce permanent farmland protection elsewhere, at a defined ratio.
- Community benefits should be measurable, contractual, and enforceable, not promotional.
- Agricultural investment commitments should continue for the operating life of the facility.
- Farmers and rural residents should hold real seats in the governance of local benefit programs.
- Where technically feasible, computing infrastructure should actively support agricultural productivity, through waste heat, energy, water, or data partnerships.
- Performance against these commitments should be independently reviewed and publicly reported.

These principles apply symmetrically. A project that avoids farmland entirely but discloses nothing about its water use has not met the standard. A project that publishes extensive sustainability data but sites on prime farmland without an alternatives analysis has not met the standard either.

Partnership Opportunities

The most persuasive case for coexistence is not aspirational: it is already operating, in a small number of real projects, in several countries. The opportunities below are presented with their current limitations, not as universally applicable solutions.

Waste heat recovery

Servers convert nearly all of their electricity into heat, and that heat is typically discarded. Commercial developers have proposed and, in some cases, built systems in which relatively small data-center loads supply heat to adjacent greenhouses; one vendor estimates that a 200-kilowatt data center load could heat roughly one hectare (2.47 acres) of greenhouse space. The amount of usable greenhouse area and agricultural output such a system can support depends heavily on local climate, growing system, heat quality, and greenhouse design, and this figure should be read as a vendor estimate rather than an established general fact. [14]

A small number of operating and pilot projects illustrate what the concept looks like in practice. These are drawn from trade-press reporting rather than independently verified operator disclosures, and their current operating status should be confirmed directly before being cited as established precedent:

Location	Agricultural use	Reported status	Source type
Boden, Sweden	Greenhouse / vegetable production	Pilot / operating, developer-reported	Trade press
Luleå, Sweden	Microgreens (hydroponic)	Operating, company-reported	Trade press
Paris, France	Rooftop urban farm	Pilot, operator-reported	Trade press
Hokkaido, Japan	Eel aquaculture	Demonstration, operator-reported	Trade press
Norway (Green Mountain)	Lobster and trout aquaculture	Operating, company-reported	Trade press

Sources: trade and sustainability press coverage of individual projects [15]. Status labels reflect how each project was described in that coverage, not independent verification.

Heat recovery is generally easier and more efficient when facilities use liquid or closed-loop cooling systems that concentrate heat into a usable stream, along with meaningful proximity to the agricultural user and a consistent, predictable heat load, conditions that will not exist at every site. Recovery from air-cooled systems is also possible in principle, but tends to yield lower-grade heat and less favorable economics. In one peer-reviewed case study, researchers modeled a data-center-to-farm heat recovery system at the China Brain Green Data Center and found a dynamic payback period of approximately 3.4 years and a positive cumulative net present value; results for other sites will vary substantially by distance, temperature, infrastructure cost, energy prices, and the receiving agricultural operation. [16]

Water innovation

Reclaimed and closed-loop cooling systems can reduce or eliminate a facility's evaporative water demand, at some cost in energy efficiency. Where evaporative cooling remains necessary, agreements can prioritize reclaimed municipal water over groundwater or surface withdrawals that compete with irrigation, and can commit to public reporting of both withdrawal and consumption, the two figures companies most often decline to publish separately.

Energy and agrivoltaics

Facilities can help fund grid capacity, battery storage, and renewable generation that benefits the surrounding community and not only the facility itself. Agrivoltaics, combining solar generation with continued grazing or crop production on the same land, offers one model for computing-related energy investment that does not remove land from agricultural use, though yield and management tradeoffs vary by crop and require site-specific evaluation.

AI in service of agriculture, not only adjacent to it

Separately from physical infrastructure, the computing capacity driving this growth can be applied directly to agricultural problems: crop and soil monitoring, livestock health and disease prediction, water-efficient irrigation scheduling, and extension services delivered to smaller and beginning farmers who currently have the least access to this technology. This is a partnership opportunity independent of where any given facility is sited.

Proposed Pilot: Virginia

Virginia is proposed as the Compact's first pilot geography. Northern Virginia is widely recognized as the world's largest data-center market (JLARC reported that it accounts for an estimated 13 percent of reported global operational data-center capacity), and the state also has one of the most active and organized farmland-preservation communities in the country, and is the site of several of the specific conflicts documented in Section 2: Hanover County, Prince William County, and Caroline County among them. [6]

Concept: Virginia Agricultural Resilience and Data Infrastructure Pilot

The pilot would pair one or more data-center projects, at concept or early planning stage, with a defined package of agricultural commitments negotiated under the Compact's draft standard, including:

- A waste-heat-supported greenhouse or aquaculture operation, sited adjacent to a facility with closed-loop cooling capacity.
- A farmland preservation commitment, structured through a conservation easement held by an established regional land trust, at a ratio to be negotiated as part of the pilot.
- Public, site-level reporting of water withdrawal and consumption, updated at least annually.
- A locally governed agricultural resilience fund, with farmer and rural-resident representation on its governing committee, funded for the operating life of the facility rather than as a one-time payment.
- An evaluation of whether conduit, middle-mile fiber, rights-of-way, or interconnection points associated with the facility could reduce the cost of expanding rural broadband, not an assumption that facility fiber automatically delivers last-mile access.

Candidate partners include Virginia-based land trusts and conservation organizations active in farmland preservation (American Farmland Trust's Mid-Atlantic program, the Virginia Outdoors Foundation, the Piedmont Environmental Council, the Capital Region Land Conservancy, and the Northern Virginia Conservation Trust among them), along with Virginia Cooperative Extension and county governments that have already engaged publicly with data-center siting questions. The specific easement holder and service partners would depend on the pilot county selected.

The pilot is a concept at this stage. It is not yet paired with a committed technology company, county, or funding source, and this paper does not represent that any specific project has agreed to participate.

Governance and Disclosure

The credibility of this initiative will depend on its governance at least as much as on the content of its standards. Before any certification, scoring, or public recognition function is introduced, the Compact commits to establishing:

- Agricultural advisory representation, with farmers and rural residents in the majority of any standards-setting body.
- Technical advisory representation from independent water, energy, and land-use experts.
- A public conflict-of-interest policy covering advisors, reviewers, and staff.
- A public funding-disclosure policy identifying any participating company, foundation, or government funder, and whether funders can influence standards or research conclusions.
- A published standards-revision process, including a public comment period before any version is finalized.
- A corrections policy for factual errors in published research or project information.
- A clear statement that no participating company can purchase a favorable rating, and that certification, if and when it launches, will separate sponsorship from verification decisions.

Until this governance structure is in place and has been reviewed publicly, the Compact will not represent any project as "certified," "approved," or "compliant." This paper and the draft standard within it are offered explicitly as works in progress.

What this initiative is not

- It is not a certification program today, and does not currently evaluate or endorse any specific project.
- It does not claim to represent all farmers, all rural residents, or all technology companies.
- It is not a lobbying platform and does not draft or submit legislation on behalf of participants.
- It does not replace county land-use, zoning, or environmental review processes.

How to Participate

The Compact is being developed with input from the people and organizations it affects most. Participation at this stage does not constitute endorsement of any final standard, and no organization's participation implies that others must join.

Farmers and rural residents

- Share a concern or a development impact from your own community.
- Suggest an agricultural investment that would materially help your region.
- Join the advisory network or a working group on a specific standard section.

Technology companies and data-center developers

- Request an introductory discussion about the draft standard.
- Propose a pilot project or sponsor independent feasibility research.
- Participate in a technical working group on water, energy, or heat recovery.

Local and state governments

- Request a briefing or model language for local review processes.
- Share an existing community benefit agreement for the Compact's case-study library.

Universities, conservation organizations, and researchers

- Submit research, propose a study, or join technical review of a specific standard.
- Offer subject-matter expertise on water, land use, energy, or agricultural economics.

Contact and participation details will be published at farmcompute.org as the initial website launches.

References

Labels indicate source type: [Gov] government or legislative report, [Peer-reviewed] academic publication, [Forecast] company or analyst forecast, [News/Trade] news or trade publication, [Advocacy] advocacy or op-ed publication.

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[13] [Advocacy/News] Food & Water Watch, June 24, 2026 (Kosciusko County, IN; Montour County, PA); The New American, "Data Centers Are Destroying Farmland," May 26, 2026 (Saline Township, MI; Linn County, IA).

[14] [News/Trade] TechTarget, "Data center heat reuse: How to make the most of excess heat," citing vendor Blockheating's greenhouse-heating estimate. Presented in this paper as a vendor estimate, not an independently verified general finding. techtarget.com.

[15] [News/Trade] The Cool Down, "Researchers are harnessing 'huge problem' of heat waste to power greenhouses of the future," January 18, 2024; RESET.org, "Re-Using Waste Heat From Data Centres," February 24, 2026; InformationWeek, "Reusing Waste Heat from Data Centers to Make Things Grow," March 15, 2024.

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