A Transparency-Based Approach to Regulating the Resource Footprint of U.S. Data Centers

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Executive Summary

- **AI Development Has Unsustainable Demands:** The growing rate of energy consumption and water usage for AI workloads is straining resources across the U.S., particularly in rural communities.
- **U.S. Lags in Regulation:** Unlike its global counterparts, the U.S. has minimal requirements for reporting data center resource consumption.
- **Transparency-First Policy Proposal:** This paper proposes mandated reporting of energy and water consumption with audits and a public database to ensure transparency in data centers' resource consumption.
- **Ensuring Accountability:** The proposed policy includes civil penalties, such as fines and lawsuits for non-compliant firms, enforced by the Department of Energy and the Securities and Exchange Commission.
- **Towards an Efficient and Sustainable Future:** This proposal encourages companies and data centers to enhance their operational efficiency, ultimately driving American innovation while aligning with global sustainability objectives.

Introduction

AI models have gained widespread traction across industries, but training and deploying large models demand significant computational resources for processing datasets, updating model parameters, and executing floating-point operations in training and inference. While AI systems may run in the "cloud," they have a real impact on the ground – in data centers that consume vast amounts of energy and water to host computing infrastructure. Growing resource demand is outpacing companies' efforts to increase hardware and training efficiency, posing challenges to sustainability objectives. Moreover, the true costs of these models are often obfuscated by the absence of mandatory reporting practices, allowing tech companies to evade accountability. Without transparency, policymakers and stakeholders lack the reliable data necessary to craft effective regulation targeting resource consumption and environmental concerns. Thus, to motivate evidence-based policymaking, this paper proposes (1) reporting requirements, (2) mandatory audits, and (3) a public database to bring to light the environmental cost of AI development and inform mitigation strategies.

Scope of the Problem

Each query of ChatGPT requires ten times more electricity than a typical Google search (Kerr, 2024), emphasizing a new level of strain on energy resources when multiplied by millions of users. Cooling these servers also presents a sizable water footprint: in 2023, data centers consumed 4.4% of the nation's electricity and 800 billion liters of water in operation and maintenance (Shehabi et al., 2024). These figures are only set to increase, with projections that data centers will consume up to 12% of the nation's electricity by 2028 (Shehabi et al., 2024). More specifically, within the next five years, 70% of data center capacity demand will be for hosting AI workloads (Srivathsan et al., 2024).

This demand remains unevenly distributed, with data centers depleting the resources of rural and suburban America in particular. Ideal construction sites are in areas with sprawling land insulated from natural disasters and in electricity transmission corridors (Vincent, 2025). As a result, data centers cluster among rural federal lands in Northern Virginia's "Data Center Alley," Texas, Georgia, and the Midwest. Energy strain multiplies in these few locations: Georgia's electricity consumption may rise to 17 times its current amount within the decade, and Virginia would require several new power plants to meet demand (Castellanos & Halper, 2024). Texas has already experienced electricity shortages from excess demand, so more data centers will only exacerbate this issue (Castellanos & Halper, 2024). Rural communities are "not against growth and economic development," but instead advocate for "doing it the right way" (Buck, as cited in O'Donovan, 2024). Residents near proposed facilities in Missouri, Kansas, and Northern Virginia have voiced strong opposition, citing water and electricity consumption as primary concerns (O'Donovan, 2024).

In addition to affecting resource supply, data centers also contribute to greenhouse gas emissions. A 2024 Google sustainability report attributed their data center and supply chain emissions for AI workloads to a 48% rise in their annual total company emissions since 2019 (Google, 2024). Thus, ensuring sustainability in data centers is crucial for preserving these resources and preventing worsening climate change. Increased global temperatures from rising emissions, exacerbated by increased electricity consumption to support AI infrastructure, will create a positive feedback loop that intensifies extreme weather events and natural disasters.

Severe weather, such as extreme heat, risk grid disruptions and strain water supply—both of which are exacerbated by data center operations. During a severe drought, a Google data center consumed one-third of the water supply of an Oregon community (Ocampo and

Schumann, 2024). The impacts of an unreliable grid and loss of water supply are far-reaching. Blackouts affect homes and businesses alike, alongside critical use cases in hospitals. Under the status quo, the digital divide widens as the communities most affected by data center construction bear AI's environmental costs without gaining access to its technology or economic benefits.

A Survey of Current Approaches

Current approaches vary across locales, but the U.S. lacks the rigor of the sustainability requirements that global counterparts in the European Union and Asia have adopted. In the U.S., the Security and Exchange Commission's (SEC) Environmental, Social, and Governance (ESG) disclosure framework requires U.S.-listed companies to submit annual reports on their carbon offsets and renewable energy credits, among other targets. Additionally, certain companies like Google voluntarily report the resource consumption of their data centers (van Dijk, 2024). The reporting requirements have motivated innovation in improving the energy efficiency of Google products, resulting in improved public perception (van Dijk, 2024). Thus, though an additional requirement, the proposed policy is already an industry standard supported by the precedent of existing environmental reporting requirements and reporting requirements for other facets of the supply chain (van Dijk, 2024).

In contrast, the European Union has a higher level of mandates, with the EU Energy Efficiency Directive requiring data centers with over 500kW capacity to disclose energy and water consumption, the proportion of renewable energy used, and the reuse of waste heat (European Commission, 2023). As part of the EU Taxonomy Environmental Delegated Act, investors must consider data center compliance with sustainability best practices under a penalty of cost premiums (European Commission, 2024). Other directives require commercial data

centers to provide energy data to authorities and customers (European Commission, 2023). These policies incentivize companies to incorporate sustainability into business practices (van Dijk, 2024). Similarly, in Asia, multiple countries either mandate or incentivize Power Usage Effectiveness (PUE) ratios below certain thresholds. China and Singapore lead by requiring new centers to reach PUE less than 1.3, while India reduces import duties for data centers with a PUE of less than 1.4 (Xie et al., 2024; Infocomm Media Development Authority, 2024; INDIA). Other enforcement structures include South Korea's fines, project cancellations, and license revocations for facilities that fail to comply with environmental regulations (Publicover, 2025). By contrast, the U.S. largely relies on voluntary adherence to regulatory frameworks, relying on corporate commitments without concrete incentives.

Additional weaknesses in the current U.S. approach include administrative turnover and jurisdictional fragmentation. In January 2025, former President Biden signed an executive order aimed at accelerating AI infrastructure projects and a longer-term green transition. Shortly after his inauguration this year, President Trump announced The Stargate Project, a proposed $500 billion investment in AI infrastructure exclusive to OpenAI (OpenAI, 2025). The Stargate Project does not include specific references to sustainability measures, which has prompted discussion about how data center expansion might affect environmental footprints (Sayegh, 2025). In addition to this tension at the federal level, there is also a discrepancy in state regulation. More environmentally progressive states have more stringent requirements, which contrast heavily with federal inaction. For instance, while the U.S. does not have national PUE targets, states like California mandate that all data centers larger than 10,000 square feet report their PUE. In California, building regulations require that data centers with PUE over 1.5 must reduce their PUE by 10% annually until they reach a target of 1.5 (Ellis et al., 2024). However,

this PUE remains higher than other adopted standards, such as the 1.3 PUE target adopted by China and Singapore with accompanying multi-year green transition plans, indicating a regulatory lag between the U.S. and other countries.

TABLE 1. Summary of global approaches to data center resource regulation

U.S.	EU	Asia
● Broad environmental impact disclosure (SEC ESG) ● Voluntary reporting (Google)	● Mandated energy efficiency metrics ● Investor and customer accountability	● National PUE targets of 1.3 (China, Singapore) ● Multi-year green transition plans

Despite PUE mandates in California, other data center clusters are in states like Texas, which lack similar regulations. Thus, it is evident that inconsistent policy can embolden facilities and firms to optimize their location to avoid regulation. It is worth noting that implementing standardized, national reporting requirements can raise compliance costs and enforcement challenges, leading to policy hesitance. Furthermore, there remain minimal direct incentives towards renewable energy use; instead, regulators like the EU leave it up to investors and businesses to consider sustainable practices, while the U.S. lacks an incentive structure entirely. The global inconsistency in current policies introduces additional complications for multinational corporations. Thus, our proposal builds off the foundations of existing U.S. regulation and derives additional reporting requirements empirically grounded in EU and Asian policies.

Policy Proposal

Transparency is a critical first step in reducing the environmental footprint of data centers. Downstream actions, whether environmental regulation, setting PUE targets, or creating financial incentives to reward energy efficiency, depend on a comprehensive and accurate

understanding of the extent of data center resource consumption. While transparency alone will not resolve the excess resource consumption of data centers, it is a necessary prerequisite to responsible data center resource management. Empirically, such approaches have spurred companies to improve efficiency, as seen in Google's voluntary reports, which have already driven internal energy optimizations (van Dijk 2024). Thus, mandated reporting requirements will pave the way for future environmental regulations and empower public and investor pressure on technology corporations to reduce resource consumption.

We propose reporting requirements limited to specific types of companies and data centers to minimize regulatory burden and compliance costs while ensuring comprehensive oversight. Specifically, the policy would apply to covered data centers operated by covered entities, with the terms defined as follows,

- Covered data centers: data centers with a minimum capacity of 500 kW, based on the precedent of the EU Energy Efficiency Directive (van Dijk, 2024).
- Covered entities: U.S.-listed companies and U.S.-based privately held corporations

Including U.S.-listed companies ensures that reporting requirements apply to offshore data centers and data centers operated by foreign companies on U.S. land, so offshoring centers or changing the base of a company would not avoid regulation among listed companies (Chapman, 2024). This scope has precedent: offshore sites and foreign companies are subject to reporting requirements on using conflict minerals per the Dodd-Frank Act of 2010 (Chapman, 2024). Thus, the proposed regulation applies to all sufficiently large data centers in the supply chain of covered entities.

Covered entities would be required to submit annual reports to a joint portal managed by the Department of Energy (DoE) and to the Securities and Exchange Commission (SEC), of their data centers' total annual:

- Electricity consumption, itemized by energy source
- Water consumption
- Proportion of renewable energy used
- Reuse of waste heat, energy, and water

Additionally, hyperscale data centers, defined as having a minimum capacity above 50 mW, will be required to submit third-party audits of their reports due to their sheer size (IBM 2024). As of 2023, hyperscale data centers comprise approximately 30% of the total data centers in the U.S., and U.S. hyperscale data centers account for 51% of the world's hyperscale data centers (Vincent, 2024; Knapp & Kammen, 2024).

The SEC has jurisdiction over publicly listed companies, while the DoE has jurisdiction over U.S.-based companies. Publicly listed companies must submit annual filings, known as 10-K filings, and ESG disclosure reports to the SEC at the end of their fiscal year. Thus, under our proposed policy, publicly listed companies will submit their data center report concurrent with their ESG disclosure and 10-K filings to the joint portal. Private U.S.-based companies will submit only their data center report at the end of the fiscal year to the same joint portal. The forms in the joint portal will be aggregated into a singular, public database. Public data allows for third-party verification by researchers, journalists, and environmental groups, preventing corporate greenwashing. Additionally, a public dataset empowers companies and third parties to analyze how data centers consume resources to optimize data center locations and adjust local policies to ensure responsible resource management.

The proposed policy will not require or include the disclosure of proprietary business information or trade secrets. Public reporting is the industry standard among voluntary reporters, and all ESG disclosures are public (Securities and Exchange Commission, 2024). Initial concerns about ESG disclosures centered on protecting proprietary information—early drafts required detailed disclosures of internal carbon price calculations and detailed emission-reduction plans. These requirements were later relaxed to prevent revealing such trade secrets (Securities and Exchange Commission, 2024). This proposed policy also does not infringe on proprietary information as it only requires data on consumption rather than rationale or action plans. Both per-data center and in-aggregate resource consumption will be made public. Firms' possession of data centers in and of themselves are not company secrets, and reporting per-data center ensures that third parties can analyze how resource consumption can manifest disproportionately in different areas.

Audits of hyperscale data centers must be conducted annually by accredited third parties. The SEC and DoE will keep private, unredacted copies of the audits, while redacted versions with references to proprietary data or trade secrets removed will be published publicly. Given the size of hyperscale data centers and how they are typically focused on AI, audits ensure that companies have accurate reports of their most resource-intensive data centers. Furthermore, publishing the redacted audits also incentivizes compliance, as watchdogs and researchers can utilize the datasets for analysis. Transparency facilitates greater trust in the energy reports, which in turn improves investor and consumer confidence. According to a McKinsey report regarding the current SEC ESG disclosures, 97% of surveyed investors were in favor of auditing sustainability disclosures (Bernow et al., 2019). Transparency critical to environmental

accountability, and can improve investor confidence, investment prospects, and consumer approval of the data-center operating company.

Failure to comply with the proposed policy risks fines, with additional civil penalties for fraudulent reporting. Companies may fail to comply by submitting reports that are late, incomplete, or inaccurate. The existing precedent for environmental disclosures is the SEC's ESG, where the SEC determines fines based on non-compliance severity with an internal calculus understood to be proportional to a company's net worth. The SEC has full enforcement authority over publicly listed companies, and ESG fines have historically reached nearly 20 million dollars (Grewal, 2024). Thus, for the proposed policy, noncompliance among publicly listed companies would be enforced civilly by the SEC with fines determined by their internal process used for ESG violations. Additionally, for publicly listed companies, fraudulent reporting can result in investor lawsuits, lowered stock prices, a securities violation, and can even cause a company to be delisted (Grewal, 2024). Given the higher possible penalties for listed companies, the DoE should defer enforcement authority to the SEC if a company is U.S.-based and publicly listed. Executive agencies have more limited enforcement authority for regulations, so the DoE should only handle cases of private U.S.-based companies to minimize the overhead of creating an enforcement team within the DoE. To comply with precedent and minimize discrepancies in penalties between listed and private companies, the DoE should also have the flexibility to determine fine amounts relative to a company's worth. Regardless of the agency, penalties should be tiered, so late submissions receive warnings, incomplete submissions incur fines, and fraudulent reporting results in fines and potential lawsuits. Although the policy will be enforced against all covered entities operating a covered data center, the fines will be proportional to the company's net worth. A small company will not receive the same fine as a

"Big Three" datacenter company like Amazon, Google, or Microsoft. Ultimately, companies will incur civil and financial damages in lieu of criminal penalties for violating the proposed policy.

Advantages and Limitations

The proposed policy has several advantages and limitations that affect the stakeholders interested in the policy. First, the policy provides transparency into the resource consumption of data centers that enables a clear, data-driven understanding of which data centers consume which resources and how sustainable that consumption is. Thus, the policy will find support from environmental groups and associated investigative journalists interested in preventing corporate greenwashing and holding companies accountable for resource overconsumption. The policy will likely be championed by politicians who prioritize environmental sustainability, including progressive and left-wing Democrats at the federal and state levels. Additionally, the policy may find grassroots support from residential groups who want to ensure their utilities are not diverted toward data centers. Southern communities facing impending data center contracts have increasingly organized to block construction, from creating Facebook groups to hosting rallies and creating anti-data center yard signs (O'Donovan, 2024). The focus of grassroots opposition centers on resource consumption, so local community members and politicians may appreciate having the historical data of a company's resource consumption before approving or protesting the construction of a data center in their locality (O'Donovan, 2024). Additionally, transparency and access to historical data will empower local governments, utility companies, and infrastructure stakeholders to prepare for changes to their demand and supply if a data center is being constructed in their jurisdiction. These constituencies can be engaged through town halls and meetings to understand what data and results would be most useful to them. For example, utility companies have empirically required technology companies to contribute to upgrading

electrical infrastructure based on the projected demand of the data centers (O'Donovan, 2024). Access to a larger dataset of electricity consumption by data centers can result in more fine-grained estimations and analyses, leading to better business planning. Meetings and discussions can result in certain groups endorsing the policy, which will build its political support.

Transparency in resource consumption can result in a competitive advantage for businesses. According to a 2019 McKinsey survey, nearly 90% of investors and 65% of company executives believe companies should be legally required to submit standardized sustainability reports, and research has proven a positive correlation between financial performance and a company's sustainability performance (Bernow et al., 2019). Environmental disclosures can build investor confidence and improve public and customer relationships by highlighting the company's commitment to environmental sustainability, high energy efficiency, and low resource consumption. This industry support should be leveraged to build alliances and receive endorsements to improve buy-in. There should also be public forums and discussions with investors and executives to field and address concerns.

The transparency motivated by the policy will also create a renewed focus on energy efficiency innovation. Thus, companies that want to use efficiency as a competitive advantage, and the green, renewable, and energy efficiency industries will back the policy as it stimulates business. Such supporters should be engaged with joint press releases to form alliances, receive endorsements, and emphasize the economic benefits that mandated reporting can provide.

However, the policy will also increase compliance costs for covered entities and may be perceived to have a chilling effect on data center construction and, by extension, the AI industry. Thus, companies with data centers and stakeholders in construction, AI, national security, and local economies may oppose the policy. The executives and stakeholders of concerned parties

should be invited to town halls and forums to address concerns. Additionally, press releases should highlight how reporting spurs innovation, improves investor and customer confidence, and is a prerequisite for creating power usage efficiency targets and associated financial incentives to be within those targets. Coverage should also emphasize how the policy is precedented, and most companies already have environmental reporting and compliance wings. This proposed policy is more limited in scope and thus less onerous than the ESG requirements.

Conclusion

Transparency is the first step toward a sustainable AI future. Now is the time for policymakers, industry leaders, and environmental advocates to act, or AI's escalating energy demands will continue to burden vulnerable communities, derail sustainability efforts, and compromise the reliability of power grids. Mandated reporting requirements for the resource consumption of data centers provide a critical foundation for informed decision-making, allowing stakeholders to analyze, improve, or halt inefficient data center operations. The proposed policy is built upon existing precedent and industry standards, balances innovation with oversight, and progresses towards more responsible data center management. By enacting this policy, policymakers will pave the way for future power usage efficiency targets, financial incentives for energy efficiency, environmental regulations, and bolstered investor and consumer confidence. Policymakers must act to implement these reporting measures, industry leaders must commit to compliance and innovation, and environmental interest groups must utilize this data to keep accountability and enact meaningful change. Without transparency, progress is nigh impossible, and this policy is an opportunity to create a more sustainable future that supports our innovation in AI.

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