

Data Center Literature Review

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This is a Review of Materials Provided to the Village of Coal City from Residents throughout the consideration process to date.

This document provides a review of materials submitted to or provided to the Village of Coal City concerning the proposed Aligned Data Center development. The purpose of this review is to summarize the primary findings, issues, and recommendations presented in each source and identify information that may be relevant to the Village's consideration of the proposed Aligned Data Center. This review is intended as a summary of the provided literature and does not represent a recommendation for or against the proposed project. The sources vary in type, including government information, academic research, university research summaries, nonprofit research, and policy analysis. Accordingly, the findings should be considered in the context of each source's methodology, purpose, geographic focus, and limitations. A recurring theme across the materials is that data center development can create both economic and technological opportunities and environmental, infrastructure, and public-health considerations. Several sources emphasize the effects of a particular facility depend substantially on factors such as its energy source, water requirements, location, design, noise controls, infrastructure needs, and regulatory requirements.

Article 1. Harvard T.H. Chan School of Public Health – “Analyzing Air Pollution Health, Economic Risks from AI Data Centers”

Source: Harvard T.H. Chan School of Public Health

Link: [Harvard T.H. Chan School of Public Health – Analyzing Air Pollution Health, Economic Risks from AI Data Centers](#)

Summary: This academic article discusses research concerning the air-pollution and public-health implications of rapidly increasing electricity demand from artificial intelligence data centers. The article explains that some data centers are considering or constructing on-site fossil-fuel-powered electricity generation because of limitations or constraints on existing electric grids. The Harvard researchers argue that emissions from these power sources can create health and economic costs that may not otherwise be incorporated into data center permitting decisions. The article also discusses the possibility of reducing these impacts through improved energy planning. For example, data center computing workloads could potentially be shifted among facilities depending on the availability of cleaner electricity sources.

Key Takeaways

- AI data centers can require substantial amounts of electricity.
- Increased electricity demand can create additional pressure on existing electric grids.
- Some facilities have considered on-site fossil-fuel generation to provide additional power.
- Fossil-fuel generation can produce air pollutants and greenhouse gas emissions.
- Public-health costs can be overlooked when evaluating infrastructure projects.
- Energy reliability remains an important consideration when evaluating alternative energy sources.
- The researchers identify potential opportunities to reduce emissions through smarter energy and computing-system design.

Coal City Impact: The Harvard discussion is useful because it suggests that the environmental impacts of a data center are not necessarily predetermined. For Coal City, the proposed Aligned Data Center facility will rely entirely on the transmission electrical grid. Diesel backup generators shall only be used for emergency use and not the main source for generation. This information was provided by Aligned Data Center Representatives during the P.U.D testimony.

Article 2. Gour, Ortiz, and Maibach – “Health Implications of the Rapid Rise of Data Centers in Virginia: An Exploratory Assessment”

Source: Frontiers in Climate

Link: [Frontiers in Climate – Health Implications of the Rapid Rise of Data Centers in Virginia](#)

Summary: Gour, Ortiz, and Maibach examine potential health implications associated with rapid data center development in Virginia. The authors focus on Virginia because of the concentration of data centers in the state's “Data Center Alley.” The article identifies several potential pathways through which data centers could affect communities, including air pollution, water consumption, noise, land-use changes, energy consumption, and energy costs. The authors emphasize the available evidence concerning direct human health outcomes remains limited. Their article is therefore best understood as an exploratory assessment of potential health pathways rather than definitive evidence that every data center will produce specific health outcomes. The authors argue that improved planning and design could mitigate some of the potential risks.

Key Takeaways

- Data centers can require large amounts of electricity, and electricity generation can create air emissions depending on the energy source.

- Cooling systems can require significant quantities of water. The magnitude of water demand depends on the facility's cooling technology and design.
- Cooling equipment, generators, and other mechanical systems can produce noise that may affect surrounding properties.
- Large facilities can require substantial amounts of land and may affect surrounding land uses and ecosystems.
- The authors discuss the possibility that increased electricity demand could affect energy costs and potentially create socioeconomic consequences.
- The authors emphasize that planning, zoning, energy choices, water management, and facility design can influence the degree of potential impact.

Coal City Impact: The Village of Coal City is requiring appropriate noise-control measures consistent with applicable State of Illinois requirements and Village Code, as well as evaluating landscaping, buffering, and overall site design. Additional considerations include reviewing the proposed locations and operating conditions of diesel generators, evaluating energy sources and potential emissions, and providing residents with clear information about the proposed facility's expected environmental characteristics. 345kV transmission lines will be used and not local distribution for energy sources. This information was provided by Aligned Data Center Representatives during the P.U.D testimony.

Article 3. World Resources Institute – “From Energy Use to Air Quality, the Many Ways Data Centers Affect U.S. Communities”

Source: World Resources Institute

Link: [World Resources Institute – From Energy Use to Air Quality, the Many Ways Data Centers Affect U.S. Communities](#)

Summary: The World Resources Institute examines seven major ways data centers can affect communities. Such as, energy demand, water use, air pollution and climate impacts, noise, land use, environmental equity, and economic development. The article emphasizes that data center development can create economic opportunities, including construction employment, permanent jobs, investment, and government revenues. Simultaneously, communities may face infrastructure demands involving electricity, water, roads, emergency services, and other public resources. WRI argues that the effects of data center development depend significantly on how facilities are planned and governed.

Key Takeaways:

- Modern AI data centers can consume very large quantities of electricity. WRI notes that a single modern AI data center can have electricity demand comparable to that of approximately 100,000 homes, while some larger facilities can require substantially more

[Aligned Data Center's operational capacity -i.e. 864 Mw-1,296 Mw = how many homes].

- Water consumption varies significantly by facility and cooling technology. WRI identifies water-use monitoring, drought planning, and alternative cooling technologies as potential tools for managing water impacts.
- Facilities that rely on fossil-fuel generation can create greenhouse gas and conventional air-pollutant emissions.
- Cooling systems, generators, and other equipment can create noise. WRI identifies setbacks, acoustic barriers, insulation, and noise monitoring as possible mitigation measures.
- Large data centers can require substantial land areas and may compete with agricultural, residential, commercial, or other uses.
- Data centers can create construction jobs, permanent employment, private investment, and government revenue. However, WRI also notes that the number of permanent positions can be relatively limited compared with the scale of some facilities.
- Data centers can require significant investment in electrical, water, transportation, and

Coal City Impact: Coal City's consideration include Aligned Data Center's use of closed-loop, patented cooling technology to follow applicable water-conservation requirements. Other considerations include requiring appropriate noise-control measures consistent with State of Illinois requirements and Village Code, ensuring compliance with landscaping and screening requirements, and conducting a thorough analysis of potential traffic and road impacts. The Village may also consider infrastructure costs, emergency-services planning, and clear development and performance standards to guide the proposed facility and provide measurable expectations throughout the development process. This information was provided by Aligned Data Center Representatives during the P.U.D testimony.

Article 4. Guidi et al. - "Environmental Burden of United States Data Centers in the Artificial Intelligence Era"

Authors: Gianluca Guidi, Francesca Dominici, Jonathan Gilmour, Kevin Butler, Eric Bell, Scott Delaney, and Falco J. Bargagli-Stoffi

Source: arXiv research paper

Link: [Environmental Burden of United States Data Centers in the Artificial Intelligence Era](#)

Summary: This study examines the electricity consumption, electricity sources, and carbon dioxide-equivalent emissions associated with U.S. data centers. The researchers analyzed information from 2,132 U.S. data centers operating between September 2023 and August 2024. Their analysis estimated that data centers accounted for more than 4% of total U.S. electricity

consumption during the period studied. The researchers also estimated that approximately 56% of the electricity associated with the data centers in their analysis came from fossil-fuel sources and that the facilities were responsible for more than 105 million tons of CO₂-equivalent emissions. Moreover, these are national-level estimates and should not be interpreted as representing the environmental impact of an individual facility.

Key Takeaways

- Data centers have become a significant component of national electricity demand.
- Electricity source matters when evaluating environmental effects.
- Fossil-fuel-generated electricity can produce substantial greenhouse gas emissions.
- The environmental burden varies depending on electricity consumption and the electricity mix.
- National-level data cannot automatically be applied to an individual proposed facility.
- Facility-specific information is therefore important when evaluating a local project.

Coal City Impact: The proposed Aligned Data Center in Coal City specific estimated peak electricity demand in megawatts or an average electricity-consumption figure is 864Mw-1,296Mw. Aligned states that the facility will incorporate energy-efficient infrastructure, including its patented cooling technology and closed-loop cooling systems designed to reduce energy and water use. For noise, Aligned describes the proposed facility as being designed to minimize acoustic impacts through sound-attenuated cooling and backup-generation equipment, equipment setbacks, and other noise-mitigation measures, while the project would also be required to comply with applicable State of Illinois requirements and Village of Coal City Code. The facility is expected to include on-site backup-generation equipment to maintain reliability during power interruptions, with generators housed in acoustically treated enclosures. This information was provided by Aligned Data Center Representatives during the P.U.D testimony.

Article 5. Environmental and Energy Study Institute – “Data Centers Are Hotbeds of Health Risks”

Source: Environmental and Energy Study Institute (EESI)

Link: [EESI – Data Centers Are Hotbeds of Health Risks](#)

Summary: EESI examines potential health and environmental effects associated with data center development. The article identifies electricity consumption, water use, utility costs, fossil-fuel emissions, and diesel backup generators as areas of concern. EESI explains that data centers may contribute to greenhouse gas emissions through electricity generation and may also contribute to local air pollution through on-site diesel generators. The article is particularly relevant because it connects environmental considerations to potential public-health and economic effects.

Key Takeaways

- Data centers can require substantial amounts of electricity and water.
- Electricity demand can affect broader energy systems.
- Fossil-fuel electricity generation can contribute to greenhouse gas emissions.
- Diesel backup generators can emit particulate matter and other pollutants.
- Data center development can create potential concerns involving local air quality.
- Higher energy demand can raise questions about how infrastructure and electricity costs are allocated.
- Environmental impacts can extend beyond the physical boundaries of a data center.

Coal City Impact: Diesel Generators are not primarily used. They shall not exceed 10 hours a year and abide by IEPA, Tier 4 Standards. During, P.U.D testimony, this information was provided by Aligned Data Center Representatives.

Article 6. University of Michigan STPP — What Happens When Data Centers Come to Town?

Source: Science, Technology and Public Policy Program (STPP), Gerald R. Ford School of Public Policy, University of Michigan

Link: [What Happens When Data Centers Come to Town? | Science, Technology and Public Policy \(STPP\)](#)

Summary: The University of Michigan brief takes a strongly cautionary position toward large-scale data-center development. Its central argument is that communities should not evaluate data centers primarily on promised investment and jobs. Instead, they should examine the full cost to electricity customers, water resources, schools, local governments, infrastructure and the environment. The authors argue that data centers can produce substantial economic activity during construction but may create relatively few permanent jobs once operational. They also warn that very large electricity loads can result in grid upgrades and other costs being shifted to residential and small-business customers. The report's recommended response is essentially that if a community is going to accept a data center, require transparency, measurable efficiency standards, renewable-energy commitments, protection against ratepayer cost shifting, and safeguards for local tax revenues. That message is highly relevant to Coal City, but there is an important distinction which is that the University of Michigan article is a general policy study.

Key Takeaways

- Data centers can bring significant economic activity, but the local benefits need to be weighed against substantial demands on electricity, water, infrastructure, and public services.
- Schools and other local taxing bodies should not be overlooked. The report recommends protecting local tax revenues, including revenues supporting schools.
- Transparency is important. Communities should require data centers to report energy usage and other environmental impacts so local officials can evaluate whether the project is meeting expectations.
- Performance standards can help manage growth. The report recommends energy audits, environmental performance standards, renewable-energy requirements, and mandatory reporting.
- State and local climate goals should be considered. Large increases in electricity demand could prolong reliance on fossil fuels if new energy supplies are not aligned with clean-energy objectives.

Coal City Impact: The policy brief can be viewed as a framework for making a potential data-center project more beneficial to the community rather than simply viewing the project as either “good” or “bad.” The Aligned Data Center project could also create an economic development opportunity by bringing significant private investment and construction activity to the area, while potentially attracting a major new employer or investment to Coal City. Moreover, the developer could contribute toward necessary improvements to roads, utilities, electrical infrastructure, water systems, and other public infrastructure, creating longer-term community benefits if these costs are appropriately allocated. The Village would also have an opportunity to negotiate strong development conditions before approving the project. These conditions could address energy efficiency, water usage, noise, emergency planning, infrastructure costs, landscaping, environmental monitoring, and ongoing reporting. Ultimately, Coal City has established ongoing accountability measures requiring Aligned Data Center to report on electricity use, water consumption, environmental performance, and compliance with agreed-upon standards.

Article 7. Penn State Institute of Energy and the Environment — Hannah Wiseman, “*What AI Data Centers Could Mean for Your Electric Bill*,” published June 18, 2026.

Source: Institute of Energy and the Environment

Link: <https://iee.psu.edu/news/blog/what-ai-data-centers-could-mean-your-electric-bill>

Summary: The Penn State article examines how the rapid growth of AI data centers could affect electricity costs for households and businesses. Since data centers require very large amounts of

electricity, utilities may need to build new power plants, expand transmission infrastructure, and maintain additional generation capacity to serve this demand. The article explains that these costs can potentially be spread across all electricity customers rather than being paid directly by the data centers creating the additional demand. The article focuses on policies that can help ensure large electricity users pay an appropriate share of the infrastructure and reliability costs they create. These include large-load electricity tariffs, minimum utility contract terms, exit fees if a data center closes or leaves early, more accurate forecasting of proposed data-center demand, and greater transparency regarding agreements between utilities and large energy users. The goal is to prevent residential and small-business customers from being left responsible for infrastructure costs if a project does not materialize, scales back, or eventually leaves the area. This article provided is from the Institute of Energy and the Environment. It is similar to article 5 in the fact that both authors are from the Institute. Whereas this article is more graphics and descriptions compared to “Data Centers Are Hotbeds of Health Risks.”

Key Takeaways

- Additional electricity demand can require major infrastructure investments, including new generation, transmission upgrades, and additional capacity to maintain reliability. Institute of Energy and the Environment
- Data centers should be responsible for the infrastructure costs they create. The article describes this as having data centers pay their “fair share” rather than spreading those costs across all customers. Institute of Energy and the Environment
- Minimum contract terms and exit fees can protect existing ratepayers. If a data center closes, relocates, or significantly reduces its operations, these protections can help prevent customers from being left with the costs of infrastructure that was built for the facility. Institute of Energy and the Environment
- Transparency matters. Making agreements between utilities and large energy users more transparent can help regulators and the public understand who is paying for infrastructure and electricity-system costs. Institute of Energy and the Environment
- The timing of these protections matters. The article emphasizes putting safeguards in place before large infrastructure costs become obligations that other customers may ultimately have to pay. Institute of Energy and the Environment

Coal City Impact: The Penn State article provides a useful framework for considering the electricity and utility implications of a potential data-center development. A data center could represent a significant new electricity customer and an opportunity for economic development. The article suggests that one way to address this concern is to ensure that the data center is responsible for the infrastructure and system costs directly associated with its electricity demand rather than shifting those costs to residential and other existing customers. Institute of Energy and the Environment. Aligned Data Center signed onto a TSA guaranteeing they would pay for a

substation and ten years of power supply approved by FERC. From a community perspective, the article's overall message is that a data-center project can be accommodated while taking steps to ensure Aligned Data Center Representatives have a driving substantial new electricity demand are also responsible for the costs they create.

Article 8. United Nations – “1.5°C: What It Means and Why It Matters”

Source: United Nations

Link: [United Nations – 1.5°C: What It Means and Why It Matters](#)

Summary: The United Nations explains the importance of limiting global warming and describes why the difference between 1.5°C and 2°C of warming is significant. Under the Paris Agreement, countries committed to keeping the increase in global average temperature well below 2°C above pre-industrial levels while pursuing efforts to limit warming to 1.5°C. The United Nations explains that each additional increment of warming increases the risks associated with extreme heat, drought, heavy precipitation, wildfires, and other climate-related hazards. The organization reports that 2024 was the warmest year in the observational record, with a global average temperature approximately 1.55°C above the 1850–1900 average. The source also makes an important distinction: a single year above 1.5°C does not mean that the long-term Paris Agreement temperature threshold has been permanently exceeded. Long-term warming is evaluated over much longer periods.

Key Takeaways

- Every additional increment of global warming increases climate-related risks.
- Limiting greenhouse gas emissions is an important component of addressing climate change.
- Energy-intensive technologies should be considered within the larger context of global energy consumption and emissions.
- The climate impact of a data center depends substantially on the electricity sources used to operate it.
- Data center electricity demand can have different environmental implications depending on whether electricity comes from renewable, nuclear, natural gas, coal, or other sources.
- Climate effects are primarily a broader, long-term consideration rather than an impact that can automatically be attributed to one individual facility.

Coal City Impact: The article does not specifically relate to Coal City or individual data center projects. However, it provides a broader framework for evaluating the energy characteristics of a

proposed facility in which Aligned Data Center has energy-efficiency plans and energy supply which was provided by Aligned Data Center Representatives during the P.U.D testimony.

Conclusion

The materials reviewed demonstrate that data center development involves a combination of economic development, technological infrastructure, energy consumption, environmental considerations, public health, land use, and municipal governance. The United Nations source provides the broader climate context, emphasizing the importance of reducing greenhouse gas emissions. The Harvard and EESI materials focus more specifically on potential air-pollution and public-health implications associated with electricity generation and backup power. Gour, Ortiz, and Maibach examine potential health pathways involving air pollution, water, noise, land use, and energy costs. The World Resources Institute provides a broader community-level assessment including both potential costs and economic benefits. Guidi et al. provide national-level data concerning electricity consumption and greenhouse gas emissions from U.S. data centers.

A consistent finding across the materials is the impacts of data centers vary according to facility design, energy sources, cooling technology, location, infrastructure requirements, and operating practices. As a result, national or state-level findings should not automatically be interpreted as predictions of what will occur in Coal City. For the Village of Coal City, the literature may therefore be most useful as a framework for identifying questions that should be answered through the review process. Rather than relying exclusively on generalized information about data centers, the Village can evaluate the proposed facility using project-specific information concerning energy, water, emissions, noise, land use, infrastructure, employment, tax revenue, emergency services, and mitigation measures.

The literature also indicates potential negative impacts can be possibly avoided. The articles identify planning, zoning, facility design, energy choices, water-management practices, noise controls, infrastructure planning, and community engagement as tools that can influence the outcomes of data center development. Moreover, the materials identify potential benefits, including private investment, construction employment, permanent employment, tax revenue, infrastructure investment, and participation in the growing digital and artificial-intelligence economy. The magnitude of these benefits should likewise be evaluated using information specific to the proposed Coal City Aligned Data Center that has been given through the P.U.D testimony and posted on the Village of Coal City website. Furthermore, the materials support a project-specific and comprehensive review in which the potential economic and technological benefits of the proposed data center are considered alongside its potential environmental, infrastructure, public-health, and community impacts.