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AI Data Center Siting on Federal Lands

An Energy View

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About This Report

The past few years have seen rapid advances in the capabilities of artificial intelligence (AI) models and their increasingly widespread use. As the resulting demand for AI computational resources is growing, difficulty finding and accessing reliable electric power grid capacity poses challenges for data center construction in the United States. To anticipate the constraints that these challenges might pose to future AI growth, a series of RAND reports is seeking to answer the following questions:

- What will the U.S. additional power capacity be by 2030?[1]
- What are the key constraints to scaling the U.S. power grid to meet additional demand?[2]
- What sites or regions in the United States have favorable and unfavorable characteristics for maximizing available energy capacity for AI data centers? What is an estimate of the maximum amount of power available for AI data centers at a single site by 2030?[3]
- What are the existing electrical equipment supply chain vulnerabilities that might constrain frontier AI data center development?[4]
- What federal policies could facilitate locating data centers on federal lands?[5]

Our previous research focused on data center energy constraints to evaluate potential sites based on their maximum available energy capacity. In that research, sites were already defined. This research instead focuses on a selection of sites on federal lands that may host data centers as part of public private partnerships (PPPs). We use methods developed in previously published work to evaluate a large sample of federal sites and identify existing patterns across them. We also update our previous framework by developing a data center cost model of energy procurement whose drivers are site-dependent; this update will allow quantitative comparisons across and within sites and agencies. We also ran a workshop during which we elicited information about site selection and PPPs and conducted a Day After exercise that explored the robustness of site selection decisions against different uncertainties, such as security or affordability. The results from this analysis inform our recommendations and guidelines to facilitate the location of data centers in federal lands.

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[1] Arciniegas Rueda et al., *Assessing the United States' Additional AI Power Capacity by 2030*.

[2] Arciniegas Rueda et al., *Expanding U.S. Net Available Power Capacity by 2030*.

[3] Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

[4] Arciniegas Rueda et al., *Supply Chain, Energy, and AI Nexus*.

[5] Our analysis in this report focuses on large data centers with large energy needs. Those large data centers are also called hyperscalers. For our modeling purposes, we consider data centers larger than 1GW.

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Summary

In July 2025, President Donald J. Trump signed Executive Order 14318, "Accelerating Federal Permitting of Data Center Infrastructure,"[6] indicating that, as part of his plan to promote technological leadership, his administration would "utilize federally owned land and resources for the expeditious and orderly development of data centers." The order also calls for support to identify suitable sites for the development of data centers. Given the increasing demands on the electrical grid—because of increasing electricity demand from data centers, decarbonization through electrification, and industrial growth[7]—and the Ratepayer Protection Pledge (RPP), made by the artificial intelligence (AI) industry to the Trump administration, that the data center boom will not raise electricity costs,[8] not all potential federal sites are well positioned for private sector investment in data center construction.

In this report, we explore how the federal government could facilitate the siting and construction of data centers on federal lands within the context of energy constraints. To do so, we address three questions:

1. What are the barriers and facilitators to locating infrastructure on federal lands, and what lessons can be learned from previous efforts to site infrastructure on federal lands?
2. What are the preferred characteristics of sites that are suitable for data center development on federal lands, for both the federal government and for private developers?
3. What information would support developers in responding to requests for lease proposals (RFLPs)?

Approach

For this research, we followed a mixed-methods approach to characterize existing and future efforts to site data centers on federal land. We identified characteristics of suitable federal sites for data centers that minimize energy constraints and created a data center energy cost model to allow a quantitative comparison of sites.

We held a workshop and Day After exercise with 14 federal and industry stakeholders to evaluate our findings regarding the development of frontier-scale data centers on federal lands and contribute to strengthened PPP guidance for such development.[9]

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[6] Executive Order 14318, "Accelerating Federal Permitting of Data Center Infrastructure."

[7] North American Electric Reliability Corporation, *2024 Long-Term Reliability Assessment*.

[8] White House, "President Trump Secures Historic Commitment to Keep Electricity Costs Down Amid Data Center Boom."

[9] This workshop was based on a series of RAND wargames and tabletop exercises called Infinite Potential that use the Day After methodology to explore potential artificial general intelligence (AGI) crises. Although the workshop

Key Findings

Siting and Building Data Centers on Federal Lands to Date

- **Contracts to develop data centers on federal lands are still limited, and those that exist might require accelerated schedules.** Seventeen federal sites have been selected across the U.S. Department of Energy (DOE)[10] and the U.S. Department of War (DOW)[11] for data center development, with no publicly announced U.S. Department of the Interior sites to date. Only three of the 17 sites have progressed to development agreements with private companies; given planned operational timelines as early as 2027, several of these projects will require accelerated permitting, construction, and energy deployment schedules.
- **Our analysis of Army RFLP frequently asked questions indicates that energy supply represents a major area of bidder inquiry**, approximately 27 percent of all questions. These inquiries focus on electricity availability, grid capacity, and natural gas infrastructure, **reinforcing the importance of clearly defined energy provisioning assumptions in federal RFLPs.**

Lessons Learned from Previous Infrastructure Development Acceleration on Federal Lands

- **Evidence from prior coordinated infrastructure acceleration initiatives suggest that grid interconnection constraints, permitting complexity, and fragmented multiagency coordination are persistent challenges that could affect data center development on federal lands.** Such impacts could include interconnection challenges for energy infrastructure, limited participation from bidders in the RFLP process for certain sites, shifting federal priorities and policies, and limited understanding of the National Environmental Policy Act process in the context of federal lands.
- **Federal land siting strategies for data centers should treat energy availability, interconnection capacity, and generation colocation potential as primary site selection criteria rather than downstream implementation constraints.** Early stage siting frameworks should explicitly incorporate transmission access, substation proximity, and scalable generation pathways into RFLP design to reduce permitting risks and accelerate time-to-power.

Suitability of Potential DOW Sites for Data Centers

- **The offered DOW sites are generally not as well-positioned for data center development as the offered DOE sites**. From an application of our framework, we

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scenario here is not conditional on AGI, the approach to facilitating a diverse stakeholder workshop is similar. For more information, see Smith et al., *Infinite Potential—Insights from the Robot Insurgency Scenario*.

[10] Four DOE sites have been selected for development. A larger list of 16 sites at 17 locations was released by the DOE in 2025. This larger collection was considered in our previous work: Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*. Our analysis in Chapters 3 and 4 of this report considers 29 potential federal sites (17 DOE locations and 12 DOW, excluding Lemoore Naval Air Station) and two comparator private sites.

[11] The Department of War is designated the Department of Defense under Public Law 81-216, National Security Act Amendments of 1949.

found that about 60 percent of the DOE sites have no serious energy capacity challenges, while only 20 percent of the DOW sites have no such challenges.
- Most sites across both departments have, at most, moderate potential energy capacity to provide the energy supply needed, **indicating that significant investments in energy generation will be needed at any site.**
- Approximately half of sites for both departments (40 percent for DOE and 50 percent for DOW) have sufficient land to host a 1-GW data center.[12]
- The DOW-identified sites are generally more suited for development from a governance perspective compared with DOE sites; the exception is the Alaska DOW sites.

Data Center Energy Cost Considerations

- **Sites reliant on grid power become less cost-effective at supporting larger compute loads.** As the load increases, it becomes more efficient to collocate generation, given that grid power includes market premiums to support front-of-the-meter generation elsewhere alongside the capital expenditure for interconnection, including building transmission and distribution infrastructure.
- **Energy infrastructure costs are of comparable magnitude to data center facility costs in large-scale deployments and represent an equivalent driver of site selection and investment decisions.** Energy system design should therefore be treated as a primary planning constraint alongside core data center construction.
- **There is no optimal site selection that robustly dominates the other sites examined under all possible scenarios; rankings vary depending on the sensitivity of input factors.** Under conditions that might be considered desirable for hyperscale AI data center development (such as 1-GW compute, onsite gas generation with local electricity grid interconnection, moderate water cooling costs and consumption, and a 5-percent discount rate), sites may be ranked according to expected present value energy costs (Table S.1). Under this assumption, a site (such as Edwards Air Force Base [AFB]) will be almost four times more expensive than the most desirable site, Sandia National Laboratories.
- Generally, sites in the Southwest, particularly in New Mexico and Texas (e.g., Sandia National Laboratories, Los Alamos National Laboratory, Stargate Abilene, and Fort Hood), performed well on energy cost modeling because of a combination of cheaper energy costs and existing gas and power infrastructure. However, although there were no sites that were always dominant, there were sites that were always poor performers, such as Edwards AFB, Princeton Plasma Physics Laboratory, and Brookhaven National Laboratory, suggesting these sites are not cost-effective for large-scale energy infrastructure development.

[12] Sufficient land use is based on the area allocated for a data center, generation resources, and transmission and distribution infrastructure.

Table S.1. Ranking of Sites, by Normalized Cost Under Standardized Assumptions

Rank	Site Name	Normalized Cost
1	Sandia National Laboratories	100
2	Los Alamos National Laboratory	100
3	Idaho National Laboratory	106
4	Fort Bliss	109
5	NETL Morgantown Campus	111
6	National Renewable Energy Laboratory	122
7	Eielson Air Force	127
8	Stargate Abilene	129
9	Portsmouth Gaseous Diffusion Plant	130
10	Savannah River Site	137
11	Fort Hood	138
12	Pantex Plant	139
13	Paducah Gaseous Diffusion Plant	153
14	Clear Space Force Station	154
15	xAI Colossus	161
16	Oak Ridge National Laboratory	161
17	Kansas City National Security Campus	161
18	Robins AFB	167
19	Fort Bragg	169
20	Arnold AFB	175
21	Pacific Northwest National Laboratory	178
22	Davis-Monthan AFB	202
23	Dugway Proving Ground	203
24	Joint Base Elmendorf-Richardson	215
25	NETL Pittsburgh	243
26	Argonne National Laboratory	246
27	Brookhaven National Laboratory	258
28	Fermi National Accelerator Laboratory	266
29	Edwards AFB	365
30	Joint Base McGuire-Dix-Lakehurst	366
31	Princeton Plasma Physics Laboratory	366

NOTE: The list of sites that we considered are two private sites (Stargate Abilene and xAI Colossus), 17 potential DOE sites identified in 2025, and 12 DOW sites across Army, Air Force, and Space Force bases that were announced in 2025 and 2026. Stargate and Colossus are included as examples of where hyperscale data centers are being built and powered to identify whether proposed federal sites are comparable. NETL = National Energy Technology Laboratory.

Findings from a Workshop to Deepen an Understanding of and Vet Useful Policies

- **PPP guidelines should focus on site-specific details, including early, structured engagement** with land authorities, utilities, state and local governments, tribal and community representatives, and operators and should **require up-front analysis** of land constraints, grid and water availability, security needs, permitting risks, workforce limitations, and clear contract terms for energy, mitigation, cost-sharing, and decommissioning. The guidelines should specifically design for long time horizons, cover financial structure and risk allocation, and clearly define accountability for broader public-interest obligations.
- **When environmental, cultural, and infrastructure conflicts are left unresolved after federal approval, a data center project can rapidly escalate from a siting dispute into overlapping community opposition, injunction-driven litigation, and political backlash** that together delay deployment, overshadow possible exploitable cyber and physical security vulnerabilities, and undermine broader U.S. strategic AI objectives.

Recommendations

- **Federal agencies considering offering sites for data centers should use screening methods, such as the ones used in this report, to make sure that the sites offered in an RFLP meet a minimum set of energy procurement requirements.** A pre-RFLP federal site-screening framework, such as the one developed in this report (see Chapter 4), could rank candidate data center locations. Such an approach can mitigate future delays by addressing foreseeable challenges early in the process.
- Current development RFLPs for federally sited data centers consider energy infrastructure to be a component that can be adapted to data center planning, but we find that energy availability is a critical path constraint that could restrict large-scale, high-density compute deployments. **A more-explicit treatment of energy infrastructure in RFLPs as a parallel and structurally integrated workstream, alongside civil works and data center construction,** would reduce the risk of sequential bottlenecks and support better coordination among responsible entities at the proposal stage rather than being introduced as a post-award integration requirement.
- Our analysis indicates that all considered sites will require considerable investments to supply energy to the data center. Given this, **federal agencies should request that potential RFLP bidders include information on what financing structure options they are considering to meet the Ratepayer Protection Pledge that these costs will not increase electricity rates for consumers**.
- To facilitate government and private organizations working together to develop data centers on federal lands, **the government should produce policy guidelines for data center PPPs**, such as the example shared in Appendix D of this report.

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Chapter 1. Introduction

Rapid advances in artificial intelligence (AI) are driving unprecedented growth in demand for computing power, creating new pressures on the U.S. electric grid. Between 2020 and 2023, power requirements for AI data centers increased tenfold, from 0.4 GW to 4.3 GW, and continue to grow exponentially.[1] RAND researchers expect that global AI data center power requirements could reach 327 GW by 2030.[2] Meeting this surge will require tens of GW of new generation capacity within the next few years to sustain U.S. competitiveness and prevent energy shortfalls that could undermine economic and national security interests.[3] Coordinated planning is becoming crucial to ensure that new energy resources, transmission networks, and data center siting decisions evolve in tandem with the accelerating growth of AI-driven electricity demand.[4]

Background and Motivation

This research focuses on the process of selecting data center sites on federal lands. In July 2025, President Trump issued Executive Order 14318, "Accelerating Federal Permitting of Data Center Infrastructure," promoting the use of federal lands for developing data centers.[5] The scale of infrastructure required to support AI operations and the specialized capabilities needed to sustain high-density, continuous power loads has renewed interest in developing federal sites for large-scale data centers and power generation projects. Federal lands offer unique advantages in terms of available space with existing transmission assets, but siting data centers on federal lands could also introduce regulatory and administrative challenges that can delay or constrain development.

In this report, we explore how the federal government could facilitate the siting and construction of data centers on federal lands within the context of energy constraints. To do so, we address three questions:

1. What are the barriers and facilitators to locating infrastructure on federal lands, and what lessons can be learned from previous efforts to site infrastructure on federal lands?

[1] Patel, Nishball, and Ontiveros, "AI Datacenter Energy Dilemma—Race for AI Datacenter Space."

[2] Pilz, Mahmood, and Heim, *AI's Power Requirements Under Exponential Growth*.

[3] Bistline et al., "Emissions and Energy Impacts of the Inflation Reduction Act"; North American Electric Reliability Corporation, *2024 Long-Term Reliability Assessment*; Pilz, Mahmood, and Heim, *AI's Power Requirements Under Exponential Growth*.

[4] Mahmood et al., *Possible Options for Unlocking and Securing U.S. Energy for AI Production*.

[5] Executive Order 14318, "Accelerating Federal Permitting of Data Center Infrastructure."

2. What are the preferred characteristics of sites that are suitable for data center development on federal lands, for both the federal government and for private developers?
3. What information would support developers in responding to requests for lease proposals (RFLPs)?

Structure of This Report

In Chapter 2, we discuss the motivation behind putting data centers on federal lands and lessons learned from previous efforts to develop infrastructure on federal lands. In Chapter 3, we examine the characteristics of federal sites suitable for data centers, including an assessment of energy supplies, grid infrastructure, supporting inputs, environmental conditions, and governance and community factors. We draw on a previously developed framework to rank U.S. Department of War (DOW) sites and explore the strengths and limitations of proposed sites.[6] In Chapter 4, we present a new data center energy cost model that can be used to further refine site feasibility evaluations, particularly with respect to the costs that data center developers will face in ensuring needed electrical supplies without raising rates for consumers. The analyses from our previous work were discussed during a workshop with government and industry representatives, which we discuss in Chapter 5. Insights from across the different chapters are connected in a set of policy recommendations in Chapter 6. Appendix A details additional assumptions that we used in our data center cost model. Appendix B presents applications of our evaluation framework to select sites. Appendix C provides workshop details, and Appendix D provides a set of policy guidelines for public-private partnerships (PPPs). We also include a glossary of key terms at the end of the report.

Key Assumptions and Limitations

Our approach has several assumptions and limitations related to the methods we used for qualitative site evaluations and quantitative cost modeling and the conclusions that we drew from the workshop, including the Day After exercise.

Qualitative Site Evaluation Framework

Chapter 3 follows a site evaluation framework (described in detail in the RAND report *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*) to evaluate the energy suitability of federal sites recently available by DOW.[7] This framework allows the categorization of sites in different tiers of energy suitability based on their overall

[6] The Department of War is designated the Department of Defense under Public Law 81-216, National Security Act Amendments of 1949.

[7] Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

grades across five categories: energy supply, energy system, supporting inputs, environmental considerations, and governance and community considerations. A site's relative suitability reflects the combination of these category scores rather than any single factor. The importance that specific users attach to different requirements for a specific data center could allow the use of more-specific criteria and help determine rankings between sites within a specific tier.

The framework used in this report is general; it has not been tailored for the specific needs associated with different federal agencies when considering placing a data center on their locations. A more detailed discussion of the assumptions and limitations of the methodology are described in the cited report.

Cost Modeling and Quantitative Scoring

Chapter 4 presents an exploratory cost modeling and qualitative scoring approach to evaluate sites under consideration. We use this model to evaluate prospective sites' potential to access the energy required to power 1,000 MW (1 GW) of compute. Our cost modeling approach is built on the main assumptions that

- we can identify all data center energy infrastructure components that vary in cost with location.
- these components, which we refer to as the *exterior supply infrastructure*, can be separated into multiple subsystems—transmission, gas generation, geothermal generation, cooling, workforce, land, and insurance—which drive site selection for an energy maximization and cost minimization decision.
- each subsystem is costed with the same assumptions (e.g., inflation, discount rate, normalized to 2026, 1,000 MW of compute, operational for fifteen years), the subsystems reference each other when appropriate (e.g., cooling efficiency and water use affect total required energy), and there are consistent costs (e.g., transmission line costs, labor costs per type of worker and region, industrial power prices).

Additionally, we gave each potential site a rough order-of-magnitude estimate of the cost to provide 1,000 MW of power to that site using a generation technology chosen by the user (grid, gas, and, where possible, solar or geothermal). Specific assumptions within each subsystem modeling, model construction, and inputs for the base-case scenario are provided in Chapter 4.

Our cost modeling approach is exploratory, and it borrows from preexisting models. Therefore, any limitations or outdated practices in these models will apply to the overall rankings we provide. We have taken efforts to align these different models so they are all updated to 2026 U.S. dollars and rely on the same consistent set of assumptions (e.g., labor costs, discount rate, project life cycle, and forward-looking inflation). We intend for our combined approach to focus primarily on relative comparisons between sites at a rough order-of-magnitude estimate, and not to ensure a high level of precision within that estimate. Similarly, we do not adjust estimates to account for differences in material costs by location; instead, the cost model reflects local conditions and the built environment to estimate what new infrastructure is needed. When conditions are less favorable, costs to support the same amount of compute load are high. This

approach allows comparison between sites using the inputs captured in the framework. Our sensitivity analysis reflects the model as is following the integration of multiple smaller models and the ranking of sites according to that model.

Workshop and Day After Exercise

We designed the workshop to elicit structured, scenario-based responses describing how participants and their organizations would likely respond under defined conditions. These responses are self-reported intended actions rather than empirical facts or subjective opinions. Also, the Day After methodology typically needs to be conducted multiple times to collect enough data; we did only one such collection, so any results from the workshop should be understood as tentative at best.

Further Research

Our research identifies a couple of areas of further research. The federal government expects that the data center pledge of a 0-percent increase in rates is respected.[8] **The mechanisms by which this pledge can be met and the implications of those options deserve further research**. For instance, more research could be done on whether this pledge could be met with only a bridge power option in which there is no anticipated connection to the grid.[9] Such an option will have implications for the reliability and resilience of the data center itself. Similarly, the results of our analysis indicate that most of the existing sites would require significant investments during a time of deep uncertainty related to AI demand, and so the risk of overcapacity and the emergence of stranded assets is a real possibility. **Research on alternative uses for data centers and other stranded asset management mechanisms is worth considering.**

[8] White House, "Ratepayer Protection Pledge."

[9] *Bridge power* refers to a temporary power source used to support a system during a transition period, such as power grid buildup or power grid maintenance.

Chapter 2. Building on Federal Lands: Prior Infrastructure Development and Efforts to Site and Build Data Centers

In this chapter, we contextualize the federal government's initiative to use federal lands for AI data center development. In July 2025, Executive Order 14318 prioritized the acceleration of and use of federal lands for AI data center infrastructure development. Executive Order 14318 established a framework to expedite the federal permitting and development of large-scale AI data centers and associated infrastructure by offering financial support for qualifying projects; ordering federal agencies, such as the U.S. Environmental Protection Agency (EPA), to streamline environmental reviews and permitting; and instructing the U.S. Department of the Interior (DOI), U.S. Department of Energy (DOE), and DOW to identify potential federal sites for data center project development.[10] In addition to Executive Order 14318, *America's AI Action Plan* outlines a framework to secure and expand U.S. dominance and leadership in AI organized around three main pillars: accelerating innovation, building U.S. AI infrastructure, and leading international AI diplomacy and security.[11]

Lessons Learned from Previous Efforts to Accelerate Infrastructure Development Using Federal Lands

Several previous initiatives have sought to use federal lands or federal real estate to accelerate infrastructure development in such sectors as energy and telecommunications. Table 2.1 summarizes these campaigns and the lessons learned for AI data center development. For example, power grid interconnection and grid capacity constraints have affected past infrastructure initiatives. Similarly, given the large and multiyear nature of data center investments, investors will likely be concerned, as they have been in previous initiatives, with the political landscape.

Table 2.1. Examples of Using Federal Lands to Accelerate Infrastructure Development

Initiative	Description of Initiative	Applicable Lessons Learned for Data Centers
Utility-scale renewable energy production (BLM leasing programs)	In 2021, the Biden administration directed DOI (specifically BLM) to increase renewable energy production by developing geothermal, solar, and wind power generation infrastructure on	• Political uncertainty hindered private sector investment. For example, in 2025, the Trump administration revoked tax credits for renewable energy projects, reduced grant funding, and cancelled loan commitments. These setbacks resulted in the

[10] Executive Order 14318, "Accelerating Federal Permitting of Data Center Infrastructure."

[11] White House, *Winning The Race: America's AI Action Plan*, July 2025.

Initiative	Description of Initiative	Applicable Lessons Learned for Data Centers
	federal lands. The BLM developed and implemented the Renewable Energy Rule, which was designed to reduce development fees and accelerate the project approval process.	cancellation of 32 projects representing $22 billion in domestic investments in the first half of 2025. • Programs tied to the federal renewable energy production initiative lacked clear top-down priorities. Programs attempted to achieve multiple goals and objectives resulting in project trade-offs and delays. • The absence of standardized performance metrics for deployment timelines and firm capacity delivery created difficulties in tracking program effectiveness. • Several projects faced grid interconnection constraints, such as limited transmission capacity, inconsistent regulatory processes, and queue delays. • Although some sites received several bids, many had limited bidder participation.
5G deployment	The Mobile Now Act of 2018 directed the FCC and the NTIA to accelerate the deployment of advanced wireless broadband services. The use of federal lands and rights-of-way supported rapid 5G infrastructure deployment through interagency coordination.	• Colocation of infrastructure on federal lands was effective when physical and regulatory dependencies were prealigned, but project delays existed because of environmental reviews and historic preservation requirements. • Although the FCC and FTIA made progress to accelerate deployment and infrastructure development, the absence of a unified federal siting and infrastructure coordination strategy across agencies led to fragmented implementation. • Coordination between land management agencies and the FCC and NTIA was fragmented.
Federal spaceport and launch infrastructure expansion	Per Executive Order 14056 and the *National Space Policy*, the federal government encouraged public-private collaboration to accelerate space infrastructure development. Specifically, these policies enabled the commercial sector to use and access government infrastructure for space-related activities. Federal facilities were opened to commercial use through leasing, licensing, and partnership agreements (e.g., Space Act Agreements) to expand launch capacity and support commercial space activity.	• The increase in both commercial and government space launches has led to capacity constraints and challenges in cost allocation and recovery mechanisms. Although DOW can bill commercial entities for the use of federal infrastructure, the federal government struggles in its ability to accurately calculate these costs. • Although the use of federal launch sites for commercial operations has been successful, the coordination processes were complex and time-consuming. Better data-sharing and coordination could help to streamline property access and safety reviews. • Early communication and mutual understanding between organizations is essential for the partnerships to be successful.

SOURCES: Bureau of Land Management, DOI, “Rights-of-Way, Leasing, and Operations for Renewable Energy”; Executive Order 14056, “The National Space Council”; Fahs, Propp, and White, *Implementing Federal Clean Energy Programs*; Lindbergh, *Commercial Space*; NTIA, “Final Report on Status of Implementation of Mobile Now Act Section 606(c) Requirements”; Office of Audit and Evaluation, *Broadband Stakeholders Identified Various Challenges Affecting Broadband Deployment*; Renewable energy infrastructure subject-matter expert, interview with the authors, April 17, 2026; Scherer, *Policy Reforms to Launch U.S. Space Innovation*; U.S. Government Accountability Office, *National Security Space Launch*; U.S. Senate, Mobile Now Act; White House, *National Space Policy of the United States of America*.
NOTE: BLM = Bureau of Land Management; FCC = Federal Communications Commission; NTIA = National Telecommunications and Information Administration.

Existing Efforts to Site and Build Data Centers on Federal Lands

Identification of Potential Sites

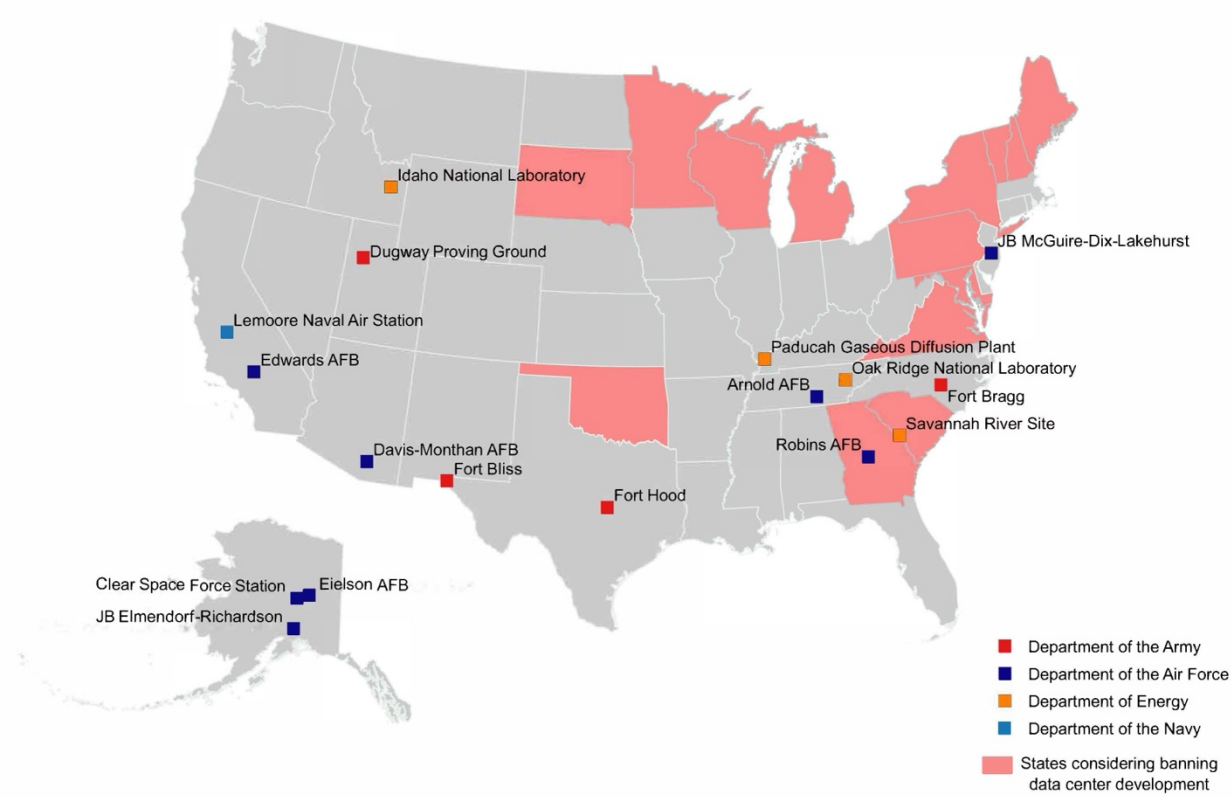
At the time this report was prepared, we identified 17 federal sites that had been selected for data center development by DOE, the U.S. Department of the Army (DOA), the U.S. Department of the Air Force (DAF), and the U.S. Department of the Navy (DON), as illustrated in Figure 2.1. We identified these sites by reviewing site selection announcements, federal procurement and leasing notices (e.g., requests for information [RFIs], RFLPs) from federal entities, and partnership and project announcements from private sector entities. These sites are at varying stages of procurement and development, and agencies have used different siting and solicitation approaches. As of April 2026, no DOI site selections have been publicly announced.

In a few cases, these sites are in states where state policy might ban or limit the development of data centers. The National Conference of State Legislatures tracks states considering moratoriums on data centers (highlighted red in Figure 2.1).[12] These policies vary from state to state, including moratoriums banning data centers until a specific timeframe, bans on the development of data centers greater than a specific size, prohibitions on the development of data centers unless specific conditions are satisfied, and prohibitions on the development of data centers entirely. The status of these policies also varies by state; such states as Delaware, Georgia, Pennsylvania, and Michigan have introduced bills, whereas such states as New York and Oklahoma have passed legislature and failed legislature, respectively. Most federal sites selected for data center development are not located in states that are considering bans on data center development with the exception of Savanah River Site in South Carolina and Robins AFB in Georgia. Some sites, such as Fort Hood in Texas, are in states that are favorable to the data center industry.[13]

[12] National Conference of State Legislatures, "Which States Are Banning Data Centers?"

[13] Arciniegas Rueda et al., *Assessing the United States' Additional AI Power Capacity by 2030*.

Figure 2.1. Publicly Announced Federal Sites Selected for Data Center Development



SOURCES: Features information from federal data center site election announcements from DAF, "RFLP Artificial Intelligence (AI) Data Center Development at Joint Base Elmendorf Richardson, Eielson Air Force Base, and Clear Space Force Station"; DOA, "Enhanced Use Lease for Commercial Data Centers"; DOE, "DOE Announces Site Selection for AI Data Center and Energy Infrastructure Development on Federal Lands"; Ameresco, "Ameresco and U.S. Navy Partner to Build AI-Optimized Data Centers and Energy Infrastructure at NAS Lemoore"; and states considering moratoriums on data centers through the National Conference of State Legislatures as of July 6, 2026 (National Conference of State Legislatures, "Which States Are Banning Data Centers?").
NOTE: AFB = Air Force base; JB = joint base.

In April 2025, DOE issued an RFI to assess industry interest in developing AI infrastructure on DOE-owned or DOE-managed lands; the RFI identified a list of 16 potential sites that DOE was considering for such development.[14] The RFI also requested input from electric grid operators serving DOE sites on the challenges of and opportunities for existing energy infrastructure and collocating data centers alongside new energy generation infrastructure. In July 2025, DOE announced it had selected four sites that it would advance to RFLPs for data center and energy generation projects: Idaho National Laboratory, Oak Ridge National Laboratory, Paducah Gaseous Diffusion Plant, and Savannah River Site.[15]

[14] Office of Policy, DOE, "Request for Information on Artificial Intelligence Infrastructure on DOE Lands."

[15] DOE, "DOE Announces Site Selection for AI Data Center and Energy Infrastructure Development on Federal Lands."

Across DOW, 13 sites were identified as feasible for data center development:

- DAF announced five sites on October 21, 2025: Arnold AFB, Davis-Monthan AFB, Edwards AFB, JB McGuire-Dix-Lakehurst, and Robins AFB. The announcement included an RFLP inviting offers by November 14, 2025.[16] According to DAF, the selection of these five sites was "based on market analysis, infrastructure availability, and strategic importance."[17]

  On April 10, 2026, an additional three sites in Alaska were announced: JB Elmendorf-Richardson, Eielson AFB, and Clear Space Force Station.[18]

- Similarly, DOA announced the selection of four sites through an RFLP on January 29, 2026: Fort Hood, Fort Bragg, Fort Bliss, and Dugway Proving Ground. Offers for this RFLP were due on February 23, 2026.[19]
- DON selected Lemoore Naval Air Station for AI data center and energy infrastructure per an announcement on September 9, 2025.[20]

Sites with a Private Developer Selected

Of the 17 federal sites we examined, only three have advanced to developer selection and conditional agreements. On March 26, 2026, DOA announced conditional agreements with CyrusOne and Carlyle to develop data centers on Dugway Proving Ground and Fort Bliss, respectively.[21] The planned operational dates are 2027 for Fort Bliss and 2029 for Dugway Proving Ground.[22] DON has partnered with Ameresco and CyrusOne for a 100-MW AI data center and associated energy infrastructure at the Lemoore Naval Air Station, and initial operations are expected to begin in 2027.[23] Although several projects target operational dates as early as 2027, industry benchmarks suggest that achieving 1 GW–scale facility power can take approximately 1.0 to 3.6 years from the start of construction, depending on the site and energy conditions.[24]

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[16] DAF, "Request for Lease Proposal for Artificial Intelligence (AI) Data Center Development at Arnold AFB, TN, Davis-Monthan AFB, AZ, Edwards AFB, CA Joint Base McGuire-Dix-Lakehurst, and Robins AFB, GA."

[17] Office of the Assistant Secretary of the Air Force for Energy, Installations, and Environment, "Have Questions About the Solicitation for AI Data Centers? We Got Answers."

[18] DAF, "RFLP Artificial Intelligence (AI) Data Center Development at Joint Base Elmendorf Richardson, Eielson Air Force Base, and Clear Space Force Station."

[19] DOA, "Enhanced Use Lease for Commercial Data Centers."

[20] Ameresco, "Ameresco and U.S. Navy Partner to Build AI-Optimized Data Centers and Energy Infrastructure at NAS Lemoore." Lemoore Naval Air Station is not included in the subsequent site analysis in this report.

[21] U.S. Army Communications and Outreach Office, "Army Reaches Conditional Agreement with Private Industry for Hyperscaled Data Centers."

[22] Jim Turkel, "What Is Enhanced Use Leasing?"

[23] Ameresco, "Ameresco and U.S. Navy Partner to Build AI-Optimized Data Centers and Energy Infrastructure at NAS Lemoore."

[24] Somala and Cottier, "Build Times for Gigawatt-Scale Data Centers Can Be 2 Years or Less."

Analysis of the Army's RFLP Frequently Asked Questions

To better understand what information developers might be seeking to respond to data center RFLPs, this section analyzes frequently asked questions (FAQs) submitted by potential bidders in response to Army RFLPs at the four sites identified by DOA.[25] We collected and categorized 67 question-answer pairs by topic areas and in four site-specific RFLPs and one consolidated RFLP (Tables 2.2 and 2.3).[26]

Table 2.2. Question-Answer Count, by Source

Source	Questions
Fort Bliss FAQs	9
Fort Bragg FAQs	13
Dugway Proving Ground FAQs	8
Fort Hood FAQs	15
Consolidated RFLP FAQs	22

SOURCES: DOA, "Dugway Proving Ground Industry Day Q&A"; DOA, "Fort Bliss Industry Day Q&A"; DOA "Fort Bragg Industry Day Q&A"; DOA, "Fort Hood Industry Day Q&A"; DOA, questions received by DOA in reference to Request for Proposals DACA27-1-26-102.

Topic classification indicates that the largest share of questions (28 of 71 coded instances) related to the RFLP process, including bid evaluations, contract structures, site access, and procedural requirements. Energy supply constituted the second-largest category (19 questions), reflecting bidders' focus on electricity and gas availability, grid capacity, and interconnection constraints. Supporting inputs—such as land conditions, water availability, and easements—accounted for 19 questions, and governance and community considerations accounted for five questions.

[25] DOE FAQs were not available for a comparable analysis of DOE sites.

[26] There were 71 codes instances because some of the questions covered more than one topic.

Table 2.3. FAQ Topics

Subject	Questions
Topics specific to the RFLP process	28
Army utility finance	3
Bid selection	4
Contract negotiation	3
In-kind preference	5
RFLP logistics	4
Site access	5
Use of data center facility	4
Energy supply	19
All utilities	3
Electric grid	7
Electric supply	4
Gas grid	2
Gas supply	3
Governance and community considerations	5
Environmental impacts and permitting	3
Jurisdiction	2
Supporting inputs	19
Building permits and easements	4
Land specifics	8
Rail access	1
Water	6
Total	**71**

SOURCES: DOA, “Dugway Proving Ground Industry Day Q&A”; DOA, “Fort Bliss Industry Day Q&A”; DOA “Fort Bragg Industry Day Q&A”; DOA, “Fort Hood Industry Day Q&A”; DOA, questions received by DOA in reference to Request for Proposals DACA27-1-26-102.
NOTE: We use *all utilities* to refer to questions that were about both gas and electricity.

RFLP Process

Three questions related to utility financing indicate bidder uncertainty regarding counterparties responsible for energy provisioning and infrastructure coordination. Clearer delineation of utility engagement pathways could improve bid efficiency and reduce coordination risk during project development.

Five questions about in-kind rent preferences point to a demand for a more-explicit articulation of acceptable compensation structures across sites. Providing standardized examples of acceptable in-kind contributions could improve bid comparability and reduce ambiguity in proposal designs.

Five questions were about site access, reflecting the importance of logistics and security constraints in construction sequencing and in operational data centers as critical infrastructure systems. The responses confirmed that access routes bypass internal security checkpoints, reducing potential construction delays and minimizing operational disruption to base activities.

Energy Supply

The largest number of energy supply questions related to grid interconnection and generation availability, which is consistent with broader evidence that energy supply is a binding constraint in data center deployment and that AI training and inference require new sources of generation alongside a preference for grid access.[27] This reinforces the importance of defined power-delivery assumptions in future RFLP solicitations.

Governance and Community Relations

Within this category, there were three questions related to environmental impact and permitting. Specifically, these questions related to the availability of environmental impact statements and responsibilities for both wetland permitting and mitigation lands for threatened and endangered species. Additionally, there were two questions seeking clarification about which land areas and/or systems were under which jurisdictions.

Supporting Inputs

Eight land-related questions highlight uncertainty regarding site conditions, including prior military use and environmental hazards. Land availability is an important issue when considering the location of behind-the-meter (BTM) generation because some options (such as solar) require a significant amount of land. Departments can be clearer about the history of their offered land. They can also consider framework refinements to reflect their specific land-use characteristics; we discuss this issue further in the "Qualitative Analysis Using the Energy Suitability Evaluation Framework" section of Chapter 3.

Energy System

There were no questions in the energy system category. Again, this could reflect the fact that it includes criteria broadly applicable beyond Army facilities. For example, processes at the level of independent system operators (ISOs) and public utilities commissions (PUC) apply to the entire jurisdiction if it includes the base. The lack of energy system questions could also reflect developers' sentiment that they are more efficiently poised to affect these criteria. Data centers are involved in regulatory reform efforts at all levels of government. Developers might wish to avoid any potential backlash from such federal entities as DOW becoming involved in state and

[27] Arciniegas Rueda et al., *Assessing the United States' Additional AI Power Capacity by 2030*.

regional proceedings. We see no evidence that data centers are seeking DOW involvement or expertise relating to energy system criteria.

Key Findings

We developed the following key findings as they relate to past infrastructure development efforts on federal lands and our assessment of data center developers' questions about the DOA's RFLPs:

- **Contracts to develop data centers on federal lands are still limited, and those that exist might require accelerated schedules.** Seventeen federal sites have been selected across DOE and DOW for data center development, although there have been no publicly announced DOI sites to date. Only three of the 17 sites have progressed to development agreements with private companies; given planned operational timelines within 1 to 2 years, several of these projects will require accelerated permitting, construction, and energy deployment schedules and contingencies for the likelihood of delayed projects.
- **Evidence from prior coordinated infrastructure acceleration initiatives suggest that grid interconnection constraints, permitting complexity, fragmented multiagency coordination, and political uncertainties are persistent challenges that could affect data center development on federal lands.** Such impacts could include interconnection challenges for energy infrastructure, limited participation from bidders in the RFLP process for certain sites, shifting federal priorities and policies, and a limited understanding of the National Environmental Policy Act (NEPA) process in the context of federal lands.
- **Analysis of Army RFLP FAQs indicates that energy supply represents a major area of bidder inquiry**, approximately 27 percent of all questions. These inquiries focus on electricity availability, grid capacity, and natural gas infrastructure, **reinforcing the importance of clearly defined energy provisioning assumptions in federal RFLPs.**
- **Federal land siting strategies for data centers should treat energy availability, interconnection capacity, and generation colocation potential as the primary site selection criteria rather than downstream implementation constraints.** Early stage siting frameworks should explicitly incorporate transmission access, substation proximity, and scalable generation pathways into RFLP design to reduce permitting risks and accelerate time to power.

In Chapter 3, we assess the sites identified on federal lands according to energy supply, energy system, supporting inputs, environmental considerations and governance and community considerations using a framework developed in our previous report, *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.[28]

[28] Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

Chapter 3. Using an Energy Suitability Ranking Framework to Screen Potential Federal Sites for Data Center Development

Given the importance of energy availability for developing data centers on public land, in this chapter, we use a framework to screen the energy suitability of the eight DAF sites and four DOA sites that have been offered for lease for this purpose.[29] We refer to previously published research and evaluate the DOE sites using this framework. We begin with an overview of the framework and then present the results for each site.

Framework and Process Overview

The qualitative site evaluation framework, which was developed in the previous report *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*, focuses on energy generation options that are available or required to meet power demand at a single data center location.[30] The framework includes an analysis of the various inputs to local energy supply (such as the regional transmission network and grid-connected generation) and opportunities for colocated generation resources that could be powered by either fossil fuels or renewable energy and supported by battery or other storage technologies. It also accounts for both critical site-specific factors (such as land and water availability) that can constrain or enable energy generation and other solutions that support the development of data center clusters. These factors are organized into categories and then combined to form an overall assessment of each site's relative energy-related suitability.

The framework allows the categorization of sites into different tiers of energy suitability based on their overall grades across five categories: energy supply, energy system, supporting inputs, environmental considerations, and governance and community considerations. A site's relative suitability reflects the combination of these category scores with equal weight rather than any single factor.

Limitations to Our Application of the Framework for This Study

The framework used in this report is general; it has not been tailored for the specifics associated with different federal agencies that might consider placing data centers at their locations. We discuss additional steps that DOW and other agencies can take to refine this framework at the end of this chapter. Additionally, the framework was developed to evaluate site

[29] Our analysis did not include the single DON site (Lemoore Naval Air Station) because of time constraints.

[30] Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

suitability for a data center with a peak electric load requirement of 1 GW.[31] Sites much bigger or much smaller might face unique challenges not fully considered by the criteria and evaluation rankings within the framework.

Finally, we reiterate that the framework focuses on enabling the substantial energy resources needed for data centers. The framework does not address all considerations for siting data centers. For example, DOW might wish to consider the security considerations and potential health impacts to its employees and their families if power generation for data centers is built near DOW installations.[32, 33] Our framework does not reflect these considerations nor related ones, such as the strategic rationale for data centers designed for AI competition with U.S. geopolitical adversaries, including resilience to kinetic or cyber-attacks. Any considerations beyond the energy needs of the data centers should be evaluated with tools designed for those purposes.

Selected Framework Details

The application of the framework begins by defining the three components needed to provide a data center's energy needs: energy generation that will be the source of power, energy delivery that will bring the power to the site, and an implementation plan to begin actual power flow. Energy generation and energy transmission include such infrastructure as power plants, towers, and power lines. The implementation plan is a set of resources and processes. Within this set of resources and processes, there are potential barriers to implementation and enablers that work to minimize the barriers. **We assume that the energy-related suitability of a site for hosting a data center is based on maximizing the effect of enablers while limiting the impact of barriers.**

The framework assessment contains 27 criteria (listed in Table 3.1) that are evaluated within the five categories identified previously:[34]

- The **energy supply** category contains evaluations of the potential for various generation resources (solar, wind, natural gas, nuclear, geothermal, and other resources) and the ability of the local electric grid to accommodate new generation.
- The **energy system** category contains evaluations of the performance of the energy ecosystem in the region and measures of the effectiveness of processes for planning grid changes, connecting new generation resources, and connecting with large new customers. It also contains measures of local utility rates and reliability.

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[31] Multiple firms are planning to build and building data centers of this size. For details, see Staley, "AI Data Centers Are Pushing Past 1 Gigawatt. Here's What That Means for the Grid."

[32] Muller, *Measuring the Impact of Data Centers in the United States Economy*.

[33] Belle et al., "The National Security Implications of Building Frontier AI Data Centers Overseas."

[34] Details on the criteria used in this framework and the measures used for criteria indicators are available in Appendix A of Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

- The **supporting inputs** category contains measures of the requirements for carrying out the construction and operation of a data center, such as the availability of land and water, the accessibility of the workforce, and construction costs. This category also contains measures of the effectiveness of local regulatory and legislative processes.
- The **environmental considerations** category contains evaluations of local temperatures to measure the resource intensity of cooling a data center and of air quality to measure the ability to perform certain types of construction. It also contains measures of natural disaster risk to evaluate the likelihood of calamity in the region.
- The **governance and community considerations** category relates to the community aspects of implementing a data center. Criteria in this category are state-level regulatory risks that could affect the approval potential for new projects, community stress to measure the potential for new construction to be a welcome economic force, market size to gauge the energy importance of a new project, and electricity affordability to mitigate against potential rate increases.

Table 3.1. Energy Suitability Evaluation Framework Categories and Criteria

Category	Criterion (Name)
Energy supply (site specific)	Solar availability (BTM)
	Natural gas availability (BTM)
	Wind availability (BTM)
	Geothermal availability (BTM)
	Nuclear availability (BTM)
	Other resource availability
	Resource diversity
	Nearby capacity
	Delivery (existing T&D)
Energy system	ISO-level expected capacity additions
	ISO-level resource adequacy assessment (NERC)
	Utility-level reliability performance (EIA SAIDI and SAIFI data)
	State-level average power price (EIA)
	ISO- and PUC-level large-load interconnection processes and timelines (regulatory)
	ISO- and PUC-level resources and T&D planning processes (regulatory)
Supporting inputs	Regulatory and legislative processes
	Cleared land
	Water availability
	Workforce accessibility
	Construction costs
Environmental considerations	Climate zone and cooling needs
	EPA nonattainment zone
	Natural disaster risk

Category	Criterion (Name)
Governance and community considerations	Regulatory risk assessments, by state
	Community stress level index (assessed at the city level)
	Market size
	Electricity affordability for the community
	Community opposition

NOTE: EIA = U.S. Energy Information Administration; NERC = North American Electric Reliability Corporation; SAIDI = System Average Interruption Duration Index; SAIFI = System Average Interruption Frequency Index; T&D = transmission and distribution.

The framework was designed to evaluate individual indicators that collectively determine overall grades ranging from A to E for each category. Each category consists of multiple quantitative and qualitative indicators, and a category's grade represents the average of those component scores. Although indicators have specific quantitative descriptions—such as measured energy prices, generation capacity, or transmission-line distances—the final grade for each category is more qualitative.[35] Because categories vary in the number of indicators they include, interpretations of category grades should account for differences in the underlying details. The grades can generally be interpreted as follows:[36]

- A—Factors in this category do not constrain potential energy capacity.
- B—Factors in this category are supportive of high potential energy capacity.
- C—Factors in this category are supportive of moderate potential energy capacity.
- D—Factors in this category are supportive of low potential energy capacity.
- E—Factors in this category do not support energy capacity and sites should not be included in an RFLP.

Qualitative Analysis Using the Energy Suitability Evaluation Framework

We present the results of our analysis in Table 3.2. Details about the specific criteria ratings for each site are in Appendix B.

[35] We use this approach for ease of communication. Although we link more than 20 metrics to estimate the potential available energy capacity for data centers, the novelty of the topic means that there is no existing formula into which these inputs can be combined to calculate a single power capacity and reliability output at any site. Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites* provides quantitative metrics in Appendix B and, in Appendix C, briefly presents a more-quantitative analysis using simple decision rules to score sites.

[36] We provide precise definitions for each grade in Appendix A. We discussed the boundaries between grades with industry stakeholders and chose these boundaries to ensure that each grade can be interpreted per the previous explanations. These explanations were known to the raters' but not a factor in their decisions; the raters evaluated categories according to the full framework described in Appendix A of Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

Table 3.2. DOW Site Evaluations

Site	Grade, by Category					Land (Acres)
	Energy Supply	Energy System	Supporting Inputs	Environmental Considerations	Governance and Community Considerations	
Air Force						
Arnold AFB	C	C	C	C	C/B	274
Davis-Monthan AFB	C	C	C	D	C/B	2,300
Edwards AFB	B	D/C	C	D	B	2,115
JB McGuire-Dix-Lakehurst	C	D	C	D	C	193
Robins AFB	C	D/C	B	C	B	219
JB Elmendorf-Richardson	C	D	D	B	D	64,000
Eielson AFB	C/B	D	D	C	D	600
Clear Space Force Station	C	D	D	A	D	11,000
Army						
Fort Hood	B	C/B	B	D	B	207
Fort Bragg	C	C	B	C	B	734
Fort Bliss	C	C/B	B	D	B	1,384
Dugway Proving Ground	D	C	C	C	C/B	3,466

NOTE: This table presents a summary of the federal site evaluations in Tables B.1 through B.12 in Appendix B.

We see several common themes. One is that energy supply grades are middling for most sites. Edwards AFB and Fort Hood get Bs, the best ranking achieved across all sites. Dugway Proving Ground has the only D, owing to its isolation. Similarly, energy system grades are not particularly good for any site; most achieve a C. Forts Hood and Bliss rank the highest at the upper end of the C category. In addition, the available land is not particularly advantageous at any site except JB Elmendorf-Richardson.

Four of the sites have fewer than 300 acres available. This will be a problem for constructing a 1-GW data center. If the land requirement is 1 acre per MW,[37] the minimum required land will be 1,000 acres. **Thus, six of the sites do not meet this minimum.**

The three Alaska bases receive similar rankings. They have low energy supply and energy system grades. Their isolation yields low supporting inputs grades, and Alaska is not well suited for data center siting in terms of governance and community considerations.

Apart from the isolated Dugway Proving Ground, the Army sites are in areas with above-average supporting inputs grades. Finally, excluding the Alaska bases, nearly all sites yield a grade in the B range for governance and community considerations; only JB McGuire-Dix-Lakehurst falls short with a C.

[37] Kaiser, Craig, "Does My Land Qualify for a Data Center?"

The results suggest two focus areas for DOW to achieve data center construction on these sites. The first area relates to energy supply. Developers will need to expend significant resources to build generation supply. (In Chapter 4, we quantify some of these costs.) Low energy supply scores mean that the sites are constrained in terms of suitable energy supply alternatives.[38] Developers might need to focus their efforts on a single alternative for each site. Developers also might require expansions of the facilitating power plant networks, including electric grids, natural gas pipelines, and/or rail networks. **These expansions are typically carried out by the utility and rail companies, leaving developers unable to directly facilitate the work**. Regardless, such expansions require rights-of-way and permits, substantially increasing construction timelines. The other focus area relates to environmental considerations. Except for two Alaska bases, no site is in a good environmental situation. This could further restrict the choice of technologies available to supply generation. It could also require additional build-out to accommodate additional cooling loads and/or to mitigate against elevated levels of natural disaster risk.

Insights from Comparing DOW Sites with DOE Sites

In previous work, we evaluated the suitability of 17 DOE data center sites.[39] Comparing those evaluations with our evaluations of DOW sites in this report yields some observations that we describe in this section and summarize in Table 3.3.

Table 3.3. Comparison of DOW and DOE Sites

Category of Comparison	DOE Sites	DOW Sites (Excluding Alaska)	DOW Sites (Alaska Only)
No D or E category grades	10 of 17	2 of 9	0 of 3
Land availability to host 1-GW data center	7 of 17	4 of 9	2 of 3
Need for significant investment in generation	17 of 17	9 of 9	3 of 3
Most-common energy supply category grade	C	C	C
Most-common supporting inputs category grade	C or B	C or B	D
Most-common governance and community considerations category grade	C	B	D

[38] On-site generation technologies that we considered included natural gas, geothermal, wind, solar, and nuclear.

[39] The list of 17 identified DOE sites included two National Energy Technology Laboratory (NETL) options: Morgantown, West Virginia, and Pittsburgh, Pennsylvania. We treat these as separate sites because of differences in energy availability, regulations, and the surrounding environment. For more information, see Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.

First, most of the DOE sites are better than the DOW sites. Ten of the 17 DOE sites have no Ds in any category, while two of the 12 DOW sites have no Ds. Another observation is that most of the sites across both departments have a C in the energy supply category. There might be systemic reasons for why most of these facilities are not well suited to supply energy to a 1-GW data center. The reality is that very few sites in the United States are well positioned under existing policies to accommodate 1 GW of additional generation. In Chapter 4, we price the details of the energy constraints of a hypothetical 1-GW data center on the proposed sites.

A final observation is that the non-Alaska DOW sites tend to have higher governance and community considerations scores than the DOE sites. This could reflect the criteria within the category. One is community distress levels as measured by the Distressed Communities Index (DCI).[40] Most of the non-Alaska DOW sites have a DCI rating of mid-tier, comfortable, or prosperous as compared with other sites, which have a DCI rating of at risk or distressed. This dynamic could also be reflected in the energy burden criterion—higher incomes make energy at any price more affordable. The governance and community considerations criteria generally reflect broad societal realities around the sites—developers might not be able to alter these realities, but they might be able to tailor their community engagement strategies depending on which department's land the development will occur. Furthermore, given the lessons learned from previous infrastructure development projects on federal lands (Table 2.1), the federal government might opt to offer sites with favorable governance and community considerations grades so that local government entities will be incentivized to coordinate planning, reviews, and other parts of the development process.

[40] Economic Innovation Group, "Distressed Communities Index (DCI): A Definitive Lens on American Economic Wellbeing," webpage, undated.

Chapter 4. Using a Data Center Energy Cost Model to Further Refine Feasibility Analyses

As discussed in Chapter 3, most candidate sites require a substantial investment in energy infrastructure. In this chapter, we develop a quantitative energy cost model that extends the framework from *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites* to estimate the relative costs of constructing exterior energy supply infrastructure for powering a 1-GW data center.

The model compares four generation scenarios to power the data center: grid power, gas generation, geothermal power, and solar power with battery storage. To populate the model, we extended the qualitative framework from Chapter 3 to include workforce availability for industrial machinery and solar installation, wage levels, natural gas prices and required pipeline infrastructure, and geothermal temperature.

A sample of 31 sites were evaluated using the cost model: two private sites (Stargate Abilene and xAI Colossus),[41] 17 DOE sites (13 potential, four announced), and 12 DOW sites across Army, Air Force, and Space Force bases. The following is the full list of sites that we considered:

- Stargate Abilene (private site)
- xAI Colossus (private site)
- Idaho National Laboratory (announced DOE site)
- Paducah Gaseous Diffusion Plant (announced DOE site)
- Portsmouth Gaseous Diffusion Plant (potential DOE site)
- Argonne National Laboratory (potential DOE site)
- Brookhaven National Laboratory (potential DOE site)
- Fermi National Accelerator Laboratory (potential DOE site)
- NETL Morgantown Campus (potential DOE site)
- NETL Pittsburgh Campus (potential DOE site)
- National Renewable Energy Laboratory (potential DOE site)
- Oak Ridge National Laboratory (announced DOE site)
- Pacific Northwest National Laboratory (potential DOE site)
- Princeton Plasma Physics Laboratory (potential DOE site)
- Los Alamos National Laboratory (potential DOE site)
- Sandia National Laboratories (potential DOE site)

[41] In addition to the DOE sites, Stargate Abilene and xAI Colossus were included in our previous report, *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites,* as the two most prominent examples of publicly announced, private sector, hyperscale AI data centers. This report extends that analysis by adding 12 announced federal sites on DOW bases. Although other GW-scale private sector data centers have been announced, including by competitors to xAI and OpenAI (such as Microsoft and Meta), the purpose of this report is to evaluate and understand the siting of data centers on federal lands. Therefore, the two private sites are included as comparisons and examples of what can already be achieved on private land with limited federal support.

- Savannah River Site (announced DOE site)
- Pantex Plant (potential DOE site)
- Kansas City National Security Campus (potential DOE site)
- Arnold AFB
- Davis-Monthan AFB
- Edwards AFB
- JB McGuire-Dix-Lakehurst (Air Force, Army, and Navy base)
- Robins AFB
- Fort Hood (Army base)
- Fort Bragg (Army base)
- Fort Bliss (Army base)
- Dugway Proving Ground (Army facility)
- JB Elmendorf-Richardson (Air Force and Army base)
- Eielson AFB
- Clear Space Force Station.

Introduction to the Quantitative Data Center Energy Cost Model

Rationale

The suitability evaluation framework presented in Chapter 3 is not sufficient to distinguish the relative ranking of sites within the same tier or to understand sensitivity to changing assumptions. To address some of these limitations, we developed a quantitative data center energy cost model by linking qualitative scores to cost drivers. The rough order-of-magnitude cost estimate remains uncertain because of incomplete project definitions and evolving design details, but our approach is useful for comparisons in helping determine the relative costs of different sites and under what conditions these rankings change. This estimate is intended for the relative comparison of sites and not for procurement or budgeting purposes.

Because we developed the suitability evaluation framework for maximum energy potential, there are many factors affecting data center costs that are not covered by the framework. This model does not represent full data center costs but rather focuses on the exterior energy supply infrastructure required to power a facility.

Method

The energy cost model compares four generation scenarios (grid power, gas generation, geothermal power, and solar power with battery storage), and it translates rubric grades into the expected development, installation, and operating costs for energy infrastructure supporting a 1-GW data center. Our preliminary order-of-magnitude estimate combines estimates for the capital operational expenditure associated with the data center's exterior energy supply infrastructure to estimate lifetime costs to power 1 GW of compute. This is not an estimate of the cost of the data center itself but the cost to power the data center.

Developing the model involved identifying which elements from the suitability framework could be used for quantitative cost modeling; we used all the other elements for a qualitative assessment of viability, which can still provide rankings as discussed in the "Qualitative Metric Aggregation" section at the end of this chapter. To populate the model, we extended the qualitative framework from Chapter 3 to include workforce availability for industrial machinery and solar installation,[42] wage levels, natural gas prices and required pipeline infrastructure, and geothermal temperature.

The cost modeling approach also required nine new criteria in addition to those gathered with the previous framework: gas pipeline infrastructure, geothermal temperature at depth, battery storage potential, gas workforce availability, gas workforce salary, solar workforce availability, solar workforce salary, total building value, and expected annual loss from natural disasters. The mapping of the criteria needed for the cost model is provided in Table 4.1. Although this section primarily focuses on the cost model, Table 4.2 provides an example approach of applying thresholds to determine the additional benefits of a particular site using criteria from the evaluation framework that were not used for the energy cost model.

Table 4.1. Inputs to the Energy Cost Model

Category	Criterion (Name)	New Criterion?
Energy supply (site specific)	Natural gas availability (BTM)	No
	Gas pipeline infrastructure	Yes
	Solar availability (BTM)	No
	Geothermal temperature	Yes
	Battery storage potential	Yes
	Nearby capacity	No
	Delivery (existing T&D)	No
Energy system	Utility-level reliability performance	No
	State-level average power price	No
Supporting inputs	Gas workforce availability[a]	Yes
	Gas workforce salary	Yes
	Solar workforce availability	Yes
	Solar workforce salary	Yes
	Water availability	No
Environmental considerations	Climate zone and cooling needs	No
	Building value	Yes
	Expected annual loss to building value	Yes
Governance and community considerations	NA	NA

[42] *Industrial machinery workforce* and *solar installation* are U.S. Bureau of Labor Statistics (BLS) categories used for evaluating the labor availability for different components of the exterior energy system.

Category	Criterion (Name)	New Criterion?

NOTE: NA = not applicable.
[a] We estimated the gas workforce availability and salary values from BLS's Occupational Employment and Wage Statistics data for industrial machinery mechanics and electrical and electronics repairers for powerhouse, substation, and relay. We also used these data to provide a general labor cost adjustment to all parts of the model.

Table 4.2. Threshold-Based Criteria Not Included in Cost Modeling

Category	Criterion (Name)	Threshold
Energy supply (site specific)	Wind availability	5.0 m/s average wind speed
	Nuclear availability	C grade
	Other resource availability	C grade
	Resource diversity	3 resources
Energy system	ISO-level expected capacity additions	6 GW
	ISO-level resource adequacy assessment	Normal risk
	ISO- and PUC-level large-load interconnection processes and timelines (regulatory)	C grade
	ISO- and PUC-level resources and T&D planning processes (regulatory)	C grade
Supporting inputs	Regulatory and legislative processes	B grade
	Cleared land	100 acres
	Construction costs	<$11/W
Environmental considerations	EPA nonattainment zone	0 NAAQS pollutants
	Natural disaster risk	<30 NRI
Governance and community considerations	Regulatory risk assessments, by state	Very credit supportive
	Community stress level index (assessed at the city level)	Mid-tier
	Market size	C grade
	Electricity affordability for the community	<4% of income
	Community opposition	C grade

NOTE: NAAQS = National Ambient Air Quality Standards; NRI = National Risk Index.

Energy Components Included in the Model

Interior energy systems are assumed to vary less across sites and are excluded to maintain a focus on comparable energy infrastructure differences. Many of the excluded components could be included in future versions of the model, leading to more-accurate cost estimates and a greater level of detail. They are excluded here to allow construction of a simple model and maintain a focus on data captured in the preexisting framework.

Table 4.3 shows which components are and are not included in the data center energy cost model. We provide additional details in Appendix A.

Table 4.3. Quantitative Model Components

Exterior Energy Supply Infrastructure (Included)	Interior Infrastructure and Other Costs (Excluded)
Energy generation systems	Interior data center systems
Transmission and interconnection infrastructure (all scenarios)	Chips, compute hardware, and racks
Cooling systems and their impact on total energy demand	Site preparation and access infrastructure
Workforce and labor cost differentials	Permitting and procurement variability
Insurance costs adjusted for local disaster risk	

Financial Modeling Approach

The cost estimates are derived from exploratory models produced by government agencies, utilities, and academic literature. The cost model uses site-level energy potential estimates to infer generation capacity costs, transmission requirements, cooling demands and costs, and workforce requirements. We do not account for detailed material cost breakdowns, regional procurement differences, or terrain effects, which we assumed to be constant across sites.

Each component includes capital expenditure (capex) and operating expenditure (opex). We estimated component costs by adjusting existing approaches used in peer reviewed and gray literature. We assumed that capex occur in year 0 (2026) and include procurement and installation. Opex includes annual costs for labor, material, fuel, and maintenance for 15 years. The model does not currently account for any retirement costs; the tax benefits of depreciation reflect this and assume no resale value for the project at end of life.

Costs are discounted back to their present value according to following formula:

$$Net\ Present\ Costs = \sum_{j} Capex_j + \frac{Opex_j}{r-i}\left(1 - \left(\frac{1+i}{1+r}\right)^{15}\right)$$

where j represents model components (e.g., transmission, cooling system, geothermal, gas, solar and battery, labor costs,[43] maintenance and depreciation, insurance). Each opex is treated as a recurring annuity for the 15-year life of the project. This is adjusted for an expected inflation rate i and discount rate r. We assumed the base inflation rate to be 5.1 percent and the discount rate to be 8 percent. Sensitivity analyses estimate the impact of changes to the inflation rate and discount rate to the costs for all sites.

More-detailed descriptions of how we estimated costs for the different components and other assumptions are available in Appendix A.

[43] Labor costs are determined for all components based on BLS's Occupational Employment and Wage Statistics state-level data on industrial machinery mechanics; electricians and electronics repairers, powerhouse, substation, and relay; and solar photovoltaic (PV) installers. Industrial machinery mechanics and electricians and electronics repairers are used for gas generation, and solar PV installers are used for hybrid solar and energy storage systems. All other components have labor costs accounted for at the industrial machinery mechanics and electricians and electronics repairers' rates. We provide more detail in Appendix A.

Limitations

Estimating a quantitative model to compare sites is complicated by a variety of factors. We used the cost estimation approach to simplify many of the risks that could arise from weighting the criteria in the evaluation framework, but this approach generates its own risks. Our cost estimates are rough order-of-magnitude and best suited for identifying points of difference between sites. There are multiple factors—including detailed material cost breakdowns, regional procurement differences, and terrain effects—that we did not consider in the model, and, thus, we assumed these factors to be constant between sites. If a more complex model is developed, the costs would likely be higher. Although we account for some differences (for example, by escalating the prices of the components that are modeled), the exact differences between sites cannot be understood at the level of analysis conducted in this report.

Other limitations include that the model does not estimate costs for interior energy supply infrastructure or location-specific costs associated with installing compute and other non-energy aspects of AI hardware at various locations. The cost of leveling and preparing land, acquiring semiconductor chips and racks, or other factors not considered in the model might lead to a site costing more than an alternative option because this model is assessing only the exterior energy supply infrastructure. The model also does not account for any other potential variations in the cost caused by site discrepancies not explicitly stated in this chapter, such as variations in procurement and materiel delivery costs or permitting. The high level of uncertainty means that the model is intended for comparison across the sites and relevant rubric metrics, not for evaluation of individual sites.

Cost Modeling for Four Energy-Generation Scenarios

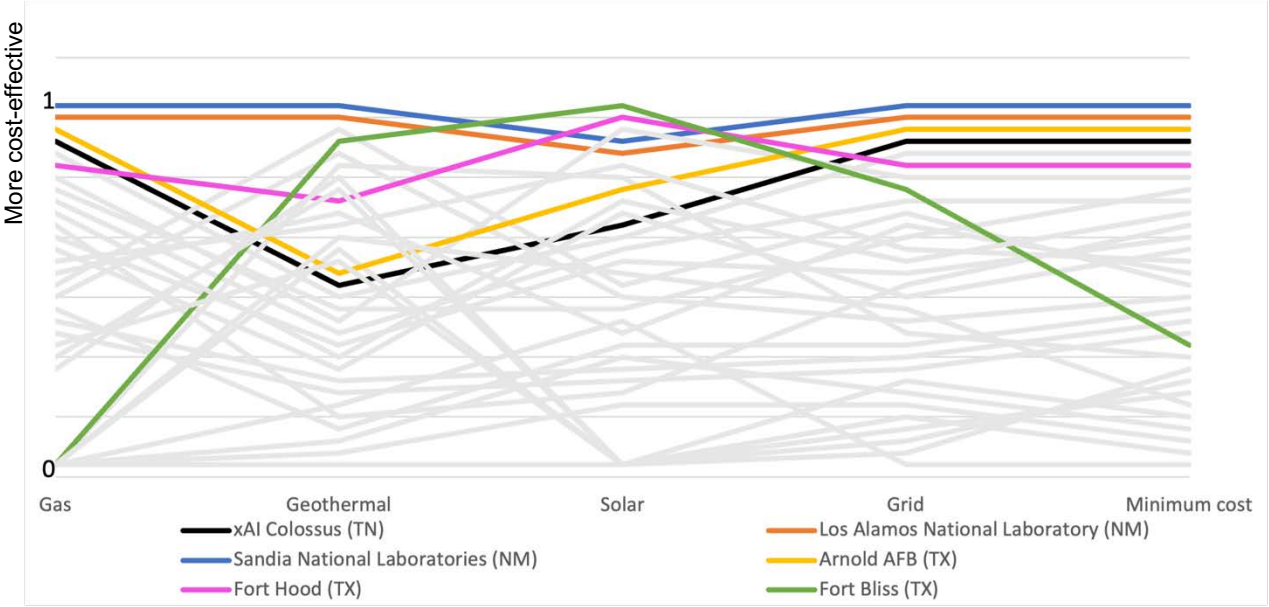
A more cost-effective site has a lower preliminary cost estimate than other sites using the same generation technology to power 1 GW of compute. Variable inputs, such as labor, are determined by the quantitative variables identified in Table 4.1.

Ordinal rankings are normalized to a scale between 0 and 1; 1 represents the most cost-effective (i.e., cheapest) sites and 0 represents either the least cost-effective sites or sites that are not feasible given their characteristics. Gas generation is not feasible if there are existing EPA restrictions on new gas generation because of the presence of NAAAQS pollutants. Solar generation requires a large area of land, so it is not feasible when the available land is less than the land required for solar installations.[44] Figure 4.1 illustrates the ordinal ranking, depending on the generation scenarios. Only six sites were colored to facilitate visualization; four are the two best site options for each generation type: Sandia and Los Alamos National Laboratories in New

[44] Solar irradiance (kWh/m^2/day) is adjusted by a 15-percent efficiency factor to determine an expected generation capacity per square meter. This is adjusted by the required solar plant size (determined by calculating the compute and cooling requirements minus the baseload from the grid) to determine a required land size in meters, which can then be converted to acres.

Mexico and Fort Bliss and Fort Hood in Texas. The remaining two sites, xAI Colossus and Arnold AFB (both in Tennessee), closely follow the New Mexico sites and might be more favorable for short-term gas powered projects.

Figure 4.1. Cost-Effectiveness for Different Generation Technologies at Various Sites (1-GW Compute)



NOTE: Each gray line represents the relative ranking of any specific site compared with all the other DOE and DOW sites we considered. Colored lines depict sites of interest that appear to be cost-effective across the metrics; these are highlighted subjectively to preserve clarity. 0 represents the most expensive or infeasible sites, and 1 represents the optimal, most cost-effective sites. The cluster of sites at 0 for gas generation represent sites where NAAQS pollutant limits prevent new gas generation.

Our model found that the two New Mexico sites (Sandia National Laboratories and Los Alamos National Laboratory) are the most cost-effective. This is because the cost modeling was favorable to sites with low workforce costs, low grid power costs, and a suitable climate for cooling and because many other potential differences were assumed to be constant between sites. These factors led to a finding of strong cost-effectiveness for Sandia and Los Alamos. It is worth noting that other sites (such as Arnold AFB and xAI Colossus) have a much lower upfront capex for gas generation, but over a 15-year lifespan, these advantages are not fully realized relative to the New Mexico options. Finally, the two Texas Army bases, Fort Bliss and Fort Hood, are also relatively cost-effective options, with strong potential for hybrid solar storage projects. Although solar is not the most cost-effective approach for full BTM projects, the inclusion of solar and gas generation could help foster community support for the projects.

Sensitivity Analysis

Although the cost model provides an order-of-magnitude estimate, we conducted sensitivity analyses to test how robust the site rankings are on inputs that combine the greatest cost impact with the greatest uncertainty. These analyses focused on the parameters most likely to change the ranking of a site. Notably, the discounted cost estimate is dominated by opex (particularly grid power, gas, and maintenance over the 15-year horizon) over capex. As a result, our sensitivity analyses were primarily focused on the drivers of these operating costs and on the parameters that determine how they are weighted. We prioritized three parameters:

- **Compute capacity** (load size) is one of the largest drivers of total cost. Changes in data center size alter the rankings as sites exhibit increasing, constant, or decreasing returns to scale.
- **Cost of capital** (discount rate) is particularly important because, for most sites, the most cost-effective option (e.g., gas or grid generation) shifts costs toward future opex. The discount rate effectively determines how heavily those future costs weigh on present-value totals.
- **Cooling requirements** were tested given community concerns about data center cooling and water consumption, notwithstanding that, even in large quantities, the operating cost of water is relatively inexpensive, and cooling is a capital cost.[45]

We also considered other inputs and assumptions (e.g., transmission line cost per mile), but their effect on rankings and total cost was much smaller.[46] In several cases, these values are driven by site characteristics we did not have data on, while the appropriate discount rate, data center size, and technology choices for generation and cooling are more likely to be business decisions that are dependent on specific data center projects, timelines, and financing opportunities, which might be influenced but not fully determined by the site.

In our analysis, we varied key inputs and compared site costs across all generation options and then compared the minimum-cost option for each site. For example, we conducted sensitivity analyses with discount rates at 5 percent, 8 percent, 10 percent, 12 percent and 15 percent. We present our main findings in this section. When we used criterion grades from the evaluation rubric as cost modeling inputs, we tested the effect of using the low, central, and high value of each grade's range. We present more details about the cost model in Appendix A.

Energy infrastructure costs, as represented in the model, must be internalized by the data center developer, and they are a major determinant of the siting decision. Sensitivity in these

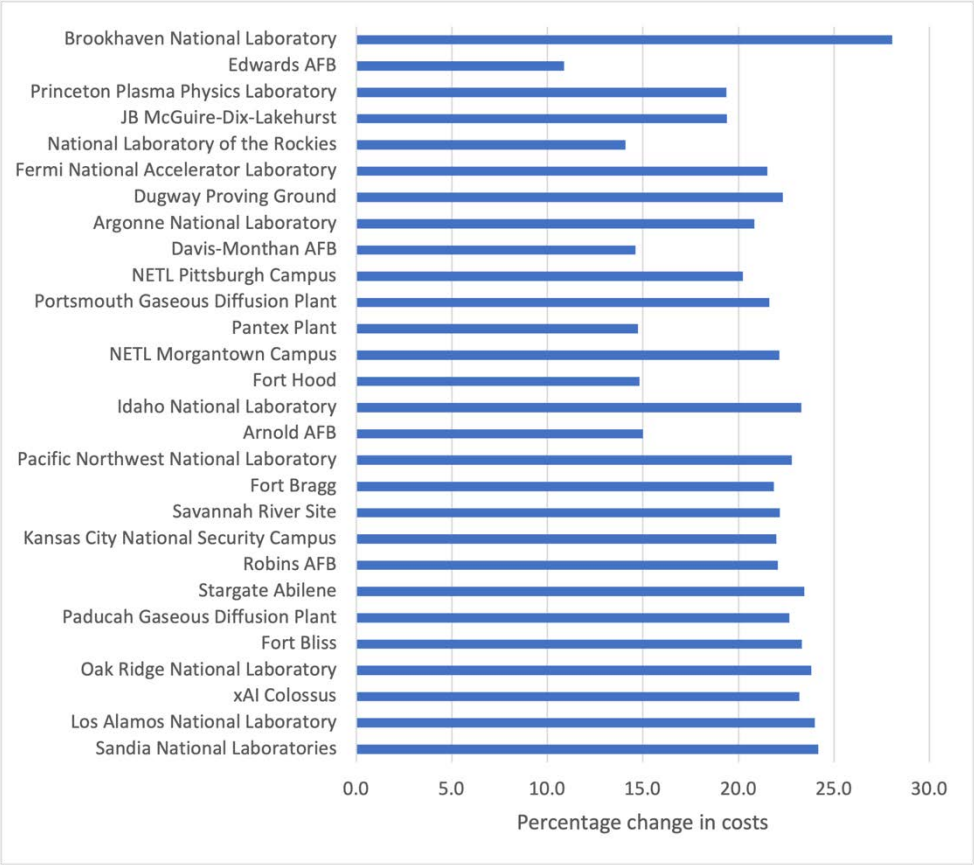
[45] Taft, "Data Center Operators Are Trying to Fix Their Water Use Problems"; Wong, "The Truth About AI's Water Use."

[46] One of the most remote sites that we considered Eielson AFB in Alaska. The energy infrastructure for a hyperscale data center could include 10 to 20 miles of new 250-kV high-voltage direct current (HVDC) transmission line, which could feasibly cost between $3 to $5 million per mile. Even at $40 million of total uncertainty in the transmission line capex, this is less than 1 percent of a project that could cost upward of $6 billion in discounted lifetime costs.

rankings reflects decision risk; for any given site, developers are likely to prioritize mitigating the largest sources of cost sensitivity.

Uncertainty in cooling requirements is represented by the difference between net present costs when assuming total replacement of energy lost to heat (low efficiency cooling)[47] and net present costs when assuming perfect efficiency of optimum cooling technology (see Figure 4.2).[48] Sites that are easier to cool (Pacific Northwest, New Mexico, Idaho), have a higher level of variation between the high and low cooling scenarios, while sites with more difficulty in cooling (Texas, National Renewable Energy Laboratory, Edwards AFB) will have high cooling costs even when using more-efficient cooling technology. Although there is some variation from changes in cooling needs, it has minimal impact on site rankings.

Figure 4.2. Sensitivity to Cooling Requirements



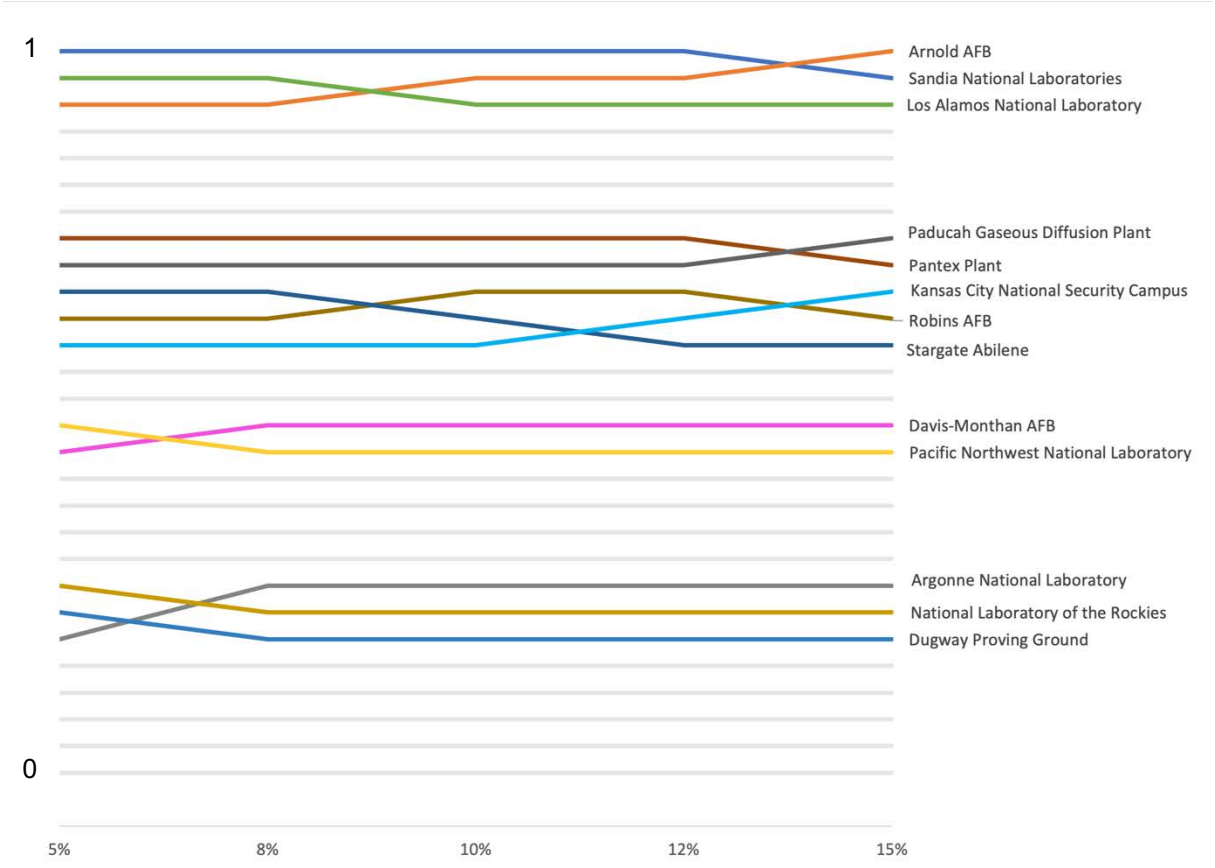
The cost of capital has a minimal impact on the site choice (Figure 4.3). One of the most notable shifts in rankings is Arnolds AFB becoming more cost-effective than the New Mexico

[47] Mitsubishi Electric, "Data Center Cooling Systems."

[48] Mortensen, "A Review of Evaporative Cooling's Efficiency and Environmental Value." We adjusted the perfect-efficiency assumption based on water availability and climate conditions, as recorded as inputs to the cost model.

sites as the discount rate increases. Higher capital costs indicate that money is worth more today than tomorrow, so the low fixed costs and higher operating costs of Arnolds AFB are preferred in the high capital cost environment. This also reflects a relationship in which the sites preferred in higher capital cost environments might also be preferred if developers are focused on more-immediate short-term timelines rather than planning for a full 15-year life cycle of costs and returns. Alternatively, when capital costs are lower, it is easier to fund projects with high upfront fixed costs. In this model, high capex geothermal sites decrease in cost-effectiveness compared with other sites as the discount rate increases. Alternatively, grid power becomes more favorable as the cost of capital increases. Sites that are the least cost-effective, such as Edwards AFB, Brookhaven, and Princeton Plasma Physics Laboratory, are still undesirable for development if financing becomes more readily available.

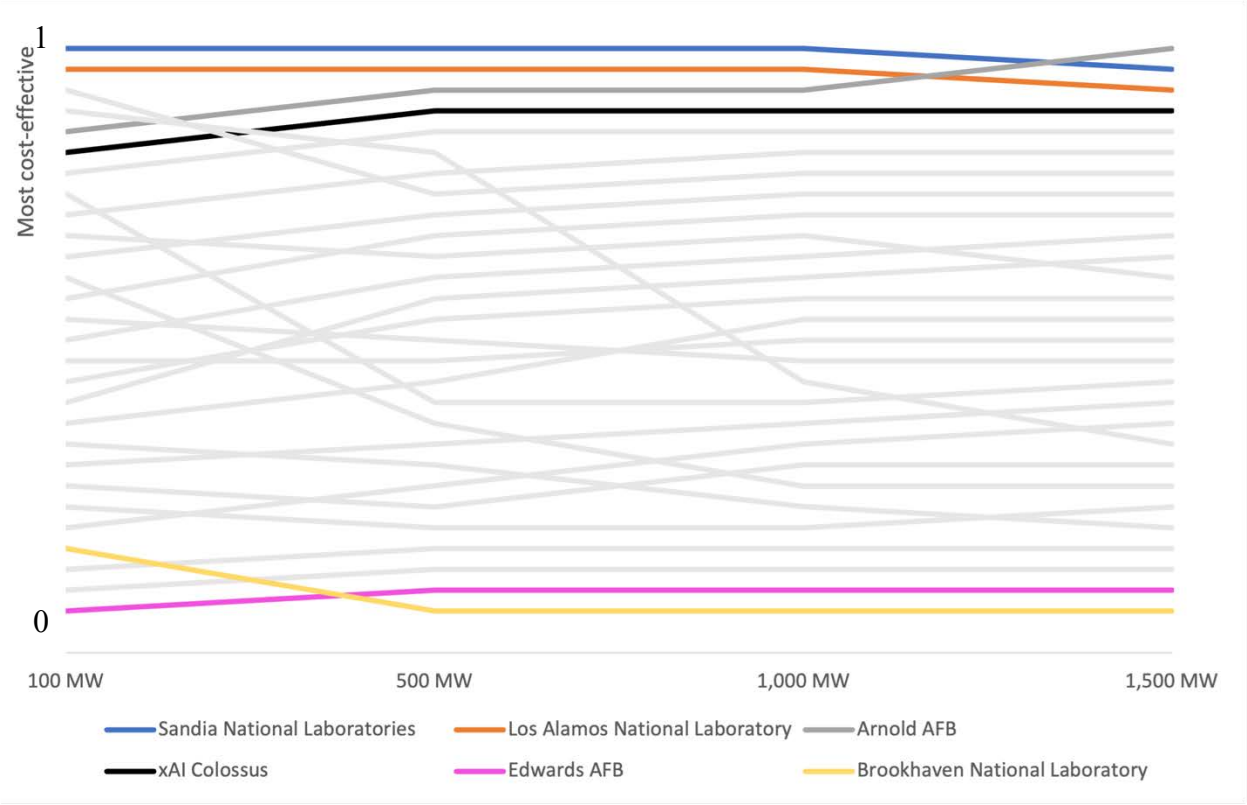
Figure 4.3. Site Performance, by Cost of Capital (Discount Rate)



NOTE: Each gray line represents the relative ranking of any specific site compared with all other DOE and DOW sites considered. Colored lines depict any sites that change rankings because of changes in the discount rate. Sites ranked 0 represent the most expensive or infeasible sites, while sites ranked 1 represent the optimal, most cost-effective sites.

The last variable that we considered in the sensitivity analysis is compute requirement. A low-cost workforce and access to water in Tennessee helps deliver economies of scale for Arnolds AFB and xAI Colossus in the cost model (Figure 4.4). At 1,500 MW, Arnold AFB leads in compute requirement performance (above Sandia National Laboratories), and it is also the optimal site if there are any associated increases in the discount rate. This performance appears to be primarily because of improved economies of scale across the project life cycle, including in required workforce to install and operate the plants. However, a big assumption is that large quantities of turbines will be available, installed, and operational in time, but this could be difficult because of existing shortages.[49]

Figure 4.4. Site Performance, by Compute Requirement



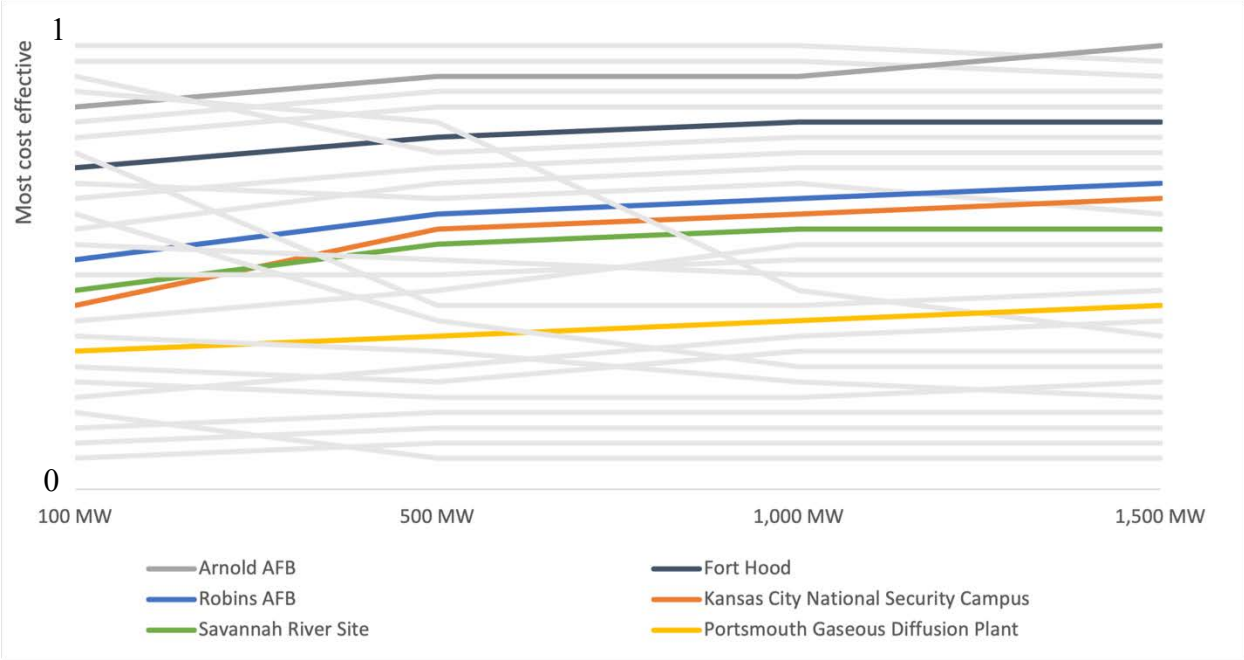
NOTE: Each gray line represents the relative ranking of any specific site compared with all other DOE and DOW sites considered. Colored lines depict sites of interest. This figure shows the four most cost-effective and the two least cost-effective sites for 1.5 GW of compute. Sites ranked 0 represent the most expensive or infeasible sites, while sites ranked 1 represent the optimal, most cost-effective sites.

Similarly, geothermal is more competitive for smaller compute loads. Such sites as Idaho National Laboratory, National Laboratory of the Rockies, NETL Morgantown Campus, and Fort Bliss have drops in cost-effectiveness when increasing from 100 MW to 500 MW and 1,000 MW

[49] Wood Mackenzie, "Gas Turbine Prices Soar 195% as Market Faces Supply-Demand Crisis."

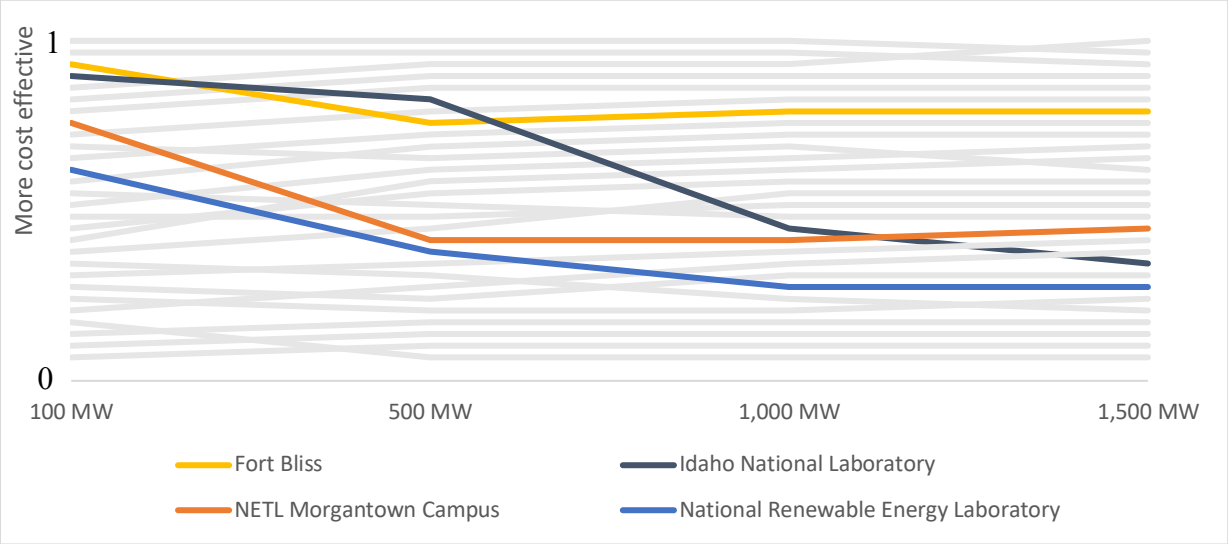
compute clusters. NETL Morgantown Campus and Fort Bliss have other advantages, while Idaho National Laboratory and National Laboratory of the Rockies continue to drop at the larger compute sizes. This is because, as the load increases, it becomes more efficient to collocate gas generation than to have to dig more geothermal wells to a greater depth (Figures 4.5 and 4.6).

Figure 4.5. Sites Using or Switching to Gas Generation Can Decrease Relative Costs If Turbines Are Installed and Made Operational in Time



NOTE: Each gray line represents the relative ranking of any specific site compared with all other DOE and DOW sites considered. Colored lines depict sites of interest that appear to be improving as compute size increases. We colored these lines based on apparent trends and resource generation types; the lines we chose to color is not comprehensive but a stylistic choice to demonstrate the observed relationships between compute and cost effectiveness. Sites ranked 0 represent the most expensive or infeasible sites, while sites ranked 1 represent the optimal, most cost-effective sites.

Figure 4.6. Geothermal Is More Competitive for Smaller Compute Loads



NOTE: Each gray line represents the relative ranking of any specific site compared with all other DOE and DOW sites considered. Colored lines depict sites of interest that use geothermal power at 100 MW and appear to be decreasing in cost-effectiveness as compute size increases. Sites ranked 0 represent the most expensive or infeasible sites, while sites ranked 1 represent the optimal, most cost-effective sites.

Decreasing costs per MW show increasing returns to scale before constant and then decreasing returns to scale are reached around $5 million per MW for most sites (Figure 4.7). This estimate lies between two notable values, reflecting the components that are covered in the cost model. Estimates for data center power systems are typically given as $1,500 to $2,000 per kW, equivalent to $1.5 to $2.0 million per MW.[50] On the other hand, total cost estimates for all data center components, including physical architecture, chips, and server racks are between $9 and $15 million per MW.[51] The cost model was constructed to consider exterior energy infrastructure, including generation, transmission, cooling, and other related costs (such as insurance and maintenance). Therefore, it does not include all costs of a full data center project but instead represents discounted life-cycle costs for a wider variety of factors than those considered in generation-only cost estimates.

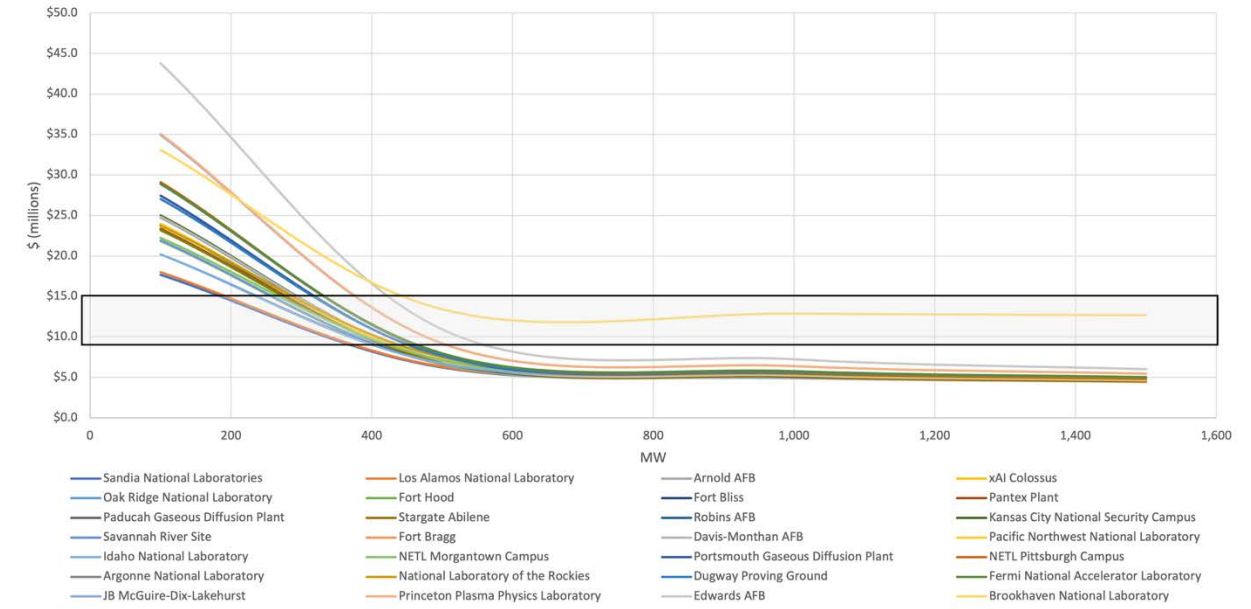
As Figure 4.7 shows the decreased cost is given by increasing returns to scale as we look to hyperscale data centers and GW-scale power generation projects. However, as this model is focused primarily on energy infrastructure, it might be more appropriate to interpret the cost to power a data center as likely to cost as much as the data center itself. For hyperscale GW data centers, the cost per MW from this model is below the Cushman and Wakefield estimate.[52]

[50] Pandey, Ontiveros, and Patel, "How AI Labs Are Solving the Power Crisis."

[51] Cushman and Wakefield, "Data Center Development Cost Guide 2025."

[52] Cushman and Wakefield, "Data Center Development Cost Guide 2025."

Figure 4.7. Cost per Megawatt Load, by Capacity



Ultimately, this approach shows that, although there are clear instances in which certain sites are more expensive for data center development (e.g., Edwards AFB, Princeton Plasma Physics Laboratory), in many cases the optimal data center site will depend on what assumptions are made about the development process and required data center size. Although this model could be used to narrow down a set of data center sites for selection and identify which type of generation technology might be more appropriate in different regions, stakeholders might need to first agree on the appropriate level of robustness for site rankings before investing in a single site.

Generally, we find that the New Mexico sites performed better than the other sites, particularly for data centers using under 1 GW of compute (Table 4.4). As compute increases to more than 1 GW, Arnold AFB becomes the most cost-effective location, and other Tennessee sites (such as xAI Colossus and Oak Ridge) approach cost parity with the New Mexico sites. On shorter timeframes (i.e., ones with a project life of less than 15 years), Texas sites, such as Stargate Abilene, Fort Bliss, Fort Hood, and Pantex Plant, become the most cost-effective.

Table 4.4. Most Cost-Effective Sites for Custom Discount Rates and Compute Loads

Discount Rate	100 MW	500 MW	1,000 MW	1,500 MW
5%	Sandia National Laboratories **Geothermal**	Sandia National Laboratories **Geothermal**	Sandia National Laboratories **Gas**	Arnold AFB **Gas**
8%	Sandia National Laboratories **Geothermal**	Sandia National Laboratories **Geothermal**	Sandia National Laboratories **Gas**	Arnold AFB **Gas**
10%	Sandia National Laboratories **Geothermal**	Sandia National Laboratories **Gas**	Sandia National Laboratories **Gas**	Arnold AFB **Gas**
12%	Sandia National Laboratories **Grid**	Sandia National Laboratories **Gas**	Sandia National Laboratories **Gas**	Arnold AFB **Gas**
15%	Sandia National Laboratories **Grid**	Sandia National Laboratories **Grid**	Arnold AFB (Air Force Base) **Gas**	Arnold AFB **Gas**

Finally, our cost modeling approach aids inductive reasoning not only to understand whether site A is preferred to site B but also to trace the model's dependents and understand why A is cheaper than B. These differences can then be evaluated through more-detailed cost modeling and analyses before proceeding with an investment. For example, consider a developer who is considering whether to build a data center in Fort Hood (in central Texas) or Fort Bliss (on the Texas–New Mexico border). Both regions have strong potential for local colocated generation. The New Mexico side of Fort Bliss might be able to support grid-connected data centers at a cheaper price with less cooling needs, while the Texas side presents an opportunity for colocated gas-powered data centers supported by a large, local (in-state) workforce. According to the cost model, it would be approximately 21-percent cheaper to provide energy infrastructure to Fort Bliss than Fort Hood, potentially making Fort Bliss more attractive for a data center developer interested in maximizing speed-to-power.

The sensitivity of energy infrastructure cost rankings to cooling assumptions, capital costs, and compute scale highlights the central role of energy system design in determining site-level feasibility for large-scale data center deployment. Although this model focused on the energy infrastructure component of net present project costs, it captures the impact of energy supply availability, cost, and configuration as a primary constraint on data center siting decisions.

These findings are consistent with recent federal policy developments, including the Ratepayer Protection Pledge, which requires data center developers to internalize the full cost of energy generation and associated transmission infrastructure rather than shifting these costs to retail electricity consumers.[53] In this context, the sensitivity of energy infrastructure rankings

[53] White House, "Ratepayer Protection Pledge."

reinforces that energy delivery certainty, generation mix, and grid interconnection constraints are primary determinants of site attractiveness within the energy subsystem.

In particular, the observed increase in relative cost-effectiveness toward colocated generation at higher compute loads indicates that energy infrastructure planning will become increasingly dependent on the deployment scale and timing of that colocated generation. Therefore, robust site selection requires prioritizing configurations that minimize exposure to delayed or uncertain grid-delivered capacity, particularly for data centers with binding energy constraints.

Qualitative Metric Aggregation

Not all our framework criteria are direct inputs to the quantitative cost model, despite these criteria measuring values that are meaningful yet harder to quantify. Metrics that are not inputs to the cost model are displayed in Table 4.2 as qualitative metrics, and they can be assessed using a threshold counting method. Each of the qualitative metrics can be assigned a minimum passing grade using desired site characteristics or known development guidelines and project plans; all metrics that achieve a passing grade are then tallied up to a final count. Examples of passing grades are provided for demonstration purposes only in Table 4.5.

Table 4.5. Sample Thresholds for Ranking Sites by the Framework's Qualitative Criteria

Criteria	Required Grade
Wind availability (BTM)	C
Nuclear availability (BTM)	C
Other resource availability	C
Resource diversity	B
ISO-level expected capacity additions	B
ISO-level resource adequacy assessment (NERC)	B
ISO- and PUC-level large-load interconnection processes and timelines (regulatory)	C
ISO- and PUC-level resources and T&D planning processes (regulatory)	C
Regulatory and legislative processes	B
Cleared land	C
Construction costs	B
EPA nonattainment zone	A
Natural disaster risk	B
Regulatory risk assessment, by state	C
Community stress level index (assessed at the city level)	C
Market size	C
Electricity affordability for the community	C
Community opposition	C

Sites with lower scores are likely to face more barriers to data center development, while sites with higher scores might have an easier path forward.

Some known limitations of this approach are that it gives all metrics equal weight, meaning it does not capture a user's preferences regarding which metrics might be the most important. Second, it does not directly show any differentiation between sites that have the same score; a user would need to dive deeper into the ratings to identify whether one site might be preferred over another. And finally, the approach simplifies passing as a yes-or-no question, while it is known that overcoming barriers from low grades might be easier in some metrics than in others.

The 13 highest-ranked sites, based on their threshold scores from Table 4.5, are presented in Table 4.6. Multiple ties occurred, so placement within tied rankings is arbitrary and does not indicate a preference among those sites.

Table 4.6. Qualitative Ranking of Sites by the Threshold Method

Site Name	Rank
Stargate Abilene	1
Pantex Plant	1
Fort Hood	1
xAI Colossus	2
Oak Ridge National Laboratory	2
Arnold AFB	2
Robins AFB	2
Los Alamos National Laboratory	3
Fort Bragg	3
Fort Bliss	3
Paducah Gaseous Diffusion Plant	4
Sandia National Laboratories	4
Kansas City National Security Campus	4

Several locations that performed strongly in the quantitative ranking also emerged as strong candidates under the threshold-based criteria, including Stargate Abilene, Los Alamos National Laboratory, Sandia National Laboratories, and Fort Hood. In addition, some sites that ranked closer to average in the quantitative analysis performed well under these threshold considerations, such as the Pantex Plant and Arnold AFB. The ability to consider factors that are harder to quantify and have a potential impact on the project cost provides decisionmakers with a first-pass interpretation of the grading assigned to multiple potential sites, and this grading can be leveraged to narrow the options and perform deeper dives into alternatives that show the most promise (as defined by decisionmakers' goals and priorities).

Methods, such as the threshold approach, can be used in multicriteria decision analysis to provide a quantitative estimate of the more qualitative criteria. An application of this framework and approach could determine a final site selection or ranking of sites through assigning appropriate weights to both the cost estimate and qualitative scoring for each site.

Summary

The cost model presented in this chapter provides quantitative exploratory comparisons of data center energy infrastructure costs across sites and generation technologies. Although not a full life-cycle model, our analysis enables relative rankings, sensitivity analyses, and the decomposition of cost drivers by framework criteria and infrastructure type. Site optimality depends heavily on scale, financing assumptions, and generation strategy. The model would be best used as a decision-support tool to narrow candidate sites and identify key cost drivers rather than to produce a single definitive ranking. Generally, the best locations (New Mexico, Fort Hood, Stargate Abilene, and Portsmouth) have strong energy potential, including existing infrastructure, with few regulatory barriers and access to water for cooling.

Chapter 5. Workshop

To complement our analyses, which was based on publicly available datasets, we hosted a workshop to collect data from stakeholders about how barriers could be addressed. The Frontier Data Center Siting on Federal Lands: Policy and Planning Workshop built on insights from our framework and data center energy cost model and convened federal and industry stakeholders to translate our research findings into actionable planning approaches that could strengthen U.S. capacity for next-generation AI infrastructure. The workshop was formatted to answer two questions:

1. Using fictionalized but plausible data center siting scenarios, what barriers, decision factors, information needs, and process considerations do stakeholders identify as important for inclusion in PPP guidelines?
2. How might unresolved local environmental, cultural, and infrastructure constraints after siting and building transform a federally approved data center project into a multifront legal, political, and security crisis that threatens national strategic objectives?

We begin this chapter with a description of the overall workshop context and background. Then, we describe the methods and results for the data center citing workshop, which focused on the first question, and the Day After exercise, which focused on the second question. Finally, we extrapolate from these events to create a set of guidelines for PPPs for future contracting. We used internal AI tools for content in this chapter, both to create workshop materials and to summarize the workshop results.

Data Center Siting Workshop

Methods

The workshop used a structured, scenario-based, small-group discussion design to elicit stakeholder-identified considerations for siting a fictionalized but plausible 1-GW data center on DOA lands. Each small group focused on one scenario, and participants were given an overview, supporting maps, and site evaluation rankings for their respective site.[54] By design, no site was perfect so that participants could discuss each site's barriers and how to overcome them. Table 5.1 provides general details about the fictional sites, including the main problem at each. For details on workshop participants and logistics, see Appendix C.

[54] Sites were ranked using the framework presented in Chapter 3. In Appendix C, we include the site rankings that we provided to participants. In addition to the materials in Appendix C and to provide context for the exercise, participants were given descriptions of the underlying criteria for each category, the method used to apply the rubric, and site-specific observations or units.

Table 5.1. Overview of Fictional U.S. Department of the Army Sites for Data Centers

Characteristic	Camp Ridgeline	Clearwater Research Station	Fort Sandoval
Address	Camp Ridgeline, Stokes County, NC 27017	Clearwater Research Station, Owyhee County, ID 83648	Fort Sandoval, Grant County, NM 88061
State	North Carolina	Idaho	New Mexico
Owner	DOA	DOA	DOA
ISO; balancing authority	PJM Interconnection; Duke Energy Progress	Western Interconnection; Idaho Power Company	Western Interconnection; Public Service Company of New Mexico
Utility	Duke Energy Progress	Idaho Power Company	Public Service Company of New Mexico
Land available	412 acres	2,180 acres	856 acres
Main problem	Too little land for a 1-GW data center	Insufficient grid capacity	Highly remote, with a need to build transmission infrastructure

Moderators opened by emphasizing that no scenario represented an ideal site and that the purpose of the workshop was for small groups to roleplay as an interagency team that had been asked to work together to identify a plausible path forward after which the small groups would report their respective site's key pros, cons, barriers, and potential solutions to the full group. While documenting discussion points in real time, facilitators led participants through initial reactions, barrier identification, discussion of decision factors and information needs, consideration of missing stakeholders and coordination requirements, and exploration of possible solutions or partnership approaches. The exercise concluded with each small group briefly reporting out its major observations. Because the workshop was designed to generate nongeneralizable, nonweighted inputs to the development of guidelines rather than empirical findings, no formal voting or comparative scoring was conducted. The session closed after the groups shared their observations; the participants did not select a preferred site or approach.

Results

The workshop pointed to three areas for future PPP considerations: (1) who should be included, (2) what kind of barriers need to be considered, and (3) other considerations.

Participants indicated that effective data center development partnerships require a broad, cross-sector of stakeholders to be involved from the outset. They suggested that core participants should include the Army or other federal land authorities, utilities and public utility commissions, and state and local government officials, because these stakeholders are central to land access, permitting, interconnection, energy supply, and regulatory approval. Participants also emphasized the importance of including data center operators, community and tribal representatives, and engineering-procurement-construction firms to ensure that technical requirements, local concerns, cultural resources, and buildability considerations are incorporated early. In some cases, legal counsel, national laboratories, and members of the congressional

delegation might also be important to support agreement structuring, technical analysis, funding access, and broader political coordination.

We also collected data on participants' discussions of the types of barriers that future PPPs should be sure to consider, which are summarized in Table 5.2. Although all three sites had disparate major barriers by design, some barriers came up in all groups. Specifically, all three small groups discussed land availability and restrictions, grid interconnection delays, and water access. Given that these barriers were consistently salient across participant small groups, future PPP guidelines should address each of these topics explicitly.

Table 5.2. Small Group Discussions of Barriers to Siting Data Centers

Title	Description	Number of Small Groups That Mentioned Barrier
Land availability and restrictions	Securing sufficient usable land is a core challenge, with military landowner restrictions, competing infrastructure, and unclear decommissioning status limiting where development can occur. Land requirements are more a restriction on powering data centers than on the technical hardware (e.g., chips, racks) data centers need.	3 of 3
Grid interconnection delays	Transmission and interconnection backlogs create multiyear lead times before a site can receive reliable power, which is particularly problematic for remote or underdeveloped locations.	3 of 3
Water access	Data centers require significant water for cooling; several sites face uncertainty about water availability or suitability for liquid cooling systems.	3 of 3
Workforce and remote location	Sites far from population centers face challenges recruiting and retaining skilled workers, and remote locations drive up construction timelines and costs.	2 of 3
Cybersecurity and physical security	Federal or militarily adjacent sites require elevated security protocols—cyber, physical, and access control—that add complexity and cost to siting.	2 of 3
Regulatory and environmental compliance	NEPA reviews, tribal land considerations, air quality permits, and ratepayer protection statutes create regulatory hurdles that can delay or block siting.	2 of 3
Supply chain constraints	Critical equipment, such as large transformers (only approximately 10 percent of which are made domestically) and control systems with foreign-sourced components, create procurement and security risks.	2 of 3
On-site power generation requirements	Some sites require backup or primary on-site generation, adding cost and complexity, especially where underground infrastructure installation is restricted.	2 of 3
Disaster risk	Wildfire, landslide, and other natural-hazard exposure at certain sites creates operational risks and could require costly mitigation measures.	1 of 3

Finally, across the materials reviewed, participants consistently emphasized three considerations for PPP agreement structures for data center siting:

- **Design for long time horizons** while remaining flexible enough to accommodate technology refresh, changing operational requirements, and phased infrastructure buildout. Relatedly, participants noted that agreements should clearly define

responsibilities for energy supply and generation, including who is responsible for procuring, financing, or developing such resources as solar, geothermal, gas peakers, or nuclear generation and how parties will manage the multiyear ramp-up to full electrical load. Several participants also stressed the importance of planning for the full asset life cycle, including decommissioning and retirement, so that end-of-life obligations and associated costs are explicitly allocated between public and private partners rather than left unresolved.

- **Financial structure and risk allocation** is needed to address cost containment by specifying how cost overruns, delays, or changing infrastructure needs would be shared across parties. Participants also suggested that agreements should consider revenue-sharing or community-benefit mechanisms, such as approaches that could reduce local utility costs or otherwise return value to affected communities. In addition, respondents pointed to the importance of integrating DOE grants and other federal infrastructure funding streams into PPP structures wherever possible, both to improve project feasibility and to avoid placing the financial burden solely on private developers or ratepayers.
- **Clearly define accountability** for broader public-interest obligations. Security responsibilities emerged as a particularly strong concern, and participants repeatedly called for contracts to specify both cybersecurity and physical security roles, especially in cases involving federal lands, sensitive operations, or classified computing. Participants also emphasized that workforce- and community-development commitments should be built directly into agreements, including provisions for local hiring, training pipelines, and community-support measures that can strengthen public acceptance and political support. Similarly, respondents argued that environmental and community mitigation strategies should be codified in the contract itself so that commitments made during project development remain enforceable throughout the life of the partnership.

Day After Scenario for Data Centers

Methods

To address how unresolved local constraints at a federally approved data center might drive national security–related crises, we used RAND's Day After methodology, which has been well documented in published literature.[55] In line with this methodology, on April 30, 2026, we conducted a two-turn tabletop discussion in which participants engaged a fictional, yet plausible, near-future crisis. The fictionalized scenario involved opposition to and security threats against a partially built 1-GW frontier data center at a DOA ground lease at Fort Carver Army Reserve Training Center in San Bernardino County, California. Participants were asked to engage in light roleplay from their real-life positions, acting as if they were principals and advisors of an AI litigation task force receiving information from National Security Council staff. The facilitator opened the session by framing the scenario as a planning tool rather than a prediction and

[55] Examples include Smith et al., *Infinite Potential—Insights from the Robot Insurgency Scenario*; Smith et al., *Infinite Potential—Insights from the Cyber Surprise Scenario*; and Predd, Chessen, and Smith, *Infinite Potential—Insights from the Two Moonshots Scenario.*

emphasizing that the exercise was designed to identify information gaps, capability shortfalls, decision pressures, and possible policy playbooks for a U.S. government response to AI-related crises.

Turn 1 was set in the short-term future of July 2026. Participants were briefed on a rapidly escalating public controversy involving environmental, tribal, water, and ratepayer opposition; pending legal challenges; and suspicious drone incursions over the site. They were then asked to provide a strategy to respond to opposition to the Fort Carver data center and to establish a framework for protecting federal data center siting going forward.

Turn 2 was set three months later, in October 2026. After some of the participants requests from Turn 1 were answered, the fictional scenario advanced to include classified preliminary assessments from FBI's Counterintelligence and Espionage division and the Department of Homeland Security's Cybersecurity Infrastructure Security Agency suggesting possible links between the opposition campaign and Chinese-connected influence activity, along with evidence that drone activity at the site might have involved industrial espionage focused on its energy infrastructure. Participants were then asked to revisit and revise their prior objectives, discuss response options, and recommend a path forward considering the new security information.

The exercise wrapped up with a backcasting exercise in which participants returned to the present day (April 30, 2026) and were asked what could be done now to mitigate against the hypothetical Day After events.

Results

The Day After exercise revealed that community opposition and litigation pose the greatest risks to the project; participants largely agreed that these threats are more likely to terminate the project than physical security issues, such as drones. There was a notable split among participants between prioritizing the immediate project timeline and strengthening the longer-term political position, reflecting a broader tension between moving fast and ensuring critical vulnerability assessments are not skipped. Participants viewed the scenario as being larger than a single project, and there was a strong sentiment that it should serve as a case study for building best practices around protecting federal and private AI infrastructure installations.

Key recommended actions fell into several groups: hardening the facility with anti-drone technology and netting; improving public communications about water rights, energy rates, and national security concerns; revisiting the fictional Community Benefits Agreement to reduce ratepayer impacts; and coordinating with U.S. Department of Justice and EPA on outstanding legal and permitting questions. Participants also flagged the need to loop in groups, such as the National Energy Dominance Council, and to assess whether retaliatory measures against China are warranted.

Looking ahead, participants emphasized that a physical attack on AI infrastructure is a matter of "when, not if," and that important stakeholders (e.g., data center operators, Congress) have not taken physical and cyber security seriously enough. There were strong calls for predefined

emergency response plans, a task force that could draw on experience from nuclear and military drone incidents, and a push toward more-decentralized and more-distributed AI and energy infrastructure to reduce systemic vulnerabilities.

Summary

The workshop resulted in two key findings:

- PPP guidelines should focus on site-specific details, including early, structured engagement with land authorities, utilities, state and local governments, tribal and community representatives and operators. Guidelines should also require up-front analyses of land constraints, grid and water availability, security needs, permitting risks, workforce limitations in addition to clear contract terms for energy, mitigation, cost-sharing, and decommissioning.
- When environmental, cultural, and infrastructure conflicts are left unresolved after federal approval, a data center project can rapidly escalate from a siting dispute into overlapping community opposition, injunction-driven litigation, and political backlash that, combined, delay deployment, overshadow possible exploitable cyber and physical security vulnerabilities, and undermine broader U.S. strategic AI objectives.

Chapter 6. Recommendations

Given the observed challenges with energy procurement in prior federal initiatives, such as Cleanup to Clean Energy,[56] and the reality that data center energy consumption remains a persistent focus among investors, federal agencies considering leasing sites for data centers should use screening methods, such as the ones introduced in this report, to make sure that the sites offered in an RFLP meet a minimum set of energy procurement requirements.[57] **For future site-selections, we recommend establishing a pre-RFLP federal site-screening framework, similar to the one introduced in Chapter 4, that ranks candidate data center locations based on levelized cost of energy, cost per MW firm generation, time-to-firm-power-delivery, grid interconnection feasibility, and infrastructure readiness.** Such a framework could help mitigate future delays and litigation and, because delays in site selection can cascade through the development process, accelerate the deployment of data center infrastructure.

Although existing federal RFLP structures require bidders to describe integrated project phases, site layouts, and conceptual energy and interconnection plans, these requirements treat energy infrastructure as a dependent component of the development plan rather than a coequal critical path constraint. Such an approach understates the reality of large-scale, high-density compute deployments in which power-delivery delays can independently govern the overall schedule feasibility, regardless of progress in civil works or facility construction.

The deeper problem is that no single entity is accountable for improving electric supply. Responsibility is diffused across ISOs, state PUCs, the Federal Energy Regulatory Commission, NERC, DOE, and the private sector, each of which has partial authority. We therefore recommend establishing a single accountable authority with a clear mandate and the standing to compel coordination across ISOs, PUCs, the Federal Energy Regulatory Commission, NERC, and DOE and which is responsible for power-delivery timelines on priority PPP deployments. Establishing such an authority might create friction with incumbent stakeholders because fragmented accountability would be consolidated, but that can be anticipated and planned for.

A more explicit treatment of energy infrastructure as a parallel and structurally integrated workstream, alongside civil works and data center construction, would strengthen alignment between system dependencies at the execution level. By aligning incentives across these interdependent workstreams, this approach to energy infrastructure

[56] The Cleanup to Clean Energy initiative is a DOE program launched in July 2023 to repurpose parts of DOE-owned land—much of which was used for the nation's nuclear weapon program—into sites for utility-scale clean energy generation.

[57] For instance, a minimum set of requirements could include restricting sites promoted for development to those with a grade of C or better on the energy systems and energy supply criteria using the framework discussed in Chapter 3.

reduces the risk of sequential bottlenecks and supports improved schedule coordination between firm power delivery and compute readiness. Coordination among responsible entities is incorporated at the proposal stage rather than introduced as a post-award integration requirement. This enables bidders to present integrated delivery plans, including phased ramp schedules and firm capacity delivery guarantees that explicitly link energy availability to compute deployment milestones.

Our analysis indicates that all considered sites will require considerable investments to supply energy to a data center. Considering these investment requirements along with the Ratepayer Protection Pledge that they will not increase energy costs for consumers, **we recommend that federal agencies request information from potential bidders during the RFLP process about the financing structure options that those bidders are considering to ensure that the Ratepayer Protection Pledge is met.**

To facilitate how government and private organizations work together developing data centers on federal lands, **we recommend developing PPP policy guidelines for data centers on federal lands to increase information-sharing regarding the risks, constraints, timelines, workforce needs, and contractual obligations**. We provide an example of such guidelines in Appendix D.

Appendix A. Data Center Cost Model

In this appendix, we provide details about the assumptions that we used in our data center cost model.

Components Included in the Data Center Energy Cost Model

The exterior energy supply infrastructure includes

- large-load interconnection, including grid connection, design and permitting, and new transmission lines
- primary power generation systems, such as
  - grid power–only generation
  - on-site gas generation: natural gas power plants and natural gas fuel supply (which includes gas pipeline infrastructure, gas storage infrastructure, and such alternatives to natural gas pipelines as trucking or shipping liquefied natural gas)
  - on-site geothermal
  - on-site hybrid solar PV and battery energy storage system (including design and installation), which requires land acquisition
- cooling systems, including cooling technology, water demand and availability, and additional energy requirements for cooling; this increased energy consumption is reflected by the total energy requirement of the data center
- a workforce for each subsystem adjusted for available labor and potential relocation costs
- additional operating, including required operations, maintenance and insurance (based on location-specific natural disaster risks).

For each component, upfront capex and recurring opex costs are identified based on existing modeling and a classification of one-off or recurring costs. Comparisons between submodels for different generation types and supporting systems are made through a consistent set of inputs (e.g., inflation, compute size, operating life, framework inputs) and a conversion of prices to current dollars. All costs were updated to 2026 dollars using the Federal Reserve Economic Data (FRED) construction price index.[58] The model does not include the data center and associated interior components, such as the interior energy supply components.

[58] Federal Reserve Bank of St. Louis, "Producer Price Index by Commodity: Special Indexes: Construction Materials."

How Costs Were Estimated for Each Component

Load Interconnection Costs

Interconnection costs include transmission line construction to the nearest transmission line that is greater than or equal to 140 kV, and electricity purchases at state-average industrial rates. We estimated the distance to the nearest 140kV or higher transmission line using the Open Infrastructure Map.[59] We based the capex of constructing the transmission line on the exploration cost estimate in Midcontinent ISO's "Transmission Cost Estimation Guide for MTEP24" for a new 250-kV bipole HVDC transmission line at $2,350,000 per mile plus two voltage source converters.[60] We escalated this cost per mile by a factor of 70 percent (30-percent line length adder and 30-percent contingency factor) to account for the high end of uncertainty that has been previously observed between Midcontinent ISO's exploratory cost estimates and actual project costs. Therefore, the cost model uses an estimate of $4,000,000 per mile plus a fixed cost of $318,000,000 for transmission costs. Actual transmission costs might be higher or lower depending on terrain, project management, potential delays, and additional infrastructure (such as substations) not included in the model. Specifically, the capex component scales transmission line proximity by the average cost to bridge the gap to the nearest high-voltage power line.

We estimated the operating costs for grid power using the state industrial average power prices reported in EIA's "Electric Power Monthly" for December 2025.[61] In the grid power scenario, we assume that all power needs are provided by the grid 24-7, while in the other local generation scenarios, we still assume some connection to the grid but with a much lower baseload based on nearby preexisting generation infrastructure.

Primary Power Generation Costs

On-Site Gas Generation

We estimated on-site gas generation costs using baseline combined-cycle natural gas plant cost data from the NETL in 2022;[62] these data were subsequently revised in 2023.[63] These costs are escalated to 2026 dollars at the construction price index,[64] and we added 7 percent to

[59] Garrett, "Open Infrastructure Map."

[60] Midcontinent ISO, "Transmission Cost Estimation Guide for MTEP24."

[61] EIA, "Electric Power Monthly."

[62] Schmitt et al., *Cost and Performance Baseline for Fossil Energy Plants*.

[63] Turner, "NETL's Updated Performance and Cost Estimates for Power Generation Facilities Equipped with Carbon Capture."

[64] Federal Reserve Bank of St. Louis, "Producer Price Index by Commodity: Special Indexes: Construction Materials."

represent growth in demand (per the producer price index) for gas turbine components.[65] Capital, labor, and operating costs are scaled linearly by installed capacity to match site-specific demand requirements. Plant capacity is sized based on total data center electricity demand (including cooling loads) and incorporates an $n + 1$ redundancy configuration consistent with Tier IV data center standards. We modeled capacity in discrete 120 MW increments, representing modular combined-cycle plant turbines.[66]

Installation costs are driven primarily by labor requirements, estimated from NETL labor productivity assumptions, and adjusted using site-specific wage and workforce availability grades. Operational costs include fuel consumption, routine maintenance, labor, and water use for cooling systems. Water consumption scales with plant size and is adjusted by the climate-zone classification. We applied a linear scaling assumption for both capital and operating costs per MW. All unspecified cost components are held constant across sites to isolate the effects of location-specific variables.

Labor availability determines the proportion of the workforce requiring relocation, with worse grades corresponding to higher relocation costs. Pipeline availability determines whether new pipeline infrastructure is required and the associated distance-based capital cost. Climate zone affects water use intensity and associated operating costs.

Table A.1 shows the conversion that we used between criteria grades and modeling inputs, and Table A.2 shows an example of the net present cost accounting for the gas component, which is then included as part of the larger data center cost model.

[65] Federal Reserve Bank of St. Louis, "Producer Price Index by Industry: Turbine and Turbine Generator Set Units Manufacturing: Steam, Gas, and Other Turbines and Turbine Generators."

[66] Ontiveros, Patel, and Nishball, "Datacenter Anatomy Part 1."

Table A.1. Relationship Between Framework Criteria and Gas Generation Model Inputs

Framework Criteria	Model Input	A	B	C	D	E
Gas workforce salary	Workforce salary ($/hour)[a]	28	29	30	31	34
Gas workforce availability	Relocation cost ($/worker)[a]	0	10,000	12,500	30,000	30,000
Gas workforce availability	Share relocated (%)[b]	0.00	0.10	0.40	0.55	0.75
Natural gas availability	Gas price ($/MMcf)[c]	6,500	8,800	10,850	12,550	14,500
Gas pipeline infrastructure	Pipeline distance (miles)[d]	0.00	0.25	0.50	5.00	30.00
Climate zone	Water adjustment[e]	0.9	1.0	1.1	1.3	1.5

NOTE: MMcf = million cubic feet.
[a] Inputs based on BLS, “Occupational Employment and Wage Statistics (OEWS) Maps.”
[b] This input is assumed.
[c] These inputs are based on December 2025 data from EIA, “Natural Gas Prices.”
[d] These inputs are based on midpoint of rubric framework using Global Energy Monitor, “Global Gas Infrastructure Tracker.”
[e] These inputs are the inverse of implied water-cooling efficiency for temperature, and humidity changes in Ayoub, Gjorgiev, and Sansavini, “Cooling Towers Performance in a Changing Climate.”

Table A.2. Sample Capital Expenditure and Operating Expenditure Breakdown, by Subcomponents for Gas Generation System

Component	Fixed Capex	Operating Cost
Procurement	$839,669,000[a]	NA
Installation (labor)	$182,898,000[b]	NA
Operating gas and labor	NA	$20,301,000[c]
Operating water	NA	$7,647,000[d]
Emissions abatement	NA	NA
Total natural gas plant costs	*$1,022,567,000*	*$27,948,000*
Natural gas fuel supply		
Gas pipeline infrastructure	$15,730,000[e]	$174,244,000[f]
Total gas costs	*$1,038,297,000*	*$202,192,000*
2026 dollars[g]		
Inflated gas costs	$1,709,036,000	$311,471,000
Discounted gas costs[h]	**$5,199,756,000**	
Cost per MW	**$4,815,000**	

NOTE: These figures are given as examples only. Installation costs are sensitive to assumed labor scaling factors and dominate total capex under the NETL-based scaling assumptions. Inflation is based on the construction price index, plus 7 percent to capex to account for increased demand. The 7-percent figure is the increase in turbine prices over the past year according to Federal Reserve Bank of St. Louis, "Producer Price Index by Industry: Turbine and Turbine Generator Set Units Manufacturing: Steam, Gas, and Other Turbines and Turbine Generators." NA = not applicable.

[a] This is the NETL capex for a natural gas 727 MW power plant converted to 1,080 MW minus labor cost.

[b] This figure represents 4,523 full-time equivalents employed for 27 weeks at 50 hours per week, adjusted for workforce availability and salary.

[c] This figure represents 25 operators employed at $38.50 per hour and 1.705 dollars per MW-hour-net of consumables for 793.8 MW effective capacity for 8,765.76 hours per year.

[d] This figure represents $6.13 per 1,000 gallons of water at 2,090 gallons per day for 727 MW adjusted for a 1,080-MW plant size and adjusted again per Table A.1 for climate zone.

[e] This figure represents $12,100,000 per mile. See Smith and Bell-Hammer, "Pipeline Construction Costs Reach Record $12.1 Million/Mile."

[f] This figure represents available capacity, gas energy factor, and gas-to-power conversion efficiency that is then adjusted by gas price, as determined by Table A.1

[g] This component is escalated in reference to the FRED construction price index. See Federal Reserve Bank of St. Louis, "Producer Price Index by Commodity: Special Indexes: Construction Materials."

[h] This component is based on treating opex as a 15-year annuity growing at 5.1-percent inflation and discounted at 8 percent.

On-Site Geothermal

We estimated geothermal costs using the Geothermal Electricity Technology Evaluation Model (GETEM),[67] and we made adjustments for each location based on the estimated temperature at 3.5-km depth.[68] We chose a temperature at a fixed distance because of the lack of available data for the depth required to achieve the desired temperature. To account for uncertainty in interpreting the Blackwell et al. temperature map, a new framework criterion was created for geothermal temperature at 3.5-km depth, with an A grade for sites that are hotter than 175°C and an E grade for sites cooler than 100°C.

Table A.3 shows an example of some of the assumptions used in the GETEM modeling and outputs.

[67] Etingh, Mines, and Mansure, "Geothermal Electricity Technology Evaluation Model (GETEM) Individual Case Files and Summary Spreadsheet (GETEM version Spring 2013)."

[68] Blackwell et al., "Temperature-at-Depth Maps for the Conterminous US and Geothermal Resource Estimates."

Table A.3. Assumptions and Outputs of the Geothermal Electricity Technology Evaluation Model

Variable	Unit	Value
ISO region	NA	PJM Interconnection[a]
Temperature grade	Grade	E
Temperature at 3.5-km depth	°C	100[b]
Discount rate	%	8[c]
Time for construction	years	5
Operations commence	date	2030
Costings	date	2027
Original cost year	date	2012
Cost GETEM	US$	$3,786,333,000[d]
Output	MW	40[d]
Capacity factor	%	0.908[e]
Available capacity	MW	36.3[f]
Target	MW	916[g]
Required number of units	#	25[h]
Total cost of geothermal plant	US$	$95,458,464,000[i]
Inflated cost	US$	$170,173,441,000[j]

NOTE: Figures are given as examples only.
[a] PJM Interconnection is an ISO that operates in 13 states; this classification was determined in Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*.
[b] This figure is based on a discount-rate assumption applied across all sites.
[c] Blackwell et al., "Temperature-at-Depth Maps for the Conterminous US and Geothermal Resource Estimates."
[d] Etingh, Mines, and Mansure, "Geothermal Electricity Technology Evaluation Model (GETEM) Individual Case Files and Summary Spreadsheet (GETEM version Spring 2013)."
[e] Capacity factors are taken from the effective load-carrying capability factors in Arciniegas Rueda et al., *Assessing the United States' Additional AI Power Capacity by 2030*.
[f] This figure represents the output multiplied by the capacity factor.
[g] This figure is calculated as follows: 1,000 MW compute + cooling requirement − load from grid.
[h] This figure is calculated as follows: target / available capacity, rounded up.
[i] This figure is calculated as follows: required number of units × cost GETEM.[kj] This figure represents the total cost inflated to 2026 dollars using FRED construction price index.

Hybrid Solar Photovoltaic and Battery Energy Storage System

The solar and battery storage model is based on cost estimates prepared by Sargent & Lundy for the EIA, regarding a reference system comprising 150 MW of solar capacity coupled with 200 MWh of AC battery storage.[69] The model disaggregates the Sargent & Lundy cost estimates into five components: battery capital costs (limited to direct battery costs only), solar capital costs, battery labor costs, solar labor costs, and operating cost. These cost components are

[69] U.S. Energy Information Administration, *Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies*.

normalized by their respective capacities, yielding a cost per kilowatt for solar components and a cost per kilowatt-hour for battery components.

The BTM solar storage system is scaled to the same output as BTM gas and grid power through two adjustments: (1) a conversion efficiency factor of 15 percent and (2) inclusion of transmission and interconnection capital costs (adding between 5 to 14 percent to total project costs). Therefore, the solar storage data center arrangement overbuilds solar power to power the data center based on average expected generation and can switch to grid power if there is a prolonged period with no solar generation (e.g., multiple days). Other options are available for a fully off-grid data center, such as backup diesel or reciprocating gas generators.

Four site-specific metrics drive cost variations across locations: solar resource availability, PV workforce availability, PV workforce salary levels, and land availability. Solar resource availability, measured by maximum solar power potential, determines the land area and solar panel quantity required to meet demand. This provides us with an estimate of the solar capacity required, which is multiplied by the cost per kilowatt. The battery size is provided based on the provided site demand and the hours of storage operation. The PV workforce availability metric adjusts costs upward for locations with limited local expertise by incorporating relocation costs for a percentage of the required workforce or decreasing those costs for sites with a B grade or greater. The PV workforce salary metric adjusts labor costs from a nominal salary assumption of a C grade to reflect regional wage variations. The same PV workforce and salary grades are used to adjust for the battery installation labor cost.

An example breakdown of the high-level costs considered in the solar PV model is provided in Table A.4.

Table A.4. Sample Capital Expenditure and Operating Expenditure Breakdown, by Subcomponents for Hybrid Solar-Storage System

Component	Fixed Capex	Operating Cost
Solar plus battery	$8,625,233,000[a]	$241,584,000[b]
Wages	$1,587,323,000[c]	NA
Relocation costs (labor)	$29,341,000[d]	NA
Land	NA	$5,128,000[e]
Total solar plus battery costs	$10,241,897,000	$246,712,000
Discounted solar plus battery costs	$11,444,365,000	NA
Discounted solar plus battery per MW	$12,494,000	NA
2026 dollars[f]	$10,883,341,000	$262,163,000
Escalated net present value	**$12,149,762,000**	NA
Cost per MW[g]	$13,263,000	NA

NOTE: These figures are given as examples only.
[a] This figure is calculated as follows: total required solar capacity × non labor solar cost per MW + Storage capacity × battery storage duration × cost per MWh
[b] This figure is calculated as follows: total required capacity × operating cost / MW-year
[c] This figure is calculated as follows: average employee salary (based on workforce data) × average number of employees per Watt solar and per kWh storage capacity.
[d] This figure is based on PV workforce availability.
[e] This figure is calculated as follows: required land use (power plant capacity / average power outage per square meter) × $708 / acre. It uses a rental cost of $814,200 for land to support 150 MW solar generation, estimated at $1,150 per acre, at approximately 5.2 kW per square meter. Initial land costs are from EIA, *Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies*.
[f] This figure is escalated using the FRED construction price index.
[g] This figure is divided by required capacity (in this case, 916 MW).

Cooling

The optimal cooling technology for a data center's heat load varies across geographical locations. Although we do not consider a site-specific equipment selection, a rough approximation of the best technology can be proxied by looking at the climate zone grade and the water availability grade.[70] The nominal model is based on energy and water consumption for an air- and water-cooled chiller, adjusted for our data center size. The model captures this variation by assigning cooling technologies based on the combined assessment of climate zone grade and water availability. The technology options are air-cooled chillers, water-cooled chillers, a water-cooled chiller-economizer combination, and economizer only. The selected cooling technology subsequently affects both data center cooling water consumption and additional energy demand.[71]

[70] Antonopoulos et al., *Guide to Determining Climate Zones by County*; Van Geet and Sickinger, *Best Practices Guide for Energy-Efficient Data Center Design*.

[71] Mortensen, "A Review of Evaporative Cooling's Efficiency and Environmental Value"; Richardson, Battle Royale."

We estimated cooling infrastructure capex using technology-specific fixed rates per ton of cooling capacity, and we calculated operational costs from water consumption volumes and a fixed water-cost rate. The model assumes linear scaling relationships for both cooling efficiency and infrastructure costs, although this represents a strong assumption with limited empirical support. This approach is not intended to provide precise estimates of absolute cooling requirements and costs but rather to enable relative comparisons of cooling needs across different data center locations. Equipment costs are approximated as scaling linearly with cooling demand. Economizer costs are estimated at approximately twice the cost of standard pumps.

In terms of operational cost, the model is limited to capturing only variations in water consumption. We assumed water consumption is assumed to scale linearly with cooling load using California baseline data as the anchor point, and this consumption is adjusted by climate zone through constant factors. Adjustment factors are based on cooling tower efficiency across different climates.[72] Four cooling tower models were evaluated: economizers, air-cooled chillers, water-cooled chillers, and a combined water-cooled chiller and economizer system. More specifically, an air-cooled chillers is assisted with primary and secondary chilled water pumps and has a total operational efficiency of approximately 1.181 to 1.384 kW per ton,[73] and it uses approximately 200 gallons per ton of cooling per year.[74] Similarly, the water-cooled chiller system consists of the water-cooled chiller, cooling tower, primary and secondary chilled water pumps and condenser water pumps; it has a total operational efficiency of approximately 0.650 to 1.060 kW per ton, [75] and it uses approximately 1,735 gallons per ton per year.[76]

We assumed that water availability and climate conditions would affect the choice of cooling technology. Cooling technology was determined by the evaluation framework grades for water availability (from the World Resources Institute's *Water Risk Atlas*) and climate zone, according to Table A.5.

[72] Ayoub, Gjorgiev, and Sansavini, "Cooling Towers Performance in a Changing Climate."

[73] Richardson, "Battle Royale: Air-Cooled Vs. Water-Cooled Chillers."

[74] Mortensen, "A Review of Evaporative Cooling's Efficiency and Environmental Value."

[75] Richardson, "Battle Royale: Air-Cooled Vs. Water-Cooled Chillers."

[76] Mortensen, "A Review of Evaporative Cooling's Efficiency and Environmental Value."

Table A.5. Relationship Between Water Availability, Climate Zone, and Cooling Technology

	Water Risk				
Climate	**E**	**D**	**C**	**B**	**A**
E	Air-cooled chiller	Air-cooled chiller	Air-cooled chiller	Air-cooled chiller	Air-cooled chiller
D	Air-cooled chiller	Air-cooled chiller	Air-cooled chiller	Water-cooled chiller	Water-cooled chiller
C	Air-cooled chiller	Air-cooled chiller	Water-cooled chiller and economizer	Water-cooled chiller and economizer	Water-cooled chiller and economizer
B	Air-cooled chiller	Air-cooled chiller	Water-cooled chiller and economizer	Economizer only	Economizer only
A	Air-cooled chiller	Air-cooled chiller	Economizer only	Economizer only	Economizer only

We assumed water to have a constant marginal cost of $6.13 per thousand gallons.[77] Where water is less available, we changed the technology in the model to rely on a less water intensive (but often more costly) cooling mechanism.

Labor Workforce Costs

We estimated labor wages and availability directly for gas (Industrial Machinery Mechanics; Electrical and Electronics Repairers, Powerhouse, Substation and Relay) and solar hybrid generation (Construction and Extraction Occupations; Solar Photovoltaic Installers) using BLS May 2024 Occupational Employment and Wage Statistics Maps.[78] We then estimated the labor component for gas and solar hybrid generation costs based on the expected full-time equivalent labor hours, multiplied by the average wage, and then an additional relocation cost ($0 to $30,000 per person) that would need to be paid to a fraction of the workforce, between 0 to 75 percent, depending on the local workforce availability.

In the NETL 2022 cost and performance baseline estimate for a 2018 natural gas 727 MW power plant used for the base gas model, labor costs are approximately 18 percent of the total cost, including equipment costs, material costs, engineering, construction management, home office, fees, and process and project contingencies. This 18-percent rate of labor to total costs is also used to estimate labor costs for nongas and nonsolar components, in which the estimated total system capex before labor and insurance adjustments (e.g., transmission, generation, cooling) is then adjusted for labor availability. This larger labor availability is based on the difference from the base estimate using the same approach for the state wages and availability of Industrial Machinery Mechanics, Electrical and Electronics Repairers, Powerhouse, Substation and Relay.

[77] EPA, "Data and Information Used by WaterSense."

[78] BLS, "Occupational Employment and Wage Statistics (OEWS) Maps."

Insurance and Disaster Risk

Previous versions of the framework included the Federal Emergency Management Agency's (FEMA's) NRI, which uses a score from 0 (no risk) to 100 (very high risk) that represents a county's percentile of risk exposure based on expected annual loss, social vulnerability, and community resilience.[79] Instead of using the NRI as is, however, we extracted the expected annual building value loss from FEMA's Resilience Analysis and Planning Tool, along with the total building value, to estimate the baseline probability of a natural disaster event.[80] Thus, we could estimate the expected annual loss to a data center's exterior energy system. Finally, insurance costs are based on this expected annual loss plus a 10-percent margin for the insurance company, and they are treated as a recurring opex.

Other Assumptions

Other assumptions inherent in the financial modeling approach include backup generation, accounting for inflation and the escalation of outdated estimates, maintenance, and the tax benefits of depreciation.

We estimated backup generation based on the SAIDI for the expected minutes of outages from the grid power component of the energy supply and the cost for building additional power that could cover such an outage. We assume that backup generation should also be required to cover a temporary disruption to nearby generation capacity (in the same county) because of potential future policies or regulations mandating fault ride-through and grid-supported behavior from data center operators.[81]

For inflation estimates, we used a forward-looking rate of 5.1 percent, reflecting the increased economic supply pressures following continued conflicts in the Middle East, Russia, and Ukraine. A rate of 5.1 percent was chosen over 5 percent so that the net-present-cost formula was well defined when capital costs were decreased to 5 percent in the sensitivity analyses.

Escalation brought all component costs to 2026 dollars, using a construction materials price index.[82] This included a 1.54-times multiplier for gas components (NETL's original modeling was based on 2018 values), 1.79-times multiplier for the geothermal estimate (based on 2013 GETEM analysis), 1.06-times multiplier for hybrid solar (2023 estimates), and 1.01-times multiplier for cooling (2022 estimates taken during the initial Ukraine supply crunch).

We estimated depreciation using straight-line depreciation for the expected 15-year project life. This allows the cost of the energy infrastructure to be deducted as a tax expense against

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[79] FEMA, "National Risk Index Data."

[80] FEMA, "Resilience Analysis & Planning Tool."

[81] Watson, "Data Centers—A Good Grid Citizen."

[82] Federal Reserve Bank of St. Louis, "Producer Price Index by Commodity: Special Indexes: Construction Materials."

profits once operational, allowing for a tax benefit.[83] We estimated maintenance at the upper expected cost of depreciation. This is an upper limit, given that many of the system components (e.g., transmission lines, gas turbines) have expected lifetimes much longer than the 15-year operating life.[84] Therefore, if maintenance is greater than depreciation, it would be worthwhile to replace the infrastructure before its end of life, but the end of life is greater than depreciation, so we assume maintenance at depreciation as an upper bound on the expected annual maintenance costs for the system.[85]

Grade Variations and Framework Interpretation

We evaluated model results for sensitivity to grade interpretation because each grade corresponds to a range of possible values that could affect the outcomes. We considered three value assignments for each grade: low, nominal, and high. We then combined these assignments were to produce five interpretations for each of the four scenarios: low, mid-low, nominal, mid-high, and high.

The nominal interpretation represents the default meaning of each grade, typically corresponding to the midpoint of its range. The low interpretation reflects value selections that produce a lower overall cost, whereas the high interpretation reflects the opposite. We provide the complete set of value combinations used in the sensitivity analysis in Table A.6.

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[83] Legal Information Institute, "Straight-Line Depreciation."

[84] Carvalho, Hittinger, Williams, "Payback of Natural Gas Turbines: A Retrospective Analysis with Implications for Decarbonizing Grids"; Zeng et al., "Whole Life Cycle Cost Analysis of Transmission Lines Using the Economic Life Interval Method."

[85] Given that depreciation is less than the infrastructure lifespan, the underlying assumption is that technological advancements will make a 2026-era data center power system obsolete by 2037 because of technological advancements and new approaches to AI training and inference problems. One example is the proposals by SpaceX to establish data centers in space using 24-7 high-intensity solar power.

As this model estimates only costs, costs are lower with a shorter lifespan. However, a full analysis of any project should also account for the revenues that would be generated by the data center or the AI training and inference using data center compute. In this case, a shorter duration project is less profitable than longer duration data centers. However, as the entire AI business model is considered holistically, the risks of technological obsolescence become even stronger, leading to our confidence in a 15-year lifespan assumption for site selection purposes.

Table A.6. Variation in Grade Interpretation for the Relevant Metrics

Scenario	Metric	Grade	Low	Mid-Low	Nominal	Mid-High	High
Gas	Workforce salary ($/hour)	A	28	28	29	29	29
		B	29	29	30	30.5	30.5
		C	30	30	31	31.5	31.5
		D	31	31	34	34.5	34.5
		E	34	34	42	45	45
Gas and solar	Workforce relocation ($/person)	A	0	0	0	0	0
		B	10,000	10,000	15,000	20,000	20,000
		C	12,500	12,500	15,000	25,000	25,000
		D	30,000	30,000	40,000	45,000	45,000
		E	30,000	30,000	40,000	50,000	50,000
Gas and solar	Workforce relocation (%)	A	0.00	0.00	0.00	0.00	0.05
		B	0.1	0.2	0.2	0.2	0.3
		C	0.4	0.5	0.5	0.5	0.6
		D	0.55	0.65	0.65	0.65	0.75
		E	0.75	0.80	0.80	0.80	0.90
Gas	Gas price ($ thousand/MMcf)	A	6.5	7.0	7.0	7.0	8.0
		B	8.8	9.8	9.8	9.8	10.8
		C	10.85	11.80	11.80	11.80	12.50
		D	13.00	12.55	12.55	12.55	14.00
		E	14.5	16.0	16.0	16.0	17.5
Gas	Gas pipeline connection (miles)	A	0.0	0.0	0.0	0.0	0.5
		B	0.25	0.50	0.50	0.50	1.00
		C	0.5	1.0	1.0	1.0	5.0
		D	5	10	10	10	25
		E	30	50	50	50	100
Geothermal	Temperature at depth (3.5 km)	A	225	200	200	200	175
		B	175.0	167.5	167.5	167.5	150.0
		C	150.0	137.5	137.5	137.5	125.0
		D	125.0	112.5	112.5	112.5	100.0
		E	100	100	100	100	95
Solar and battery	Solar radiance (kWh/day)	A	7.0	6.5	6.5	6.5	6.5
		B	6.5	5.5	5.5	5.5	5.0
		C	5.0	4.5	4.5	4.5	4.0
		D	4.0	3.5	3.5	3.5	3.0
		E	3.0	2.5	2.5	2.5	2.0

Scenario	Metric	Grade	Low	Mid-Low	Nominal	Mid-High	High
Solar and battery	Workforce salary ($/hour)	A	15.78	15.78	20.78	25.80	25.80
		B	25.86	25.86	26.55	27.00	27.00
		C	27.05	27.05	28.83	30.30	30.30
		D	30.36	30.36	34.96	38.50	38.50
		E	38.5	38.5	39.5	39.5	39.5
Grid	Transmission line ($ thousand/mile)	-	2,000	3,000	3,000	3,000	4,000

The results enabled comparisons of the best scenario for each site against the others under different rubric interpretations, and they also showed how alternative rubric interpretations could change which technology appears most favorable. Figure A.1 presents the site rankings as a function of rubric interpretation. The figure shows limited variation among the highest- and lowest-ranked contenders, with greater variation among the middle-ranked results. This suggests that, under the existing rubric, uncertainty remains high enough to preclude strong claims about the relative potential of one site over another. However, the results are sufficiently consistent to support broad comparisons, such as comparing whether a site generally appears to be a strong or less favorable one.

Figure A.1. Site Ranking Under the Low-to-High Rubric Interpretations

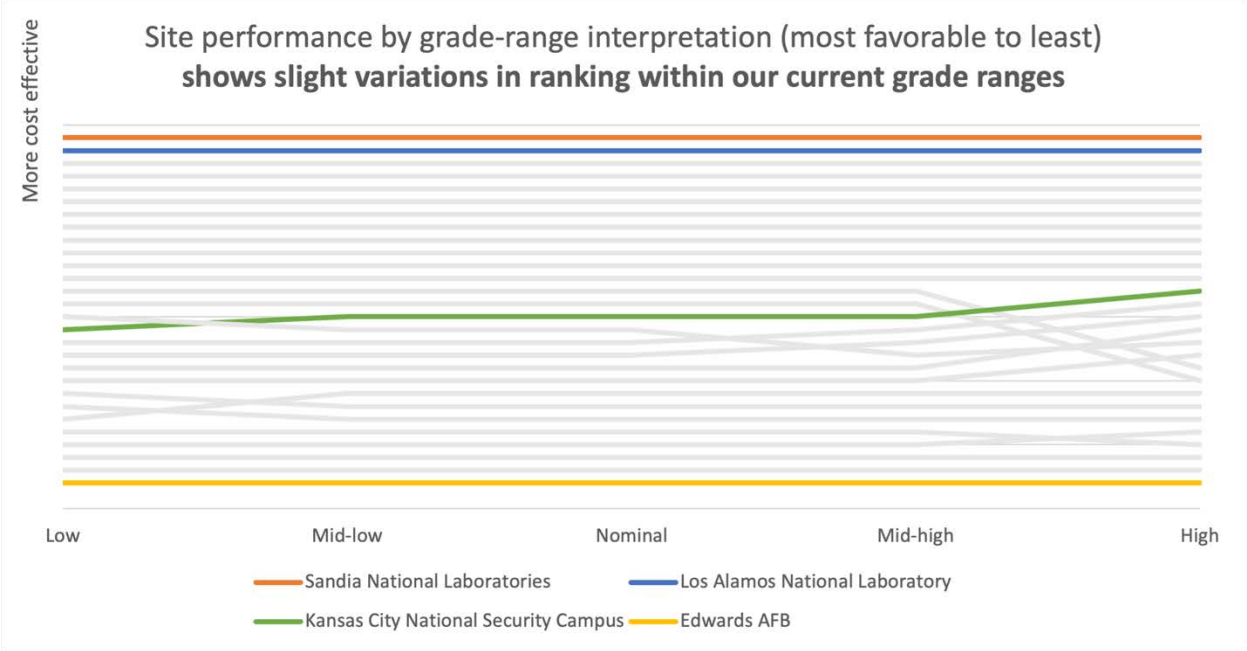

Table A.7 illustrates how the preferred technology at each site might change under different grading interpretations. In general, the preferred technology remains consistent across sites, with a few exceptions. Among the selected test sites, four exhibit a change in preferred technology:

Sandia National Laboratories, Los Alamos National Laboratory, Oak Ridge National Laboratory, and the Paducah Gaseous Diffusion Plant. In each case, the preference shifts from an off-grid technology to grid connectivity. We observed no other transitions.

Table A.7. Best Technology Selection per Site

Location	Low	Low-Mid	Nominal	Mid-High	High
Sandia National Laboratories	Geothermal	Geothermal	Geothermal	Geothermal	Grid
Los Alamos National Laboratory	Geothermal	Geothermal	Geothermal	Geothermal	Grid
Idaho National Laboratory	Geothermal	Geothermal	Geothermal	Geothermal	Geothermal
Fort Bliss	Geothermal	Geothermal	Geothermal	Geothermal	Geothermal
NETL Morgantown Campus	Geothermal	Geothermal	Geothermal	Geothermal	Geothermal
National Renewable Energy Laboratory	Geothermal	Geothermal	Geothermal	Geothermal	Geothermal
Stargate Abilene	Gas	Gas	Gas	Gas	Gas
Portsmouth Gaseous Diffusion Plant	Gas	Gas	Gas	Gas	Gas
Fort Hood	Gas	Gas	Gas	Gas	Gas
Savannah River Site	Gas	Gas	Gas	Gas	Gas
Pantex Plant	Gas	Gas	Gas	Gas	Gas
Oak Ridge National Laboratory	Gas	Grid	Grid	Grid	Grid
Paducah Gaseous Diffusion Plant	Gas	Gas	Gas	Gas	Grid

Appendix B. Federal Site Analysis

In this appendix, we describe the evaluations of the four DOA and eight DAF sites listed in each organization's respective RFP for data center development. We used a two-part process to conduct the site evaluations. First, two RAND researchers independently applied the framework to all twelve sites.[86] Then, the two researchers met to compare ratings and discuss differences. Reasons for rating differences include one researcher finding additional supporting detail that the other did not, subjective interpretations of more-qualitative criteria, differing methods on aggregating individual criteria ratings into category grades, and errors.

Army Sites

This section contains evaluations of the four sites listed in the DOA's RFP. Descriptions of individual criteria ratings reflect the evaluation of one or both researchers (Tables B.1 through B.4).

Table B.1. Fort Hood Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	B	Fort Hood has high potential for gas, coal or other solid combustibles, and wind power. Existing pipelines are near and additional planned capacity is high. The fort has rail access, and the county has no EPA restrictions. Windspeed exceeds 6.5 m/s and there are large tracts of land available for turbines. The site, in Texas, has good potential for solar power. The local grid has good potential to support additional load delivery. Geothermal and nuclear power are not good options here, as there are no current, retired, or planned projects of either type.
Energy system	C/B	Our previous estimates of available capacity additions were higher in [Electricity Reliability Council of Texas] ERCOT than any other ISO region, with approximately 69 GW of firm load expected to be added to the grid by 2030. However, NERC has identified the potential for elevated reliability risk in the region from 2026 caused by increased load growth and winter weather risks. The average industrial power price in Texas is relatively low at $0.0667/kWh. The local grid operated by Oncor Electric Delivery Company, LLC, has midrange SAIDI outage statistics.
Supporting inputs	B	Using Dallas and San Antonio as proxies, we estimate the cost of construction to be relatively inexpensive at less than $11/Watt. There is ample population within a 50-mile radius to support the work. Water stress is fairly low in this area, also a favorable B score. And ERCOT has an effective and streamlined regulatory process. The worst grade in this category is a C for available land. The RFP details that only 207 acres are available.

[86] Here, the framework refers to the one developed in Arciniegas Rueda et al., *Evaluating Potential Artificial Intelligence Energy Capacity at Different Data Center Sites*. In addition to the original report, refer to Chapter 3 of this report for more information on how we applied these evaluations.

Category	Grade	Descriptions of Individual Criteria Ratings
Environmental considerations	D	Environmental considerations are tough for this site. Although the area is in EPA attainment as discussed above for coal availability, it is categorized as [International Energy Conservation Code] IECC climate zone 2A, hot humid. This is among the heaviest cooling burden in [the continental United States] CONUS as only the southern tips of Texas and Florida are worse at 1A, very hot humid. Natural disaster risk is also a major challenge. Fort Hood lies in Coryell and Bell Counties—Bell County has a FEMA NRI score of 91.13 out of 100.
Governance considerations	B	Texas is very credit supportive and is among the biggest energy markets. Surrounding areas display a mix of distress levels but roughly average to a rating of at risk, a B score. Finally, the energy burdens of Coryell and Bell Counties are 3.30% and 2.87% respectively—this yields an average that gives a C score.

NOTE: For Fort Hood, the owner is DOW, and the ISO and Balancing Authority (BA) is ERCOT.

Table B.2. Fort Bragg Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Nuclear energy could be a good option for a data center at Fort Bragg because Duke Energy operates multiplied nuclear power plants in North Carolina. Likewise, coal and other solid combustibles could be a good option because the fort has direct rail access and lies in an area with full attainment of Clean Air Act standards. Natural gas appears to be a viable option: There is some existing pipeline infrastructure nearby and active plans to add more. Solar and wind power are less good options because of the source of power for those technologies, meaning there is ample land but middling irradiance and less than adequate wind speed. Geothermal energy is not a viable option in North Carolina.
Energy system	C	The grid might constrain suitability at Fort Bragg. Duke's SAIDI in their North Carolina territory is 1,626.01 minutes, almost a D rating. And NERC has judged power reliability to be at elevated risk in the near term. Worst of all is the score for regional transmission and distribution planning. The generation portions of the energy system are more favorable. Industrial power in the state averaged 7.91 cents per kWh. And the generation project regulatory process appears to be highly efficient.
Supporting inputs	B	Supporting inputs for a data center at Fort Bragg are above average. Best is the access to construction workforce. Next are water availability and cost of construction. Worst in this category, achieving C levels, are available land at 734 acres and regulatory/legislative processes in the state.
Environmental considerations	C	The favorable impact of clean air attainment is weighed down by a warm humid climate and by a natural risk score in Cumberland County of 89.47, almost an E rating.
Governance considerations	B	There is a mix of community stress levels around the large area that Fort Bragg occupies; we judge the average to be at risk, a B rating. North Carolina is high credit supportive. Cumberland County has a midrange energy burden at 3.41%. Best in this category is the marginal effect of 1 GW of power, which would increase the approximately 40-GW total capacity in the state by 2.5%.

NOTE: For Fort Bragg, the owner is DOW, and the ISO and BA is Duke Energy.

Table B.3. Fort Bliss Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Natural gas is the least constraining generation supply option for a data center at Fort Bliss. After that come solar and wind, with sufficient irradiance, wind speed, and land. Geothermal and nuclear power do not currently exist anywhere nearby. Coal and other solid combustibles are likewise a poor option because the general El Paso area has nonattainment for 2 NAAQS pollutants. Though, Fort Bliss does have good railroad access. The existing electric ecosystem appears B-level favorable. Transmission and distribution infrastructure has adequate ability to support energy delivery. El Paso County had 1,928 MW of existing and retired generation according to recent EIA data.
Energy system	C/B	Energy system factors affecting Fort Bliss are a little better than energy supply. Best in class is price of power, which is below 7 cents per kWh, the threshold for an A rating. SAIDI for the El Paso Electric Co. was 56.241 minutes, a B rating. Normal NERC reliability risk and efficient regulatory planning processes for generation also earn B ratings. Regulatory processes for transmission and distribution planning as well as generation projects in the queue both earn D ratings, dragging the category average down to a C/B.
Supporting inputs	B	There are two A ratings in this category. One is for available workforce, as most of Fort Bliss lies within the city limits of El Paso, with a population over 600,000. The other is for regulatory/legislative processes. We estimate construction costs to be in the B range using an average of the costs of construction in Phoenix at $11.20/Watt and in San Antonio at $10.60/Watt. The RFP details that 1,384 acres are available. Worst in this category is water availability risk, a C.
Environmental considerations	D	Environmental considerations at Fort Bliss will be difficult. There are 2 air pollutants to worry about. El Paso County has a natural disaster risk index score of 95.45 out of 100. These are both E ratings. The climate is categorized as warm dry, a C rating which brings the category average up to a D.
Governance considerations	B	El Paso, TX, is characterized as distressed on the Distressed Communities Index. Texas has about 205 GW of capacity, so an incremental 1 GW would be less than a 1% increase. Both these result in A ratings. El Paso County has an energy burden of 2.28%, a B rating. And Texas is very credit supportive, a C rating. The average across all four factors is a category rating of B.

NOTE: For Fort Bliss, the owner is DOW, and the ISO and BA is El Paso Electric Company.

Table B.4. Dugway Proving Ground Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	D	Dugway has no good energy supply options because it is so isolated. There is plenty of land available for solar panels and wind turbines, but the sun's irradiance and the wind's speed are rated at only the C level. These are the highest-rated technologies. The natural gas infrastructure near Dugway is limited. Geothermal energy is producing electricity in Utah, but not in large amounts. The state has no nuclear energy. And although it is sparsely populated, Tooele County has 2 NAAQS nonattainment pollutants. On top of all this, though not surprisingly given the sparse population, there are no sub transmission or transmission lines above 30 kV within 5 miles of the installation.

Category	Grade	Descriptions of Individual Criteria Ratings
Energy system	C	Energy system criteria are more favorable than supply. PacifiCorp achieved a SAIDI of 117.720 minutes, which is a C grade but close to a B. Industrial power average 7.89 cents per kWh in the state, a B. The grid has normal long-term reliability risk and efficient regulatory planning processes for generation projects. Criteria rated below C are regulatory planning processes for transmission and distribution, as well as our analysis of generation projects in the queue.
Supporting inputs	C	Most supporting inputs criteria for Dugway rate at the B level. The only exception is available workforce. There are less than 50,000 residents within a 50-mile radius of Dugway, giving the lowest grade for this metric. This low grade is enough to bring the category average down to a C.
Environmental considerations	C	As mentioned, Tooele County is a region with nonattainment of 2 NAAQS pollutants. This low suitably rating is balanced by a high score for cooling, as the region is categorized as a cool dry climate. Natural risk for the county is scored nearly in the middle of the range at 48.89. We saw above that generation supply for this site will be a challenge. But if a developer solves that problem, the site should be suitable in terms of cooling need and average in terms of natural disaster risk.
Governance considerations	C/B	Although sparse, the nearby population is shown to have low stress at the comfortable Distress Index level. All other criteria in this category are rated Bs. This suggests that a developer could appeal to non-economic benefits of a proposed data center to win over residents. Or perhaps the small number inhabitants, as mentioned in Supporting Inputs, might make it easier to achieve community support by engaging more directly with residents.

NOTE: For Dugway Proving Ground, the owner is DOW, and the ISO and BA is Rocky Mountain Power (PacifiCorp).

Air Force Sites

This section contains the evaluations of the eight sites listed in the DAF's initial RFLPs. Descriptions of individual criteria ratings reflect the evaluation of one or both researchers (Tables B.5 through B.12).

Table B.5. Arnold Air Force Base Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Arnold AFB is perhaps the most average of all DOW sites we evaluated: It received essentially C ratings across all criteria. In Energy Supply, there are generation technologies at all levels of suitability. From worst to best they are: geothermal, wind, solar, natural gas, and tied for best are nuclear and coal/other solid combustible. These alone average to a C. Adding the remaining factors does not change the average. The transmission and distribution infrastructure is robust, ready to accommodate additional load at an A rating level. However, the nearby nameplate capacity available is less than 100 MW, an E level.
Energy system	C	At this location, power is cheap, SAIDI is low, and long-term grid reliability is normal. Interconnection timeline is middling. The low scores bringing the category down are regional T&D planning as well as our projected capacity available in the region, from our previous research.
Supporting inputs	C	Most supporting inputs for Arnold rate as Cs and Bs, but we found no evidence of processes supporting fast-tracking or other timeline acceleration efforts. This lack brings the average down to a C.

Category	Grade	Descriptions of Individual Criteria Ratings
Environmental considerations	C	Tennessee is split between two climate ratings, warm humid and mixed humid. Unfortunately for our purposes, Arnold AFB is in the warm humid portion. Site environmental considerations are buoyed by clean air as evidenced by Clean Air Act pollution level attainment. Natural risk here is midrange, as is the resulting category score.
Governance considerations	C/B	B ratings in this category for Arnold are Tennessee's highly credit supportive environment and large amount of capacity, the latter of which means an incremental 1 GW would increase the total by less than 5%. C ratings for Arnold are stress levels and energy burdens in the surrounding communities. The category average splits the difference as a C/B.

NOTE: For Arnold AFB, the owner is DOW, and the ISO and BA is Tennessee Valley Authority.

Table B.6. Davis-Monthan Air Force Base Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	The potential for solar is high in southern Arizona, and Davis-Monthan is near plenty of available land. In contrast, wind speed in the region does not make wind power a great option for supply. Both the natural gas and electric grid infrastructure are adequate at C ratings. Arizona has no existing or planned utility-scale geothermal projects. And the zone has an NAAQS pollutant nonattainment status, rendering coal and other solid combustibles a poor choice.
Energy system	C	The energy system criteria of Davis-Monthan are like the energy supply ones: some OK, some worse, nothing an A rating. Our previous work shows the region has less than a gigawatt in the generation queue. This is the site's worst rating in this category. Power is fairly cheap and long-term reliability risk is normal, both B ratings.
Supporting inputs	C	This category has 5 criteria and Davis-Monthan scores one of each grade across them. From least- to most-favorable criteria, the site has: no evidence of fast tracking interconnection requests, high water-stress risk, adequate available land at 2,300 acres, inexpensive data center construction costs using Phoenix as a proxy, and great access to workforce as the base is located within the city limits of Tucson, population exceeding half a million residents.
Environmental considerations	D	The base has no favorable environmental considerations. The climate is hot dry, the natural risk rating exceeds 90, and the zone has an Air Act pollutant nonattainment rating.
Governance considerations	C/B	Governance considerations are the most favorable group of criteria for this site. Though Arizona gets a D rating for credit support, the other three criteria are evaluated as Bs. These factors, combined with the other categories, suggest that a developer might be able to site a data center at Davis-Monthan if the developer has the resources to build out supporting infrastructure for generation and to weather the long development process. Put another way, the community appears suitable to accept a data center if a developer has the time and money to build one.

NOTE: For Davis-Monthan AFB, the owner is DOW, and the ISO and BA is Tucson Electric Power.

Table B.7. Edwards Air Force Base Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	B	Edwards Air Force Base has the best potential for energy supply options of the five sites in the DAF RFP. The grades below C are for nuclear and coal/other combustible. The San Onofre nuclear plant is 150 miles away but has been closed since 2013 and is dismantled. And while the site has decent rail access, the air quality is among the worst in the country with nonattainment for 6 NAAQS pollutants. All other sources show potential in the B or A range. And the nearby grid appears to be adequately capable.
Energy system	D/C	The highest Energy System grade is a B for regional grid planning. The lowest is an E for price of electricity. All other criteria score in the D and C range, yielding the category average of D/C.
Supporting inputs	C	The regulatory process shows potential for improvement. In January 2026, the California Public Utilities Commission (CPUC) issued a ruling to consider comments on a proposal for a standardized tariff for large-load customers. Other favorable supporting inputs are high availability of workforce and a large amount of available land: 2,115 acres per the RFP. Other criteria bring the category grade down to a C average.
Environmental considerations	D	In addition to the extremely high number of air quality pollutants, this site has a high natural risk score. Both criteria are rated as Es. The climate is labeled warm marine, yielding a C rating and a total category rating of D.
Governance considerations	B	In contrast to environmental, governance considerations are favorable at Edwards. We judge the average distress level of surrounding communities to be at risk, a B rating. An incremental 1 GW of capacity would represent less than a 1% increase to total California capacity, an A rating. And energy burden is lowish, receiving a B rating. California is not the most credit supportive; this criteria gets a D rating, bringing the category average to a B.

NOTE: For Edwards AFB, the owner is DOW, and the ISO and BA is California ISO.

Table B.8. Joint Base McGuire-Dix-Lakehurst Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Across the various supply options we evaluated, [JB McGuire-Dix-Lakehurst] received every possible grade. The resulting average is a C. Natural gas is the only A rating, with ample existing infrastructure and high expansion capacity. Similarly, the electric grid is robust nearby, yielding a B. Renewables received C grades: Solar irradiance and wind speed are middle of the range, while there is some but not a lot of land available for building these types of generators. Nearby existing and retired capacity is low, D rating. There is no large-scale geothermal energy in New Jersey. And while [JB McGuire-Dix-Lakehurst] has ample rail access, the area has multiple NAAQS nonattainment and would be poorly suited to coal and other solid combustibles. These last two criteria get E ratings.
Energy system	D	There are no bright spots in the Energy System category for McGuire-Dix-Lakehurst. Jersey Central Power and Light, a FirstEnergy company, has a SAIDI of 481.120 minutes per year, a C rating. All other criteria are Ds or Es. In particular, the price of electricity is very high.
Supporting inputs	C	Water stress and access to construction workers are not issues near [JB McGuire-Dix-Lakehurst]. Regulatory/legislative process improving but not yet evidenced to be expedient. Available land is low: The RFP lists 193 acres, which is just over the threshold to be rated a C. And construction would be expensive—nearby Newark is judged to have costs at $12.50/Watt, the fourth-highest cost of all the regions included in the Cushman and Wakefield report.

Category	Grade	Descriptions of Individual Criteria Ratings
Environmental considerations	D	Much of New Jersey, including [JB McGuire-Dix-Lakehurst], is a mixed humid climate. Though, a few counties north is the dividing line with cool humid. But we rate the site a C for cooling need. The other environmental considerations rank poorly. Natural disaster risk is above 90. As mentioned, the area around [JB McGuire-Dix-Lakehurst] has multiple EPA nonattainment pollutants.
Governance considerations	C	New Jersey is not the most credit supportive state. In addition, the communities surround JB McGuire-Dix-Lakehurst are generally comfortable on the Distressed Communities Index. Both these factors contribute D ratings to Governance. The state is small enough that 1 GW of incremental power would represent an increase of 5.541% in total capacity. This is just over the threshold of 5% that demarcates a B rating from a C. The best rating in this category is a B for energy burden.

NOTE: For JB McGuire-Dix-Lakehurst, the owner is DOW, and the ISO and BA is PJM Interconnection.

Table B.9. Robins Air Force Base Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Coal and other solid combustibles received the highest rating at this site, followed by natural gas. Above-average marks also went to the existing T&D system. Middle grades went to existing and retired capacity in the region, solar, and nuclear power—the latter because there are operating nuclear plants in Georgia but the ability to serve additional AI data center load is unknown. Wind potential received a D rating while geothermal got an E because there are no current or planned projects in the state.
Energy system	D/C	The Energy System around Robins AFB is poorly equipped to support data centers. Our previous analysis shows less than 1GW of new resources in the interconnection queue. The large-load interconnection process is of average duration while the resource and grid planning process is slow enough to earn the worst grade. B grades were achieved in both NERC reliability assessment and power price criteria.
Supporting inputs	B	The worst supporting input grade is for regulatory/legislative process. A January 23, 2025 Georgia Public Service Commission (PSC) ruling ordered that any new contract for electric service over 100 MW must be submitted to the PSC for review. This could tend to slow the connection process. Available land on the lower end of a C: The RFP details 219 acres. Water availability and construction costs are rated as Bs. Robins gets an A in workforce availability because of the number of people living within the specified radius. In particular, the installation is about 30 miles from Macon.
Environmental considerations	C	Environmental considerations at Robins are a mixed bag. A favorable condition is air quality; the area is in EPA attainment for pollutants, yielding an A. Unfavorable conditions include a warm humid climate and a relatively high natural risk score. Both criteria get D ratings.
Governance considerations	B	Energy burden near Robins is middle-of-the-pack, yielding a C rating. All other Governance criteria get Bs. Georgia is judged to be highly credit supportive. The addition of an incremental 1 GW of supply would represent just a 2.35% increase in total state capacity. We evaluate community stress to be at risk on the index but note that this is an average of sorts as the areas around Robins contain a mix of communities. There are a substantial number of distressed communities, but also some comfortable and prosperous.

NOTE: For Robins AFB, the owner is DOW, and the ISO and BA is Georgia Power (Southern Co.).

Table B.10. Joint Base Elmendorf-Richardson Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Coal and battery storage received the highest rating at this site, followed by natural gas. Above-average marks also went to the existing nearby generation capacity and potential for resource diversity. Middle grades went to wind and geothermal availability and nearby T&D infrastructure. The site is not suitable for solar or nuclear power which received grades of E.
Energy system	D	The Energy System around JB Elmendorf is poorly equipped to support data centers. Our previous analysis shows less than 50-MW nameplate of planned resources, all hydroelectric. Local utility Chugach Electric reports an adequate 200 minutes SAIDI.
Supporting inputs	D	The worst supporting input grades are for labor availability, both industrial machinery mechanics for gas generation and specialized labor for any other generation options are scarcely available in Alaska. Data center construction costs are also expected to be higher than in the mainland states. Available land is a strong A, with more than 64,000 acres available on base. Water availability is also high and low risk.
Environmental considerations	B	Environmental considerations at JB Elmendorf are generally favorable with high disaster risk. The climate and air quality do not pose any restrictions on data center development, both being As. There are no restrictions on the use of gas turbines, and JB Elmendorf has a very cold climate. However, the natural disaster risk is E, indicating potential limitations or additional costs to prepare for a very high risk of earthquakes, tsunamis, landslides, blizzards in the winter, and avalanches in the spring.
Governance considerations	D	Energy burden near JB Elmendorf is low, receiving a B rating. However, all other Governance criteria get Ds. Alaska is more credit supportive, but borrowing conditions are restrictive compared to many mainland states. Alaska is judged to be highly credit supportive. The addition of an incremental 1 GW of supply would represent just a 32% increase in total state capacity. We evaluate community stress to be comfortable on the index, suggesting limited benefits to the residents of Anchorage from a local data center.

NOTE: For JB Elmendorf-Richardson, the owner is DOW, and there is no ISO or BA, but the Alaska RRC (Railbelt Reliability Council) and Railbelt Transmission Organization support local utilities in coordinating the interconnected Railbelt grid.

Table B.11. Eielson Air Force Base Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	B/C	Energy Supply for Eielson AFB is very mixed. It is one of the best sites evaluated for geothermal, natural gas supply, and battery storage but severely constrained by its remoteness more than 20 miles from the city of Fairbanks and any form of [high-voltage] transmission lines. Other generation options are middling at best, such as coal, wind and nuclear, or infeasible at worst (solar). Nearby capacity is limited, receiving a D, while resource diversity received a B. However, it is worth noticing that there is a local, 31-MW coal power plant and supporting railway system which could be upgraded.
Energy system	D	The Energy System around Eielson AFB is poorly equipped to support data centers. Our previous analysis shows less than 50-MW nameplate of planned resources, all hydroelectric. Local utility Golden Valley Electric reports an adequate 550 minutes SAIDI.

Category	Grade	Descriptions of Individual Criteria Ratings
Supporting inputs	D	The worst supporting input grades are for labor availability, both industrial machinery mechanics for gas generation and specialized labor for any other generation options are scarcely available in Alaska. Data center construction costs are also expected to be higher than in the mainland states and with an increased cost for materials than locations closer to Anchorage or major ports, receiving an E. Available land is a moderate C, with 600 acres available. Terrain is not overly favorable to expand the base, bounded by the Tanana River to the southwest and mountains to the northeast. Water availability is low risk and graded A.
Environmental considerations	C	Environmental considerations at Eielson are a mixed bag. A favorable condition is the very cold climate providing natural cooling. The area has one NAAQS pollutant, restricting the use of gas generation, and yielding a D. Unfavorable conditions also include the high natural disaster risk, receiving a D.
Governance considerations	D	Energy burden near Eielson is middle-of-the-pack, yielding a C rating. All other Governance criteria get Ds. Alaska is more credit supportive, but borrowing conditions are restrictive compared to many mainland states. Alaska is judged to be highly credit supportive. The addition of an incremental 1 GW of supply would represent just a 32% increase in total state capacity. We evaluate community stress to be comfortable on the index, suggesting limited benefits to the residents of Fairbanks and the Tanana Valley from a local data center.

NOTE: For Eielson AFB, the owner is DOW, and there is no ISO or BA, but the Alaska RRC and Railbelt Transmission Organization support local utilities in coordinating the interconnected Railbelt grid.

Table B.12. Clear Space Force Station Evaluation

Category	Grade	Descriptions of Individual Criteria Ratings
Energy supply	C	Coal and battery storage received the highest rating at this site, followed by natural gas and geothermal. Above-average marks also went to the existing T&D system, with high voltage lines and through the middle of the base. There is no potential for solar and nuclear power, receiving E grades, while wind and existing nearby generation have low potential, receiving D grades. Resources diversity was scored as a B.
Energy system	D	The Energy System around Clear [Space Force Station] is poorly equipped to support data centers. Our previous analysis shows less than 50-MW nameplate of planned resources, all hydroelectric. Local utility Golden Valley Electric reports an adequate 550 minutes SAIDI.
Supporting inputs	D	The worst supporting input grades are for labor availability, both industrial machinery mechanics for gas generation and specialized labor for any other generation options are scarcely available in Alaska. Data center construction costs are also expected to be higher than in the mainland states and with an increased cost for materials than locations closer to Anchorage or major ports, receiving an E. Available land is A, with 11,000 acres available. Water availability is low risk and graded A.
Environmental considerations	A	Environmental considerations at Clear are very favorable. The very cold climate provides natural cooling. There are also low natural disaster risks, with the location shielded from Pacific storms by the Alaskan range to the South. There are no NAAQS pollutants and the area is in EPA attainment.
Governance considerations	D	The nearby city of Anderson is a very small but prosperous community and would struggle to support a major infrastructure project. There are also high energy burdens receiving a D. Alaska is more credit supportive, but borrowing conditions are restrictive compared to many mainland states. Alaska is judged to be highly credit supportive. The addition of an incremental 1 GW of supply would represent just a 32% increase in total state capacity.

NOTE: For Clear Space Force Station, the owner is DOW, and there is no ISO or BA, but the Alaska RRC and Railbelt Transmission Organization support local utilities in coordinating the interconnected Railbelt grid.

Appendix C. Workshop Appendix

In this appendix, we provide details about the workshop, its participants, and its limitations.

Workshop Participants and Logistics

Participants

We identified participants through prior personal connections and professional networking conducted on behalf of Ismael Arciniegas Rueda and Kelly Klima. A save-the-date invitation was sent via email to 36 individuals, including seven professionals internal to RAND. Seventeen invitees responded to the outreach, and 14 of those respondents confirmed their attendance. All individuals who confirmed participation subsequently received a formal invitation to the workshop. Including five RAND participants, there were 19 people present at the workshop. Excluding the internal RAND participants, the 14 participants included mid- to senior-level representatives from multiple DOE offices (23 percent) and state-policy and governance organizations (8 percent), analysts and leadership from firms focused on energy systems and data center development (39 percent), and experts from think tanks and research organizations working on AI, energy, and industrial policy (30 percent). The group included participants with backgrounds in technology development, environmental compliance, energy policy, market analysis, operations, and strategic planning. Overall, the participant mix was designed to capture a variety of perspectives on energy infrastructure, AI deployment, industrial capacity, and public policy without concentrating on any single sector or institution.

Workshop Details

The workshop was held on Thursday, April 30, 2026, at RAND's Washington, D.C., office. It was structured as two sessions. A morning Data Center Siting Workshop session focused on Question 1 ("Using fictionalized but plausible data center siting scenarios, what barriers, decision factors, information needs, and process considerations do stakeholders identify as important for inclusion in PPP guidelines?") and included small-group discussion and a reconvening and report-out opportunity. The afternoon Day After scenario session focused on Question 2 ("How might unresolved local environmental, cultural, and infrastructure constraints after siting and building transform a federally approved data center project into a multifront legal, political, and security crisis that threatens national strategic objectives?"), and it was run in two turns, each followed by a discussion.

The workshop was conducted under Chatham House Rules to encourage open discussion while protecting attribution. At the outset, participants were also asked to focus on sharing facts,

experience, and information rather than opinions, in keeping with the workshop's goal of collecting factual inputs to inform subsequent analysis.

Workshop Limitations

The workshop has several important limitations that should inform the interpretation of our findings. First, the participant pool was a convenience sample recruited through professional connections and networking rather than through a systematic or representative sampling strategy. Although the workshop included individuals from federal government, industry, nonprofit, philanthropy, and research organizations, the resulting group was small and skewed toward DOE equities and, thus, will not reflect the full variety of perspectives relevant to frontier data center siting on federal lands. Workshop participants were asked to identify missing stakeholders and suggested, among others, the need for tribal representatives, local community members, environmental justice advocates, utilities, regulators, project implementers in specific regions, financiers, and other federal government agencies, such as DOW. As a result, the workshop findings should be interpreted as illustrative as opposed to either generalizable across any broader stakeholder population or as evidence of consensus across sectors.

Second, the latter half of the workshop reflects a single set of discussions using fictionalized but plausible scenarios designed to "deep dive" on certain issues with an intent to elicit stakeholder reactions, information needs, and process considerations. This design was appropriate for exploratory inquiry and for generating candidate issues for future PPP guidelines, but it also limits the generalizability of the results. Participant responses were shaped by the specific scenarios, prompts, facilitation approach, and time available for discussion, and different scenarios would have surfaced different issues or priorities. Accordingly, the results should be understood as preliminary, nonweighted inputs to guideline development rather than as validated findings, ranked priorities, or empirical conclusions about stakeholder preferences, likely outcomes, or best practices.

Tables C.1 through C.3 present scores for each evaluation category with the full category-level assessment narrative for each fictional DOA data center site. Scores range from A (does not constrain potential) to E (inadequate for large scale) (see Chapter 3 for more detail on the framework's scoring rubric). The Land row reflects available acreage rather than a rubric grade.

Table C.1. Camp Ridgeline Evaluation Scores, by Category with Assessment Narrative

Category	Score	Category Assessment
Energy supply	B	A variety of energy resources are present for BTM generation, and the T&D system is well-positioned to support large-load interconnections and new generation projects. Multiple announced projects are underway, showing strong potential to alleviate constraints and increase capacity in the near term.
Energy system	B	Robust energy system, with average to faster-than-average interconnection times and active programs to fast-track interconnections. Proactive transmission planning with stakeholder engagement. Regulatory support also indicates high potential for large-scale energy supply.
Supporting inputs	C	Some inputs are supportive of data center development, while other inputs are restrictive. Processes may not be fully efficient or effective. Some progress has been made in addressing resource needs, but challenges in at least two of land, water, workforce, or costs remain.
Environmental considerations	B	Environmental landscape is generally favorable for data center operations, with ample resources and a supportive regulatory environment. Natural disaster risks are manageable, and the climate zone allows for efficient cooling needs. Air quality is acceptable, and the area has no EPA restrictions, making it suitable for large-scale development.
Governance considerations	B/C	Governance landscape is mixed but generally workable for large-scale data center development. Duke Energy Progress carries a “more credit supportive” regulatory rating, reflecting a constructive but not top-tier utility environment. Stokes County falls in the at-risk economic tier, though the site presents a meaningful job creation opportunity that could strengthen community receptiveness. North Carolina's larger grid footprint (~32 GW) moderates the impact of a 1-GW addition, with a manageable impact ratio of 0.031. Residential energy burden is relatively contained at ~3.1% of income, sitting in the midrange. Overall, utility regulation and grid scale are reasonable, but community economic sensitivity calls for targeted engagement to maximize local benefit and maintain stakeholder support.
Land	412 acres	Very small for a data center; 500–800 acres typically needed to site a 1-GW data center.

Table C.2. Clearwater Research Station Evaluation Scores, by Category with Assessment Narrative

Category	Score	Category Assessment
Energy supply	C	There are some energy resources available, and the T&D system can accommodate a moderate level of new interconnections. While there are several announced projects that can provide meaningful contributions to the energy supply, they may face challenges that could impact their timely execution.
Energy system	C	Energy system demonstrates mixed capacity and reliability, with interconnection timelines facing minor delays. New projects unlikely to be completed, but announced projects, if completed, will be available on target. Some efforts are in place to improve transmission planning. Moderately supportive regulatory environment allows large-load interconnection, with some risk of delays.
Supporting inputs	D	Supporting inputs are limited, with existing infrastructure and resources falling short of requirements for large-scale data centers. Processes for securing necessary approvals and resources are slow and cumbersome, creating challenges for development and expansion efforts.
Environmental considerations	B	Environmental landscape is generally favorable for data center operations, with ample resources and a supportive regulatory environment. Natural disaster risks are manageable, and the climate zone allows for efficient cooling needs. Air quality is acceptable, and the area has no EPA restrictions, making it suitable for large-scale development.

Category	Score	Category Assessment
Governance considerations	C	Governance landscape presents moderate challenges for large-scale data center development. Idaho Power holds an investment-grade credit rating with a very credit supportive regulatory environment, though the surrounding Owyhee County community carries an at-risk economic profile, requiring proactive stakeholder outreach. Idaho's relatively small grid capacity (~6.5 GW) means a 1-GW load addition could meaningfully stress local power markets and affect electricity pricing. Energy burden for county residents sits in the midrange at ~3.8% of income, posing some affordability sensitivity. Overall, while the utility regulatory framework is sound, community economic conditions and grid-scale constraints warrant careful engagement and mitigation planning.
Land	2,180 acres	More than the 500–800 acres typically needed to site a 1-GW data center.

Table C.3. Fort Sandoval Evaluation Scores, by Category with Assessment Narrative

Category	Score	Category Assessment
Energy supply	A	There is much abundant solar energy for BTM generation. In addition, other energy sources are available, and the T&D system can accommodate a moderate level of new interconnections. While there are several announced projects that can provide meaningful contributions to the energy supply, they may face challenges that could impact their timely execution.
Energy system	D	Energy system faces considerable challenges, with average interconnection times facing large delays and minimal stakeholder engagement. New generation projects are unlikely to be available in the near term, and announced projects will face delays. Regulatory processes are reactive, leading to inefficiencies and delays in addressing future energy demands. While some capacity exists, it is insufficient to support large-scale operations.
Supporting inputs	C	Some inputs are supportive of data center development, while other inputs are restrictive. Processes may not be fully efficient or effective. Some progress has been made in addressing resource needs, but challenges in at least two of land, water, workforce or costs remain.
Environmental considerations	D	Environmental considerations present notable challenges, with limited resources and infrastructure available to support data center operations. The area may experience some natural disaster risks, and regulatory frameworks are not conducive to efficient development. There are concerns regarding air quality, and cooling needs may be elevated due to the climate zone, impacting operational efficiency.
Governance considerations	C	Governance landscape requires careful risk management before large-scale development can proceed. [Public Service Company of New Mexico]/Avangrid's "Credit Negative Watch" designation reflects meaningful regulatory uncertainty tied to a pending acquisition, introducing potential for delays in rate case proceedings and capital investment timelines. Grant County ranks in the distressed economic tier, though this also represents a compelling opportunity for transformative economic impact if community benefits are structured appropriately. New Mexico's modest grid size (~9 GW) produces a high impact ratio of 0.095, raising legitimate concerns around grid saturation and upstream price effects for existing ratepayers. Compounding this, Grant County's energy burden of ~4.7% of income is among the highest in the state, leaving residents with limited capacity to absorb any rate increases. Overall, while the economic development upside is real, utility regulatory instability and affordability pressures demand a deliberate, community-forward approach.
Land	856 acres	More than the 500–800 acres typically needed to site a 1-GW data center.

Appendix D. Public-Private Partnership Guidelines

This appendix includes a set of AI-generated PPP guidelines from the results of this report. We generated these guidelines generated through prompting an internal AI tool with the following:

> Hello, please review the following report, on locating data centers on federal lands. Please generate a list of guidelines for PPPs (public-private partnerships) for AI data center development, as a function of phase of project and collect guidelines into topics.
>
> It might be helpful to structure this by phase, topic, guideline, and why it matters.

Table D.1 is the list generated by the internal AI tool in response to our prompt.

Table D.1. AI-Generated List of Public-Private Partnership Guidelines

Phase	Topic	Guideline	Why It Matters
1: Pre-Development & Site Screening	Energy Assessment	Conduct a formal energy suitability screening using a multi-criteria framework (energy supply, energy system, supporting inputs, environmental considerations, governance) before offering any site for lease.	The report finds that 60% of DOE sites but only 20% of DOW sites have no serious energy capacity challenges. Screening prevents offering sites that will fail to attract bidders or stall during development.
1: Pre-Development & Site Screening	Energy Assessment	Treat energy availability, interconnection capacity, and generation co-location potential as primary site selection criteria rather than downstream implementation constraints.	Evidence from prior federal infrastructure initiatives (BLM renewables, 5G) shows that grid interconnection constraints are persistent challenges; addressing them early prevents cascading delays.
1: Pre-Development & Site Screening	Energy Assessment	Assess sites against multiple generation technology scenarios (grid, gas, geothermal, solar+battery) to understand cost-effectiveness under different assumptions.	The cost model shows no single site robustly dominates under all scenarios; rankings vary by technology, scale, and discount rate. Understanding this range upfront informs realistic expectations.
1: Pre-Development & Site Screening	Energy Assessment	Evaluate the levelized cost of energy, cost per MW of firm generation, time-to-firm-power-delivery, grid interconnection feasibility, and infrastructure readiness for each candidate site.	These metrics directly determine whether a site can meet the Ratepayer Protection Pledge while remaining commercially viable for developers.
1: Pre-Development & Site Screening	Energy Assessment	Assess whether sites can support collocated generation, particularly at scales above 500 MW, where grid-only approaches become less cost-effective.	The cost model demonstrates that sites reliant on grid power become less cost-effective at larger loads because market premiums and

Phase	Topic	Guideline	Why It Matters
			transmission/distribution infrastructure costs compound.
1: Pre-Development & Site Screening	Land & Physical Suitability	Verify that offered land meets minimum acreage requirements (≥1,000 acres for a 1-GW facility, or ≥500–800 acres for smaller scales).	Six of twelve DOW sites analyzed do not meet the 1,000-acre minimum for 1 GW. Insufficient land was a barrier raised at all three workshop tables.
1: Pre-Development & Site Screening	Land & Physical Suitability	Document and disclose prior military use, unexploded ordnance risks, and environmental contamination history of offered land.	Army RFLP FAQs show eight land-related questions highlighting uncertainty about site conditions. Due diligence for ordnance adds cost and timeline.
1: Pre-Development & Site Screening	Land & Physical Suitability	Assess water availability and stress levels at each site as a primary screening criterion.	Water access was raised as a barrier by all three workshop discussion tables. Data centers require significant water for cooling, and several federal sites face uncertainty about availability.
1: Pre-Development & Site Screening	Stakeholder Identification	Identify all required stakeholders early, including: federal land authority, utilities, public utility commissions, state/local government, tribal representatives, community members, EPC firms, data center operators, legal counsel, national laboratories, and congressional delegation.	Workshop participants emphasized that effective partnerships require a broad cross-sector group from the outset. Missing stakeholders cause delays when issues surface later.
1: Pre-Development & Site Screening	Stakeholder Identification	Map regulatory jurisdictions and identify which agencies (federal, state, tribal, local) have authority over permitting, environmental review, water rights, and energy interconnection for each site.	The 5G and BLM renewable initiatives demonstrated that fragmented multi-agency coordination without a unified siting strategy leads to fragmented implementation and delays.
1: Pre-Development & Site Screening	Governance & Community Assessment	Evaluate state-level regulatory risk, community economic distress levels, market size, and electricity affordability for surrounding communities before site selection.	Non-Alaska DOW sites generally scored well on governance (B), while sites in states considering data center bans (e.g., South Carolina, Georgia) present higher regulatory risk.
1: Pre-Development & Site Screening	Governance & Community Assessment	Prefer sites where local government entities are incentivized to coordinate planning and where community economic conditions support transformative investment.	The report notes that favorable governance ratings increase the likelihood that local governments will actively facilitate the development process.
2: Procurement & RFLP Design	Energy Infrastructure in Solicitations	Structure RFLPs to treat energy infrastructure as a parallel and structurally integrated workstream alongside civil works and data center construction, not as a dependent sub-component.	Energy availability functions as a co-equal critical path constraint. Delays in power delivery independently govern schedule feasibility regardless of progress in other areas.
2: Procurement & RFLP Design	Energy Infrastructure in Solicitations	Require bidders to present phased ramp schedules and firm capacity delivery guarantees that explicitly link energy availability to compute deployment milestones.	This enables coordination at the proposal stage rather than introducing it as a post-award integration requirement, reducing sequential bottlenecks.

Phase	Topic	Guideline	Why It Matters
2: Procurement & RFLP Design	Energy Infrastructure in Solicitations	Clearly define electricity availability, grid capacity, natural gas infrastructure, and interconnection constraints in RFLP documentation.	Energy supply constitutes ~26% of all Army RFLP FAQ questions. Bidder uncertainty about energy provisioning reduces bid quality and participation.
2: Procurement & RFLP Design	Energy Infrastructure in Solicitations	Require bidders to describe financing structures and mechanisms for meeting the Ratepayer Protection Pledge (ensuring data center energy costs are not passed to consumers).	All sites require considerable energy investment. Without clarity on how the no-rate-increase pledge will be met, projects risk political backlash and litigation.
2: Procurement & RFLP Design	Process Clarity & Information Sharing	Provide standardized examples of acceptable in-kind compensation structures across sites to improve bid comparability.	Five Army FAQ questions focused on in-kind rent preferences, indicating demand for more explicit articulation of acceptable compensation structures.
2: Procurement & RFLP Design	Process Clarity & Information Sharing	Clearly specify site access logistics, security checkpoint requirements, and their implications for construction sequencing.	Five site access questions in Army FAQs reflect the importance of logistics and security constraints. Responses confirm bypass routes reduce delays.
2: Procurement & RFLP Design	Process Clarity & Information Sharing	Delineate utility engagement pathways and identify counterparties responsible for energy provisioning and infrastructure coordination.	Three utility financing questions indicate bidder uncertainty about who is responsible for what.
2: Procurement & RFLP Design	Process Clarity & Information Sharing	Publish pre-RFLP site characterization data including grid distance, substation proximity, gas pipeline proximity, water availability assessments, and land condition reports.	This reduces duplicative due diligence costs for multiple bidders and increases the quality and number of bids received.
2: Procurement & RFLP Design	Competitive Process Design	Allow sufficient response time for RFLPs given the complexity of energy infrastructure planning (avoid compressed timelines like the 24-day window in the Army RFLP).	Complex energy and generation planning for GW-scale facilities requires substantial engineering analysis that cannot be compressed without sacrificing quality.
2: Procurement & RFLP Design	Competitive Process Design	Recognize that multiple sites may be suitable for development using different generation types; avoid approaches that concentrate all investment on a small selection of sites.	The cost model shows no site that robustly dominates all others. A distributed buildout approach is more resilient to changing assumptions.
3: Agreement Structuring & Contracting	Financial Structure & Risk Allocation	Specify how cost overruns, delays, and changing infrastructure needs will be shared between public and private partners.	Workshop participants identified financial structure and risk allocation as a core PPP consideration. Without clarity, disputes delay projects.
3: Agreement Structuring & Contracting	Financial Structure & Risk Allocation	Incorporate revenue-sharing or community-benefit mechanisms (e.g., approaches that reduce local utility costs or return value to affected communities).	Sites with high energy burden (e.g., Grant County, NM at ~4.7%) leave residents with limited capacity to absorb rate increases. Community benefits build political support.

Phase	Topic	Guideline	Why It Matters
3: Agreement Structuring & Contracting	Financial Structure & Risk Allocation	Integrate DOE grants, federal infrastructure funding streams, and concessional financing into PPP structures wherever possible.	This improves project feasibility without placing the full financial burden on private developers or ratepayers, consistent with the Ratepayer Protection Pledge.
3: Agreement Structuring & Contracting	Financial Structure & Risk Allocation	Address cost-of-capital sensitivity in contract structures, particularly for sites relying on capital-intensive generation (e.g., geothermal).	The cost model shows that cost of capital has a large impact on mid-ranked sites; geothermal sites decrease in cost efficiency as discount rates increase.
3: Agreement Structuring & Contracting	Financial Structure & Risk Allocation	Include provisions for phased investment tied to demand materialization to manage the risk of overcapacity and stranded assets.	The report identifies risk of overcapacity and stranded assets as a real possibility given uncertainty in future AI demand.
3: Agreement Structuring & Contracting	Energy Responsibilities	Clearly define responsibilities for energy supply and generation: who procures, finances, and develops resources (solar, geothermal, gas, nuclear); how parties manage multi-year ramp-up to full electrical load.	Workshop participants consistently emphasized this as a critical PPP element. Ambiguity about energy responsibilities is the single largest source of project risk.
3: Agreement Structuring & Contracting	Energy Responsibilities	Specify bridge power arrangements for the transition period between construction start and full grid/generation availability.	Bridge power refers to temporary sources during transition; without clear arrangements, projects face gaps between compute readiness and power availability.
3: Agreement Structuring & Contracting	Energy Responsibilities	Define backup generation obligations, including requirements to cover grid outages (based on local SAIDI metrics) and potential future fault-ride-through mandates.	The cost model includes backup generation based on expected outage minutes. Reliability is critical for frontier AI training workloads.
3: Agreement Structuring & Contracting	Long-Term Design & Flexibility	Design agreements for long time horizons (10+ years) while remaining flexible enough to accommodate technology refresh, changing operational requirements, and phased infrastructure buildout.	Workshop participants consistently emphasized this consideration. AI hardware cycles are 2-3 years; energy infrastructure lasts decades. Misalignment creates friction.
3: Agreement Structuring & Contracting	Long-Term Design & Flexibility	Plan for the full asset lifecycle, including decommissioning and retirement, with end-of-life obligations and associated costs explicitly allocated between partners.	Without explicit allocation, decommissioning costs become unresolved liabilities that complicate project finance and create environmental risk.
3: Agreement Structuring & Contracting	Long-Term Design & Flexibility	Include provisions for alternative use of data center infrastructure or other stranded asset management mechanisms.	The report identifies stranded asset risk as warranting further research; contracts should anticipate this scenario.
3: Agreement Structuring & Contracting	Security Obligations	Specify both cybersecurity and physical security roles and responsibilities in contracts, especially for federal land with sensitive operations or classified computing.	Workshop participants flagged security as a particularly strong concern. The Day After exercise revealed that physical attacks on AI infrastructure are considered inevitable.

Phase	Topic	Guideline	Why It Matters
3: Agreement Structuring & Contracting	Security Obligations	Include requirements for anti-drone technology, perimeter hardening, and pre-defined emergency response plans.	The Day After scenario demonstrated that drone incursions and potential industrial espionage are plausible near-term threats to data center sites.
3: Agreement Structuring & Contracting	Security Obligations	Require compliance with DOE cybersecurity strategy and CISA frameworks for critical infrastructure protection.	Data centers on federal land hosting frontier AI represent high-value targets; security standards must reflect this.
3: Agreement Structuring & Contracting	Community & Environmental Commitments	Codify environmental and community mitigation strategies in the contract itself so commitments remain enforceable throughout the partnership's life.	When conflicts are left unresolved post-approval, projects escalate from siting disputes into overlapping opposition, litigation, and political backlash.
3: Agreement Structuring & Contracting	Community & Environmental Commitments	Build workforce and community development commitments directly into agreements, including local hiring, training pipelines, and community support measures.	These provisions strengthen public acceptance and political support, reducing the risk of opposition campaigns.
3: Agreement Structuring & Contracting	Community & Environmental Commitments	Establish Community Benefits Agreements (CBAs) with specific, measurable commitments regarding ratepayer impacts, water use, air quality, and economic benefits.	The Day After exercise showed that inadequate CBAs become focal points for opposition and litigation.
4: Permitting & Environmental Review	NEPA & Regulatory Compliance	Develop clear guidance on NEPA applicability and process for data centers on federal lands, including categorical exclusions where appropriate.	The report identifies "limited understanding of the NEPA process in the context of federal lands" as a persistent challenge from prior infrastructure initiatives.
4: Permitting & Environmental Review	NEPA & Regulatory Compliance	Conduct environmental, cultural, and tribal resource assessments early and resolve conflicts before federal approval, not after.	The Day After exercise demonstrated that unresolved conflicts post-approval rapidly escalate into multi-front legal, political, and security crises.
4: Permitting & Environmental Review	NEPA & Regulatory Compliance	Address EPA nonattainment zone restrictions in site selection; avoid sites with multiple NAAQS pollutant violations for gas generation.	The cost model marks gas generation as infeasible at sites with existing EPA restrictions. Several DOW sites (Edwards AFB with 6 pollutants) face this constraint.
4: Permitting & Environmental Review	NEPA & Regulatory Compliance	Coordinate permitting across federal, state, and local agencies through a single point of accountability to prevent fragmented implementation.	Prior initiatives (5G, BLM renewables) demonstrate that absence of unified coordination leads to delays even when individual agencies make progress.
4: Permitting & Environmental Review	Accelerated Timelines	Establish clear top-down priorities for data center projects to avoid competing objectives and tradeoffs that caused delays in prior federal land initiatives.	BLM renewable programs "attempted to achieve multiple goals and objectives resulting in project tradeoffs and delays."
4: Permitting & Environmental Review	Accelerated Timelines	Develop standardized performance metrics for deployment timelines and firm capacity delivery to track program effectiveness.	Absence of such metrics in prior renewable energy programs made it difficult to track effectiveness and identify bottlenecks.

Phase	Topic	Guideline	Why It Matters
4: Permitting & Environmental Review	Accelerated Timelines	Pre-align physical and regulatory dependencies before issuing RFLPs to enable rapid post-award progression.	The 5G experience showed co-location on federal lands is effective "when physical and regulatory dependencies are pre-aligned."
5: Construction & Energy Deployment	Energy Infrastructure Delivery	Treat energy system construction as a parallel critical path alongside facility construction, with independent milestones and accountability.	Industry benchmarks suggest 1-3.6 years from construction start to 1-GW facility power; energy delays independently govern schedule.
5: Construction & Energy Deployment	Energy Infrastructure Delivery	Plan for turbine and transformer procurement lead times (up to 7 years for gas turbines; critical shortages for large power transformers).	The report notes current equipment shortages. Only ~10% of large transformers are manufactured domestically. Supply chain constraints were raised by 2 of 3 workshop tables.
5: Construction & Energy Deployment	Energy Infrastructure Delivery	Size gas generation in modular increments (e.g., 120 MW combined-cycle turbines) with n+1 redundancy consistent with Tier IV standards.	Modular deployment enables phased energization aligned with compute deployment, reducing stranded capacity risk.
5: Construction & Energy Deployment	Energy Infrastructure Delivery	Plan transmission line construction early; distance to nearest ≥140kV line is a primary cost driver (~$3M/mile for HVDC).	The cost model shows transmission costs scale significantly with distance and can make otherwise suitable sites prohibitively expensive.
5: Construction & Energy Deployment	Workforce	Assess local workforce availability for both construction and operations; budget for relocation costs (up to $30,000/worker) where local labor is insufficient.	Workforce availability varies significantly: sites with grade E availability may need 75% of workforce relocated. This was a barrier at 2 of 3 workshop tables.
5: Construction & Energy Deployment	Workforce	Develop regional workforce development programs aligned with generation technology strategy (e.g., geothermal skills for Rocky Mountain sites, gas turbine skills for Texas).	The report recommends supporting state government planning that targets specific approaches (e.g., "geothermal AI strategy for Rocky Mountains").
5: Construction & Energy Deployment	Workforce	Account for wage differentials across regions in project budgets; labor costs can range from $28/hr to $45/hr depending on location and availability.	The cost model uses region-specific wage data that materially affects total project costs and relative site rankings.
5: Construction & Energy Deployment	Supply Chain Management	Develop procurement strategies that account for critical equipment constraints (transformers, switchgear, control systems) and identify domestic vs. foreign-sourced components.	Workshop participants (2/3 tables) identified supply chain constraints as barriers: only ~10% of large transformers made domestically, and foreign-sourced components create security risks.
5: Construction & Energy Deployment	Supply Chain Management	Consider rail access as a factor in equipment delivery planning, particularly for large transformers and heavy generation equipment.	Several sites have rail access noted in their evaluations; this logistical advantage matters for equipment that cannot be transported by road.
6: Operations & Maintenance	Energy Management	Establish clear operational protocols for managing multi-source energy supply (grid + collocated generation + storage)	Most sites will require a combination of grid and collocated generation; operational coordination between

Phase	Topic	Guideline	Why It Matters
		including dispatch priorities and curtailment procedures.	these sources is essential for reliability.
6: Operations & Maintenance	Energy Management	Monitor and report on compliance with the Ratepayer Protection Pledge throughout operations, including tracking any upstream rate impacts.	The pledge is a political commitment with ongoing monitoring implications. Failure creates political backlash and threatens the broader federal data center program.
6: Operations & Maintenance	Energy Management	Plan for fuel supply continuity (natural gas pipeline access, storage, or alternatives like LNG trucking) for collocated generation.	Gas supply reliability is essential for sites using collocated gas generation, which the model identifies as optimal for many large-scale sites.
6: Operations & Maintenance	Security Operations	Maintain continuous physical security monitoring including anti-drone capabilities and coordinate with federal law enforcement on threat response.	The Day After exercise concluded that a physical attack on AI infrastructure is "when, not if." Participants said the industry has not taken physical/cyber security seriously enough.
6: Operations & Maintenance	Security Operations	Implement cybersecurity frameworks appropriate for critical infrastructure, with regular assessment and updates.	Federal land proximity to sensitive operations and the strategic value of frontier AI models make these facilities high-value targets for state actors.
6: Operations & Maintenance	Security Operations	Develop pre-defined emergency response plans drawing on experience from nuclear facility and military drone incident protocols.	Workshop participants called for task forces drawing on nuclear and military experience for AI infrastructure protection.
6: Operations & Maintenance	Community Relations	Maintain ongoing community engagement and transparently report on environmental impacts (air quality, water use, noise) and community benefit delivery.	The Day After exercise showed that opposition campaigns can be manufactured or amplified by adversaries; proactive engagement reduces vulnerability to such campaigns.
6: Operations & Maintenance	Community Relations	Monitor and mitigate public health impacts from power generation near installations, including potential effects on military families and personnel.	The report notes DOW may wish to consider health impacts to employees and families from nearby power generation, including Tricare cost implications.
7: Decommissioning & End of Life	Asset Retirement	Explicitly allocate decommissioning obligations and costs between public and private partners at contract execution, not end of life.	Workshop participants stressed planning for full asset lifecycle so end-of-life obligations don't become unresolved disputes.
7: Decommissioning & End of Life	Asset Retirement	Establish financial assurance mechanisms (bonds, escrow, insurance) to cover decommissioning costs regardless of developer financial condition at end of term.	10+ year timeframes mean developer financial situations may change; the public partner needs assurance that sites will be properly remediated.
7: Decommissioning & End of Life	Asset Retirement	Define site restoration standards and timelines, including removal of generation equipment, transmission infrastructure, and cooling systems.	Federal land must be returned in acceptable condition; standards defined upfront prevent disputes at project end.
7: Decommissioning & End of Life	Transition Planning	Include provisions for transfer of energy infrastructure to the federal facility or local utility if it has	Gas pipelines, transmission lines, and substations may have value for the

Phase	Topic	Guideline	Why It Matters
		ongoing value beyond the data center's operational life.	installation or community beyond the PPP term.
7: Decommissioning & End of Life	Transition Planning	Plan for potential alternative uses of data center facilities (e.g., government computing, other commercial use) rather than assuming demolition.	The report identifies research into alternative uses as a priority given stranded asset risk from uncertain AI demand trajectories.
Cross-Cutting (All Phases)	Coordination & Governance	Establish a single interagency coordination body for each project to manage dependencies across federal agencies, utilities, state regulators, and local authorities.	Prior initiatives (5G, BLM, space launch) all suffered from fragmented coordination despite individual agency progress.
Cross-Cutting (All Phases)	Coordination & Governance	Ensure early communication and mutual understanding between all organizations before formal partnership agreements.	The Federal Spaceport experience specifically identified early communication as "essential for partnerships to be successful."
Cross-Cutting (All Phases)	Coordination & Governance	Develop accurate cost calculation and recovery mechanisms for commercial use of federal infrastructure.	The space launch experience showed the government "struggles in their ability to accurately calculate" costs for commercial use of federal assets.
Cross-Cutting (All Phases)	Transparency & Information Sharing	Increase information sharing between public and private partners regarding risks, constraints, timelines, workforce needs, and contractual obligations.	The report's core PPP recommendation is to "increase information sharing" to facilitate how government and private organizations work together.
Cross-Cutting (All Phases)	Transparency & Information Sharing	Share data on grid interconnection queues, planned infrastructure investments, and regulatory timelines with potential developers during pre-RFLP stages.	Better data sharing was identified in the space launch context as helping "streamline property access and safety reviews."
Cross-Cutting (All Phases)	Resilience & Adaptability	Design for distributed and decentralized AI and energy infrastructure to reduce systemic vulnerability at any single site.	Workshop participants pushed toward more decentralized infrastructure to reduce systemic vulnerability. Policy should support multiple suitable sites.
Cross-Cutting (All Phases)	Resilience & Adaptability	Build flexibility into agreements to accommodate policy shifts, technology changes, and evolving security requirements over 10+ year timeframes.	The BLM renewable experience shows that political uncertainty (revoked tax credits, cancelled loans) "hindered private sector investment" with $22B in cancelled projects.
Cross-Cutting (All Phases)	Resilience & Adaptability	Establish contractual mechanisms to manage the risk of shifting federal priorities across administrations.	Prior infrastructure initiatives demonstrate that multi-year investments face political landscape risks that concern investors.

NOTE: All the quoted material in this table came from this report before it was edited; thus, there might be some slight differences between the quoted material in this table and the source text in the main report.
CISA = Cybersecurity and Infrastructure Security Agency; EPC = engineering-procurement-construction; LNG = liquefied natural gas.

Abbreviations

AFB	Air Force base
AI	artificial intelligence
BA	Balancing Authority
BLM	Bureau of Land Management
BLS	U.S. Bureau of Labor Statistics
BTM	behind-the-meter
capex	capital expenditure
DAF	U.S. Department of the Air Force
DCI	Distressed Communities Index
DOA	U.S. Department of the Army
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DON	U.S. Department of the Navy
DOW	U.S. Department of War
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
ERCOT	Electricity Reliability Council of Texas
FCC	Federal Communications Commission
FRED	Federal Reserve Economic Data
GETEM	Geothermal Electricity Technology Evaluation Model
HVDC	high-voltage direct current
ISO	independent system operator
JB	joint base
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NETL	National Energy Technology Laboratory
NRI	National Risk Index
NTIA	National Telecommunications and Information Administration
opex	operating expenditure
PPP	public-private partnership
PUC	public utilities commission
RFI	request for information
RFLP	request for lease proposal
RRC	Railbelt Reliability Council

RTO	regional transmission organization
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
PV	photovoltaic
T&D	transmission and distribution

Glossary

Available capacity is the total power output, expressed in GW, that is readily accessible for consumption at any given time.

Behind-the-meter refers to energy systems located on the customer's side of the utility meter. These systems generate, store, or manage electricity without passing through the meter that measures power consumption from the grid. The term *behind-the-meter* contrasts with *front-of-the-meter*, which refers to electricity that comes from the public grid and passes through the utility meter before reaching the consumer.

Bridge power refers to a temporary power source used to support a system during a transition period, such as power grid buildup or power grid maintenance.

Firm or dispatchable power refers to power-producing capacity that is guaranteed to always be available (firm) or can be turned on or off or adjusted on demand during normal operating conditions (dispatchable

Front-of-the-meter refers to energy systems that are connected to the utility grid and supply electricity to a broad area, typically including large-scale generation and storage facilities.

Independent system operator refers to both *ISOs* and *regional transmission organizations* (*RTOs*) in this report. ISOs comprise the six Federal Energy Regulatory Commission's jurisdictional RTOs—New York ISO, New England ISO, California ISO, Midcontinent ISO, PJM Interconnection, and Southwest Power Pool—along with ERCOT. They operate and run the regional electric transmission grid, ensuring transmission access, planning, operation, and the dispatch of energy. As of 2023, seven ISOs/RTOs managed energy and capacity markets for more than two-thirds of the United States. They also oversee reliability planning and short-term system reliability.

Nameplate capacity is the maximum theoretical output of a power generation facility as specified by the manufacturer (typically expressed as P_{max}). It represents the highest level of power the facility can produce under ideal conditions, without accounting for maintenance, fuel availability, or operational limitations.

Region refers to an ISO or non-ISO region.

Regional transmission organizations operate transmission systems and develop innovative procedures for equitable transmission management. We use ISO for both ISOs and RTOs in this report.

Resource refers to a type of generation or storage, typically associated with specific technology and fuel types. For instance, *solar* refers to solar PV or thermal technologies, while *gas* encompasses simple-cycle and combined-cycle technologies that use gas as a fuel.

Resource adequacy refers to the ability of a power system to supply enough electricity to meet its reliability target during all hours of the year. It requires system planners to ensure that the mix of resources can meet demand during periods of high system stress. Integrating intermittent resources and storage is challenging because of their dependence on the overall resource mix, season, and time of day.

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